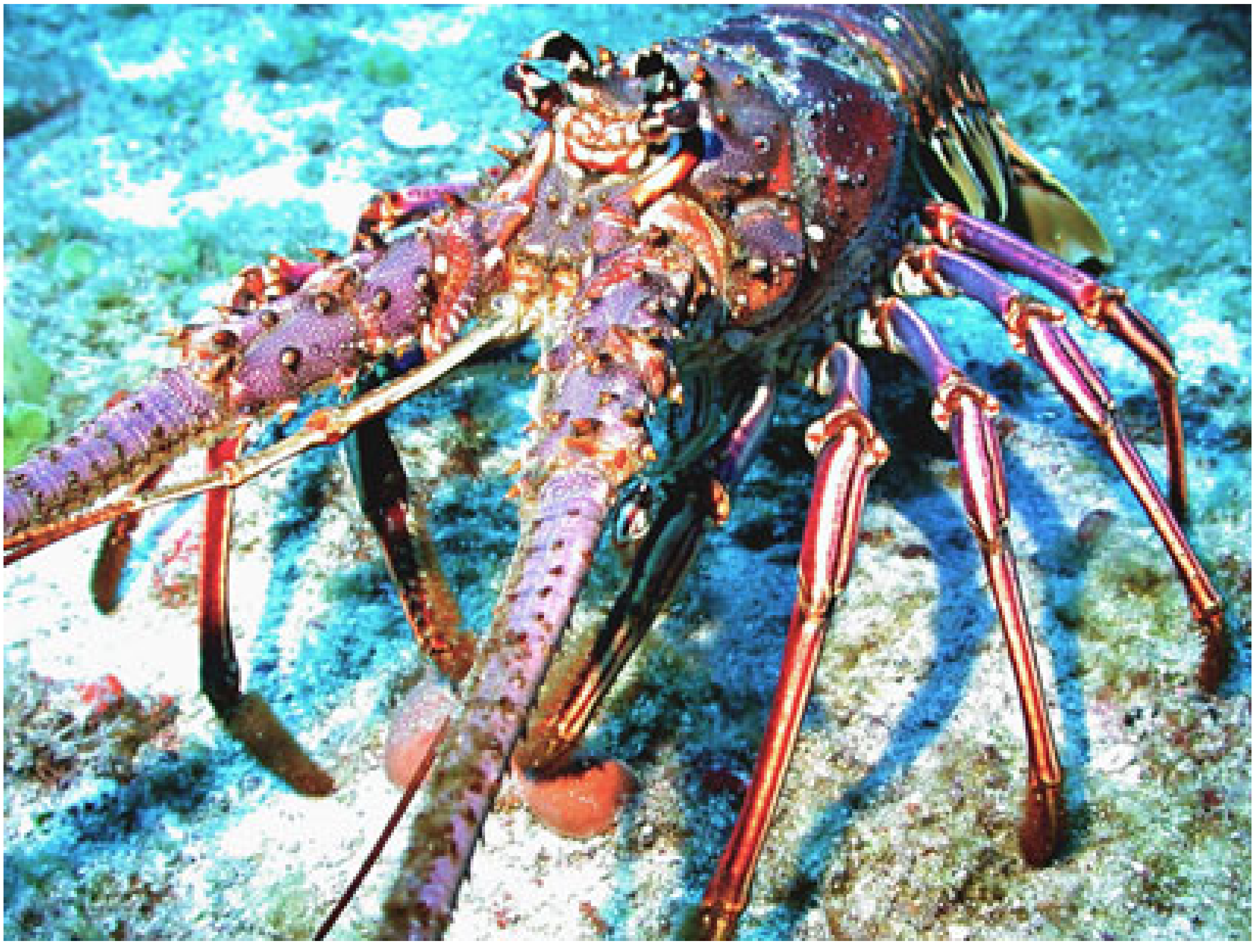

Amendment 11

to the Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and South Atlantic

Supplemental Environmental Impact Statement
Regulatory Flexibility Act Analysis
Regulatory Impact Review
December 2011

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Amendment 11 to the Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and South Atlantic Regions

INCLUDING A DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (DSEIS), REGULATORY IMPACT REVIEW (RIR), REGULATORY FLEXIBILITY ACT ANALYSIS (RFA)

Proposed actions:	Establish trap line marking requirements and closed areas to protect *Acropora* spp. coral species.
Lead agency:	FMP Amendment – Gulf of Mexico and South Atlantic Fishery Management Councils SEIS - NOAA Fisheries Service

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Abbreviations and Acronyms used in this Document

APA	Administrative Procedure Act
B_{MSY}	biomass at MSY
Bi Op	biological opinion
CEA	Cumulative Effects Analysis
CEQ	Council on Environmental Quality
CFMC	Caribbean Fishery Management Council
CFR	Code of Federal Regulations
Councils	Gulf of Mexico Fishery and South Atlantic Management Councils
CZMA	Coastal Zone Management Act
DQA	Data Quality Act
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
ESA	Endangered Species Act
FAC	Florida Administrative Code
FIS	Fishery Impact Statement
FKNMS	Florida Keys National Marine Sanctuary
FMP	fishery management plan
FTT	Florida trip ticket
FWC	Florida Fish and Wildlife Conservation Commission
FWS	United States Fish and Wildlife Service
GC	general counsel
GMFMC	Gulf of Mexico Fishery Management Council
Gulf	Gulf of Mexico
IRFA	initial regulatory flexibility analysis
M	instantaneous natural mortality rate
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
mp	million pounds
MRIP	Marine Recreational Information Program
MSY	maximum sustainable yield
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	Same as NMFS
OMB	Office of Management and Budget
PRA	Paperwork Reduction Act
RFA	Regulatory Flexibility Act
RIR	regulatory impact review
RO	Research Only area
SAC	Sanctuary Advisory Council

SAFMC	South Atlantic Fishery Management Council
SBA	Small Business Administration
Secretary	Secretary of Commerce
SEDAR	Southeast Data Assessment Review (stock assessment)
SEFSC	Southeast Fisheries Science Center of NMFS
SEIS	Supplemental Environmental Impact Statement
SoVI	Social Vulnerability Index
SPA	Sanctuary Preservation Area
SSC	Scientific and Statistical Committee
USCG	United States Coast Guard
VEC	valued environmental component
ww	whole weight

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Abstract

NOI for SEIS:	9/19/11 (76 FR 57957)
Public Hearings held:	______
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List of Preferred Alternatives

Executive Summary

The spiny lobster Fishery Management Plan is jointly managed by the Gulf and South Atlantic Fishery Management Councils (Councils). The purpose of this amendment is to ensure the spiny lobster Fishery Management Plan meets the requirements of the Endangered Species Act which provides protection to threatened and endangered species. The regulations are expected to be implemented in 2012.

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 recommends 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

BACKGROUND

What Actions Are Being Proposed?

The Councils are considering 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 (nm) off most states, but 9-200 nm 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 Commerce. NOAA Fisheries Service is an agency in the National Oceanic and Atmospheric Administration.

Why are the Councils Considering 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 Spiny Lobster 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 Florida 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 ~~to address Endangered Species Act concerns for~~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 *Acroproa* spp. occur and in water depths less than 30 meters (96 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.

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

Alternative 4: Create new closed areas of the EEZ off the Florida Keys consisting of identified *Acropora* spp. colonies with a 500 ft buffer surrounding each colony.
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.

Overview
The Endangered Species Act (ESA) requires analyses to determine whether or not fishing operations impact threatened species including threatened and endangered 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 all lobster fishing 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. Council and NOAA Fisheries Service staffs worked with various stakeholders to develop the proposed closed areas in 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. **Alternative 3** 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. **Alternative 4** would provide about the same biological benefit to *Acropora* spp. colonies as **Alternative 3**. **Option b** under each alternative would provide greater benefits to the biological environment than **Option a** because all potential damage from fishing would be eliminated.

Economic Impacts
Alternative 2 would close approximately 71 mi^2 to fishing for spiny lobster. If all of this area is currently used for fishing, landings of spiny lobster would be reduced by 0.329 million pounds, and vessel gross revenue would be reduced by $1.88 million. This represents 14% of the total for vessel gross, enough to suggest changes in fishing behavior. However, most of the area that would be closed under **Alternative 2** is not regularly utilized for lobster fishing. Therefore, the true economic impacts will be less than stated here because much of the proposed closed areas are not fishable.

Alternative 3 would create smaller closed areas of hardbottom. The 4.107 mi^2 contains identified *Acropora* spp. colonies with straight-line boundaries. If all of this area is currently used for fishing, **Alternative 3, Option b** would reduce landings of spiny lobster by 5.6%, or 18,500 pounds gross revenue, and the economic impact would be $105,877 in terms of foregone trip gross revenue. **Alternative 3, Option a** would reduce spiny lobster landings by 18,166 pounds, and trip gross revenue would be reduced by $103,134. As stated for **Alternative 2**, not all areas that would be closed under **Alternative 3** are considered fishable area, so economic impacts would likely be less than stated here. **Alternative 4** is approximately the same area as **Alternative 3** and therefore, the impacts would be the same.

Social Impacts
In general, positive social effects from the proposed closed areas under **Alternatives 2-4** will generate from biological benefits of protecting the elkhorn and staghorn coral. As components of the marine environment, these corals are part of the ecosystem in which spiny lobster live. 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 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.

Administrative Impacts
Alternatives that create new closed areas will 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. Law enforcement officials have indicated that buffers proposed under **Alternative 4** would be more difficult to enforce than straight-line boundaries proposed under **Alternative 3**. Further, officials stated **Option b** would be easier to enforce than **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

Gulf 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.

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 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 level and severity of those impacts.

Biological Impacts

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

The average number of lobster fishing vessels in the Florida EEZ is 271 and the postulated annual cost for on-going trap replacement is $0.462 million under **Alternative 1**, or 10.4% of the trip gross, $4.459 million. If trap lines needed to be replaced over the five-year phase in period, the annual economic impact of **Alternatives 2** and **3** would be $0.266 million. However, **Alternative 3** would allow use of current trap lines until they need to be replaced on the regular schedule, which could be longer. This represents the additional annual cost of trap line replacement over what is estimated for **Alternative 1.** The phase in period would reduce economic impacts from new line requirement.

Social Impacts

Overall, **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 **Alternative 1**. Additionally, the proposed measures 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 **Alternative 1**. However, impacts may increase under Alternative 1 if new regulations must be imposed on the spiny lobster fishery because of the inability to assign interactions with protected species to the another fishery.

Chapter 1. Introduction

This Supplemental Environmental Impact Statement (SEIS) 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 considered alternatives to meet these requirements 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 made clear they intend to quickly develop Amendment 11 to put these measures into place as required by the biological opinion (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.

Who's Who?

- NOAA Fisheries Service Protected Resources Division – analyzed data and drafted the biological opinion
- 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 will recommend action to NOAA Fisheries Service after receiving public comment
- Secretary of Commerce – Will approve, disapprove, or partially approve the amendment as recommended by the Councils

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 Bi Op stated that no portion of the spiny lobster fishery was likely to adversely affect ESA-listed marine mammals, Gulf sturgeon, or designated critical habitat for elkhorn and staghorn corals. However, the Bi Op determined the commercial spiny lobster trap sector of the spiny lobster fishery would adversely affect sea turtles, smalltooth

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.

sawfish, and elkhorn and staghorn corals, but would not jeopardize their continued existence. Other gears, including diving and bully nets, would not adversely affect any of these species.

An incidental take statement was issued for 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.

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, quantitative data on former distribution and abundance are scarce. 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 less than 97% (*Acropora* BRT 2005). Although this decline has been documented as on-going during in the late 1990s, and even in the past five years in some locations, local extirpations (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 contacting 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 history of amendments to the FMP can be found in Amendment 10 to the FMP.

Amendment 10, with Environmental Impact Statement, to be implemented in December 2011, makes the following changes in the management regime:

- Removes four species of lobster from federal management
- Establishes an annual catch limit, annual catch target, and accountability measures for Caribbean spiny lobster
- Requires 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 calculate

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. The following is a list of the changes made to the actions originally contained in Amendments 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, **Alternatives 3** and **4** are different in this amendment; they are 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 both alternatives result in an approximate 500 ft buffer between the corals and fishing activity, this distance is necessary to protect colonies.
- For Action 2, the alternatives are essentially the same except the phase in period has been extended from 2014 to 2017 and the color has been designated as white.

The Secretary of Commerce approved Amendment 10 on November 17, 2011.

Chapter 2. Management Alternatives

2.1 Action 1: Limit Spiny Lobster Fishing in Certain Areas in the Exclusive Economic Zone (EEZ) off Florida 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 ~~to address Endangered Species Act concerns for~~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 *Acroproa* spp. occur and in water depths less than 30 meters (96 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.

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

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.

Alternative 4: Create new closed areas of the EEZ off the Florida Keys consisting of identified *Acropora* spp. colonies with a 500 ft buffer surrounding each colony.

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: 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. 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.

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 of staghorn and elkhorn coral (*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 the help from state and federal agencies as well as other groups including: Florida Wildlife Research Institute, Florida Keys National Marine Sanctuary, Mote Marine Laboratory, The Nature Conservancy, University of North Carolina at Wilmington. Date from individual research scientists was also included. More information about the methods used to establish the baseline maps please see

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 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 coral nurseries[1] 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 the help of 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 not only are such areas also relatively rare in the Florida Keys, the conservation benefit 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 for listing under the ESA. The data available for those seven species generally indicated little co-occurrence between those species and elkhorn and staghorn corals.

Stakeholders also recommended considering area closures for "*Acropora* coral nurseries" because these areas are susceptible to the same trap impacts. Based on that input, five coral nurseries are proposed for inclusion in areas closures. These nurseries are areas whose sole purpose is to take legally collected *Acropora* spp. coral fragments, raise them to a transplantable size, and then use these corals in restoration efforts throughout the Florida Keys. All coral nursery permit holders working with *Acropora* spp. in the Florida Keys have prior permission for their activities from the Florida Keys National Marine Sanctuary (FKNMS) and their activities have undergone ESA consultation through NOAA Fisheries Service.

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 size 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 cm^2 could be

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[1] *Acropora* coral nurseries are permitted locations where small fragments of colonies are grown to sizes larger enough that they are suitable for transplanting in support of restoration/recovery activities. See http://coralrestoration.org/CRF/index.php?option=com_content&view=category&layout=blog&id=49&Itemid=91 for further discussion of *Acropora* nurseries in the Florida Keys

considered "super colonies." A similar distinction could be made for staghorn corals with a living tissue surface area of 500 cm^2.

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 and some of 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.

Concurrent to the development of this amendment, FKNMS is 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 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 species be reviewed every 5 years following listing. NOAA Fisheries and the Councils may wish to conduct periodic reviews of proposed closed areas to coincide with the 5-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 legally be in possession of spiny lobster when transiting a closed area.

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

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 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

Florida Fish and Wildlife Conservation Commission (FWC), Florida Keys Commercial Fishermen's Association, FKNMS, FKNMS Sanctuary Advisory Council (SAC), and members of environmental organizations.

Alternative 1would not meet the requirement established under the Bi Op. If the Councils ultimately decide to take no action, NOAA Fisheries would re-visit the issue to determine if implementing these measures under Magnuson-Stevens Fishery Conservation and Management Act or ESA authority is 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 for Alternatives 2-4 were required in the future.

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 is present to prohibit spiny lobster trap fishing. This will reduce the likelihood of spiny lobster traps affecting Acropora.

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 fishing 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 alternative[2], 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. to almost zero. **Alternative 2** would close approximately 71 mi^2 of the Florida EEZ. The negative social and economic impacts of **Alternative 2** are likely to be significant. Closing all hardbottom areas to trapping would significantly reduce the area available to trapping and may make trapping impractical.

The primary challenge with selecting closed areas is balancing benefits to the fishery and impacts to the environment. Relative to **Alternative 2**, **Alternatives 3** and **4** would be less biologically beneficial to *Acropora* spp. colonies, but would be less restrictive to fishermen. These two alternatives provide a reasonable buffer around *Acropora* spp. colonies without closing large areas of bottom suitable for trapping. Buffers are 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.

Alternative 3 would establish straight-line boxes around identified *Acropora* spp. colonies or groups of colonies that encompass approximately 500 ft of buffer. The boundaries of all the closed areas only 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

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[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."

amount of non-hardbottom (fishable) areas closed to fishing (see Appendix G for more detailed discussion of methods). **Alternative 3** would close approximately 6.7 mi^2, approximately 2.5 mi^2 of which is anticipated to be fishable (i.e., non-hardbottom) habitat. Under this alternative and combined with colonies already protected by FKNMS closed areas, approximately 6,791 colonies would be protected.

Alternative 4 would establish 500-ft diameter buffers around identified *Acropora* spp. colonies. Each colony would be designated by a single point, and fishermen would be responsible for remaining 500 ft from that point. This alternative was included because some fishermen indicated they would find it easier to enter the points in their navigation units than to keep track of boxes, as in **Alternative 3**. The area closed would be approximately 6.6 mi^2; all identified colonies would be protected, but unidentified colonies would not. Because some colonies are closer to each other than 500 ft, overlap of the buffers will occur. This overlap may cause some confusion to fishermen trying to determine what area is closed. In addition, enforcement officials have indicated that **Alternative 4** would be more difficult to enforce than **Alternative 3**.

The amount of fishing area closed under **Alternatives 3** and **4** is essentially the same, but the actual areas and colonies protected would differ somewhat. For example, under **Alternative 3**, some boxes would include fishable areas between colonies that are grouped together. On the other hand, some individual colonies included under **Alternative 4** would not be included under **Alternative 3** because they are isolated and the resulting box would be too small to be effective. See Figure 2.1.8 for both of these examples.

Option b under each alternative would provide slightly more biological benefit to *Acropora* spp. colonies than **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. Based on this literature it could be speculated that 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.

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.

Figures 2.1.1-13 show the proposed closed areas for **Alternatives 3-4** from west to east. Blue dots represent identified *Acropora* spp. colonies. Halos around those dots show the proposed 500-ft buffer (**Alternative 4**). Hash-marked boxes show the proposed straight-line closed areas (**Alternative 3**). In addition, hardbottom areas that would be closed under **Alternative 2** are shown on each map. Coordinates for the proposed closed areas under **Alternative 3** can be found in Appendix A.

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.

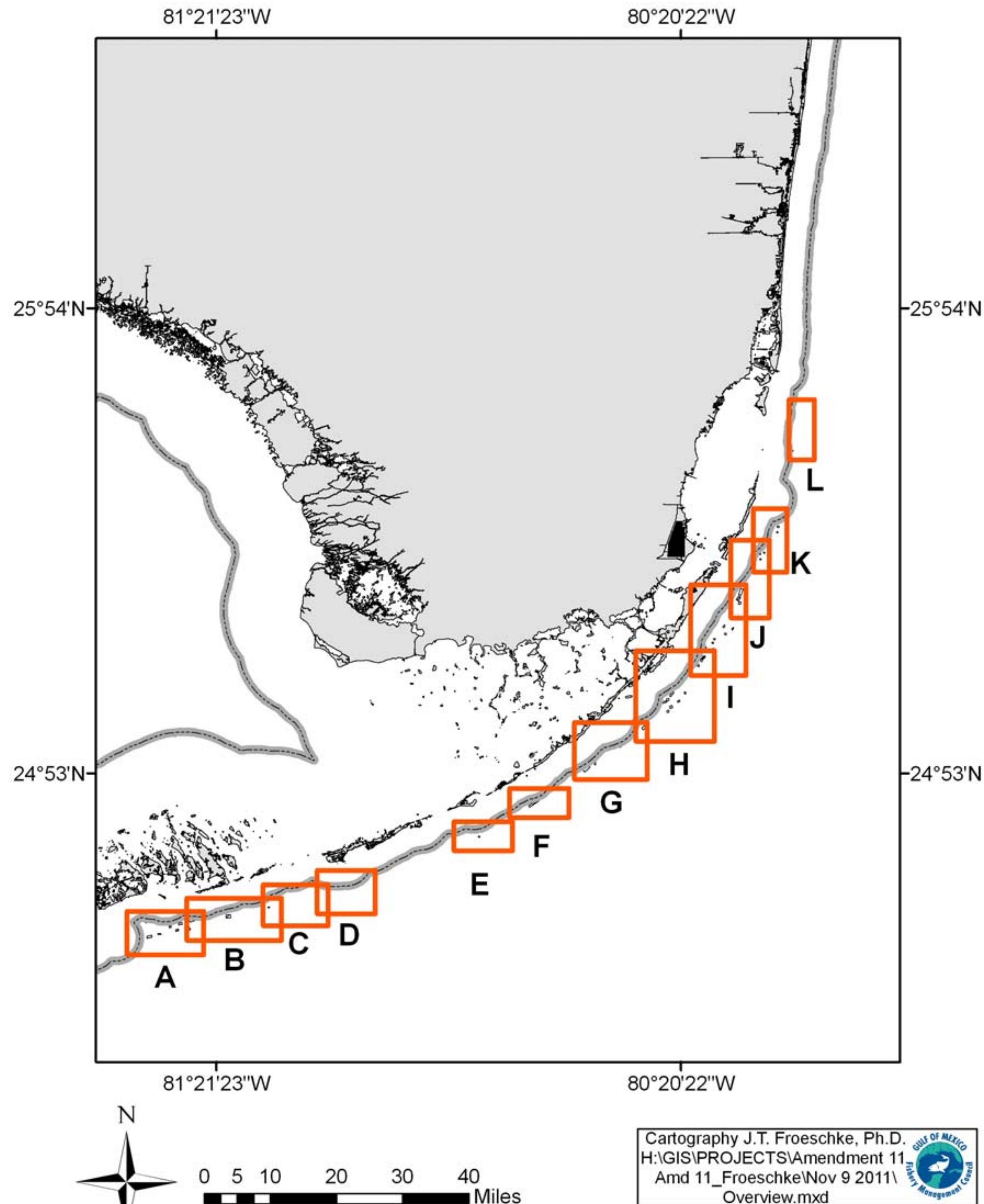

Figure 2.1.1. Overview of Florida Keys and maps showing proposed closed areas.

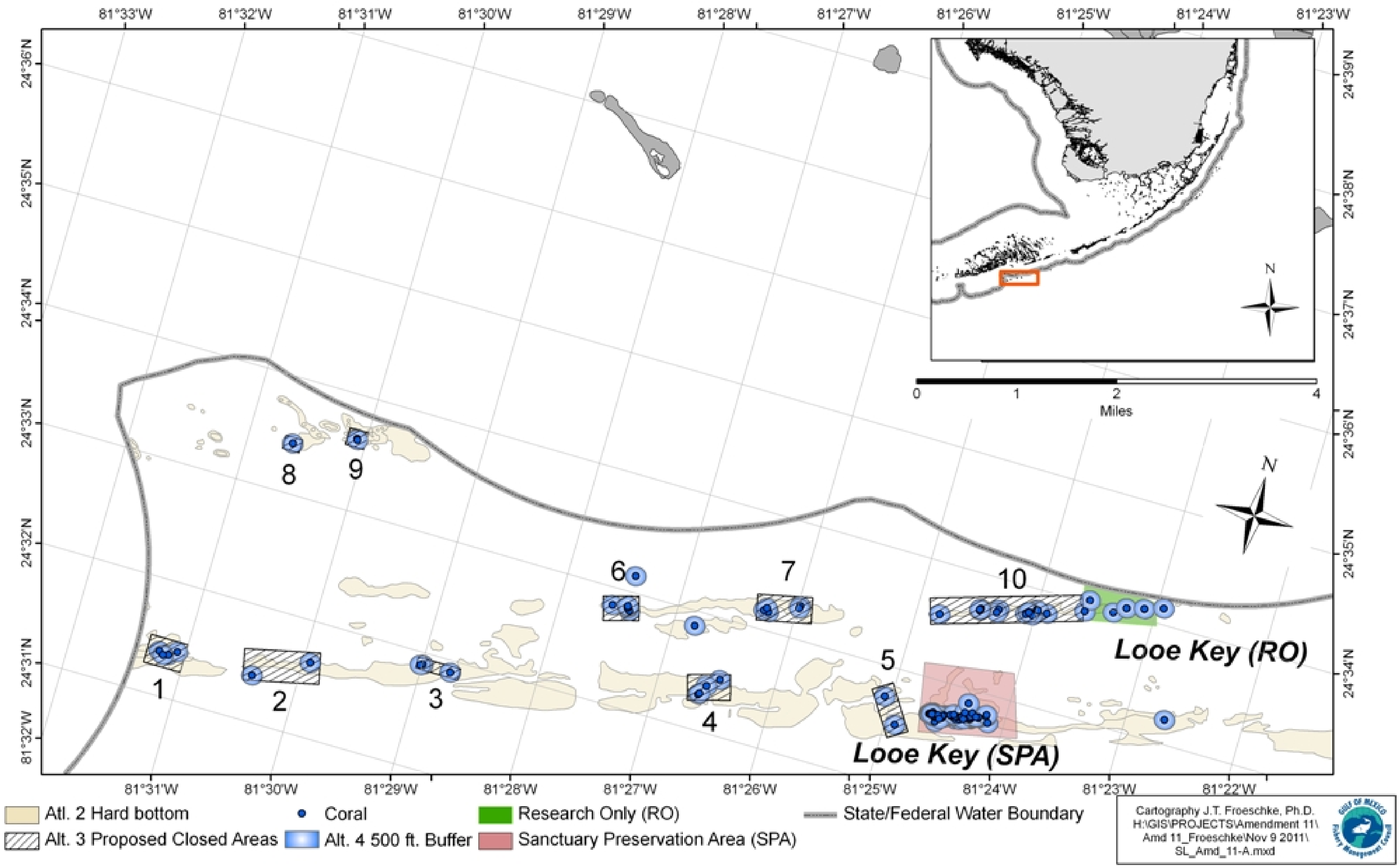

Figure 2.1.2. Map A showing proposed closed areas.

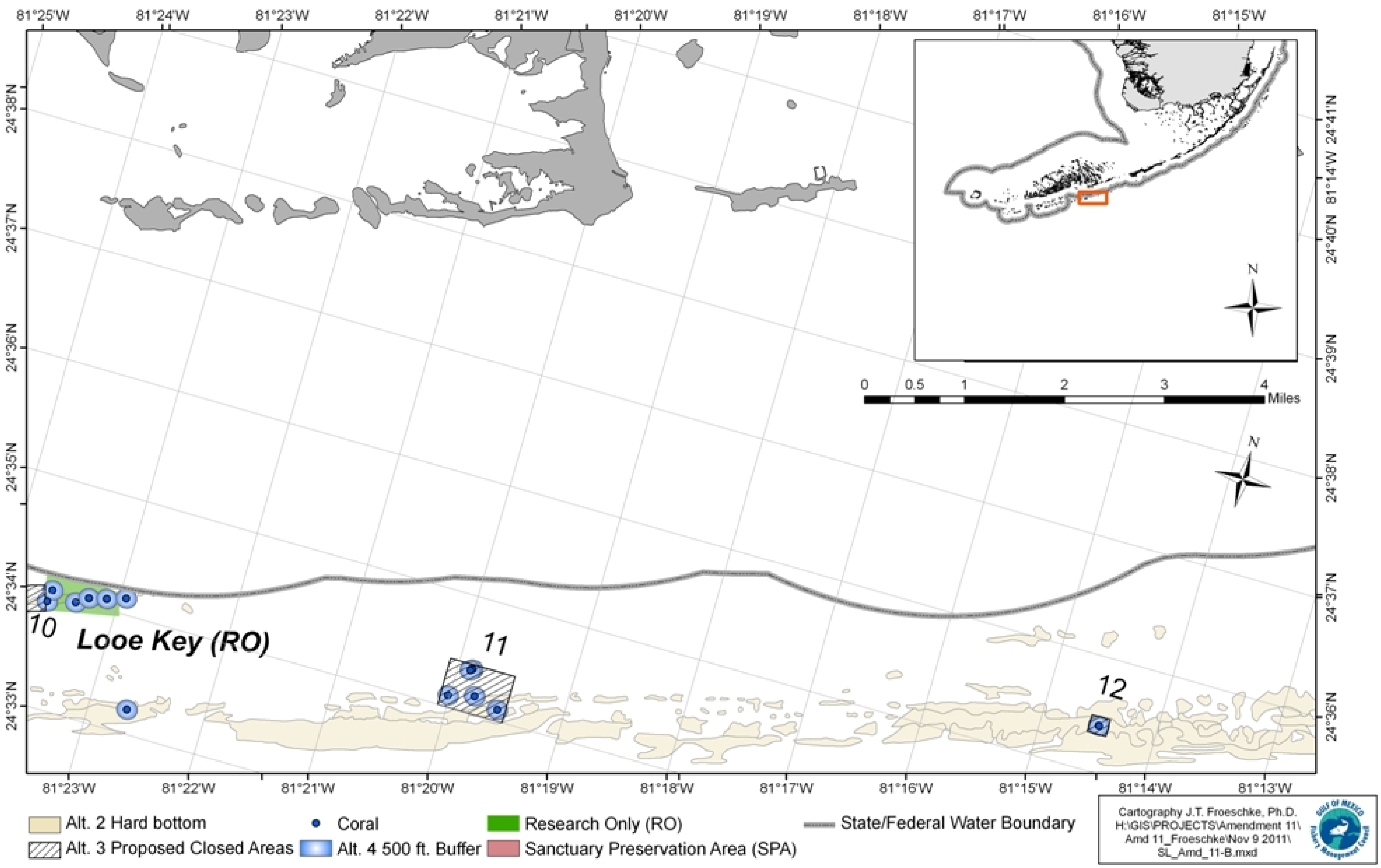

Figure 2.1.3. Map B showing proposed closed areas.

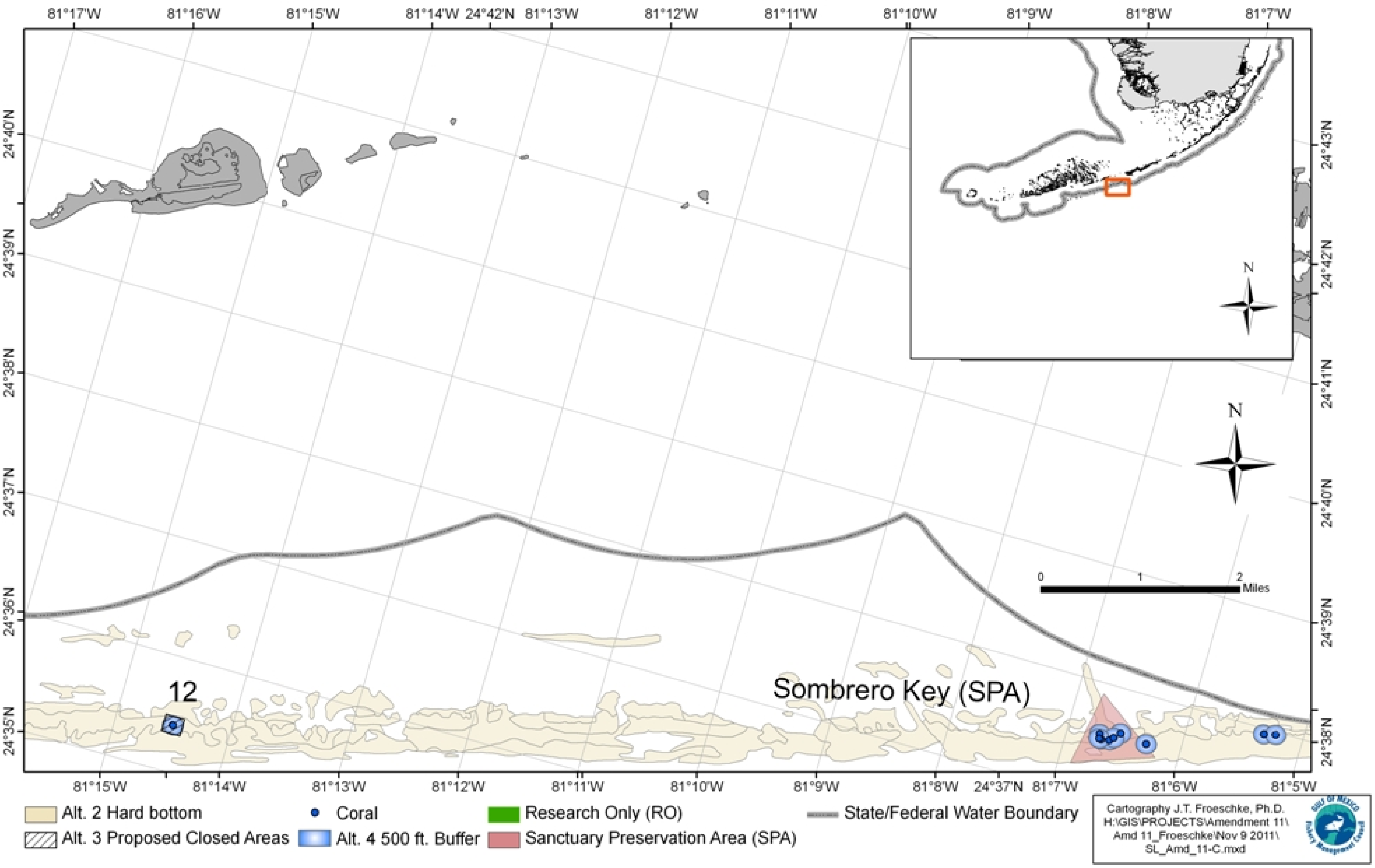

Figure 2.1.4. Map C showing proposed closed areas.

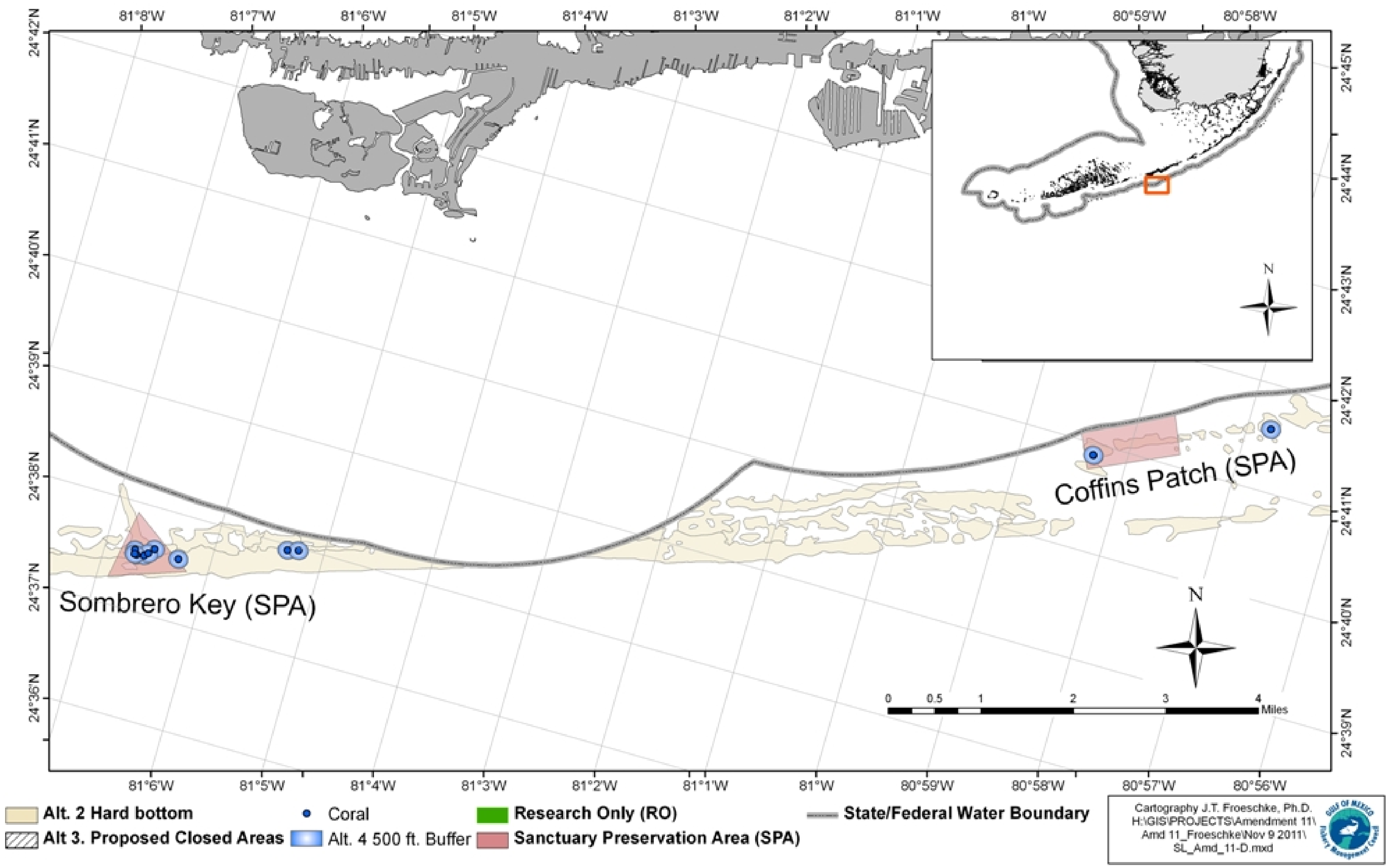

Figure 2.1.5. Map D showing proposed closed areas.

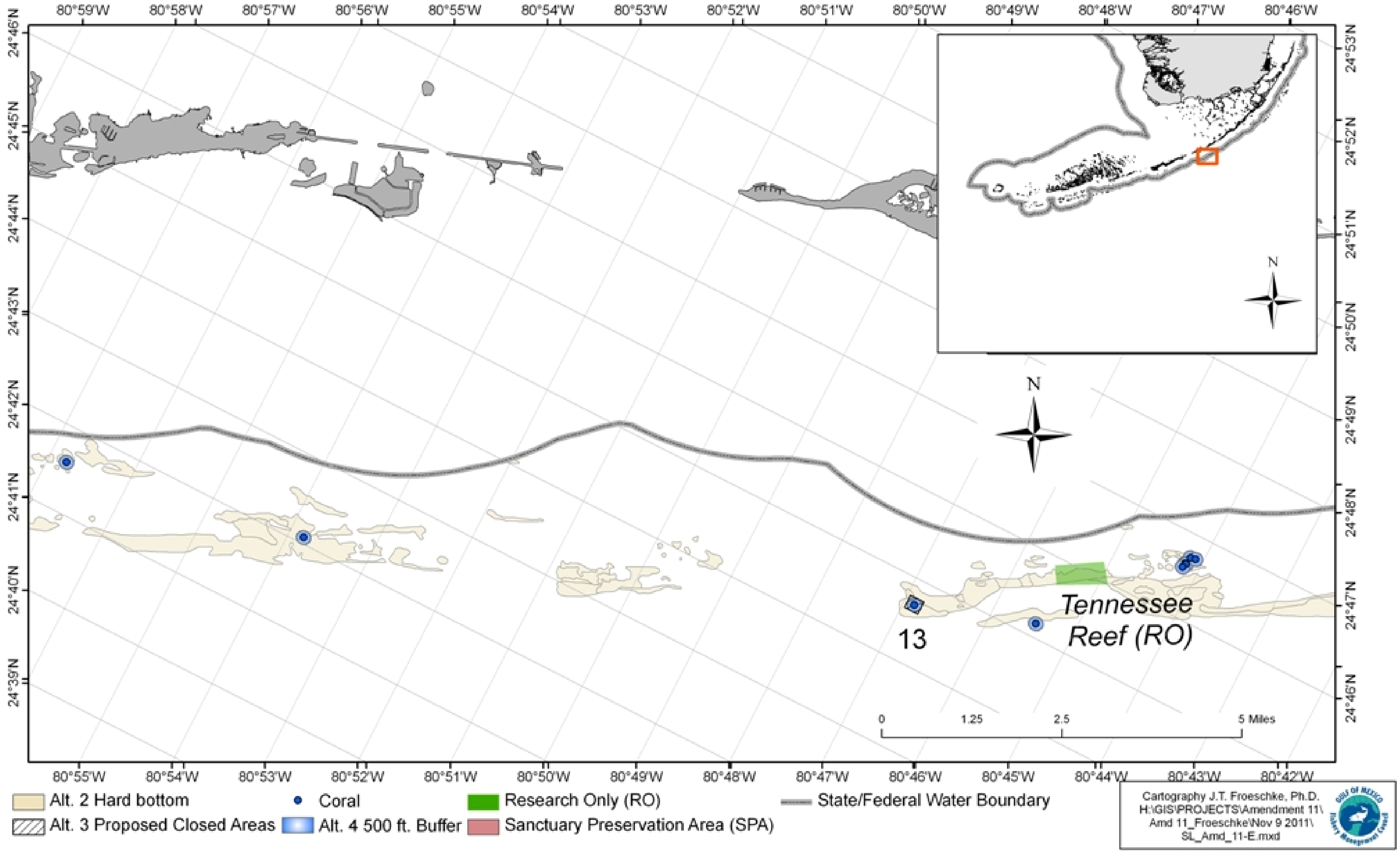
80°59'W
80°58'W
80°57'W
80°56'W
80°55'W
80°54'W
80°53'W
80°52'W
80°51'W
80°50'W
80°49'W
80°48'W
80°47'W
80°46'W
24°46'N
24°45'N
24°44'N
24°43'N
24°42'N
24°41'N
24°40'N
24°39'N
24°53'N
24°52'N
24°51'N
24°50'N
24°49'N
24°48'N
24°47'N
24°46'N
N
N
13
Tennessee Reef (RO)
0
1.25
2.5
5 Miles
80°55'W
80°54'W
80°53'W
80°52'W
80°51'W
80°50'W
80°49'W
80°48'W
80°47'W
80°46'W
80°45'W
80°44'W
80°43'W
80°42'W
Alt. 2 Hard bottom
Coral
Research Only (RO)
State/Federal Water Boundary
Alt. 3 Proposed Closed Areas
Alt. 4 500 ft. Buffer
Sanctuary Preservation Area (SPA)
Cartography J.T. Froeschke, Ph.D.
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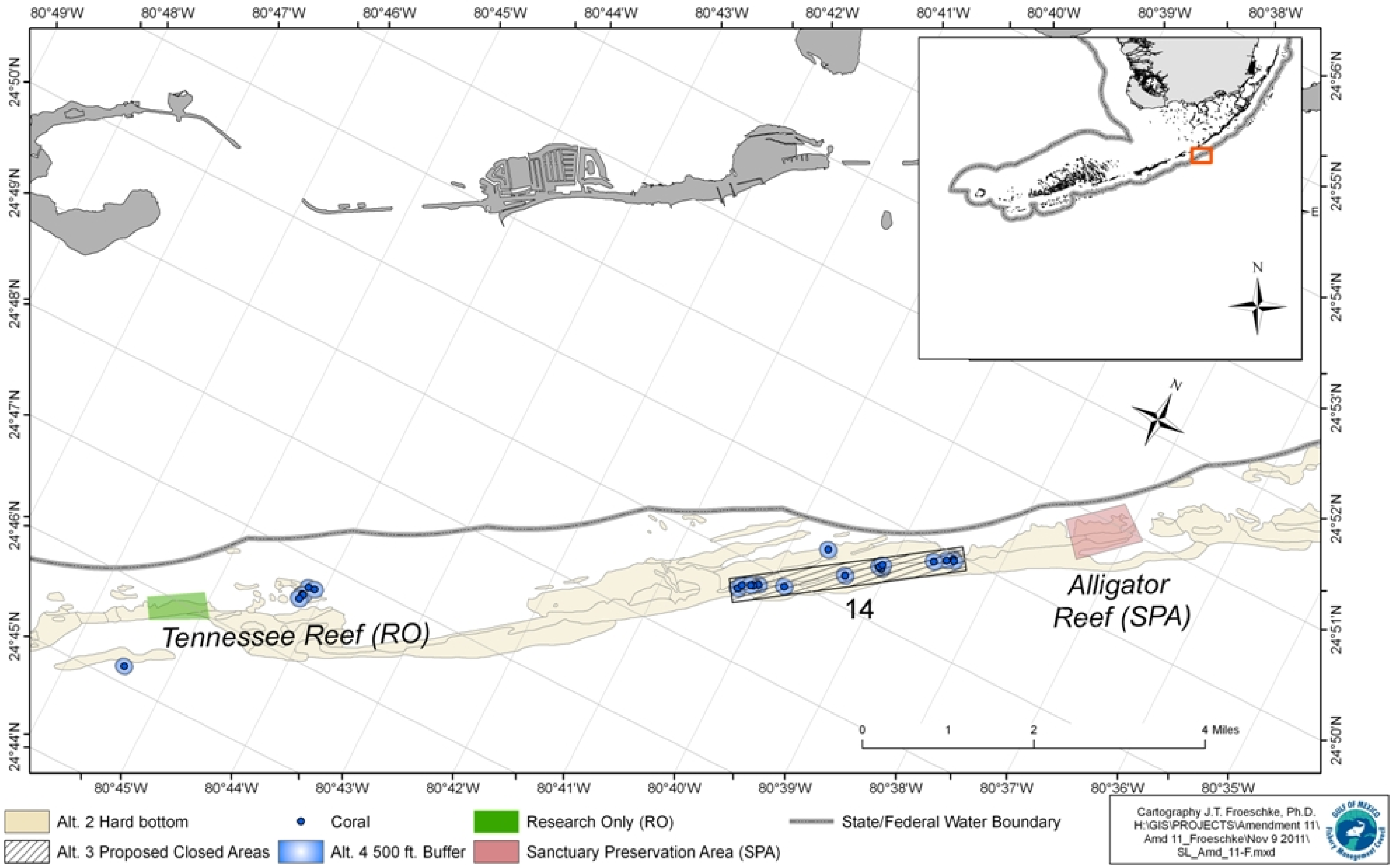
Figure 2.1.6. Map E showing proposed closed areas.



Tennessee Reef (RO)
14
Alligator Reef (SPA)
Alt. 2 Hard bottom
Coral
Research Only (RO)
State/Federal Water Boundary
Alt. 3 Proposed Closed Areas
Alt. 4 500 ft. Buffer
Sanctuary Preservation Area (SPA)
Cartography J.T. Froeschke, Ph.D.
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Figure 2.1.7. Map F showing proposed closed areas.

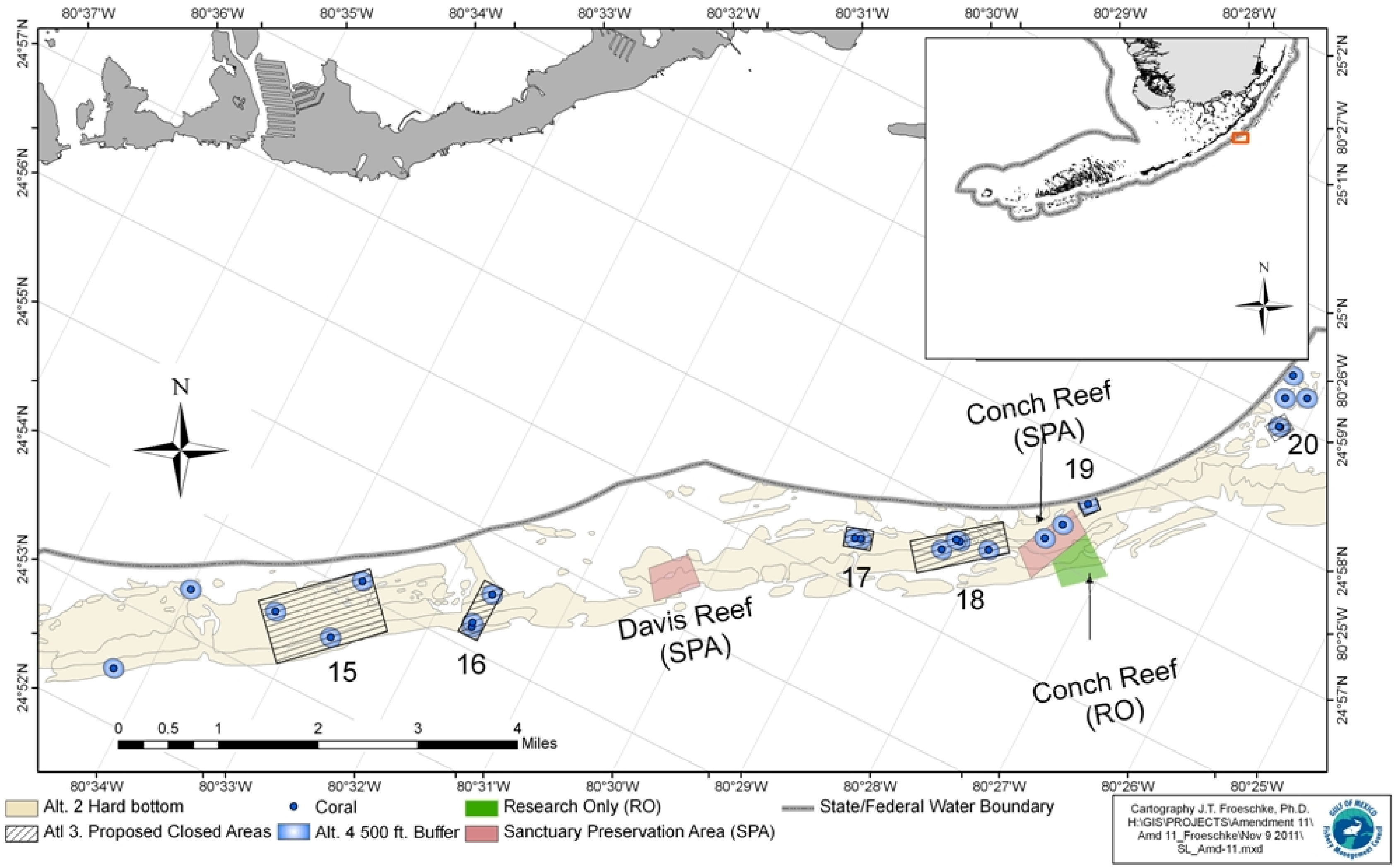
80°37'W
80°36'W
80°35'W
80°34'W
80°33'W
80°32'W
80°31'W
80°30'W
80°29'W
80°28'W
24°57'N
24°56'N
24°55'N
24°54'N
24°53'N
24°52'N
25°2'N
80°27'W
25°1'N
25°N
80°26'W
24°59'N
24°58'N
80°25'W
24°57'N
N
N
Conch Reef
(SPA)
19
20
17
18
15
16
Davis Reef
(SPA)
Conch Reef
(RO)
0 0.5 1 2 3 4
Miles
80°34'W
80°33'W
80°32'W
80°31'W
80°30'W
80°29'W
80°28'W
80°27'W
80°26'W
80°25'W
Alt. 2 Hard bottom
Coral
Research Only (RO)
State/Federal Water Boundary
Atl 3. Proposed Closed Areas
Alt. 4 500 ft. Buffer
Sanctuary Preservation Area (SPA)
Cartography J.T. Froeschke, Ph.D.
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Figure 2.1.8. Map G showing proposed closed areas.

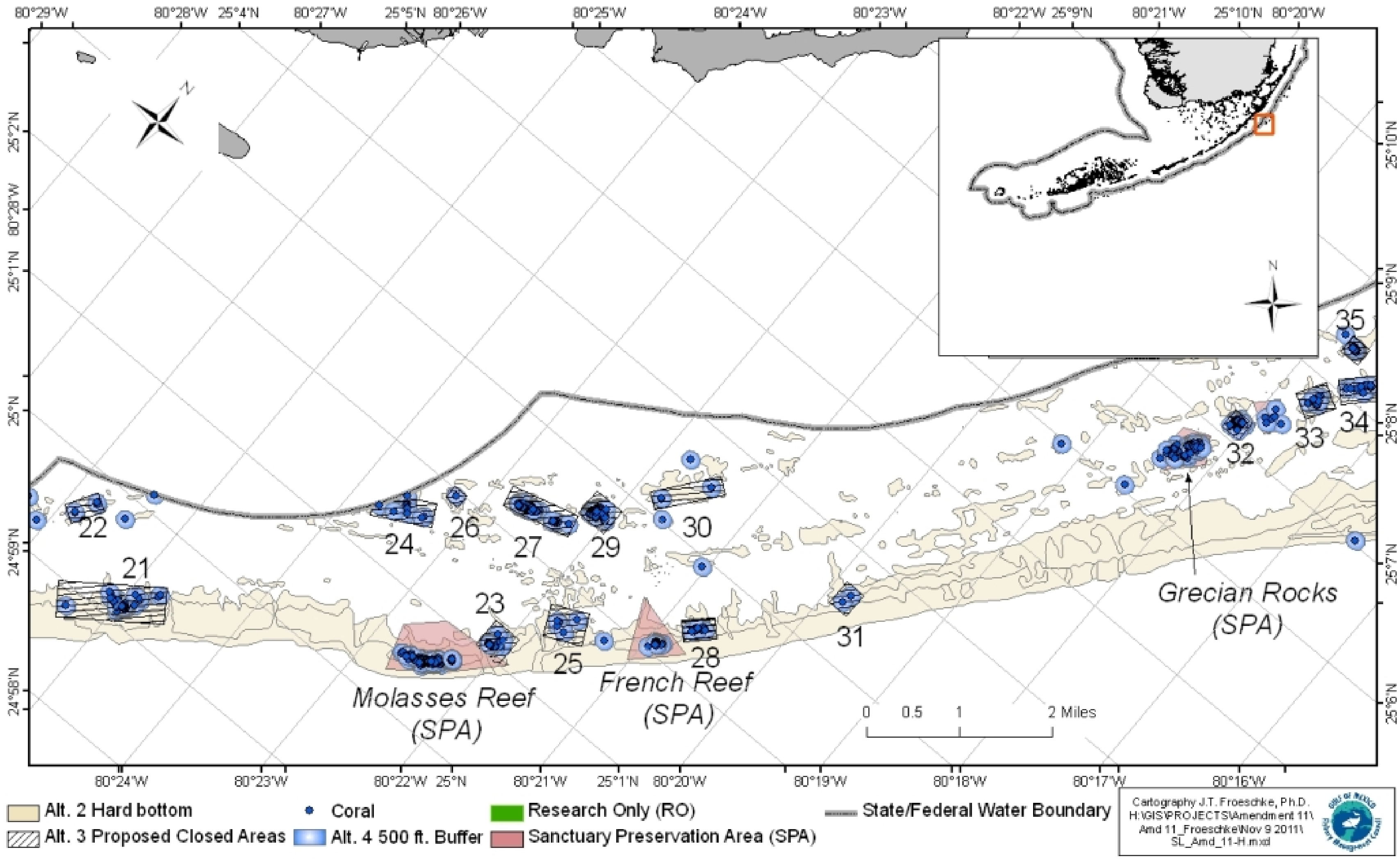


Figure 2.1.9. Map H showing proposed closed areas.

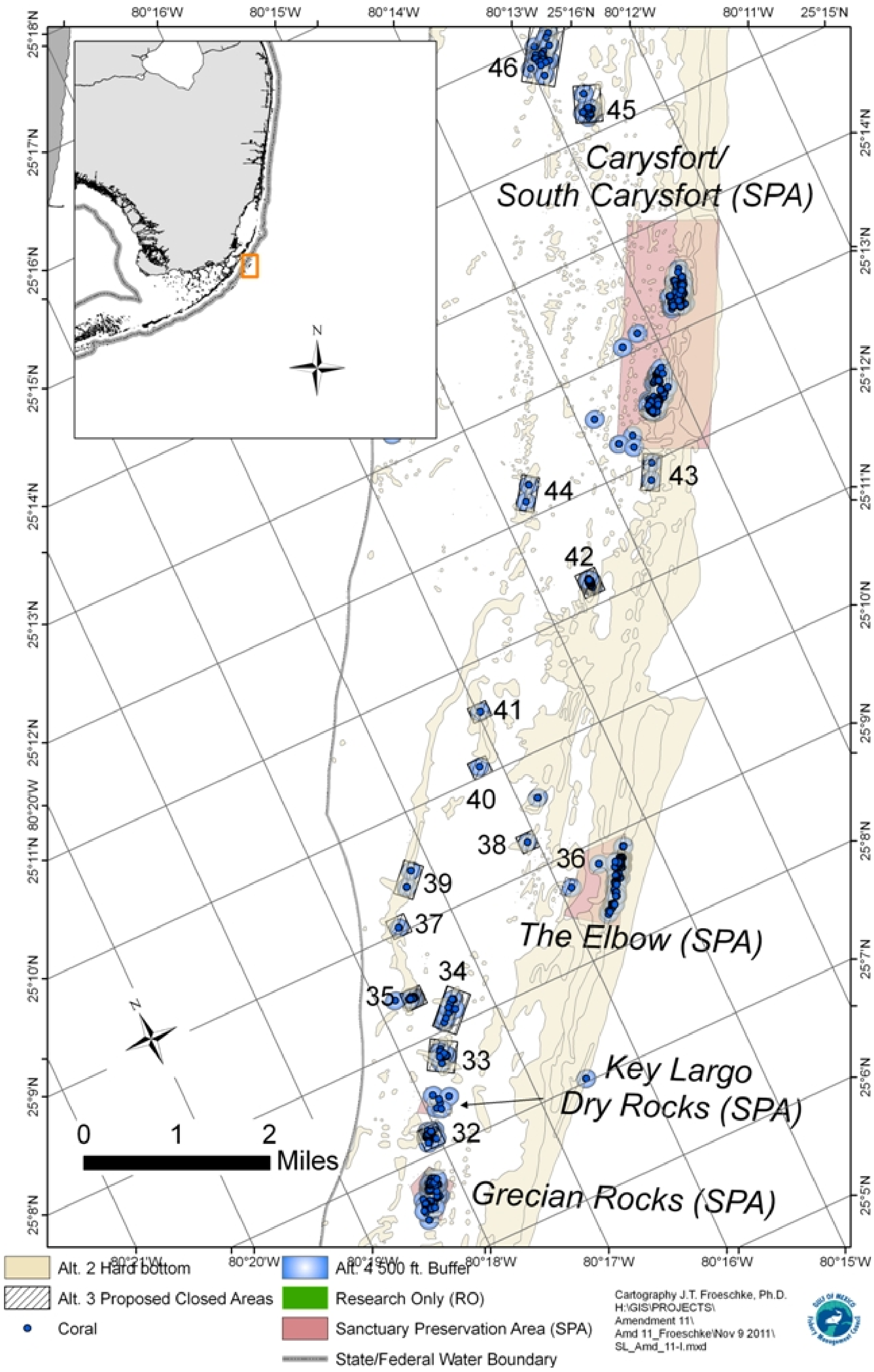


Figure 2.1.10. Map I showing proposed closed areas.

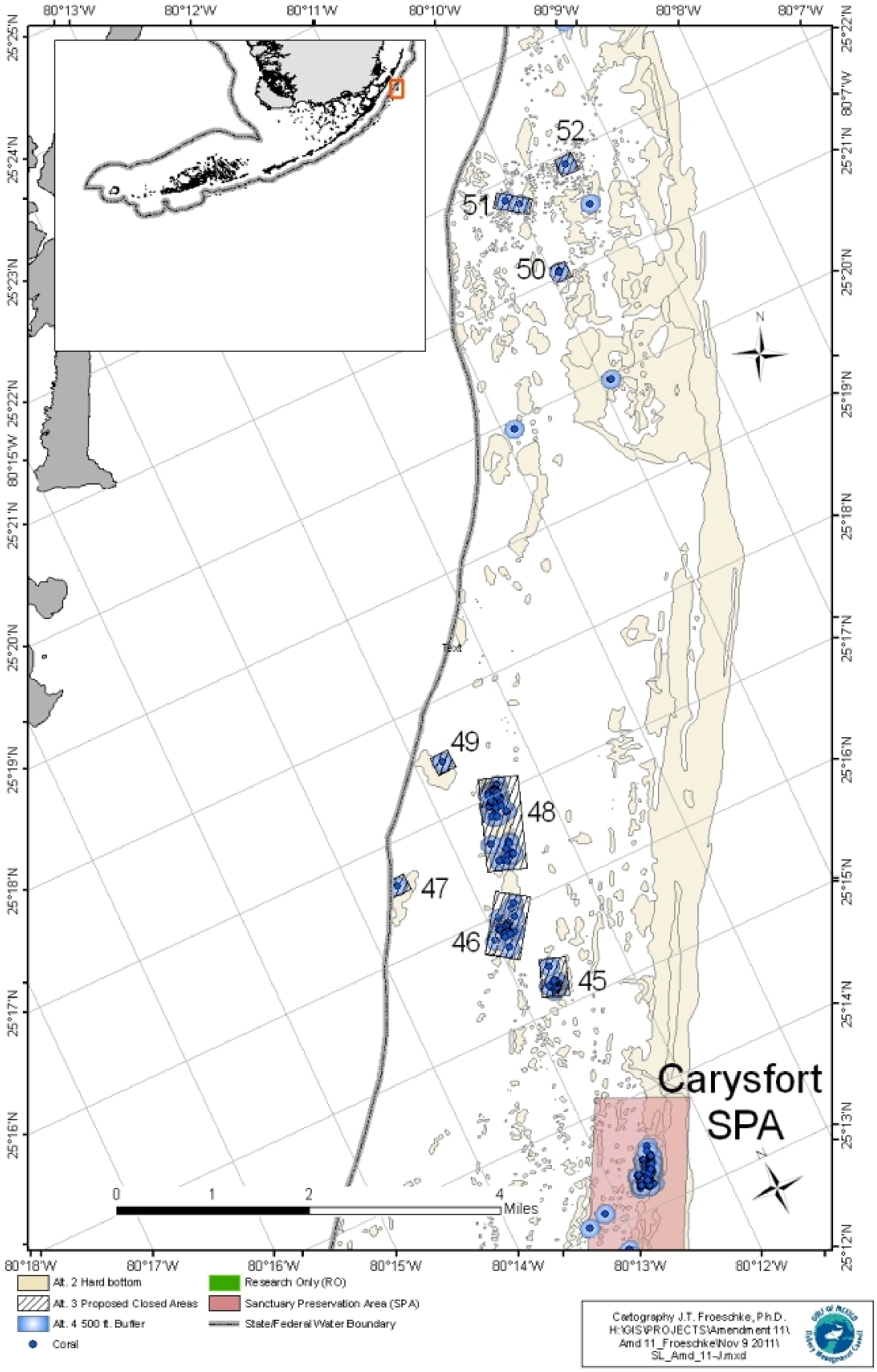


Figure 2.1.11. Map J showing proposed closed areas.

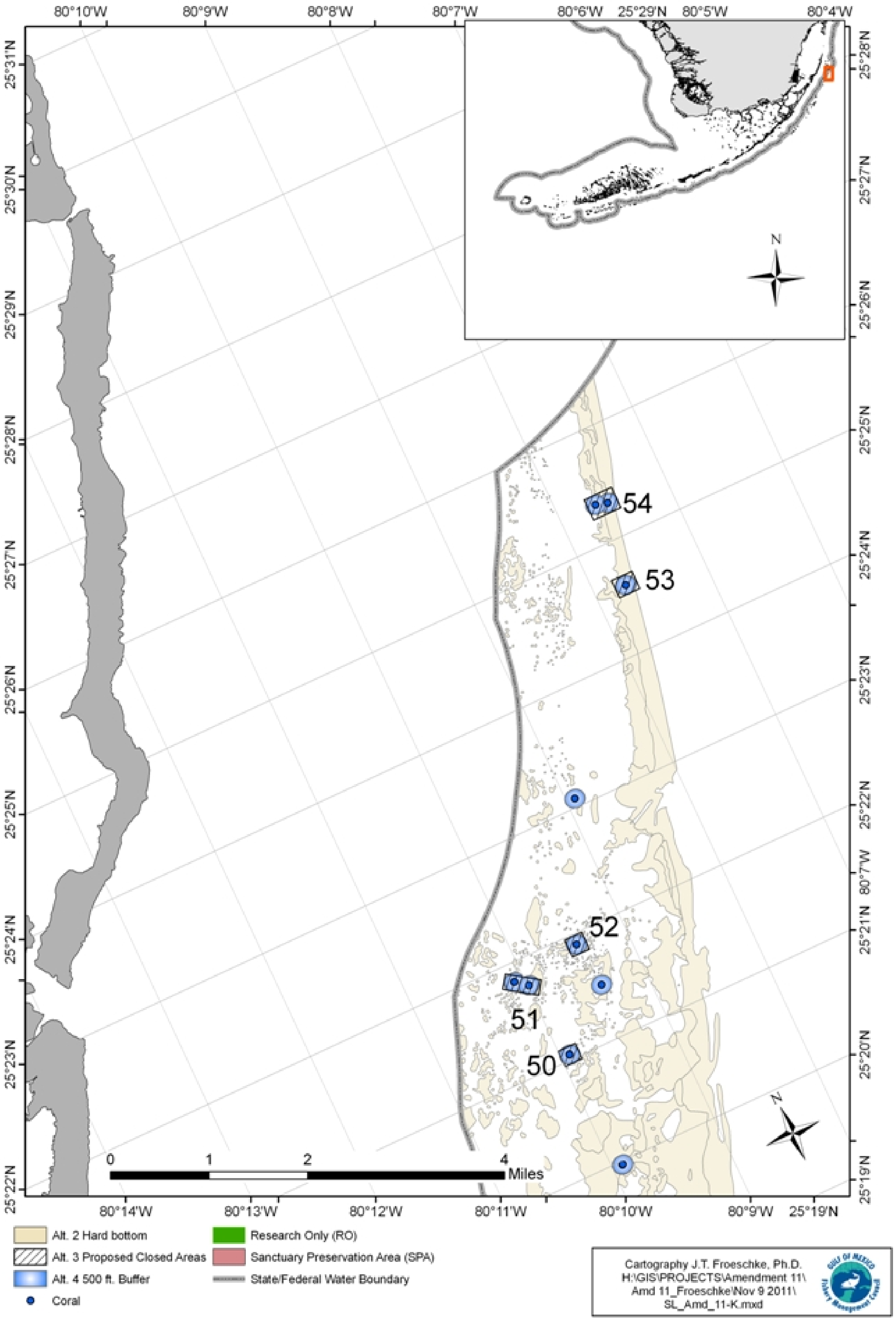


Figure 2.1.12. Map K showing proposed closed areas.

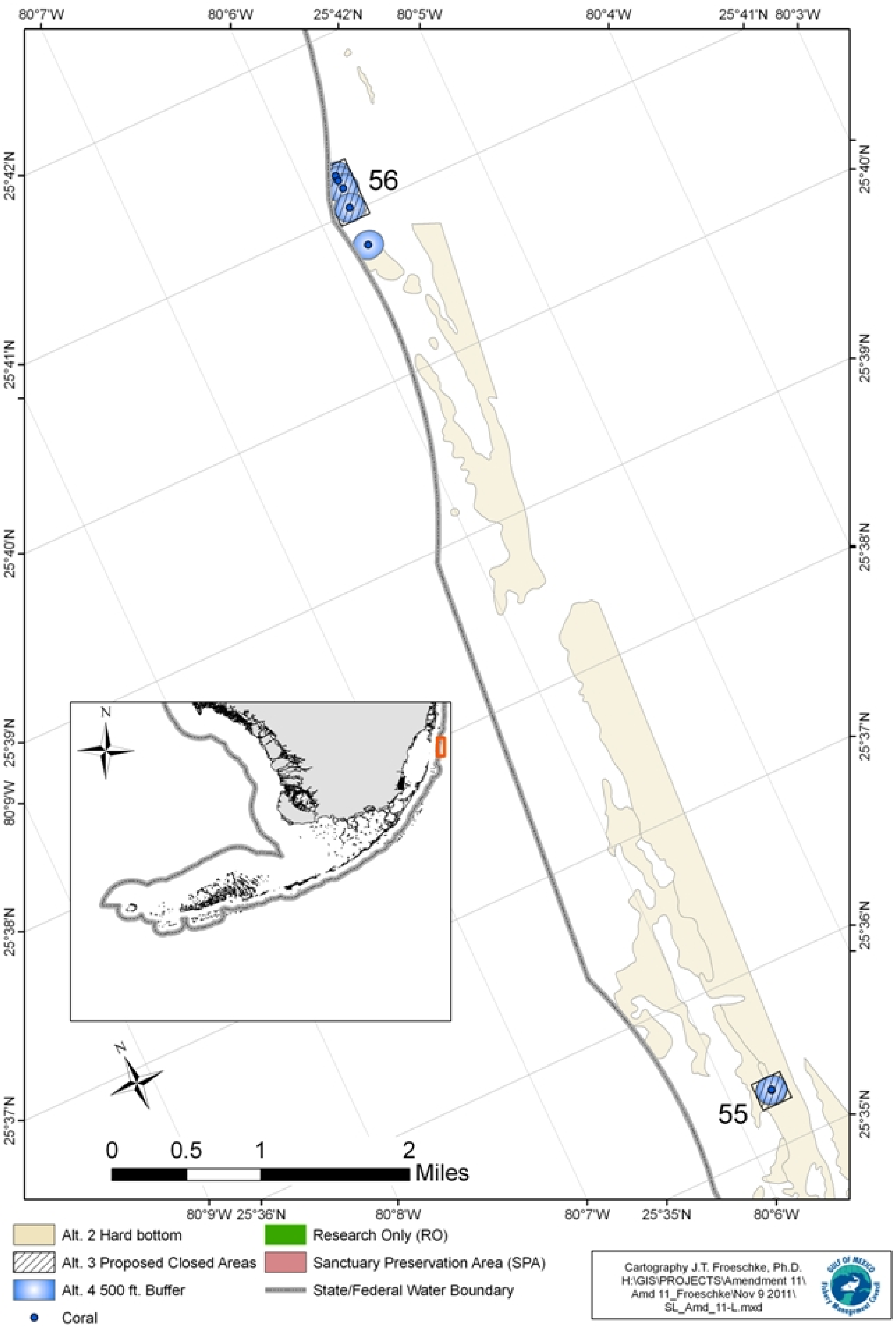


Figure 2.1.13. Map L showing proposed closed areas.

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

Gulf 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.

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. (2008) 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 level and severity of those impacts.

The Bi Op on the spiny lobster fishery mandated the establishment of trap line marking requirements no later than 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

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.

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, the EEZ off Florida, and the EEZ off southern Atlantic states other than Florida. Because little spiny lobster trap fishing occurs outside Florida, the Bi Op did not consider trap impacts 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, 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 fisheries. It is not clear how implementing a requirement to use black line would improve the accuracy of differentiating between similar looking gears.

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). Economically, 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 UV degradation in waters off Florida.

Spiny lobster industry members requested only 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;

Mäthger 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 or 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, 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 Spiny Lobster Amendment 10 and the South Atlantic Spiny Lobster Advisory Panel recommended black for the line marking requirements; however, other fisheries use black line. The second most available line is white which is used in the spiny lobster "trawl" fishery. The term "trawl" 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.

Three methods for marking gear were tested and found to work satisfactorily in the Northeast Region under normal conditions (e.g., water temperature, pot weight, etc). 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

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

electrical tape was wrapped in one direction and then back over itself to form two layers. All of these marking techniques and potentially others would be allowed under **Alternative 3**.

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).

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.

On July 12-13, 2011, the FKCFA 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 FKCFA 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 for sub-surface applications, 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, personal communications). White rope is currently used by “trawl” fishermen who string multiple lobster traps together, generally in deeper water and the degradation rate and the relative duration of white rope in the Florida Keys environment is unknown. 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. 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).

One concern with the use of white rope to identify lobster trap lines is that white rope is used in many applications associated with boating. However, trap line is polyethylene and, therefore, generally distinguishable from normal line used on recreational and other commercial boats. Currently, the stone crab fishery uses the same type of line, and typically lobster trap fishers also fish stone crab traps.

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. 2008). The average length of line encountered was approximately 35 ft (Miller et al. 2008). 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.

Both labor and costs would likely be less under **Alternative 3** than **Alternative 2**. **Alternative 3** would allow fishermen to use and 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 more economical as it does not require the purchase of a different color solid rope or rope with a tracer. The 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**.

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 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 requires trap line markings for traps fished in the EEZ, which is less than half of the traps. However, if Florida implemented compatible regulations, all traps fished off Florida would need marked lines.

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 **Alternative 1**. Based on data in Adams (2011) and deducting the estimated annual cost of trap line replacement for **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.

Chapter 3. Affected Environment

A more complete description of the affected environment can be found in Amendment 10 to the Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and South Atlantic (Spiny Lobster FMP), Section 3. That description is summarized here.

3.1 Description of the Fishery

The Caribbean spiny lobster fishery in the U.S. Exclusive Economic Zone (EEZ) of the Atlantic Ocean and Gulf of Mexico (Gulf) is jointly managed by the South Atlantic and Gulf of Mexico Fishery Management Councils (Councils) through the Spiny Lobster FMP. The Caribbean Fishery Management Council manages the fishery in the U.S. EEZ of the Caribbean Sea surrounding Puerto Rico and the U.S. Virgin Islands through a separate FMP. In the Gulf and South Atlantic, the commercial fishery, and to a large extent the recreational fishery, occurs off South Florida, primarily in the Florida Keys. To streamline a management process that involves both state and federal jurisdictions, the FMP basically extends the Florida Fish and Wildlife Conservation Commission (FWC) rules regulating the state fishery to the southeastern U.S. EEZ from North Carolina to Texas.

The commercial and regular recreational spiny lobster seasons start August 6 and end March 31. The Florida recreational spiny lobster fishing season has two parts: a two-day sport season that occurs before commercial spiny lobster fishers place their traps in the water, and a regular season that coincides with the commercial fishing season. No person can harvest, attempt to harvest, or have in his possession, regardless of where taken, any spiny lobster during the closed season of April 1 through August 5 of each year, except during the two-day sport season, for storage and distribution of lawfully possessed inventory stocks or by special permit issued by the FWC. During the two-day sport season, no person can harvest spiny lobster by any means other than by diving or with the use of a bully net or hoop net.

According to 50 CFR 640.4, anyone who sells, trades, or barters or attempts to sell, trade, or barter Caribbean spiny lobster harvested or possessed in the EEZ off Florida, or harvested in the EEZ other than off Florida and landed in Florida must have licenses and certificates specified to be a commercial harvester, as defined in the Florida Administrative Code. Similarly, for any person who sells, trades, or barters or attempts to sell, trade, or barter a Caribbean spiny lobster harvested in the EEZ other than off Florida, a federal vessel permit must be issued and on board the harvesting vessel.

In 2010, Florida issued 1,286 commercial spiny lobster permits and 293 commercial dive permits. As of October 5, 2011, NOAA Fisheries Service listed 201 valid federal spiny lobster permits. Florida has a variety of permits that allow recreational fishers to take spiny lobster. In 2010, the state issued 129,865 annual or five-year crawfish permits; in addition, they issued 36,030 other permits, such as Sportsman Gold or Saltwater Lifetime permits, that also allow holders to take spiny lobster. NOAA Fisheries Service does not require a permit for recreational fishing in the EEZ.

Landings over the recent five years have averaged around five million pounds (Table 3.1.1). Landings began to decrease in the early 2000s. Most commercial landings are from trapping; other gears include diving and bully nets. The proportion of landings from recreational fishing has remained fairly constant, around 20-25% over time.

Table 3.1.1. Florida landings of spiny lobster, by sector and gear (thousand pounds, ww).

Fishing year	Directed commercial landings by gear					Recreational		Total	Bait
	Traps	Diving	Other	Total	% of total	Pounds	% of total		
85/86	5,146	150	68	5,363	79%	1,432	21%	6,796	646
86/87	5,150	130	90	5,370	79%	1,454	21%	6,824	784
87/88	5,330	77	22	5,428	75%	1,797	25%	7,225	392
88/89	7,001	125	37	7,163	78%	2,033	22%	9,196	351
89/90	7,617	157	66	7,839	79%	2,061	21%	9,900	526
90/91	5,899	98	49	6,046	77%	1,821	23%	7,867	744
91/92	6,602	192	43	6,836	82%	1,477	18%	8,312	427
92/93	5,125	223	20	5,368	80%	1,352	20%	6,721	352
93/94	5,109	176	22	5,308	74%	1,883	26%	7,191	237
94/95	6,895	253	27	7,175	79%	1,906	21%	9,082	310
95/96	6,682	308	25	7,015	78%	1,931	22%	8,945	306
96/97	7,363	334	45	7,742	80%	1,923	20%	9,665	360
97/98	7,168	426	47	7,641	77%	2,304	23%	9,945	405
98/99	5,052	375	22	5,448	81%	1,303	19%	6,751	188
99/00	7,005	631	33	7,669	76%	2,462	24%	10,131	368
00/01	4,874	673	23	5,570	74%	1,949	26%	7,519	288
01/02	2,619	450	11	3,081	71%	1,251	29%	4,332	234
02/03	3,987	563	25	4,574	76%	1,455	24%	6,030	259
03/04	3,684	453	24	4,162	75%	1,411	25%	5,573	231
04/05	5,096	314	35	5,445	81%	1,273	19%	6,718	244
05/06	2,678	270	17	2,965	72%	1,131	28%	4,096	147
06/07	4,489	259	51	4,799	79%	1,305	21%	6,103	160
07/08	3,439	296	47	3,782	76%	1,215	24%	4,997	185
08/09	2,987	250	34	3,271	72%	1,264	28%	4,535	98
09/10	4,132	162	64	4,358	79%	1,127	21%	5,484	139
5-yr avg	3,545	248	42	3,835	76%	1,208	24%	5,043	146

Note: Five year average is for 05/06-09/10. This table updates and replaces Table 4.3.1.1 in Amendment 10. Sources: Commercial landings, 97/98 onward, NMFS, SEFSC, FTT, as of 02Sep11, methods in Vondruska 2010a. Commercial landings through 96/97, estimated mortality associated with use of bait (under-sized lobster in traps) and recreational landings, all years, SEDAR 8 update 2010 (01Dec10). Landings for "other" commercial gear estimated from unrounded data used in this table. Recreational landings from 92/93 are estimated using surveys of recreational lobster permit holders and represent combined landings during the special 2-day sport season and from opening day of the regular season (Aug. 6) through Labor Day. The Gulf Council's Standing and Special Spiny Lobster SSC estimated the recreational landings for 04/05. Grand total excludes estimated fishing mortality for bait. Underlying data may differ among sources.

3.2 Physical Environment

The Gulf has a total area of approximately 600,000 mi^2 (1.5 million km^2), including state waters (Gore 1992). The South Atlantic continental shelf off the southeastern U.S., extending from the Dry Tortugas to Cape Hatteras, encompasses an area in excess of 100,000 km^2 (Menzel 1993).

The Final EIS for the Gulf Council's Generic Essential Fish Habitat Amendment (GMFMC 2004) and the South Atlantic Council's Fishery Ecosystem Plan (SAFMC 2009) contain detailed descriptions of the physical environments related to the spiny lobster fishery.

The Deepwater Horizon MC252 oil spill in 2010 affected more than one-third of the Gulf area from western Louisiana east to the panhandle of Florida and south to the Campeche Bank in Mexico. The impacts of the oil spill on the physical environment are expected to be significant and may be long-term. However, the oil remained outside most of the area where this species is abundant. Oil was dispersed on the surface, and because of the heavy use of dispersants, oil was also documented as being suspended within the water column, some even deeper than the location of the broken wellhead. Floating and suspended oil washed onto shore in several areas of the Gulf, as well as non-floating tar balls. Whereas suspended and floating oil degrades over time, tar balls are persistent in the environment and can be transported hundreds of miles. Oil on the surface of the water could restrict the normal process of atmospheric oxygen mixing into and replenishing oxygen concentrations in the water column. In addition, microbes in the water that break down oil and dispersant also consume oxygen, which could lead to further oxygen depletion. Zooplankton that feed on algae could also be negatively impacted, thus allowing more of the hypoxia-fueling algae to grow.

3.3 Biological Environment

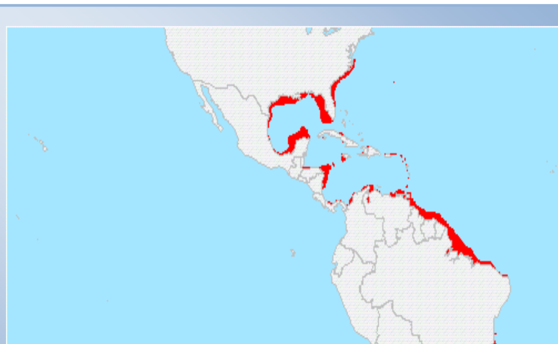


Figure 3.3.1. Distribution of Caribbean spiny lobster.
Source: FAO Fisheries Synopsis 1991

3.3.1 Caribbean Spiny Lobster

The Caribbean spiny lobster is widely distributed throughout the western Atlantic Ocean as far north as North Carolina to as far south as Brazil including Bermuda, the Bahamas, Caribbean, and Central America (Herrnkind 1980; Figure 3.3.1). Analyses of DNA indicate a single stock structure for the Caribbean spiny lobster throughout its range (Lipcius and Cobb 1994; Silberman and Walsh 1994; Hunt et al. 2009). This species inhabits shallow waters, occasionally as deep as 295 ft (90 m), possibly even deeper. Caribbean spiny lobster can be found among rocks, on reefs, in grass beds or in any habitat that provides protection. The species is gregarious and migratory. Maximum total body length recorded is 18 in (45 cm), but the average total body length for this species is 8 in (20 cm; FAO Fisheries Synopsis 1991).

Distribution and dispersal of Caribbean spiny lobster is determined by the long planktonic larval phase, called the puerulus, during which time the infant lobsters are carried by the currents until they become large enough to settle to the bottom (Davis and Dodrill 1989). As the lobsters begin metamorphosis from puerulus to the juvenile form, the ability to swim increases and they move into shallow, nearshore environments to grow and develop.

Young benthic stages of Caribbean spiny lobster typically inhabit branched clumps of red algae (*Laurencia sp*.), mangrove roots, seagrass banks, or sponges where they feed on invertebrates found within the microhabitat. In contrast to the social behavior of their older counterparts, juvenile lobsters are solitary and show aggressive behavior to ensure they remain solitary. Individuals two to four years of age show nomadic behavior, emigrating out of the shallows and moving to deeper, offshore reef environments. In the adult phase, Caribbean spiny lobsters tend to aggregate in enclosed dens. Shelter environments may include natural holes in a reef, rocky outcrops, or artificially created environments (Lipcius and Cobb 1994).

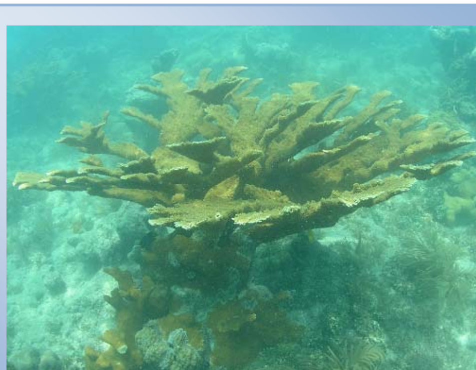
Given its wide distribution, a definitive stock structure is hard to determine for this species. A multitude of currents and other factors influence the movement of water throughout their range. The long time lobsters spend in the larval stage traveling by currents leads scientists to suspect recruits in the U.S. come from many other areas (Hunt et al. 2009). Silberman et al. (1994) and Hunt et al. (2009) concluded Caribbean spiny lobster is a single stock from Brazil to Bermuda, and throughout the Caribbean. More recent genetic studies have shown almost all recruits in U.S. waters are from elsewhere in the Caribbean. However, other studies have shown that the presence of local gyres or loop currents in certain locations could influence the retention of locally spawned larvae. In addition, benthic structures such as coral reef may disturb the flow of water and lead to the settlement of larvae in a particular location (Lee et al. 1994).

3.3.2 Protected Species

Thirty-two species of marine mammals may occur in the EEZ of the Gulf of Mexico, South Atlantic, and Caribbean. All 32 species are protected under the Marine Mammals Protection Act (MMPA) and six are also listed as endangered under the Endangered Species Act (ESA). A spatial/temporal analysis of entanglement data from 2002-2010 indicated that spiny lobster trap gear was a plausible cause of four bottlenose dolphins entanglements. During that period, an additional eight bottlenose dolphins in Florida were discovered with entangling trap/pot. The type of gear could not be definitively linked to a target species or specific fishery. No direct interactions between ESA-listed marine mammals and the spiny lobster fishery have ever been documented.

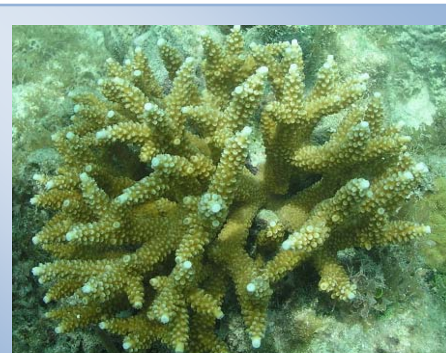
Other species protected under the ESA occurring in the Gulf, South Atlantic, and Caribbean include five species of sea turtle (green, hawksbill, Kemp’s ridley, leatherback, and loggerhead); the smalltooth sawfish, and two *Acropora* coral species (elkhorn,*Acropora palmata* and staghorn [*A. cervicornis*]). A discussion of these species can be found in Amendment 10. Designated critical habitat for the North Atlantic right whale also occurs within the South Atlantic region.

Elkhorn and staghorn corals were listed as threatened under the ESA on May 9, 2006. The Atlantic *Acropora* Status Review (*Acropora* BRT 2005) presents a summary of published literature and other currently available scientific information regarding the biology and status of both elkhorn and staghorn corals. The following discussion summarizes some of the pertinent information on the biology and threats to elkhorn and staghorn corals.



Elkhorn Coral (*Acropora palmata*)
Photo Credit: W. Jaap

Elkhorn coral is one of major reef-building corals in the wider Caribbean. Historically, this species formed dense thickets at shallow (<5 m) and intermediate (10-15 m) depths in many reef systems, including some locations in the Florida Keys and Caribbean. Early descriptions of Florida Keys reefs referred to reef zones, of which the elkhorn zone was described for many shallow-water reefs (Jaap 1984, Dustan 1985, Dustan and Halas 1987). However, the structural and ecological roles of elkhorn coral in the wider Caribbean are unique and cannot be filled by other reef-building corals in terms of accretion rates and the formation of structurally complex reefs (Bruckner 2002).



Staghorn Coral (*A. cervicornis*)
Photo Credit: W. Jaap

Staghorn coral is also one of the major reef-building corals in the wider Caribbean. Early descriptions of Florida Keys reefs referred to reef zones, of which the staghorn zone was described for many shallow-water reefs (Jaap 1984, Dustan 1985, Dustan and Halas 1987). Like elkhorn coral, the structural and ecological roles of staghorn are unique and cannot be filled by other reef-building corals (Bruckner 2002).

Historically, staghorn coral was also the primary constructor of mid-depth (10 to 15 m) reef terraces in the western Caribbean (Adey 1978).

All *Acropora* species require near-oceanic salinities (34-37 ppt). Typical water temperatures for elkhorn and staghorn coral range from 21-29°C, although colonies in the U.S. Virgin Islands have been known to tolerate short-term temperatures around 30°C without obvious bleaching. Jaap (1979) and Roberts et al. (1982) note an upper temperature tolerance of 35.8°C for elkhorn coral. All *Acropora* species are susceptible to bleaching due to adverse environmental conditions (Ghiold and Smith 1990, Williams and Bunkley-Williams 1990).

The maximum range in depth reported for elkhorn coral is less than1 m to 30 m; staghorn is less than 1 m to 60 m (Goreau and Goreau 1973). However, both species are currently believed to be found no deeper than 30 m (98 ft). The preferred habitat of elkhorn coral is the seaward face of a reef (turbulent shallow water), including the reef crest, and the shallow spur-and-groove zone (Figure 3.3.2) (Shinn 1963, Cairns 1982, Rogers et al. 1982). Colonies are occasionally exposed during low tide. Colonies of elkhorn coral often grow in nearly monospecific,[3] dense stands and form interlocking frameworks, known as thickets, in fringing and barrier reefs (Jaap 1984, Tomascik and Sander 1987, Wheaton and Jaap 1988). The predominance of elkhorn coral in shallow reef zones is related to the degree of wave energy. In areas with strong wave energy conditions only isolated colonies may occur, while thickets may develop in areas of intermediate wave energy conditions (Geister 1977). Storm-generated fragments are often found occupying back reef areas immediately landward of the reef flat/reef crest, while colonies are rare on lagoonal patch reefs (Dunne and Brown 1979). Although considered a turbulent water species, elkhorn coral is sensitive to breakage by wave action and is often replaced by coralline algae in heavy surf zones (Adey 1977).

Staghorn colonies have been common in back- and patch-reef habitats (Figure 3.3.2) (Gilmore and Hall 1976, Cairns 1982). Although staghorn coral colonies are sometimes found interspersed among colonies of elkhorn coral, they are generally in deeper water or seaward of the elkhorn zone and, hence, more protected from waves.

Like elkhorn corals, staghorn corals throughout much of the wider Caribbean, were so dominate on the reef within the 7 to 15-m depth that the area became known as the staghorn zone (Figure 3.3.2). Studies of historical distribution and abundance patterns focus on percent coverage, density, and relative size of the elkhorn and staghorn corals during three periods: pre-1980, the 1980-1990 decades, and recent (since 2000). Few data are present before 1980, likely due in part to researchers' tendencies to neglect careful measurement of abundance for ubiquitous species (*Acropora* BRT 2005).

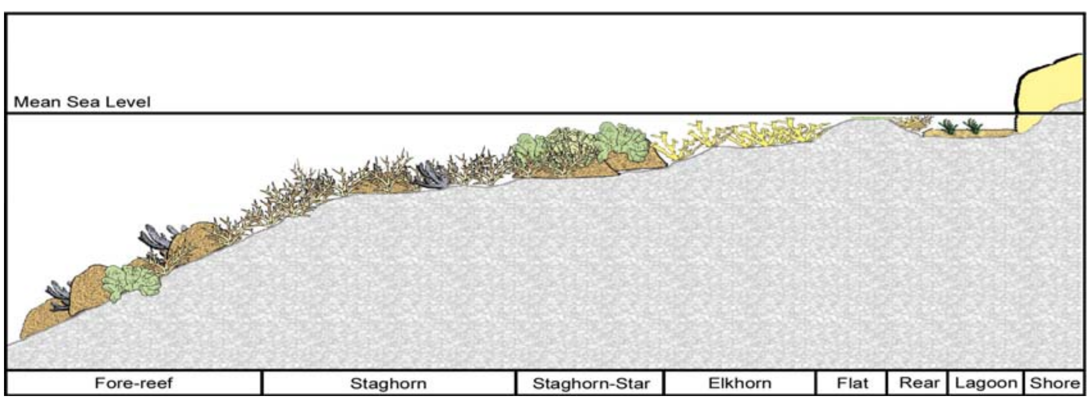


Figure 3.3.2. Reef zonation schematic
Modified from: Goreau 1959, Kinzie 1973, Bak et al. 1977

[3] Monospecific stands refer to stands made up of only one species of coral.

Both species underwent precipitous declines in the early 1980s throughout their ranges and this decline has continued. Although quantitative data on former distribution and abundance are scarce, 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 greater than 97%. Although this decline has been documented as on-going during in the late 1990s, and even in the past five years in some locations, local extirpations (i.e., at the island or country scale) have not been rigorously documented (*Acropora* BRT 2005).

Figure 3.3.3 summarizes the abundance trends of specific locations throughout the wider Caribbean where quantitative data exist, illustrating the overall trends of decline for elkhorn corals since the 1980s. It is important to note that the data are from the same geographic area, not repeated measures at an exact reef/site that would indicate more general trends (*Acropora* BRT 2005).

Few data on the genetic population structure of elkhorn and staghorn coral exist; however, due to recent advances in technology, the genetic population structure of the current, depleted population is beginning to be characterized (Baums et al. 2005, Vollmer and Palumbi 2007). Results indicate that elkhorn populations in the eastern Caribbean (St. Vincent and the Grenadines, U.S.VirginIslands, Curacao, and Bonaire) have experienced little or no genetic exchange with populations in the western Caribbean (Bahamas, Florida, Mexico, Panama, Navassa, and Mona Island). Mainland Puerto Rico is an area of mixing where elkhorn populations show genetic contribution from both regions, though it is more closely connected with the western Caribbean. Within these regions, the degree of larval exchange appears to be asymmetrical, with some locations being entirely self-recruiting and some receiving immigrants from other locations within their region (*Acropora* BRT 2005).

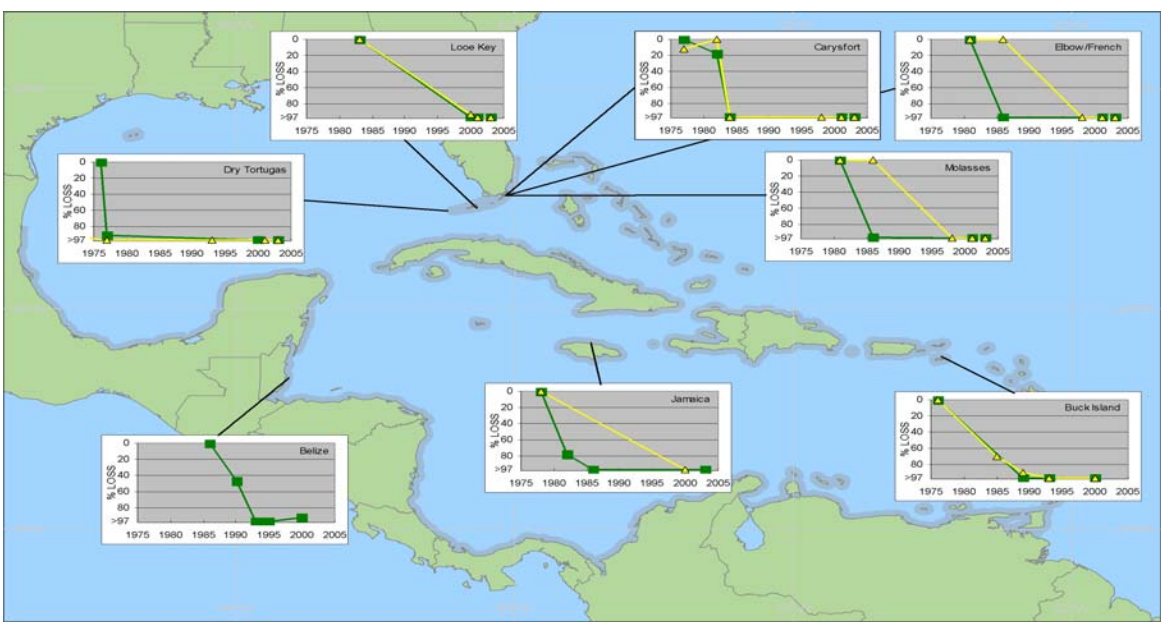


Figure 3.3.3. Percent loss of staghorn coral (green squares) and elkhorn coral (yellow triangles) throughout the Caribbean for all locations where quantitative trend data exist.

3.4 Economic Environment

3.4.1 Commercial Fishery

Commercial fishing for Caribbean spiny lobster in Florida was affected by national economic conditions in the last few years: though they increased in 2010/2011, ex-vessel prices in 2009/2010, $3.31/lb (ww) were at their lowest since the early 1960's, and fuel prices rose sharply during 2008/2009, falling later (Table 3.4.1.1 and Vondruska, 2010a). Economic conditions for commercial fishing would have been worse without long-term reductions in fishing effort, which are attributable in large part to the State of Florida's Trap Certificate Program. Productivity in terms of average vessel and trip landings exhibited flat to upward trends since the early-1990s. Vondruska (2010a), Vondruska (2010b), and Amendment 10 (GMFMC and SAFMC 2011) contain descriptions of commercial fishing for Caribbean spiny lobster, and are incorporated herein by reference. Select summary statistics for commercial fishing are provided in Tables 3.4.1.1 and 3.4.1.2, and estimates of economic impacts (economic activity) are provided in Table 3.4.1.3.

Table 3.4.1.1. Florida commercial fishing statistics for Caribbean spiny lobster.

Fishing year (July-June)	Thousand pounds	Thousand[1]	Lb[1]	Vessels	Lbs / vessel	Trips	Lbs / trip
86/87	5,351	$27,015	$5.05	1,377	3,886	30,696	174
87/88	5,417	$35,812	$6.61	2,046	2,648	34,005	159
88/89	7,154	$33,374	$4.66	2,087	3,428	36,021	199
89/90	7,830	$38,141	$4.87	2,244	3,489	39,934	196
90/91	6,044	$35,510	$5.88	2,301	2,627	40,194	150
91/92	6,834	$43,769	$6.40	2,201	3,105	45,276	151
92/93	5,367	$31,894	$5.94	1,702	3,153	35,387	152
93/94	5,309	$27,576	$5.19	1,536	3,457	31,283	170
94/95	7,181	$48,179	$6.71	1,411	5,090	32,093	224
95/96	7,017	$45,983	$6.55	1,419	4,945	32,546	216
96/97	7,748	$41,491	$5.36	1,968	3,937	32,591	238
97/98	7,641	$46,059	$6.03	1,382	5,529	33,906	225
98/99	5,448	$30,121	$5.53	1,342	4,060	26,012	209
99/00	7,669	$49,002	$6.39	1,260	6,086	27,947	274
00/01	5,570	$37,318	$6.70	1,259	4,424	26,111	213
01/02	3,081	$21,566	$7.00	1,047	2,943	19,528	158
02/03	4,574	$29,681	$6.49	1,141	4,009	23,972	191
03/04	4,162	$24,083	$5.79	1,003	4,149	22,096	188
04/05	5,445	$30,916	$5.68	928	5,868	20,308	268

05/06	2,965	$17,177	$5.79	815	3,638	14,921	199
06/07	4,799	$31,021	$6.46	780	6,152	18,184	264
07/08	3,782	$29,183	$7.72	803	4,710	18,858	201
08/09	3,271	$19,281	$5.89	773	4,232	15,239	215
09/10	4,358	$14,443	$3.31	711	6,129	14,347	304
10/11	5,830	$37,050	$6.36	808	7,215	18,125	322
5-yr avg	3,835	$22,221	$5.84	776	4,972	16,310	237

Note: Five-year average for 05/06-09/10. This table updates and replaces Table 3.4.1.1 in Amendment 10. [1]Data in 2010 dollars. Source: NMFS, SEFSC, FTT data as of 02Sep11, methods in Vondruska 2010a.

Table 3.4.1.2. Five-year average performance statistics for the commercial sector of the Caribbean spiny lobster fishery.

	Vessels	Total Lobster Ex-vessel Value[2] (millions)	Total All Species Ex-vessel Value[2] (millions)	Average Ex-vessel Value per Vessel
2005-2010 Average[1]	781	$22,227	$23,399	$29,960

Note: This table updates and replaces Table 3.4.1.2 in Amendment 10. [1]Data shown are 5-year average for 05/06-09/10. [2]Data in 2008 dollars, obtained from data in 2010 dollars (Tables 3.4.1 and 4.2.1), using the ratio 190/184.73. Source: Florida Trip Ticket System, as of 02Sep11.

Table 3.4.1.3. Average annual economic activity associated with the Caribbean spiny lobster fishery.

	Average Ex-vessel Value[1] (millions)	Total Jobs	Harvester Jobs	Output (Sales) Impacts (millions)	Income Impacts (millions)
Spiny Lobster	$22.855	4,342	597	$301.472	$128.924
- All Species[2]	$37.861	7,193	989	$499.410	$213.372

Note: This table updates and replaces Table 3.4.1.3 in Amendment 10. [1]Ex-vessel revenues and economic activity associated with the harvests of all species harvested by vessels that harvested spiny lobster.

3.4.2 Recreational Fishery

Sharp et al. (2005) estimated the number of permit holders that fished during the special two-day sport season from 1993 through 2002 ranged from approximately 32,500 to approximately 57,000, and the number of permit holders that fished at some time during the first month of the regular season ranged from approximately 49,000 to 78,000 over those same years.

Estimated recreational landings for Caribbean spiny lobster in Florida were lower in 2001/2002 onward than in the 1990s (Table 3.1.1). In the last five years, they averaged 1.208 mp (ww). The effects of weakened national economic conditions in the last few years help explain reduced effort (person-days), and a fall off in the number of recreational licensed purchased (SEDAR-8, 2010 update). In the mid-2000s, at least three hurricanes occurred when recreational fishing would otherwise be expected to be seasonally high. By virtue of their timing during the season, some hurricanes affected commercial fishing, including most recently, George in 1998, and Katrina, Rita, and Wilma in 2005; both years storms damaged or destroyed large proportions of the traps (Shivlani 2009). In contrast with declining effort and increased productivity for commercial fishing, recreational fishing effort has remained relatively flat during the last twenty years, along with productivity (number of lobsters landed per person-day).

Recreational spiny lobster fishing is important to Monroe County. Almost 230,000 person-days of recreational lobster fishing occurred that year in Monroe County. Of those person-days, approximately 75% were during the regular season, and the remaining person-days were during the two-day sport season. Approximately 79% of those person-days were attributed to visitors of Monroe County and the remaining 21% to residents (Table 3.4.2.1). Average expenditures per person-day are higher for visitors.
Visitors spend substantially more per person-day than residents of Monroe County, and visitors spend slightly more during the two-day sport season than regular season (Table 3.4.2.1). Sharp et al. (2005) estimate approximately $24 million was spent on recreational lobster fishing in the Florida Keys from the opening of the recreational season through the first Monday in September in 2001. Fishers who resided outside the Keys accounted for about 92% of the total monies spent on recreational lobster fishing in the Keys.

Table 3.4.2.1. Average expenditures per person-day in Monroe County for recreational fishing in 2001.

Season	Person Days			Avg. Exp. Per Person-Day		Total Expenditures (Million 2001$)		
	Resident	Visitor	Total	Resident	Visitor	Resident	Visitor	Total
Two-Day	12,306	45,962	58,268	$33.99	$129.41	$0.418	$5.948	$6.366
Regular	36,966	134,161	171,127	$42.83	$122.35	$1.583	$16.415	$17.998
Total	49,272	180,123	229.395	$40.61	$124.15	$2.001	$22.362	$24.363

Source: Sharp et al. 2005. Leeworthy [circa 2005] provides additional information on economic impacts (jobs, 469, output, $26.4 million, and income, $8.4 million), which may or may not be comparable with what is shown in Table 3.4.3 for commercial fishing for spiny lobster in Florida.

3.5 Social Environment

The demographic description of the social environment is presented primarily at the county level for south Florida and can be found in detail in Amendment 10. The focus on south Florida is due to the nature of the fishery which is prosecuted primarily in Miami-Dade and Monroe Counties. Communities were chosen for more detailed description based on their ranking within their "regional quota" (rq), the proportion of landings and value of community landings out of total landings for the region. Those communities where the "rq" was very low were not considered for further description. This excluded communities from other states as their landings were well below the top fifteen communities which is further evidence of a highly localized fishery. Although the most recent estimates of census data have been used, many of the statistics related to the economic condition of counties or communities do not capture the recent downturn in the economy which may have significant impacts on current employment opportunities and business operations. Therefore, in the descriptions of both counties and communities, it should be understood that in terms of unemployment, the current conditions could be worse than indicated by the estimates.

Marine Related Employment
Other county level summaries are of marine related employment within the coastal counties of South Florida. These estimates provide the number of sole proprietors and the number of employed persons for various sectors associated with employment in the marine environment. While these estimates do not encompass all employment related to fishing and its support activities, they do provide some estimate of the amount of activity associated with employment related to both recreational and commercial fishing.

Social Vulnerability
Each county was geocoded with regard to social vulnerability as measured by Social Vulnerability Index (SoVI). The Index was created by the Hazards Research Lab at the University of South Carolina (Cutter et al. 2003) to understand how places that are susceptible to coastal hazards might also exhibit vulnerabilities to social change or disruptions. These vulnerabilities may come in the form of high unemployment, high poverty rates, low education and other demographic characteristics. Although the SoVI was created to understand social vulnerability to coastal environmental hazards, it can also be interpreted as a general measure of vulnerability to other social disruptions, such as adverse regulatory change or manmade hazards. This does not mean adverse effects will occur, only that there may be a potential for adverse effects under the right circumstances. Fishing communities in these vulnerable counties may have more difficulty adjusting to regulatory changes if those impacts affect employment or other critical social capital. This concept is closely tied to environmental justice.

Fishing Communities
Table 3.5.1 shows recreational fishing communities identified by their ranking on a number of criteria, including number of charter permits per thousand population and available recreational fishing infrastructure, as listed under the Marine Recreational Information Program (MRIP) survey identified within each community. Because the recreational lobster fishery is such an important part of the Florida Keys economy, most every Keys community might be considered a recreational fishing community. This list of recreational fishing communities is not exhaustive and should be considered a guide to where substantial recreational fishing activity may take place.

Table 3.5.1. Recreational fishing communities along Florida's east coast.

Rank	Community
1	Islamorada
2	Cudjoe Key
3	Key West
4	Tavernier
5	Little Torch Key
6	Ponce Inlet
7	Marathon
8	Sugarloaf Key
9	Palm Beach Shores
10	Big Pine Key
11	Saint Augustine
12	Key Largo
13	Summerland Key
14	Sebastian
15	Cape Canaveral

Environmental Justice (EJ)
Executive Order 12898 requires federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. As mentioned, EJ is related to the idea of social vulnerability; however, no thresholds exist with regard to social vulnerability as with EJ. Thresholds for poverty and number of minorities have been established for EJ and those areas that exceed such thresholds were identified in Amendment 10.

Although the impacts of this amendment may affect communities with EJ concerns, because the impacts would not discriminate against any group, this action should not disproportionately affect low-income or minority populations and trigger any EJ concerns. In reviewing the thresholds for minorities among the coastal counties involved, Miami-Dade and Broward Counties in Florida exceed the threshold for minorities, while only Miami-Dade County exceeds the poverty threshold. Again, as illustrated by the SoVI, EJ is closely tied to social vulnerability as most of the counties that do not meet these thresholds are also considered medium high or highly vulnerable. The impacts from the following management actions may impact minorities and the poor, but not through discriminatory application of these regulations. However, while Monroe County does not exceed any of the EJ thresholds, nor is it classified as being vulnerable in terms of social vulnerability, there are processes that affect working waterfronts and therefore commercial and charter fishermen through the process of gentrification. While the regulatory actions within this amendment in and of themselves may not precipitate social change or disruptions, in combination with these and other outside factors, working waterfronts may be negatively affected.

3.6 Administrative Environment

3.6.1 Federal Fishery Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), originally enacted in 1976. The Magnuson-Stevens Act claims sovereign rights and exclusive fishery management authority over most fishery resources within the EEZ, an area extending 200 nautical miles from the seaward boundary of each of the coastal states, and authority over US anadromous species and continental shelf resources that occur beyond the EEZ.

Responsibility for federal fishery management decision-making is divided between the Secretary of Commerce (Secretary) and eight regional fishery management councils that represent the expertise and interests of constituent states. Regional councils are responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction. The Secretary is responsible for promulgating regulations to implement proposed plans and amendments after ensuring management measures are consistent with the Magnuson-Stevens Act and with other applicable laws summarized in Appendix E. In most cases, the Secretary has delegated this authority to NOAA Fisheries Service.

The Gulf and South Atlantic Councils are responsible for fishery resources in federal waters of their respective regions. These waters extend to 200 nautical miles offshore from the nine-mile seaward boundary of the states of Florida and Texas, and the three-mile seaward boundary of the Atlantic side of Florida and the states of Alabama, Georgia, Louisiana, Mississippi, North Carolina, and South Carolina.

The Councils consist of voting members: public members appointed by the Secretary, one each from the fishery agencies of the state, and one from NOAA Fisheries Service. The public is also involved in the fishery management process through participation on advisory panels and through council meetings that, with few exceptions for discussing personnel matters and litigation, are open to the public. The regulatory process is also in accordance with the Administrative Procedures Act, in the form of "notice and comment" rulemaking, which provides extensive opportunity for public scrutiny and comment, and requires consideration of and response to those comments.

NOAA's Office for Law Enforcement, the U.S. Coast Guard, and various state authorities enforce regulations contained within FMPs. To better coordinate enforcement activities, federal and state enforcement agencies have developed cooperative agreements to enforce the Magnuson-Stevens Act.

3.6.2 State Fishery Management

The purpose of state representation at the council level is to ensure state participation in federal fishery management decision-making and to promote the development of compatible regulations in state and federal waters. The state governments have the authority to manage their respective state fisheries. Each of the states exercises legislative and regulatory authority over their state's natural resources through discrete administrative units. Although each agency is the primary administrative body with respect to the states' natural resources, all states cooperate with numerous state and federal regulatory agencies when managing marine resources.

Chapter 4. Environmental Consequences

4.1 Action 1: Limit Spiny Lobster Fishing in Certain Areas in the Exclusive Economic Zone (EEZ) off Florida 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 ~~to address Endangered Species Act concerns for~~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 *Acroproa* spp. occur and in water depths less than 30 meters (96 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.

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

Alternative 4: Create new closed areas of the EEZ off the Florida Keys consisting of identified *Acropora* spp. colonies with a 500 ft buffer surrounding each colony.
Option a. In the closed areas, spiny lobster trapping would be prohibited.

Note: 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. 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.

4.1.1 Direct and Indirect Effect on the Physical and Biological/Ecological Environments

Spiny lobster traps are generally deployed on seagrass, rubble, or sandy habitats because these areas are less likely to damage traps (Hill et al. 2003). Traps also appear to move less on these substrates (Uhrin et al. 2005). However, if water quality is poor, fishers may accidentally deploy traps on habitats that could support elkhorn and staghorn corals (*Acropora* spp.). The biological opinion on the spiny lobster fishery (Bi Op) determined the deployment and retrieval of traps during normal fishing operations had little impact to *Acropora* spp. relative to traps moved from their original locations during storms.

Lewis et al. (2009) analyzed the impacts to benthic habitat in the Florida Keys of trap movement during storms. The study documented the distance traps moved during non-tropical storm events. Buoyed traps moved an average of 15 ft during each storm and as much as 98 ft from their original location (Lewis et al. 2009). The movement of buoyed spiny lobster traps following a tropical storm or hurricane has never been measured during a trap impact study, largely because those traps move so far from their original locations that they are rarely, if ever, recovered. However, anecdotal evidence indicates that fishermen have found traps several miles from their original location after tropical storms or hurricanes (FWC unpublished data).

The movement of traps during storms poses the greatest threat to *Acropora* spp. Because of the branching morphology, *Acropora* spp. colonies of any size are susceptible to fragmentation/breakage and abrasion from traps and trap lines. Even traps initially placed by fishermen in locations devoid of corals can be moved by storms into reef habitats and cause damage. Creating closed areas would reduce the likelihood of traps contacting colonies, even if they are moved by storms, by creating buffers between the closest traps and *Acropora* spp. colonies. Closed areas approximately 200 ft or more across would likely be sufficient to protect coral colonies from trap movements occurring during typical non-tropical storm conditions based on the information provided in Lewis et al. (2009). However, *Acropora* spp. commonly reproduce asexually via fragmentation, meaning pieces of a single colony can break off and establish new colonies nearby. Thus, a single point location may not capture the location of colonies that have fragmented from a parent colony and are now located nearby. This complicates the efforts to determine appropriate sized buffers. For example, if fragmented colonies are transported some distance from parent colonies and become re-established, the buffer zone appropriate for the parent colony may no longer be appropriate for the new colony as well. Selecting a 500-ft buffer provides some additional assurances that even in the case of fragmented colonies an appropriate conservation buffer can be maintained. Additionally, no global positioning system (GPS) is completely accurate, and differences in the equipment used by fishermen and researchers/divers providing colony location data further increases that inaccuracy. Using a minimum of a 500-ft buffer ensures that even with the potential for new colonies and inaccuracies in GPS systems, trap can be set nearby these areas while still achieving the goal of protecting *Acropora* spp.

Where they do occur, fisheries could cause fragmentation or abrasion resulting from: 1) fishing gear/marine debris, 2) damaging fishing practices, 3) vessel groundings, 4) anchoring, and 5) diver/snorkeler interactions (Acropora Biological Review Team 2005).

Non-trap gear is less likely to impact protected species. Bully nets require an active fishing technique that is only effective when target prey can be seen. The reliance upon visual contact with a target species greatly improves a fisher's ability to avoid contacting *Acropora* spp., and in fact, these fishers would prefer to avoid entangling their gear. Divers can impact corals through contact and breakage. Novice snorkelers/divers may stand on or kick *Acropora* spp. causing breakage, although there are no studies that document the frequency of this damage in the Florida Keys (NMFS 2009). Various studies throughout the Caribbean and Indo-Pacific have documented impacts of recreational divers on coral reefs (Hawkins et al. 1999; Barker and Roberts 2004; Uy et al. 2005; Guzner et al. 2010; Poonian et al. 2010). Some studies have documented recreational divers directly impacting coral habitat (Barker and Roberts 2004; Uy et al. 2005; Poonian et al. 2010); whereas, other studies determined recreational divers indirectly impact corals by inducing stress thereby making them more susceptible to diseases and predation (Hawkins et al. 1999; Guzner et al. 2010).

A study on coral reefs in St. Lucia documented 74% of divers made contact with the reef during their dive and that these contact rates were significantly different based on the topography of high-relief compared to low-relief corals (Barker and Roberts 2004). Further, three studies determined the primary impact from recreational divers on coral was with their fins accounting for the greatest proportion of damage and re-suspension of sediment (Barker and Roberts 2004; Uy et al. 2005; Poonian et al. 2010). Other diver related impacts include damage by touching and holding onto the reef and incidences of coral contact increased with divers wearing gloves (Barker and Robers 2004; Uy et al. 2005; Poonian et al. 2010).

The previous studies were based on recreational divers alone, without documentation of other potential impacts to the surrounding coral and sediment that may occur during lobster diving. Based on the previous literature it could be speculated that recreational divers targeting spiny lobster and commercial lobster divers could have negative impacts to coral and the surrounding habitat; however, without definitive documentation these interactions can only be speculated at this time. Regulations for FKNMS prohibit damaging, breaking, cutting, or otherwise disturbing *Acropora* spp. inside the sanctuary's boundaries [15 CFR 922.163(a)(2)]. Likewise, FKNMS regulations prohibit taking or possessing wildlife protected under the Endangered Species Act (ESA) [15 CFR 922.163(a)(10)]. Mooring buoys have also been deployed throughout the FKNMS, reducing boaters' need to anchor.

Alternative 1 would provide no 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 meet the requirement established under the Bi Op. The potential for damage to *Acropora* spp. as described above would have a higher probability of continuing.

Alternative 2 would provide the greatest biological benefit to *Acropora* spp. and other hardbottom/coral resources. **Alternative 2** would prohibit trapping or all lobster fishing on all hardbottom in the Florida EEZ south of US 1, from Key Biscayne to Key West, which could support *Acropora* spp. This would reduce the likelihood of interactions between spiny lobster fishing gear in this area and *Acropora* spp. to almost zero. The vast majority of *Acropora* spp. colonies in the Florida EEZ occur in waters within the South Atlantic Council's jurisdiction. Although areas of hardbottom habitat in the Florida EEZ fall under the jurisdiction of the Gulf Council, the water quality in these areas is generally too poor to sustain *Acropora* spp. colonies. However, if water quality improves these areas would likely support *Acropora* spp. **Alternative 2** would give the greatest protection to *Acropora* spp., but may be overly restrictive to fishermen.

Alternatives 3 and **4** were developed primarily to protect *Acropora* spp. colonies, using the six general criteria discussed in Section 2.1 as guidelines. Because elkhorn corals are relatively rare in the Florida Keys protecting these species was a primary goal of these alternatives. **Alternatives 3** and **4** also provide protection for areas where elkhorn and staghorn corals co-occur, which has great biological benefit for both species because not only are such areas relatively rare in the Florida Keys, the conservation benefit of such area closures are maximized by providing protection for both species. **Alternatives 3** and **4** also protect many of the largest colonies with the greatest reproductive potential, as well as many areas of high *Acropora* spp. density. Elkhorn corals with a living tissue surface area of 1,000 cm^2 could be considered "super colonies." A similar distinction could be made for staghorn corals with a living tissue surface area of 500 cm^2. Colonies of this size are also exceedingly rare. Sampling at over 1,000 locations throughout the Florida Keys and the Dry Tortugas identified only 17 super colonies (6 staghorn colonies and 9 elkhorn colonies). The same level of sampling has also identified 62 sexually mature colonies (32 staghorn colonies and 30 elkhorn colonies) and 61 non-sexually mature colonies (58 staghorn colonies and 3 elkhorn colonies). **Alternative 3** would also likely provide some additional indirect biological benefit by protecting *Acropora* spp. coral nurseries. Including coral nurseries in the proposed closed areas helps ensure that colonies being grown for restoration efforts are not damaged by spiny lobster fishing.

Option b would provide greater biological benefits than **Option a**. The impacts from trapping, diving, and anchoring, as described above, would all be reduced under **Option b**. Under **Option a** only the impacts of trapping would be reduced.

4.1.2 Direct and Indirect Effect on the Economic Environment

For purposes of assessing economic impacts, the extent of lobster fishing in the proposed closed areas in the EEZ off Monroe County (Keys EEZ) must be estimated. Survey-based studies by Murray (2005) and Shivlani et al. (2004) suggest similar economic characteristics of the fishermen and experience-based knowledge of the areas they fish. Fishermen have provided the Florida Trip Ticket (FTT) data used to assess the alternatives. Landings of spiny lobsters caught in Keys EEZ represent a fraction of the landings in Monroe County (Table 4.1.2.1). The Keys EEZ vessels have higher average gross revenue (ex-vessel value of all species landed in 2010$), but spiny lobster from the EEZ accounts for less of the gross compared to spiny lobster from state waters.

Table 4.1.2.1. Spiny lobster landings and effort, Florida Keys

		Landings by area of capture, Keys EEZ			
Annual averages for fishing years 2005/06 - 2009/10, or percentiles	Landings in Monroe County	Gulf and South Atlantic	Gulf and South Atlantic < 100 ft	Atlantic, < 100 ft	Atlantic, < 100 ft, traps only
Landings, thousand pounds (ww)	3,435	685	525	329	322
Thousand 2010$	$19,776	$3,662	$2,789	$1,851	$1,813
Trip gross, thousand 2010$	$20,755	$3,938	$2,979	$1,882	$1,833
Vessel gross, thousand 2010$	$30,974	$20,597	$18,998	$13,758	$13,265
%, trip gross / vessel gross	67%	19%	16%	14%	14%
Trips landing spiny lobster	13,877	1,786	1,543	1,111	1,043
Pounds (ww) / trip	249	380	334	298	311
Average depth fished (feet)	30	59	45	50	50
Depth, 90^{th} percentile	65	110	72	74	73
Depth, 99^{th} percentile	141	207	91	93	93
Vessels landing spiny lobster	588	209	192	156	132

Pounds (ww) / vessel	5,889	3,274	2,689	2,081	2,416
Vessel gross, 2010$ / vessel	$52,378	$98,901	$99,022	$88,554	$102,180

Source: NMFS, SEFSC, FTT (02Sep11), methods in Vondruska 2010. Commercial landings of spiny lobster in Monroe County represent a basis of comparison in Table 4.1.1, though some of what is caught in the Keys EEZ is landed in other counties, such as Miami-Dade, Lee and Collier Counties. "Gross" is the ex-vessel value in 2010$ of all FTT-reported landings for vessels or trips with landings of spiny lobster. Trip data (spiny lobster trip landings > 1 lb, ww) are used to specify vessels that land spiny lobster; however, vessel gross includes all FTT-reported landings of spiny lobster and other species (landings > 0 lb, ww).

Alternative 1 would not address the ESA concerns for *Acropora* spp. The Bi Op (NMFS 2009) requires NOAA Fisheries Service and the Councils to work together to protect areas of staghorn and elkhorn coral by expanding existing closed areas or creating new closed areas for lobster trap fishing where *Acropora* spp. are present.

Alternatives 2-4 would preclude all or some of the fishing for spiny lobster associated with hardbottom area in the EEZ off the Florida Keys that support threatened *Acropora* spp. From about Key Biscayne to Key West, the Atlantic EEZ off the Florida Keys totals 1,134 mi^2 out to a depth of 200 ft. The area of hardbottom being considered for closure covers 71 mi^2, and it is less than 100 ft deep. This area of 71 mi^2 is assumed to incorporate all of the economic activity associated with commercial fishing for spiny lobster in the Atlantic EEZ off Florida in waters less than 100 ft deep, i.e., 1,111 trips (by 156 vessels) with landings of spiny lobster of 0.329 mp ($1.851 million in ex-vessel value in 2010$, and $1.882 million in trip gross for all species landed on the same trips; FTT data in Table 4.1.2.1). The area of hardbottom in square miles is used for purposes of analysis, because it is the only metric available for distinguishing the proportion of economic activity associated with **Alternatives 2-4**.

In practice, fishermen deploy traps near, but not intentionally on coral.[4] Sheridan et al. (2005) used several methods to locate traps and assess habitat damage from traps in Atlantic waters off the Florida Keys. According to the method with greatest resolution (video cameras), few of the traps were found on coral; 61% of the area where traps were found consisted of seagrass; 9%, coral; 1%, sponge / gorgionian; 18%, bare substrate; and 11%, macroalgae. Habitat damage was observed in only a few instances where contact with traps occurred, but it was not quantified (damage meaning loss to live tissue, or fragmentation). Under the Florida Trap Certificate Program, which is one of the oldest limited access systems in the country, commercial fishermen have an economic interest in protecting the habitat that supports the lobsters they catch. These fishermen tend to have long experience and knowledge of the areas they fish, and they depend substantially on fishing for their income (Murray 2005, and Shivlani et al. 2004). As indicated in Section 4.2.2, the investment (asset) in traps, the cost of trap certificates, and the repair costs for traps are significant in fishing for spiny lobster. To operate effectively in the EEZ and minimize trap loss, fishermen are likely to use heavier “sinker” trap line, spiny lobster trawls, and added weights to reduce horizontal movement of traps associated with the stronger current in the deeper

[4]Spiny lobsters are reported to inhabit mostly shallow water, occasionally as deep as 295 ft (100 m), and most fishermen appear to deploy traps out to a depth of about 100 ft, and close to, but not intentionally on hard-bottom lobster habitat (den) areas, not counting surrounding areas where lobsters forage at night. When foraging at night, the lobsters move horizontally outward from their dens in the coral or other habitat, and the traps are placed in this area to attract them. See Amendment 10, Section 3.3.1 and Section 4.9.1.

water of the EEZ. It may not be possible, however, to haul traps that become entangled in coral via horizontal movement during storms. As indicated in Section 4.1.1, Lewis et al. (2009) analyzed the impacts to benthic habitat in the Florida Keys of trap movement during storms. The study documented the distance traps moved during non-tropical storm events. Buoyed traps moved an average of 15 ft during each storm and as much as 98 ft from their original location. The movement of buoyed spiny lobster traps following a tropical storm or hurricane has never been measured during a trap impact study, largely because those traps move so far from their original locations that they are rarely, if ever, recovered.

Alternative 2, Option b, would close all of the approximately 71 mi^2 to fishing for spiny lobster. Compared with **Alternative 1**, it is estimated that **Alternative 2, Option b**, would reduce landings of spiny lobster by 0.329 mp, and reduce vessel gross revenue by $1.88 million, the amount for foregone trip gross revenue (Table 4.1.2.1). This estimated economic impact of $1.88 million represents 14% of the total for vessel gross, enough to suggest changes in fishing behavior for the 156 affected vessels. Their $13.758 million total for vessel gross includes $9.248 million for spiny lobster, and this is more than the amount for spiny lobster they landed from the area proposed for closure under **Alternative 2, Option b,** $1.851 million (Table 4.2.2.1). This suggests considerable fishing by the 156 vessels within Florida waters. Their total for vessel gross revenue of $13.758 million includes in addition $2.4 million for stone crab, $1.0 million for snapper-grouper, and lesser amounts for king mackerel, shark, Spanish mackerel, shrimp and other species. Fishing for all of these species is governed by state and federal regulations, and a vessel may or may not be able to land more of these species, without purchasing access rights from other fishermen. Perhaps the 156 vessels that would be affected by **Alternative 2, Option b** could turn to more fishing in Florida waters with their existing limited-access Florida Trap Certificates, but far more trips occur in state waters than in the EEZ off Florida, and landings per trip are much lower (Table 4.1.2.1). Fishing for lobsters in deeper waters of the Keys EEZ still occurs, but deep-water, multi-day fishing for spiny lobster has declined substantially (see Amendment 10, Section 4.8).

The economic impact would be a bit less for **Alternative 2, Option a**, than for **Alternative 2, Option b**. The estimated reduction in landings would be 0.322 mp, and the reduction in vessel gross would be $1.83 million. The relatively small difference in landings for the two options is attributable to gear other than traps, notably diving. Under **Alternatives 2-4, Option a**, there is a caveat to the extent that landings by diving could increase in the absence of fishing with traps. Such an increase seems doubtful, because landings by diving in the proposed closed area have been decreasing. Daily trip limits for diving in south Florida and a diving permit moratorium have been in place since 2005. Based on FTT data for the Atlantic EEZ for waters less than 100 ft deep, the estimated landings with diving gear decline far more sharply than for traps as the commercial season progresses from August through March; landings by diving occur predominantly in August. The annual total for diving fell from a peak of 83,298 lbs (395 lbs / trip) in 2000/2001 to 1,544 lbs (62 lbs / trip) in 2010/2011.

Alternative 3 would create smaller closed areas (4.107 mi^2), 5.6% of the area for **Alternative 2**. The 4.107 mi^2 contains identified *Acropora* spp. colonies with straight-line boundaries (Figures 2.1.1 through 2.1.11). Applying the same percentage for purposes of comparison with **Alternative 1**, it is estimated that **Alternative 3, Option b** would reduce landings of spiny lobster by 5.6%, or 18,500 lbs, and the economic impact would be $105,877, which is the amount for foregone trip gross revenue. Compared with **Alternative 1**, it is estimated that **Alternative 3, Option a** would reduce spiny lobster landings slightly less than **Alternative 3, Option b,** i.e., landings would be reduced by 18,166 pounds, and trip gross revenue would be reduced by $103,134, the economic impact in terms of foregone trip gross revenue.

Based on available data, it is not possible to distinguish the economic impacts of **Alternatives 3** and **4**. They close approximately the same area and, therefore, the impacts would be the same.

4.1.3 Direct and Indirect Effect on the Social Environment

Closure of fishing areas is often a controversial management strategy and can have numerous direct and indirect effects to the social environment. In general, positive social effects from the proposed closed areas will generate from biological benefits of protecting the elkhorn and staghorn coral. As components of the marine environment, these corals are part of the ecosystem in which spiny lobster live. 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 associated with healthy marine ecosystems.

There are some general negative social impacts from spatial closures that 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. Additionally, if important fishing grounds are no longer available due to closed areas, there may be some issues with crowding and user conflict. In the Florida Keys there are numerous closed areas established through the FKNMS and Dry Tortugas National Park, which has already impacted the lobster trap fishery by limiting fishing areas.

Some of the most significant social effects from area closures come from perceptions by stakeholders, including the need and effectiveness of closed areas to protect the resource, specifically in designating closed areas that actually help achieve management goals of protecting elkhorn and staghorn coral. If proposed areas are not spatially appropriate (e.g., do not protect substantial colonies through which the *Acropora* spp. populations could be maintained and increased) or do not protect corals from other impacts (e.g., recreational fishermen and boaters, water quality issues, etc.), then perceptions of the meaningfulness of the proposed actions would likely be negative, and in turn result in broader negative social effects. Thus, it is important that any management actions that will close areas to fishing be appropriate and well planned, and that stakeholders be engaged in the entire process.

Alternative 1 would not allow for closed areas to be established through the Council process, under which the requirement in the Bi Op would not be met. **Alternative 1** would be expected to produce few social effects; positive and negative impacts would be minimal or none. **Alternative 2** would designate the largest closed area (approximately 71 mi^2) and would be expected to result in more significant negative impacts on the fishermen than **Alternatives 3** or **4**. **Alternative 2, Option a** would be expected to generate negative social impacts on the commercial trap fishermen only by eliminating present and potential fishing grounds, which may impact fishing businesses and also may contribute to crowding or gear conflict. **Alternative 2, Option b** expands the prohibition to include all spiny lobster fishing, thus would include other commercial gears (dive and bully nets) and recreational divers, and would generate an even more substantial social impact by limiting fishing areas for the entire commercial lobster fishery and the recreational fishery.

Because the square mileage of the proposed closures in **Alternatives 3** and **4** are estimated to be approximately the same, these would likely result in the same social impacts in terms of eliminating fishing grounds for fishermen. The current estimate of total area closed under **Alternative 3** is about 6.7 mi^2 and **Alternative 4** is about 6.6 mi^2. As in the options in **Alternative 2**, adverse impacts on the commercial trap fishery would be expected from a prohibition for traps only (**Option a**), and these impacts would extend into the rest of the commercial fishery and recreational fishery with **Option b**.

For **Alternatives 2-4**, broader positive social effects will likely be generated, dependent on the degree of impact to the corals by the lobster fishery relative to other factors that affect the marine environment in the Florida Keys. Otherwise, prohibitions on lobster fishing areas will have no significant effect on the population of the *Acropora* spp., and there will be no broad positive social effects that are associated with protection of a threatened species and the overall health of the coral ecosystem.

4.1.4 Direct and Indirect Effect on the Administrative Environment

Alternative 1 would not change the administrative environment from the current situation, except that not implementing reasonable and prudent measures from the Bi Op could leave NOAA Fisheries Service and the Councils subject to litigation, which would result in a significant administrative burden on the agency. Any alternative that creates new closed areas would increase the administrative burden over the current level due to changes in maps, outreach, and education of the public, and greater enforcement needs. **Alternative 2** may require more time in outreach and education because large areas traditionally fished for spiny lobster would be closed. Enforcement officials have indicated that **Alternative 4** would be more difficult to enforce than **Alternative 3**. NOAA Fisheries Service Office for Law Enforcement has stated that buffers serve little regulatory purpose other than to provide a warning of a potential or imminent violation if a behavior is not changed. Representatives for the U.S. Coast Guard have expressed similar reservations with **Alternative 4**. **Option b** compared to **Option a** would likely create a larger administrative burden because the recreational and commercial sectors would be impacted. Whereas, under **Option a** only the commercial spiny lobster trap line fishery would be impacted.

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

Gulf 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

4.2.1 Direct and Indirect Effect on the Physical and Biological/Ecological Environments

Trap lines are consistently found as marine debris and most frequently without buoys or traps still attached. These conditions create extreme difficulty in determining if line found in the environment or entangling protected species originated from the spiny lobster fishery. A lack of uniquely identifiable markings also makes monitoring incidental take by the fishery difficult. Trap line marking requirements would allow for greater accuracy in identifying fishery interactions with protected species, leading to more targeted measures to reduce the level and severity of those impacts. Trap line marking requirements would allow for greater accuracy in determining, or ruling out, fishery-based sources of marine debris.

NOAA Fisheries Service completed a formal consultation, and resulting Bi Op, on the continued authorization of the Gulf of Mexico and South Atlantic spiny lobster fishery in 2009. The Bi Op stated the fishery was not likely to adversely affect ESA-listed marine mammals, Gulf sturgeon, or designated critical habitat for elkhorn and staghorn corals. However, the Bi Op determined that the spiny lobster trap fishery would adversely affect sea turtles, smalltooth sawfish, and elkhorn and staghorn corals. The Bi Op discussed ways the commercial spiny lobster trap fishery may affect these species. It indicated that commercial lobster traps can adversely affect sea turtles and smalltooth sawfish via entanglement and/or forced submergence. Entangled sea turtles can be released alive or can be found dead upon retrieval of the gear as a result of forced submergence. Sea turtles and smalltooth sawfish that do not die from their wounds may suffer impaired swimming or foraging abilities, altered migratory behavior, and altered breeding or reproductive patterns. The Bi Op also discussed impacts to *Acropora* spp. stating traps and/or trap lines can adversely affect *Acropora* spp. via fragmentation or abrasion. Traps may also damage *Acropora* spp. during trap deployment/retrieval or if they are moved by storms and ultimately collide with colonies. Ultimately, the Bi Op concluded these adverse affects would not jeopardize the continued existence of any of those species. An incidental take statement was issued for green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles, smalltooth sawfish, and both species of coral.

Under the ESA, "takes" of most listed species are prohibited by law. 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)]. The adverse affects to sea turtles, smalltooth sawfish, and *Acropora* spp. from spiny lobster fishing are considered takes. However, some take of ESA-listed species can be authorized following the completion of a Bi Op and the associated incidental take statement. When an incidental take statement is issued, it allows for a specific number of anticipated takes to lawfully occur, so long as the takes are incidental to otherwise legal fishing. However, unless certain measures meant to minimize the impacts from and monitor the frequency of those incidental takes are followed, the protections afforded by the incidental take statement, do not apply.

No data collection programs (e.g., observer programs) are currently in place to specifically monitor interactions between the spiny lobster fishery and protected species, and the ability to monitor the authorized incidental takes is otherwise limited. Due to this paucity of data, sea turtle stranding and incidental capture records from the Sea Turtle Stranding and Salvage Network were used in the Bi Op to estimate the number of interactions in the federal spiny lobster fishery. The analysis used those data to estimate the total number of sea turtle interactions with the Gulf and South Atlantic spiny lobster fishery (Table 4.2.1.1). In the analysis, a sea turtle take rate per trap soak day was calculated, then multiplied by the number of traps in the federal spiny lobster fishery, to estimate the number of sea turtle interactions occurring in federal waters. The number of mortalities occurring as a result of those interactions was also calculated by species. The Bi Op outlines in detail the steps used in these calculations. Because of the great limitations on monitoring incidental take, the Bi Op required measures to improve those monitoring capabilities. Without the ability to monitor future incidental take, all of the measures prescribed the Bi Op to minimize the impacts from and monitor the frequency of incidental takes may not be met. Further, without a means of definitively identifying which interactions are attributable to the spiny lobster fishery, the fishery will continue to be held potentially responsible for interactions that are actually attributable to other fisheries. This may result in unnecessary additional restrictions on the spiny lobster fishery.

Table 4.2.1.1. Estimated three-year takes of protected species from the Bi Op for the commercial spiny lobster fishery.

Species	Lethal and Non-lethal	
Loggerhead	3	
Green	3	
Hawksbill/Leatherback/Kemp's ridley	1*	
	Lethal	Non-lethal
Smalltooth sawfish	0	2
	Area Affected	
Staghorn coral (*Acropora cervicornis*)	482.09 m^2	
Elkhorn coral (*Acropora palmata*)	7.41 m^2	

*The take for these species is in combination, not one per each species.

Industry representatives have expressed concern that colored line may actually attract sea turtles and cause more interactions. 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; Mäthger et al. 2007). Research on sea turtle vision shows that green and loggerhead sea turtles have peak sensitivity in the yellow range (around 580 nm), and sensitivity drops drastically above 650 nm and below 510 nm (Levenson et al. 2006). Leatherback sea turtles were shown to have peak sensitivity in the green range (Eckert et al. 2006). Few studies have been conducted on the attraction of sea turtles to colored objects. Bait (mackerel and squid) that were dyed blue did not attract turtles at a higher rate than non-dyed bait (Yokoto et al. 2009, Swimmer et al. 2006). Juvenile sea turtles were attracted to green, blue, and yellow light sticks, but only when they were lit (Lohmann et al. 2006).

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 or turtles that were incidentally caught and were dead (Lazar and Gračan 2011). Stomach analysis showed 35.2% of turtles had debris, and 42.1% of turtles with debris had rope of some sort. Of all turtles with ingested debris, 52.6% had white or translucent items; 31.6% had green, black, red, or brown items; and 15.8% had a mixture. Anecdotal evidence from sea turtle rehabilitation suggests that bright colors such as pinks, yellows, and bright greens can capture their attention (S. Schaf, FWC, pers. comm.).

Alternative 1 would have no benefit for habitat or protected species. **Alternatives 2** and **3** would have the same positive impacts on the biological environment in that they would both allow for greater accuracy in identifying fishery impacts to benthic habitats and protected species, leading to more targeted measures to reduce the level and severity of those impacts.

4.2.2 Direct and Indirect Effect on the Economic Environment

The proposed regulation would require markings and/or colors on trap lines that are unique to fishing for spiny lobster in the EEZ no later than August 6, 2017. Using a proxy for purposes of analysis, the number of "traps that could be fished" in Florida is estimated to be 416,722 traps (Table 4.2.2.1), and this represents a lower-end approximation for the number of Florida Trap Certificates, 488,072 (as of November 30, 2010, Brenda Brand, personal communication, FWC). It is estimated that 157,410 of the "traps that could be fished," 38% of the total, were used in the EEZ off Florida, an area that accounts for 19% of the Florida landings (Table 4.2.2.1). The vessels that fish in the EEZ tend to be larger, and the average depth fished is greater, 65 ft compared with 29 ft for Florida waters. It is noted that some vessels fish in both in state waters and the EEZ off Florida, meaning that the respective column totals for vessel gross, the number vessels with landings, and "traps that could be fished" in Table 4.2.2.1 are not mutually exclusive, and they cannot be added to obtain the totals for Florida as a whole. However, the amounts for the Florida EEZ and Florida as a whole are not affected.

Table 4.2.2.1. Spiny lobster landings and effort off Florida by State and EEZ waters.

Annual averages for fishing years 2005/06 - 2009/10, or percentiles	Landings, Florida	Landings in Florida by area of capture	
		State waters	EEZ
Landings, thousand pounds (ww)	3,835	3,109	726
Percentage of Florida landings	100%	81%	19%
Thousand 2008$ for spiny lobster	$22,221	$18,321	$3,900
Trip gross, thousand 2010$	$23,545	$19,137	$4,459
Vessel gross, thousand 2010$	$36,811	$33,466	$22,634
%, trip gross / vessel gross	64%	55%	20%
Trips with landings of spiny lobster	16,310	14,205	2,112
Landings, pounds (ww) / trip	237	219	339
Average depth fished (feet)	34	29	65
Depth, 25th percentile	15	15	33
Depth, 90th percentile	72	65	113
Depth, 99th percentile	148	102	206
Vessels with landings of spiny lobster	776	708	271
Pounds (ww) / vessel	4,972	4,413	2,695
2010$ / vessel, average	$28,489	$25,725	$14,387
2010$ / vessel, median	$6,708	$7,161	$2,997
Vessel gross, 2010$ / vessel	$47,274	$47,115	$83,460
Traps "that could be fished"	416,722	375,427	157,410
Traps / vessel, 25th percentile	136	154	132
Traps / vessel, average	537	532	574
Traps / vessel, 90th percentile	1,120	1,080	1,460

Source: NMFS, SEFSC, FTT (02Sep11), methods in Vondruska 2010a. Some vessels fish in both in Florida waters and the EEZ off Florida, meaning that the respective column totals for vessel gross, the number vessels with landings, and "traps that could be fished" in Table 4.2.1 are not mutually exclusive, and they cannot be added to obtain the totals for Florida as a whole. "Gross" is the ex-vessel value in 2010$ of all FTT-reported landings for vessels or trips with spiny lobster (sl) landings. Selected trip data are used (trips are selected if sl landings > 1 lb, ww) to compute statistics for trips and vessels with sl landings. Vessel gross includes the value for all FTT-reported landings of spiny lobster (spiny lobster landings > 0 lb, ww) and other species.

Selected FTT-based data on the number of traps per vessel and the depth of fishing for the Florida EEZ from Table 4.2.2.1 are used in Table 4.2.2.2, along with other information on trap line prices and replacement intervals to estimate the cost per vessel to replace trap lines.[5] Though not exhaustive, Table 4.2.2.2 suggests wide variation in postulated annual cost of trap line replacement, $213 to $16,498 per vessel, depending on assumed values for four variables, the price of trap line, length of line, number traps per vessel, and replacement intervals. Selected

[5]Prices and other information were obtained from the following sources: Adams, 2011; Cudjoe Sales, personal communication, 30Aug11 & 30Sep11 (22536 Overseas Highway, Cudjoe Key, FL 33042); W. Kelly (letter from FKCFA); Nylon Net Company (PO Box 592, Memphis, TN 38101-0592), website, 30Aug11; and Ornitz, 2011.

data on annual costs of trap line replacement per vessel in Table 4.2.2.2 are used for purposes of economic assessment of **Alternatives 1-3**, and may or may not reflect actual costs for any one vessel. According to survey data, the fisher-reported costs represent a significant part of capital (investment) cost and repair cost in fishing for spiny lobster. For example, Shivlani et al. (2004) indicate an average per-vessel value (investment or asset value) for lobster traps of approximately $29,000, and $107,430 for the vessel, along with $6,000 for annual trap repairs (2001/02 survey data for multi-species vessels landing in South Florida ports, dollar values not adjusted to 2010 levels). They report an average life span of four years for traps, with 25% of the traps being replaced each year, and the use of 1,463 traps per vessel in the 2001/2002 season. In another study, the averages are higher, and include an investment of $406,925 for the vessel, $45,923 for spiny lobster traps, and annual trap maintenance of $22,080 (Murray 2005; multi-species vessels fishing in the Dry Tortugas region in 2004-2005).

Table 4.2.2.2. Spiny lobster, Florida EEZ, estimated trap line replacement costs.

Trap line, $ / ft	Estimated annual cost of trap line per vessel							
	574 traps / vessel, 65 ft trap lines. Replace in (years):				1,460 traps / vessel, 113 ft trap lines. Replace in (years):			
	1 yr	3 yrs	5 yrs	7 yrs	1 yr	3 yrs	5 yrs	7 yrs
$0.04	$1,492	$497	$298	$213	$6,599	$2,200	$1,320	$943
$0.05	$1,866	$622	$373	$267	$8,249	$2,750	$1,650	$1,178
$0.06	$2,239	$746	$448	$320	$9,899	$3,300	$1,980	$1,414
$0.07	$2,612	$871	$522	$373	$11,549	$3,850	$2,310	$1,650
$0.08	$2,985	$995	$597	$426	$13,198	$4,399	$2,640	$1,885
$0.09	$3,358	$1,119	$672	$480	$14,848	$4,949	$2,970	$2,121
$0.10	$3,731	$1,244	$746	$533	$16,498	$5,499	$3,300	$2,357

Source: NMFS, SEFSC, FTT (02Sep11), methods based on Vondruska 2010a. Data are for trips for which spiny lobster landings exceed 1 pound. Statistics are computed separately for each variable. Averages and 90th percentiles for the Florida EEZ from Table 4.2.1 are used for depth fished and traps "that could be fished." Depth of 100 ft ~ 30 m [(98.425 ft = 30 m * (39.37 in / m) / (12 in /ft)].

To obtain the annual cost per vessel in Table 4.2.2.2, it is assumed that fishermen replace trap lines in equal annual increments over three-year, five-year and seven-year replacement intervals. Apparently, fishermen currently replace both white and black line at 5-7 year intervals. The per-vessel annual cost estimates assume that fishermen replace their own lines; the estimates do not include labor, buoys, traps, or other necessary items for trap use. The estimates for **Alternatives 1-3** are not intended to represent the lighter vertical trap lines (say 5/16-11/32 inch), which are apparently solid black, “floater” trap lines, and more likely to be used in shallower, state waters (average depth fished of 29 ft, compared with 65 ft for the EEZ; Table 4.2.2.1). By contrast, it is assumed that spiny lobster trawls with heavier, “sinker” lines (say 3/8 inch lines) and weights are used in the deeper waters, notably in the EEZ. The term spiny lobster trawl refers to the use of one or two vertical lines, with each vertical line being attached to a surface buoy, and with the other end of each vertical line being attached to bridles, which in turn are attached to lines for individual traps. In addition to the heavier, sinker line, weights are used to reduce drift caused by water currents in deeper water. One supplier indicated that the trap line they sell to fishermen for the EEZ for spiny lobster trawls is white, contains dealer-specific additional coloring, and costs more per foot than “floating” black vertical line.

Based on the discussion provided above, evaluation of the expected economic effects of the alternatives considered centers on the effect of the alternative on the cost of replacement line, replacement labor, and line longevity. As previously described, the information provided in Table 4.2.2.2 includes estimated annual trap line replacement costs for two trap-count and line-length scenarios (574 traps/65-ft trap lines and 1,460 traps/113-ft trap lines), four replacement cycles (1, 3, 5, and 7 years), and seven line costs ($0.04 to $0.10 per ft). The results from the table can be easily expanded for additional cost scenarios because the cost changes from one line price to the next in fixed amounts. For example, under the 1,460 trap/3-year replacement cycle, each $0.01 increase in the line price increases the annual replacement cost by $550. For the same number of traps and a 5-year replacement cycle, the incremental change is $330.

Starting with an estimate in Table 4.2.2.2 for **Alternative 1**, as used in the next paragraph, the estimated annual cost per vessel for ongoing trap line replacement is $1,885, assuming 113 ft of line for each trap, 1,460 traps per vessel, 7-year replacement intervals, and a trap line price of 8¢/ft. This estimate is used as a baseline to assess the added cost of trap line replacement under **Alternatives 2** and **3**; it is assumed to represent an upper-end cost estimate for ongoing trap line replacement for vessels fishing for spiny lobster in the EEZ off Florida. It is assumed that these vessels fish with spiny lobster trawls that require heavier, “sinker” lines. The assumptions for trap rope length, 113 ft, and the number of traps per vessel, 1,460 traps, are based on the 90th percentiles for observed values for trips (FTT data in Table 4.2.2.1). Adams (2011) assumed 90-ft trap lines for all spiny lobster fishing in waters off Florida, a price of 8.8¢/ft for the heavier line used in spiny lobster trawls, and a price of 7.7¢/ft for the lighter line used in vertical trap lines, but did not provide separate estimates for trap line replacement for the EEZ.

For 271 vessels, the average number fishing in the Florida EEZ, the postulated annual cost for on-going trap replacement is $510,967[6] under **Alternative 1**, or 13.1% of the trip gross, $3,899,643. The approximate counterpart for **Alternative 1** based on Adams (2011) is estimated be $647,064 per year for trap line replacement for the Florida EEZ.[7] It should be clearly noted, however, that these costs, regardless of the estimate or methodology used, represent current costs and would, therefore, be unaffected by this proposed regulatory action. It should also be noted that, although it has been previously stated that one supplier reports selling white line to fishermen harvesting spiny lobster in the EEZ, the estimates provided above do not explicitly incorporate any assumption on the color of the line used. The significance of this statement will be discussed below.

Alternative 2 would require a white tracer along a colored line’s (non-white line) entire length (perhaps as in Figure 2.2.1), or the use of white line, as appears to be used to some extent by fishermen harvesting spiny lobster in the EEZ. **Alternative 3** would require all spiny lobster trap

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[6]The postulated annual cost per vessel of $1,885 (assuming 1,460 traps per vessel, 113-ft trap lines @ 8 ¢ / ft, 7-yr replacement intervals) times 271 vessels.

[7]The 15-year cost for replacing all vertical and spiny lobster trawl lines in Florida was calculated as $3,405,600 for an estimated 484,500 traps, assuming 90-ft trap lines (Adams 2011, Tables 2). This include 48,500 spiny-lobster-trawl traps @ 8.8 ¢ / ft, $384,120; 436,000 vertical-line traps @ 8.6 ¢ / ft, $3,021,480. The EEZ share is computed using landings data from Table 4.2.2.1, 726 / 3835 ~ 19%. $3,405,600 x 0.19 = $647,064).

lines in the EEZ off Florida to have a permanently affixed white marking on black rope 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 (perhaps as in Figure 2.2.2). The specifications of each alternative overlap because the use of either a white tracer or white line, as specified in **Alternative 2**, would satisfy the requirements of **Alternative 3**. Therefore, a key consideration of the assessment is the extent to which fishermen currently use line that meet these specifications or, more specifically, the use of white line (although other line that meets the proposed specifications could be currently used, this assessment assumes that the use of white line would be most likely to occur). At the two extremes, all of the line or none of the line used in the EEZ could be white. If all of the line currently used is white, then neither alternative would result in any economic impacts on the industry. If none of the line currently used is white and all line is converted to white line, then **Alternative 2** would be expected to result in the greatest economic effects on fishing in the EEZ, estimated at $383,225. This represents an addition to the annual cost of trap line replacement over what is estimated for **Alternative 1**; i.e., the annual cost of trap line replacement goes from $510,967 (13.1% of trip gross) to $894,192[8] (22.9% of trip gross), and a difference of $383,225. The approximate counterpart for the economic impact of **Alternative 2** based on Adams (2011) is estimated be $108,642 to $219,328 per year for trap line replacement for the Florida EEZ, and this a fraction of the $577,180 per year that Adams estimated for both EEZ and State waters off Florida.[9] It should be noted that these results (**Alternative 2**) assume a 5-year replacement schedule and $0.10 per foot compared to 7 years and $0.08 per foot under **Alternative 1**. If white line lasts as long as current line and/or the cost per foot is the same, then the total cost increase associated with replacement would be reduced. In reality, it is likely that the use of white line is not universal and the actual effects would be somewhere in between the estimates provided ($0 to $383,225).

As specified in **Alternative 2**, conversion to the use of a white tracer would also be acceptable. Reduction of the line lifespan and increased cost may be more appropriate to the use of tracer line than white line and, if so, then the estimates provided above that incorporate a 5-year lifespan and $0.10 per foot may be more appropriate for this option than conversion to white line. Regardless, fishermen would be expected to select the option that is most economical.

As previously stated, because the use of white line would also satisfy the requirements of **Alternative 3**, the costs of conversion, and assumptions, under this alternative would be identical to those discussed with respect to **Alternative 2**. Marking the line, in lieu of conversion to either white or traced line, may be a more cost effective option. If marked line is commercially available, cost comparison would be relevant and, again, the use of $0.10 per foot in the analysis

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[8]Assuming 5-year replacement intervals for 1,460 traps per vessel and 113 ft lines @ 10 ¢ / ft, the estimated annual cost of trap replacement is obtained as follows: $3,300 per vessel for 271 vessels ($3,300 x 271 = $894,192).

[9]For Florida as a whole, Adams (2011) estimated a 15-year economic impact of $8,577,000. This translates into $577,180 per year. Adams assumed no additional costs for spiny lobster trawls, and additional costs for spiny lobster vertical lines (replacement every 3 yrs rather than every 7 yrs, and a price of 8.6 ¢ / ft rather than 7.7 ¢ / ft). Arguably, the EEZ share may be estimated using landings data from Table 4.2.2.1, 726 / 3835 ~ 19%, and $577,180 x 0.19 = $108,642. If the EEZ share is be estimated using trap data, it is $219,328 (157,410 / 416,722 ~ 38%, and $577,180 x 0.38 = $219,328).

above, or some other price, may be more appropriate for marking than simply a conversion from, for example, black line to white line or traced line. Other options, such as taping or painting, may cost less in out-of-pocket expenses (cost of paint or tape); however, both would require more labor than the purchase of white line, tracer line, or pre-marked line, each of which would require no additional labor compared to **Alternative 1**, and the effectiveness/durability of the marking may not be as good as commercially marked line. It should be clearly noted, however, that marking options would not be limited under **Alternative 3** and fishermen would be free to identify and use the method that worked best for them.

From the perspectives thus far discussed, regardless of the actual differences in line costs and durability based on color, tracing, or marking (commercial), the cost of conversion to either white line or tracer line under both **Alternative 2** and **Alternative 3** are identical because the baseline assumption (amount of line currently used that would or would not meet the alternative specifications; functionally this reduces to the amount of white line currently used) is the same under both alternatives and the cost of conversion to either type would not vary with the alternative. **Alternative 3**, however, may be expected to result in lower economic effects to spiny lobster fishermen who fish in the EEZ because it would allow the use of a possibly lower cost, though more labor intensive, solution. If, however, the purchase of a commercially complete product, like white line or traced line, is overall more cost effective after consideration of material costs, labor, and durability, then the costs of **Alternative 2** and **3** would be expected to be identical.

It should be noted that the discussion above covers short-term and recurrent costs. An additional consideration is the economic effects associated with the protection of habitat from marine debris and reduction of entanglement of protected species. The alternative marking requirements are proposed to facilitate an enhanced ability to associate line with the appropriate fishery so that appropriate corrective measures can be adopted in a timely fashion to protect the different resources. The proposed alternatives may differ in their ability to reduce harm to the different resources and, related, in the resultant likelihood that potentially harsher restrictions, with more severe economic consequences to the spiny lobster fishermen and industry, will not be required. Neither the degree of enhanced protection nor the subsequent effects of subsequent action can be forecast with available data. Nevertheless, from these perspectives, absent current use of white line or appropriately identifiable line by all current fishermen, which is assumed to not be the case, **Alternative 1** would not provide enhanced protection to the resources and would be expected to more likely require future restriction with more severe economic consequences than the other alternatives. Because the identifying marking would cover the entire length of the line, **Alternative 2** would be expected to result in the greatest protection for the potentially affected resources and least likelihood of more severe restrictions and associated economic consequences. The effects of **Alternative 3** would be intermediate to those of **Alternative 1** and **Alternative 2**, though these effects would be expected to be much closer to those of **Alternative 2** than **Alternative 1**.

The discussion above applies to the expected economic effects of the proposed alternatives on spiny lobster fishing in the EEZ, consistent with the scope of this amendment. NOAA Fisheries Service expects to ask Florida to implement compatible regulations for spiny lobster fishing in state waters. Although Adams (2011) evaluated the expected economic effects of gear line conversion on the entire spiny lobster fleet, comparable estimates of the effects of **Alternatives 2** and **3** on spiny lobster fishing in state waters, i.e., estimates consistent with the assumptions used in the analysis for the EEZ fleet, have not been developed for this assessment. The interested reader can generate these estimates using the information provided in Tables 4.2.2.1 and 4.2.2.2 ((number of vessels*number of traps*ft per line*cost per ft)/life per line=the average annual total cost to the fleet; remove the number of vessels from the equation to calculate the average annual cost per vessel). Key attention should be placed in any assessment, however, on the number of traps, line length, and line cost used in a state-water analysis because the assumptions used for fishing in the EEZ may not be appropriate for fishing in state waters. Consideration that some vessels may fish in both state waters and the EEZ would also be appropriate. Regardless of the estimates generated, or assumptions utilized, the ranking of the alternatives in terms of economic effects would not be expected to be affected; assuming some line conversion would be required, both **Alternatives 2** and **3** may be more costly than **Alternative 1** (if white or tracer line is more expensive or less durable than line currently used), **Alternative 3** may allow for lower cost options than **Alternative 2**, and **Alternative 2** may afford better protection than **Alternative 3** to potentially affected resources and reduce the likelihood of the need for more severe restrictions in the future.

4.2.3 Direct and Indirect Effect on the Social Environment

The proposed action to require markings on trap lines is required by the Bi Op as a means to identify ropes from the lobster trap fishery and measure the impacts on the coral. In general, positive social effects would be associated with biological benefits of improved monitoring of trap line interaction with the corals. Negative social effects would likely be tied to economic impacts on the commercial trap fishermen by the additional costs required to modify gear and the potential changes in long-term costs to replace line. Additional negative social effects are likely to result if stakeholders do not perceive the proposed measure as a necessary and effective means to protect sea turtles, Gulf sturgeon, smalltooth sawfish, elkhorn, and staghorn corals.

Alternative 1 would not require any markings on the lobster trap line, and would not be expected to result in any effects on the social environment. No social benefits linked to the biological benefits would result, nor would negative impacts associated with additional costs for fishermen or negative perceptions of the proposed actions. **Alternatives 2** and **3** both require some type of marking on the trap lines, which in some capacity likely result in negative social impacts due to additional costs for trap fishermen, as discussed in Section 4.2.2. There is a phase-in period for the requirements, which will help mitigate the negative impacts associated with additional costs.

Implementation of an identifying color on lobster trap line (**Alternatives 2** and **3**) should improve monitoring of fishery interactions with sea turtles, *Acropora* spp., and other protected resources and this information will help focus future actions toward the appropriate fishery (spiny lobster or another trap fishery). This likely would result in positive social benefits for the general public and for resource users, as it would be expected to improve the coral ecosystem health in the Florida Keys. However, there is little evidence that requiring gear markings has helped improve monitoring programs in other regions, which will likely lead to negative social impacts due to unclear outcomes of the proposed actions in **Alternatives 2** and **3**. Additionally, negative effects on the social environment may result due to changes in perception of meaningful application of the provisions of the Endangered Species Act (ESA) that are intended to help protect threatened and endangered species. Specifically with the proposed action for trap line markings, it may not be clear to stakeholders and the general public why gear markings were required, instead of other actions that would potentially be more effective in the protection of *Acropora* spp.

4.2.4 Direct and Indirect Effect on the Administrative Environment

Alternative 1 would not change the administrative environment from the current situation, except that not implementing reasonable and prudent measures from the Bi Op could leave NOAA Fisheries Service and the Councils subject to litigation, which would result in a significant administrative burden on the agency. **Alternatives 2** and **3** would increase the need for enforcement to check if trap lines are properly colored or marked. NOAA Fisheries Service Office for Law Enforcement has expressed issues with trap line marking requirements beccause of the effort required to make reasonably sure every float encountered in the EEZ has marked line beneath it. The at-sea officer and/or agent would need to pull the entire length of line to determine if the line marked actually matches the gear/trap at the other end. Therefore, enforcing line markings would require a significant amount of enforcement resource. On the other hand, the ability to identify lines entangled with endangered species would reduce the difficulty in determining assignment of incidental take to a particular fishery by NOAA Fisheries Service Protected Resources Division. In general, neither of the alternatives to mark lines would be more or less burdensome than the other.

4.3 Cumulative Effects Analysis (CEA)

As directed by the National Environmental Policy Act (NEPA), federal agencies are mandated to assess not only the indirect and direct impacts, but cumulative impacts of actions as well. The NEPA defines a cumulative impact as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7). Cumulative effects can either be additive or synergistic. A synergistic effect occurs when the combined effects are greater than the sum of the individual effects.

This section uses an approach for assessing cumulative effects based upon guidance offered by the CEQ publication “Considering Cumulative Effects” (1997). The report outlines 11 items for consideration in drafting a CEA for a proposed action.

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.
2. Establish the geographic scope of the analysis.
3. Establish the timeframe for the analysis.
4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.

5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.
7. Define a baseline condition for the resources, ecosystems, and human communities.
8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.
9. Determine the magnitude and significance of cumulative effects.
10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
11. Monitor the cumulative effects of the selected alternative and adapt management.

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.

The CEQ cumulative effects guidance states this step is accomplished through three activities as follows:

I. The direct and indirect effects of the proposed actions (Section 4);
II. Which resources, ecosystems, and human communities are affected (Section 3); and
III. Which effects are important from a cumulative effects perspective (information revealed in this CEA)

Valued ecosystem components (VECs) are "any part of the environment that is considered important by the proponent, public, scientists and government involved in the assessment process. Importance may be determined on the basis of cultural values or scientific concern" (CEAA 1999). The important VECs for this analysis are as follows:

1. Managed Resource
2. Habitat
3. Protected Resources
4. Human Communities

2. Establish the geographic scope of the analysis.

The immediate areas affected by this action and analyzed in this CEA are the federal waters of the Gulf and South Atlantic. These waters extend from the seaward side of the state waters of Texas, Louisiana, Mississippi, Alabama, Florida, Georgia, South Carolina, and North Carolina to 200 miles. In practice, the waters off south Florida are the primary area where this species is fished in the U.S. and that would be affected by actions in this amendment. Other affected VECs including non-target species, habitat, and protected species are also within this geographic scope. The human community includes the fishing community, which coincides with the managed species' geographic range, as well as the areas where processing, importing, and shipping of lobster tails takes place.

3. Establish the timeframe for the analysis

The temporal scope of impacts of past and present actions for managed resources, non-target species, habitat, and human communities is primarily focused on actions that have occurred after implementation of the Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and South Atlantic (Spiny Lobster FMP, GMFMC and SAFMC 1982). The most recent spiny lobster stock benchmark assessment was SEDAR 8 (2005). An update to that assessment was conducted in 2010; however, the Review Panel rejected that assessment. The update included data for analysis of stock status from the 1985/1986 season to the 2009/2010 season for commercial and recreational landings. The next SEDAR benchmark assessment is scheduled for 2014.

The actions in this amendment were also included in Amendment 10 to the Spiny Lobster FMP; however, the Council deferred action to allow more time for stakeholder input. This amendment is expected to be completed before the beginning of the 2012 fishing season, and the requirements in Action 2 would be enforced beginning in 2017. Therefore, the timeframe for this CEA is 1982-2017.

4. Identify the other actions affecting the resources, ecosystems, and human communities of concern.

a. Past federal actions affecting the spiny lobster fishery are summarized in Section 1.4. The following list identifies more recent actions.

- The Tortugas South marine reserve (60 nautical mi^2) was sited in the Gulf EEZ to encompass a spawning aggregation site for mutton snapper. The Tortugas North marine reserve (120 nautical mi^2) included part of the fishery jurisdiction of the FKNMS, Dry Tortugas National Monument, Gulf EEZ, and Florida, and was cooperatively implemented by these agencies. Both of these marine reserves encompass spiny lobster habitat.
- Amendment 9 (CEBA-1, SAMFC 2009) provided a presentation of spatial information for EFH and EFH-Habitat Areas of Particular Concern designations for species in the Spiny Lobster FMP.
- Amendment 10 proposes actions to revise the lobster species contained within the fishery management unit; revise definitions of management thresholds; establish an acceptable biological catch control rule, an annual catch limit, and an annual catch target for Caribbean spiny lobster; revise the federal spiny lobster tail-separation permitting requirements; revise the regulations specifying the condition of spiny lobster landed during a fishing trip; modify the undersized attractant regulations; modify the framework procedures; and give Florida the authority to remove derelict spiny lobster traps within the EEZ off Florida under their trap cleanup program.

b. The following are recent Florida actions important to the spiny lobster fishery.

- In 2001, the FWC set the target number of spiny lobster traps at 400,000 and implemented a 4% annual reduction in traps. The FWC suspended the annual trap reduction in 2003; nonetheless, the program resulted in a significant reduction in the annual numbers of traps set. In 2010, new regulations became effective that reduce the number of certificates by 10% if sold to a non-family member. This reduction will continue until the number of certificates is reduced to 400,000.

- As of January 1, 2005, and until July 1, 2015, no new commercial dive permits will be issued and no commercial dive permit will be renewed or replaced except those that were active during the 2004/2005 fishing season.
- In 2010, new regulations were enacted to remove latent trap certificates. Prior to the 2010/2011 season, any certificate for which the fee was not paid for three years shall be considered abandoned, revert to the state, and become permanently unavailable. Beginning with the 2010/2011 season, reversion will occur if the fee is not paid for two consecutive years.

c. The following are non-FMP actions that can influence the spiny lobster fishery.

- A naturally occurring, pathogenic virus, PaV1, infects juvenile Caribbean spiny lobsters. This virus is lethal to lobsters. Infection is highest in smaller juveniles; mortality occurs after larval settlement but before recruitment to the fishery. PaV1 was first detected in the U.S. spiny lobster population around 1996. No evidence shows PaV1 has increased in prevalence or virulence since around 2000, so mortality from PaV1 may explain why landings declined beginning about that time while the post-larval recruitment index remained steady.
- The Deepwater Horizon MC252 oil spill affected more than one-third of the Gulf from western Louisiana east to the panhandle of Florida and south to the Campeche Bank in Mexico. The impacts of the oil spill on the physical and biological environment are expected to be significant and may be long-term. However, the oil remained outside most of the area where spiny lobsters are abundant. Oil on the surface has largely evaporated or been removed. Heavy use of dispersants resulted in oil suspended within the water column, in some cases even deeper than the location of the broken well head. Floating and suspended oil has washed onto shore in several areas of the Gulf as non-floating tar balls. Whereas suspended and floating oil degrade over time relatively quickly, tar balls are more persistent in the environment and can be transported hundreds of miles. Information on the effects of the oil on the spiny lobster fishery is incomplete and unavailable at this time.
- The hurricane season is from June 1 to November 30, and accounts for 97% of all tropical activity affecting the Atlantic Basin (NOAA 2007). Hurricanes, although unpredictable in their annual occurrence, can devastate areas when they occur. Direct losses to the fishing industry and businesses supporting fishing activities included: substantial loss of traps, loss of vessels, loss of revenue due to cancelled fishing trips, and destruction of marinas and other fishery infrastructure (Walker et al. 2006; Shivlani 2009). However, while these effects may be temporary, those fishing-related businesses whose profitability is marginal may go out of business if a hurricane strikes.
- Because of the continuing rise in the cost of fishing, including increases in the cost of fuel and insurance, along with other increases in operating costs, more fishermen are having difficulty making a living fishing. For example, fuel prices have increased more than 2.2 times since January 2000 according to the U.S. Department of Energy. Communities dependent on jobs that support the spiny lobster fishery could also be negatively impacted. This in turn may impact businesses dependent on commercial and

recreational spiny lobster fishing because of fewer days to sell charter services, ice, fuel, tackle, hotel rooms, and other services to people participating in the fishery.

- How global climate changes will affect Gulf and South Atlantic fisheries is unclear. Climate change can impact marine ecosystems through ocean warming by increased thermal stratification, reduced upwelling, sea level rise; and through increases in wave height and frequency, loss of sea ice, and increased risk of diseases in marine biota. Decreases in surface ocean pH due to absorption of anthropogenic CO^2 emissions may impact a wide range of organisms and ecosystems, particularly organism that absorb calcium from surface waters, such as corals and crustaceans (IPCC 2007, and references therein).

5. Characterize the resources, ecosystems, and human communities identified in scoping in terms of their response to change and capacity to withstand stress.

This step should identify the trends, existing conditions, and the ability to withstand stresses of the environmental components. According to the CEQ guidance describing stress factors, two types of information are needed: the socioeconomic driving variables identifying the types, distribution, and intensity of key social and economic activities within the region; and the indicators of stress on specific resources, ecosystems, and communities.

<u>Caribbean Spiny Lobster</u>
Trends in landings and the status of Caribbean spiny lobster are summarized in Section 3.1 and 3.4. The Caribbean spiny lobster stock is not considered to be undergoing overfishing and the overfished status is unknown. Amendment 10 redefined the overfished and overfishing thresholds, so both Councils would use the same definition. The maximum fishing mortality threshold was specified as the overfishing limit set by the Gulf Council's Scientific and Statistical Committee, which equals 7.90 mp. Landings have not exceeded this level since the 1999/2000 fishing year. The minimum stock size threshold was established as (1-M) x B_{MSY}, where M is natural mortality and B_{MSY} is the biomass at maximum sustainable yield or the appropriate proxy. However, an estimate of Caribbean spiny lobster biomass is not possible without a pan-Caribbean assessment, so the overfished status remains unknown.

<u>Ecosystem</u>
Changes in the spiny lobster fishery are not likely to create additional stress on the environment. Traps and trap lines can damage habitat through snagging or entanglement. Changes in the population size structure as a result of shifting spiny lobster fishing selectivity and changes in stock abundance could lead to changes in the abundance of other species that compete with spiny lobster for shelter and food. Predators of spiny lobster could increase if spiny lobster abundance increased, and species competing for similar resources as spiny lobster could potentially decrease in abundance if less food and/or shelter are available. If spiny lobster abundance decreased, the opposite effects would take place. Efforts to model these interactions are still being developed, so predicting possible stresses on the ecosystem in a meaningful way is not possible at this time.

Spiny Lobster Fishery (Human Community)
Florida trip ticket data used to monitor commercial spiny lobster effort include the number of vessels with landings, the number of trips taken, and trip duration. Trends are described in Sections 3.1 and 3.4, and briefly summarized here.

Florida commercial landings of Caribbean spiny lobster increased from the late 1940s then decreased from 2001 onward (Vondruska 2010a). The estimated number of traps used for commercial fishing for Caribbean spiny lobster in Florida approximately doubled every 10 years during 1950-1990, reached nearly a million traps in the early 1990s, and was reduced to less than a half million traps by the late 2000s. These declines can largely be credited to the trap limitation program, which began in 1993. Commercial diving landings increased rapidly in the first decade of the trap limitation program and then declined thereafter (Table 3.1.1). Estimated recreational landings of Caribbean spiny lobster and fishing effort in Florida (based on surveys of recreational permit holders) were more consistently low from 2001/2002 onward than in the 1990s (Table 3.1.1).

Other reasons for the decline in effort include increases in fishing costs, increases in harvesting efficiency, and even improvements in the stock status. However, data currently available are inadequate to determine which of these factors may have contributed to the decline in fishing effort.

6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.

This section examines whether resources, ecosystems, and human communities are approaching conditions where additional stresses could have an important cumulative effect beyond any current plan, regulatory, or sustainability threshold (CEQ 1997). Sustainability thresholds, which are levels of impact beyond which the resources cannot be sustained in a stable state, can be identified for some resources. Other thresholds are established through numerical standards, qualitative standards, or management goals. The CEA should address whether thresholds could be exceeded because of the contribution of the proposed action to other cumulative activities affecting resources.

Caribbean Spiny Lobster
MSY is unknown but the landings data from 1991/1992-2009/2010 fishing years (Table 3.1.1) can be used to provide an indication of the productivity of the portion of the stock within the area of the Spiny Lobster FMP. Total landings provide an index of MSY and have ranged from a high of 10.1 mp in 1999/2000 to a low of 4.1 mp in 2005/2006, with an average of 7.0 mp.

Caribbean spiny lobster were not undergoing overfishing based on the SEDAR 8 (2005) benchmark assessment. The 2010 assessment update reached the same conclusion; however, the Review Panel rejected the assessment update. Because of the long planktonic larval stage for this species and hydrodynamic characteristics of the Gulf, South Atlantic, and Caribbean basins, Caribbean spiny lobsters in the U.S. fishery are believed to originate from spawning stocks outside of the U.S. Thus stressors on the population include fishing and other human activities outside the jurisdiction of the U.S. If the majority of recruitment is from areas outside of NOAA

Fisheries Service authority, then fishing levels in this country may have no effect on stock biomass.

Ecosystems
In the Bi Op, NOAA Fisheries Service determined the spiny lobster trap fishery, as it currently operates (e.g., number of traps, fishing techniques, gear types, etc.), may adversely affect the green, hawksbill, Kemp's ridley, leatherback, or loggerhead sea turtles, *Acropora* spp., or smalltooth sawfish, but is not likely to jeopardize their continued existence. The current cap on the number of traps available to the fishery [FAC. 68B-24.009(1)] is extremely unlikely to increase over the next three years. Additionally, an action to increase the number of traps available in the fishery would represent a modification to the fishery regulations and an ESA section 7 consultation may need to be reinitiated to evaluate any new risks to protected species not previously considered.

The Bi Op stated that it is reasonable to assume the estimated level of take over the 2004/2005-2006/2007 fishing seasons is likely to continue into the future. Therefore, the Bi Op anticipated that, over any consecutive three-year period, spiny lobster trap fishing would incidentally take up to three loggerhead, three green sea turtles, and one hawksbill, Kemp's ridley, or leatherback sea turtle; two smalltooth sawfish (non-lethal); and 482.09 m^2 of *A. cervicornis* and 7.41 m^2 of *A. palmata*.

Spiny Lobster Fishery (Human Community)
Commercial fishing for Caribbean spiny lobster in Florida has been affected by sharply lower prices in the last two years and by landings that have been the lowest since the early 1960's. Decreased landings are likely due to the increased cost of fuel and decreased prices are likely due to the depressed economy in recent years. There was an estimated 2.8% of the population in the civilian force that was estimated to be unemployed in Monroe County in 2007, which was quite a bit lower than the state's unemployment rate of 6.4%. Economic conditions would have been worse without long-term reductions in fishing effort and consequent increases in vessel and trip productivity. Average vessel and trip landings have exhibited flat to upward trends since the early-1990s. The number of permits may suggest an upward trend in recreational fishing activity, at least through 2007/2008, but landings and effort have been mostly lower in 2001/2002 onward than in the 1990s. These indicators reflect weakened national economic conditions in the last two to three years.

7. Define a baseline condition for the resources, ecosystems, and human communities.

The purpose of defining a baseline condition for the resource and ecosystems in the area of the proposed action is to establish a point of reference for evaluating the extent and significance of expected cumulative effects.

Although the Review Panel rejected the 2010 stock assessment update, the assessment report shows trends in biomass and fishing mortality dating to the 1985/1986 fishing season. Within this timeframe, spiny lobster were not considered to have been undergoing overfishing. Because spawning stock biomass cannot be determined without a Caribbean-wide assessment, the overfished condition could not be determined. These results are consistent with SEDAR 8 (2005).

The spiny lobster fishery was primarily a bait fishery (Labisky et al. 1980), until the development of freeze processing enabled the expansion of the retail market in the 1940's. The development of SCUBA further expanded the commercial fishery as well as the recreational fishery in the 1960's. Baseline information is lacking on the social environment of these fisheries, although some economic data are available. Ex-vessel revenues and numbers of traps in the water are available dating to the early 1960s. For further details on the history of the spiny lobster fishery, please see Section 3.0 of this amendment and Amendment 10.

8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.

Cause-and–effect relationships are presented in Table 4.3.1.

Table 4.3.1. The cause and effect relationship of fishing and regulatory actions for Caribbean spiny lobster within the time period of the CEA.

Time period	Cause	Observed and/or expected effects
1970's-80's	Increased number of traps in the water	Increased user conflicts on the water, excessive mortality of shorts, declining yield per trap
1988	Requirement and specification of live wells for holding undersized attractants	Reduced mortality of undersized attractants from 26% to 10%
1993	Florida implemented the spiny lobster Trap Certificate Program	Reduction from 750,326 traps in 1993 to 492,253 traps in 2010
1993	Florida implemented the restricted species endorsement	Limited the number of commercial spiny lobster fishermen
1993	Bag limit for recreational spiny lobster fishery	Reduced impacts of recreational divers on the lobster stock, particularly during the two-day sport season in July

9. Determine the magnitude and significance of cumulative effects.

The objective of this amendment and associated SEIS is to implement management actions consistent with reasonable and prudent measures to protect threatened and endangered species established under the Bi Op. The short- and long-term direct and indirect effects of each these actions are provided in Section 4.

To examine the magnitude and significance of the cumulative effects, important VECs were identified for the overall action to be taken with this amendment. For purposes of this analysis, four categories of VECs were identified (Table 4.3.2), and the consequences of each alternative proposed in this amendment on each VEC were evaluated. Some of these VECs were combined because the impacts of many of the past and current actions were similar.

Table 4.3.2. Evaluated VECs considered for further analysis and VECs consolidated for analysis.

VECs considered for further evaluation	VECs consolidated for further evaluation
Managed resource	Adult Caribbean spiny lobsters Sub-legal Caribbean spiny lobsters
Habitat	Hard bottom EFH
Protected resources *Acropora* spp. Endangered/threatened species	Marine mammals Sea turtles Sawfish
Human communities	Commercial harvesters Recreational harvesters Dealers Fishing communities

The following discussion refers to the effects of past and present actions on the various VECs.

Managed Resources

SEDAR 8 (2005) found the Caribbean spiny lobster stock was not undergoing overfishing, but the overfished status could not be determined. However, much evidence exists that recruitment is almost entirely from outside of the U.S. To obtain a true estimate of spawning stock biomass, a Caribbean-wide assessment is needed. Further, management and harvest practices in other countries may have a substantial impact on recruitment to the U.S. fishery. The import size restrictions (Amendment 8; CFMC, GMFMC and SAFMC 2008) may increase the size of the spawning stock in countries that previously harvested lobsters at or below reproductive size.

Non-fishing activities are likely to adversely affect spiny lobster stocks. Products from the Deepwater Horizon MC252 oil spill could potentially make their way into spiny lobster habitat in the Florida Keys. Effects could be minimal because of weathering, or effects could be more detrimental, especially impacting reproductive output and larval survival. These impacts may or may not influence the Caribbean spiny lobster stock, as most of the larvae produced in the Keys are believed to be lost to the population. Global warming could also have a detrimental effect on spiny lobsters; however, those effects cannot be quantified at this time.

Habitat

The Gulf Council's Generic Essential Fish Habitat Amendment (GMFMC 2004) and the South Atlantic Council's Fishery Ecosystem Plan (SAFMC 2009) define EFH. Sections 3.2 and 3.3 of this amendment summarize the physical environment inhabited by Caribbean spiny lobsters. In general, Caribbean spiny lobsters can be found among rocks, on reefs, in grass beds or in any habitat that provides protection. A planktonic larval stage lives in the water column for six to seven months and feeds on zooplankton and phytoplankton. Young benthic stages of Caribbean spiny lobster will typically inhabit branched clumps of red algae, mangrove roots, seagrass banks, or sponges where they feed on invertebrates found within the microhabitat. Individuals two to four years show nomadic behavior, emigrating out of the shallows and moving to deeper, offshore reef environments.

The most detrimental effects to the environment from fishing are caused by traps. Deployment of traps and movement of traps can damage both soft and hard bottom habitats. The development of marine reserves around the Dry Tortugas and the Florida Keys National Marine Sanctuary has helped protect some critical habitat. Florida's Trap Certificate Program has substantially reduced the number of traps that may be used by fishermen. Derelict traps may also impact habitat. Florida has a trap clean-up program in state waters that can be extended to federal waters under authority implemented through Amendment 10 (GMFMC and SAFMC 2011). Hurricanes are not uncommon in the Florida Keys where most of the lobster population lives. Storms can move both active and derelict traps over sensitive habitat even more than under normal conditions.

Although impacts to habitat are less for fishermen using gears other than traps, damage can still be done. Boats carrying recreational or commercial divers may drive through sea grass beds creating the ubiquitous prop scars visible in the Keys. Boats are sometimes anchored over hard bottom, and inexperienced recreational divers sometimes stand on or grab bottom structures with living organisms. The illegal use of casitas by commercial divers, artificial dens to attract lobsters, can damage or alter bottom structure. For commercial diving, state daily trip limits and a diving permit moratorium (in place since 2005) have reduced fishing effort. There is, however, no such limit for recreational fishing, and, consequently, a relatively large number of state-permitted recreational divers (Shivlani et al, 2005, survey data).

The Bi Op determined the spiny lobster fishery is not likely to adversely affect *Acropora* spp. critical habitat. The physical feature essential to the conservation of *Acropora* spp. critical habitat (typically referred to as the essential feature) is substrate of suitable quality and availability to support larval settlement and recruitment, as well as reattachment and recruitment of asexual fragments. Effects to the essential feature from bully netting and diving for spiny lobster either do not occur or occur so rarely they are discountable. Commercial trapping may affect *Acropora* spp. critical habitat, but any affects will be temporary and insignificant. Traps do not cause consolidated hardbottom to become unconsolidated, nor do they cause growth of macroalgae or increased sedimentation.

EFH, particularly coral reefs, sea grasses, and algae, is susceptible to non-fishing activities. Anything that suspends sediments, such as tropical storms, can block sunlight and decrease photosynthesis. Dramatic climate change in the future could alter temperatures to an extent to exceed the viable range for the organisms that make up these habitats.

<u>Protected Resources</u>

Acropora spp.

Commercial and recreational bully net use is not likely to adversely affect *Acropora* spp., based on the low likelihood of interactions between these species and this gear type. The reliance upon visual contact with a target species reduces the potential for fragmentation or abrasion of *Acropora* spp. caused by bully nets. *Acropora* spp. are extremely unlikely to occur on the seagrass and mud flats where the vast majority of bully nets are used.

Commercial and recreational diving for spiny lobster is not likely to adversely affect *Acropora* spp. *Acropora* spp. occur only rarely and in discrete locations within the Gulf and South Atlantic regions, and are not found in the Gulf portion of the Florida Keys. Where they do occur, fisheries could cause fragmentation or abrasion resulting from: 1) fishing gear/marine debris, 2) damaging fishing practices, 3) vessel groundings, 4) anchoring, and 5) diver/snorkeler interactions (*Acropora* BRT 2005).

Traps may affect *Acropora* spp. via fragmentation and abrasion if they become mobilized during storm events and collide with colonies. The deployment of spiny lobster traps may adversely affect *Acropora* spp. as traps drop toward the sea floor or when traps are retrieved and pulled to the surface. Abrasion may occur when traps or trap lines contact *Acropora* spp. during storm events or normal fishing activities. However, *Acropora* spp. are only rarely, if ever, observed in the Gulf off south Florida where the majority of trap fishing occurs because of relatively poor water quality. For this reason, any adverse affects from abrasion/fragmentation due to interactions with commercial spiny lobster trap gear are only likely to occur in the South Atlantic waters off south Florida. The Florida Trap Certificate Program, although suspended at this time, substantially reduced the number of traps by Florida fishermen. Fewer traps in the water reduce the likelihood of *Acropora* spp. suffering adverse impacts.

Localized adverse affects on *Acropora* spp. in the action area have resulted from many of the same stressors affecting *Acropora* spp. throughout its range, namely breakage by humans, disease, and intense weather events (i.e., hurricanes and extreme cold-water disturbances). These stressors have led to declines of *Acropora* spp. in the action area commensurate with declines seen elsewhere in the species' range (*Acropora* BRT 2005). Stresses associated with climate change have been documented worldwide and are expected to increase. For example, increased temperatures can lead to bleaching (loss of algal symbionts). Researchers predict bleaching threshold temperatures will be exceeded at least once per year on the majority of the world's coral reefs by 2030-2050 (IPCC 2007).

Increases in atmospheric carbon dioxide (CO_2) can also affect *Acropora* spp. corals. Atmospheric CO_2 has increased from about 280 parts per million (ppm) in the early 1800s to current levels of about 380 ppm (Prentice 2001). As atmospheric CO_2 is dissolved in surface seawater, it becomes more acidic, shifting the balance of inorganic carbon away from CO_2 and carbonate (CO_3^{-2}) toward bicarbonate (HCO_3^{-1}). These changes affect corals' ability to create new skeletal material because corals are thought to use CO_3^{-2} as the source of carbonate to build their aragonite ($CaCO_3$) skeletons. Kleypas et al. (1999) calculated that coral calcification could be reduced by 30% in the tropics by the middle of the 21st century. Corals grown during laboratory experiments that doubled atmospheric CO_2 manifested an 11-37% reduction in calcification (Gattuso et al. 1999, Langdon 2003, Marubini et al. 2003).

Rapid rises in sea level will likely affect *Acropora* corals by both submerging them below their preferred depth range and by degrading water quality through coastal erosion or enlargement of lagoons and shelf areas. Sea-level change is unlikely to lead to extinction in the next several hundred years by this process because sea level is not predicted to rise that rapidly in the near future (Church and Gregory 2001).

Acropora spp. corals would likely be affected by decreased water quality because of shoreline erosion and flooding of shallow banks and lagoons caused by sea-level rise. Where topography is low and/or shoreline sediments are easily eroded, corals may be stressed by degrading water quality as sea-level rise proceeds. Flooded shelves and banks at higher latitudes (higher than 15°N) may alter the temperature or salinity of seawater to extremes that can then affect corals during offshore flows. Although this process could be widespread, there will be many areas, particularly on the windward side of rocky islands, where erosion and lagoon formation will be minimal (*Acropora* BRT 2005).

The impacts of global climate change on the severity and frequency of tropical weather events (e.g., typhoons and hurricanes) are currently being debated. The Intergovernmental Panel on Climate Change stated that, based on a range of models, it was likely that future tropical weather events will become more intense, with larger peak wind speeds and more heavy precipitation associated with ongoing increases of tropical sea surface temperatures (IPCC 2007). However, a statement on tropical cyclones and climate change developed by the participants of the World Meteorological Organization states that while “there is evidence both for and against the existence of a detectable anthropogenic signal in the tropical cyclone climate record to date, no firm conclusion can be made on this point” (WMO 2006).

Sea Turtles and Smalltooth Sawfish

Commercial and recreational bully net use is not likely to adversely affect sea turtles or smalltooth sawfish based on the low likelihood of interactions between these species and this gear type. Bully nets require an active fishing technique that is only effective when target prey can be seen and the net is tended constantly. Thus, sea turtles or smalltooth sawfish are extremely unlikely to become entangled in these gears.

The distribution of spiny lobster diving effort overlaps spatially with areas inhabited by sea turtles and smalltooth sawfish. However, divers only occasionally encounter sea turtles and rarely encounter smalltooth sawfish, if at all.

Sub-adult and adult loggerhead sea turtles are primarily coastal dwelling and typically prey on benthic invertebrates such as mollusks and decapod crustaceans in hardbottom habitats. As such, loggerhead sea turtles may be attracted to spiny lobster traps when lobsters are inside. They are also known to feed on epibionts growing on traps, trap lines, and floats and may be attracted to spiny lobster traps for this reason as well (NMFS and USFWS 1991). Commercial lobster traps may adversely affect sea turtles via entanglement and forced submergence. Sea turtles released alive may later succumb to injuries sustained at the time of capture. Of the entangled sea turtles that do not die from their wounds, some may suffer impaired swimming or foraging abilities, altered migratory behavior, or altered breeding or reproductive patterns. Smalltooth sawfish feed primarily on fish, such as mullet, jacks, and ladyfish (Simpfendorfer 2001). No data are currently available on the attraction of smalltooth sawfish to spiny lobster trap gear.

There is a large and growing body of literature on past, present, and future impacts of global climate change exacerbated and accelerated by human activities. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, and change in air and water temperatures. NOAA’s climate information portal provides basic background information on these and other measured or anticipated effects (see http://www.climate.gov).

Impacts on sea turtles currently cannot, for the most part, be predicted with any degree of certainty; however, significant impacts to the hatchling sex ratios of loggerhead sea turtles may occur (NMFS and USFWS 2007). In marine turtles, sex is determined by temperature in the middle third of incubation with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25-35°C (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007). Modeling suggests an increase of 2°C in air temperature would result in a sex ratio of over 80% female offspring for loggerheads nesting near Southport, North Carolina. The same increase in air temperatures at nesting beaches in Cape Canaveral, Florida, would result in close to 100% female offspring. More ominously, an air temperature increase of 3°C is likely to exceed the thermal threshold of most clutches, leading to death (Hawkes et al. 2007).

Warmer sea surface temperatures have been correlated with an earlier onset of loggerhead nesting in the spring (Weishampel et al. 2004, Hawkes et al. 2007), as well as short inter-nesting intervals (Hays et al. 2002) and shorter nesting season (Pike et al. 2006).

The effects from increased temperatures may be exacerbated on developed nesting beaches where shoreline armoring and construction have denuded vegetation. Erosion control structures could potentially result in the permanent loss of nesting beach habitat or deter nesting females (NRC 1990). Alternatively, females may nest on the seaward side of the erosion control structures, potentially exposing them to repeated tidal overwash (NMFS and USFWS 2007). Sea level rise from global climate change is also a potential problem for areas with low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting sites and decrease available nesting habitat (Daniels et al. 1993, Fish et al. 2005, Baker et al. 2006). The loss of habitat because of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as an increase in the frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006, Baker et al. 2006).

Other changes in the marine ecosystem caused by global climate change (e.g., salinity, oceanic currents, dissolved oxygen levels, nutrient distribution, etc.) could influence the distribution and abundance of phytoplankton, zooplankton, submerged aquatic vegetation, crustaceans, mollusks, forage fish, etc., which could ultimately affect the primary foraging areas of loggerhead sea turtles.

<u>Human Communities</u>
Adverse or beneficial effects of actions to vessel owners, captains, crew, and associated shoreside businesses are tied to the ability of individuals to earn income and pursue traditional and culturally significant livelihoods. In commercial fisheries, income benefits are usually derived in terms of shares awarded after fishing expenses are accounted for. The greater the difference between expenses and payment for fish caught, the greater the revenue generated by

the fishing vessel. For the for-hire sector, revenues are generated by the number of trips sold for charter businesses, and by the number of paying passengers for headboat businesses.

Fishing communities include infrastructure, which refers to fishing-related businesses and includes marinas, rentals, snorkel and dive shops, boat dockage and repair facilities, tackle and bait shops, fish houses, and lodgings related to recreational fisheries industry. This infrastructure is tied to the commercial and recreational fisheries and can be affected by both adverse and beneficial economic conditions in those fisheries. Therefore, the effects of past and present actions on communities should reflect responses by the fisheries to these actions.

Current management measures have had a negative, short-term impact on the commercial fishery. Both the trap limitation program and the moratorium on commercial dive permits restricted access to this fishery. On the other hand, Amendment 8 established a minimum size limit for imported spiny lobster that should, in the long run, improve the status of the domestic and foreign stocks and the associated economic benefits. The restrictions are expected to affect people who were damaged economically by the illegal importation of Caribbean spiny lobster, particularly in Florida, Puerto Rico, and the U.S. Virgin Islands.

Non-management stressors can have large effects on fishing communities. Although the Deepwater Horizon MC252 oil spill did not directly impact south Florida, fishermen and dealers may have experienced hardship from reduced consumer confidence in seafood from the region. Because of the continuing rise in the cost of fishing, including increases in the cost of fuel and insurance, making a living through fishing has become increasingly difficult.

Tropical storms can have both positive and negative economic impacts on spiny lobster fishermen, especially those that use traps. The beneficial impact is that a storm can cause lobsters to move and enter traps, which increases landings. However, the negative impacts include damages to and losses of traps, other gear, and vessels and associated losses of landings and revenues. The 2005 hurricane season was one of the worst on record. Of the storms that hit the coast of Florida, Dennis (July), Katrina (August), Rita (September), and Wilma (October) had a significant adverse impact on spiny lobster trap fishers. In the Florida Keys, one-fourth to one-half of all commercial spiny lobster traps were estimated as tangled or destroyed by the passage of Katrina alone (Buck 2005). According to an article at *keysnews.com*, Florida Keys lobster trap fishermen "reported losing up to 70 percent of their traps in the four hurricanes that skirted the Keys in 2005. Officials have estimated that the hurricanes cost lobster fishermen $35 million in lost traps and catch" (O'Hara, May 1, 2006).

10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.

The cumulative effects of the actions in this amendment on the biological/ecological, physical, social, and economic environments would be positive because they would ultimately protect endangered and threatened species. However, short-term negative impacts on the social and economic environment may occur to the fishery due to loss of fishing area and the cost of trap line replacement. NOAA Fisheries Service and Council staffs worked with stakeholders to minimize closure of fishable areas without *Acropora* spp. and to determine low-cost line marking techniques. If further significant effects are identified after this document is completed, or if new information becomes available, an additional amendment could be developed under the framework procedure to achieve the goals in the purpose and need.

11. Monitor the cumulative effects of the selected alternatives and modify management as necessary.

The effects of the proposed actions are, and will continue to be, monitored through stock assessments and stock assessment updates, life history studies, economic and social analyses, and other scientific observations.

Monitoring and tracking the level of take of protected species by the spiny lobster fishery is imperative. NOAA Fisheries Service must ensure that measures to monitor and report any sea turtle or smalltooth sawfish encounters, or any *Acropora* spp. interactions: 1) detect any adverse effects resulting from the spiny lobster fishery; 2) assess the actual level of incidental take in comparison with the anticipated incidental take; and 3) detect when the level of anticipated take is exceeded.

No data collection programs are currently in place to specifically monitor interactions between the spiny lobster fishery and protected species. Due to this paucity of data, sea turtle stranding and incidental capture records from the Sea Turtle Stranding and Salvage Network were used in the Bi Op to estimate the number of interactions in the federal spiny lobster fishery.

4.4 Other Effects

4.4.1 Unavoidable Adverse Effects

Limiting spiny lobster fishing in areas to protect *Acropora* spp. would necessarily reduce the open fishing area. The requirement to mark trap lines would incur costs to fishermen, although NOAA Fisheries Service and Council staffs have worked closely with industry representatives to choose methods that would be less expensive. Fishermen would have five years to comply, before which time many trap lines would need to be replaced anyway. Both of these actions are required by the Bi Op and are therefore unavoidable.

Actions considered in this amendment should not adversely affect public health or safety because these measures should not alter fishing practices in a substantial way. Unique characteristics of the geographic area are highlighted in Section 3.2 of Amendment 10. Adverse effects of fishing activities on the physical environment are described in detail in Sections 4.1-4.2. These sections conclude little adverse impact on the physical environment should occur from actions proposed in this document. Uncertainty and risk associated with the measures, as well as assumptions underlying the analyses, are described in detail in the same sections.

4.4.2 Relationship Between Short-Term Uses and Long-Term Productivity

The objectives of this amendment are to consider measures to protect endangered species established under a Bi Op. In achieving these objectives, the fishery may encounter short-term economic impacts, such as reduced catch or increased costs, but experience long-term economic productivity due to protection of the resources, as discussed in previous sections.

The process of managing the spiny lobster stock is expected to have a negative short-term effect on the social and economic environment, and would create a burden on the administrative environment. No alternatives are being considered that would avoid these negative effects because they are a necessary cost associated with managing this stock. The ranges of alternatives have varying degrees of economic costs and administrative burdens. Some alternatives have relatively small short-term economic costs and administrative burdens, but would also provide smaller and more delayed long-term benefits. Other alternatives have greater short-term costs, but provide larger and more immediate long-term benefits. Therefore, mitigating these measures would be difficult, and managers must balance the costs and benefits when choosing management alternatives for the fishery.

4.4.3 Mitigation, Monitoring, and Enforcement Measures

Data are not available to determine if environmental justice considerations, and the resulting need for special mitigation measures, are triggered. Nevertheless, the proposed actions would apply equally to all fishery participants regardless of minority or income status, and no information has been identified that would indicate differential costs on or benefits to minority or low income persons distinct from those expected to accrue to other constituencies involved in the fishery. Therefore, no environmental justice issues have been identified and no mitigation measures in response to environmental justice issues have been considered.

The jeopardy analyses for sea turtles, smalltooth sawfish, and *Acropora* spp. are based on the assumption that the frequency and magnitude of adverse effects that occurred in the past will continue into the future. If estimates regarding the frequency and magnitude of incidental take prove to be underestimated, the potential adverse effects to the sea turtles, smalltooth sawfish, and *Acropora* spp. may be greater than previously thought. Thus, monitoring and tracking the level of take specific to the spiny lobster trap fishery is imperative. NOAA Fisheries Service developed Reasonable and Prudent Measures (RPMs), and implementing Terms and Conditions (T/Cs), to not only help monitor future incidental takes, but also to help minimize the impacts of those takes (NMFS 2009). The RPMs and T/Cs ensure NOAA Fisheries can: 1) detect any adverse effects resulting from the spiny lobster fishery; 2) assess the actual level of incidental take in comparison with the anticipated incidental take documented in the Bi Op; and 3) detect when the level of anticipated take is exceeded. See Sections 9.3 and 9.4 of the Bi Op for the specific RPMs and T/Cs. NOAA Fisheries Service and other government agencies also support research on this species by federal, state, academic, and private research entities.

Current spiny lobster regulations can be labor intensive for law enforcement officials. NOAA Fisheries Service law enforcement officials work cooperatively with other federal and state agencies to keep illegal activity to a minimum. Violators are penalized, and for commercial operators, permits required to operate in their respective fisheries can be sanctioned.

4.4.4 Irreversible and Irretrievable Commitments of Resources

No irreversible or irretrievable commitments of agency resources are proposed herein. The actions are readily changeable by the Councils in the future. No irreversible or irretrievable commitment of natural resources is anticipated.

4.5 Any Other Disclosures

CEQ guidance on environmental consequences [40 CFR 1502.16] indicates the following elements should be considered for the scientific and analytic basis for comparisons of alternatives. These are:

a) Direct effects and their significance.
b) Indirect effects and their significance.
c) Possible conflicts between the proposed action and the objectives of federal, regional, state, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned.
d) The environmental effects of alternatives including the proposed action.
e) Energy requirements and conservation potential of various alternatives and mitigation measures.
f) Natural or depletable resource requirements and conservation potential of various alternatives and mitigation measures.
g) Urban quality, historic and cultural resources, and the design of the built environment, including the reuse and conservation potential of various alternatives and mitigation measures.
h) Means to mitigate adverse environmental impacts.

Items a, b, d, e, f, and h are addressed in Sections 2, 3, and 4. Items a, b, and d are directly discussed in Sections 2 and 4. Item e is discussed in the economic analyses. Alternatives that encourage fewer fishing trips would conserve energy. Item f is discussed throughout the document, as spiny lobster stocks are a natural and depletable resource. Mitigation measures are discussed in Section 4.4.3. Because this amendment concerns the management of spiny lobster stocks, it is not in conflict with the objectives of federal, regional, state, or local land use plans, policies, and controls (Item c).

Urban quality and the design of the built environment, including the reuse and conservation potential of various alternatives and mitigation measures (Item g), are not factors in this amendment. The actions taken in this amendment would affect a marine stock and its fishery, and should not affect land-based, urban environments. The proposed actions are not expected to result in substantial impacts to unique or ecologically critical areas.

In the South Atlantic, several notable shipwrecks can be found along the southeast coast in federal and state waters including Lofthus (eastern Florida), SS Copenhagen (southeast Florida), Half Moon (southeast Florida), Hebe (Myrtle Beach), Georgiana (Charleston), Monitor (Cape Hatteras), Huron (Nags Head), and Metropolis (Carolla). In the Gulf, the U.S.S. Hatteras isolated in federal waters off Texas and is listed in the National Register of Historic Places.

Shipwrecks in the Florida Keys and Dry Tortugas include USCG Cutter Duane, USS Alligator, San Pedro, Windjammer, and Bird Key. Fishing activity already occurs in the vicinity of these sites; but actions within this amendment would have no additional impacts on the above listed historic resources, nor would they alter any regulations intended to protect them.

With respect to the ESA, fishing activities pursuant to the spiny lobster fishery should not affect endangered and threatened species or critical habitat in any manner not considered in prior consultations on this fishery. The Bi Op stated the fishery was not likely to adversely affect ESA-listed marine mammals, Gulf sturgeon, or designated critical habitat for elkhorn and staghorn corals. However, the Bi Op determined the spiny lobster fishery would adversely affect sea turtles, smalltooth sawfish, and elkhorn and staghorn corals, but would not jeopardize their continued existence. An incidental take statement was issued for green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles, smalltooth sawfish, and both species of coral. Reasonable and prudent measures to minimize the impact of these incidental takes were specified, along with terms and conditions to implement them.

With respect to the Marine Mammal Protection Act (MMPA), fishing activities conducted under the Spiny Lobster FMP should have no adverse impact on marine mammals. The 2011 List of Fisheries (75 FR 68468; November 8, 2010) lists the Florida Spiny Lobster Trap/Pot fishery as a Category III Fishery under the MMPA. This classification indicates the annual mortality and serious injury of a marine mammal stock resulting from any fishery is less than or equal to 1 percent of the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock, while allowing that stock to reach or maintain its optimum sustainable population. The proposed actions are not expected to alter existing fishing practices in such a way as to alter the interactions with marine mammals.

Because the proposed actions are directed towards the management of naturally occurring species, the introduction or spread of non-indigenous species should not occur.

Chapter 5. Fishery Impact Statement (FIS)

The Magnus-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires a FIS be prepared for all amendments to Fishery Management Plans (FMPs). The FIS contains an assessment of the likely biological and socioeconomic effects of the conservation and management measures on: 1) fishery participants and their communities; 2) participants in the fisheries conducted in adjacent areas under the authority of another Council; and 3) the safety of human life at sea.

5.1 Actions Contained in Amendment 11 to the Spiny Lobster FMP

5.2 Assessment of Biological Effects

5.3 Assessment of Economic Effects

5.4 Assessment of the Social Effects

5.5 Assessment of Effects on Safety at Sea

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NMFS = National Marine Fisheries Service, SAFMC = South Atlantic Fishery Management Council, GMFMC = Gulf of Mexico Fishery Management Council, SF = Sustainable Fisheries Division, PR = Protected Resources Division

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GC = General Counsel, SERO=Southeast Regional Office, NEPA=National Environmental Policy Act, HC = Habitat Conservation, SEFSC=Southeast Fisheries Science Center, OLE=NOAA Fisheries Service Office for Law Enforcement

Chapter 7. List of Agencies, Organizations and Persons to Whom Copies of the Statement are Sent

Department of Commerce Office of General Counsel
Texas Parks and Wildlife Department
Alabama Department of Conservation and Natural Resources/Marine Resources Division
Louisiana Department of Wildlife and Fisheries
Mississippi Department of Marine Resources
Florida Fish and Wildlife Conservation Commission
Georgia Department of Natural Resources/Coastal Resources Division
South Carolina Department of Natural Resources/Marine Resources Division
North Carolina Division of Marine Fisheries
Florida Keys Commercial Fishermen's Association
National Marine Fisheries Service Office of General Counsel
National Marine Fisheries Service Office of General Counsel Southeast Region
National Marine Fisheries Service Southeast Regional Office
National Marine Fisheries Service Southeast Fisheries Science Center
National Marine Fisheries Service Silver Spring Office
National Marine Fisheries Service Office of Law Enforcement
United States Coast Guard
United States Fish and Wildlife Services

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Appendix A. Coordinates of proposed closed areas under Action 2, Alternative 3.

Area	Latitude	Longitude	Area	Latitude	Longitude
1	24° 31' 15.002" N	81° 31' 0.000" W	11	24° 34' 0.003" N	81° 19' 29.996" W
	24° 31' 15.002" N	81° 31' 19.994" W		24° 34' 0.003" N	81° 20' 4.994" W
	24° 31' 29.999" N	81° 31' 19.994" W		24° 34' 24.997" N	81° 20' 4.994" W
	24° 31' 29.999" N	81° 31' 0.000" W		24° 34' 24.997" N	81° 19' 29.996" W
2	24° 31' 28.914" N	81° 29' 48.869" W	12	24° 35' 19.997" N	81° 14' 25.002" W
	24° 31' 20.303" N	81° 30' 27.624" W		24° 35' 19.997" N	81° 14' 34.999" W
	24° 31' 36.302" N	81° 30' 31.174" W		24° 35' 29.006" N	81° 14' 34.999" W
	24° 31' 44.913" N	81° 29' 52.419" W		24° 35' 29.006" N	81° 14' 25.002" W
3	24° 31' 50.996" N	81° 28' 39.999" W	13	24° 44' 37.004" N	80° 46' 47.000" W
	24° 31' 50.996" N	81° 29' 3.002" W		24° 44' 37.004" N	80° 46' 58.000" W
	24° 31' 56.998" N	81° 29' 3.002" W		24° 44' 47.002" N	80° 46' 58.000" W
	24° 31' 56.998" N	81° 28' 39.999" W		24° 44' 47.002" N	80° 46' 47.000" W
4	24° 32' 20.014" N	81° 26' 20.390" W	14	24° 49' 53.946" N	80° 38' 17.646" W
	24° 32' 13.999" N	81° 26' 41.999" W		24° 48' 32.331" N	80° 40' 15.530" W
	24° 32' 27.004" N	81° 26' 45.611" W		24° 48' 44.389" N	80° 40' 23.879" W
	24° 32' 33.005" N	81° 26' 23.995" W		24° 50' 6.004" N	80° 38' 26.003" W
5	24° 32' 30.011" N	81° 24' 47.000" W	15	24° 53' 49.040" N	80° 32' 17.817" W
	24° 32' 23.790" N	81° 24' 56.558" W		24° 53' 8.006" N	80° 33' 2.002" W
	24° 32' 45.997" N	81° 25' 10.998" W		24° 53' 32.972" N	80° 33' 25.183" W
	24° 32' 52.218" N	81° 25' 1.433" W		24° 54' 14.006" N	80° 32' 40.998" W
6	24° 32' 46.834" N	81° 27' 17.615" W	16	24° 54' 6.000" N	80° 31' 33.995" W
	24° 32' 41.835" N	81° 27' 35.619" W		24° 54' 6.000" N	80° 31' 45.002" W
	24° 32' 54.003" N	81° 27' 38.997" W		24° 54' 36.006" N	80° 31' 45.002" W
	24° 32' 59.002" N	81° 27' 21.000" W		24° 54' 36.006" N	80° 31' 33.995" W
7	24° 33' 10.002" N	81° 25' 50.995" W	17	24° 56' 21.104" N	80° 28' 52.331" W
	24° 33' 4.000" N	81° 26' 18.996" W		24° 56' 17.012" N	80° 29' 5.995" W
	24° 33' 17.253" N	81° 26' 21.839" W		24° 56' 26.996" N	80° 29' 8.996" W
	24° 33' 23.254" N	81° 25' 53.838" W		24° 56' 31.102" N	80° 28' 55.325" W
8	24° 33' 22.004" N	81° 30' 31.998" W	18	24° 56' 53.006" N	80° 27' 46.997" W
	24° 33' 22.004" N	81° 30' 41.000" W		24° 56' 21.887" N	80° 28' 25.367" W
	24° 33' 29.008" N	81° 30' 41.000" W		24° 56' 35.002" N	80° 28' 36.003" W
	24° 33' 29.008" N	81° 30' 31.998" W		24° 57' 6.107" N	80° 27' 57.626" W
9	24° 33' 33.004" N	81° 30' 0.000" W	19	24° 57' 35.001" N	80° 27' 14.999" W
	24° 33' 33.004" N	81° 30' 9.998" W		24° 57' 28.011" N	80° 27' 21.000" W
	24° 33' 41.999" N	81° 30' 9.998" W		24° 57' 33.999" N	80° 27' 27.997" W
	24° 33' 41.999" N	81° 30' 0.000" W		24° 57' 40.200" N	80° 27' 21.106" W
10	24° 33' 50.376" N	81° 23' 35.039" W	20	24° 58' 58.154" N	80° 26' 3.911" W
	24° 33' 27.003" N	81° 24' 51.003" W		24° 58' 48.005" N	80° 26' 10.001" W
	24° 33' 40.008" N	81° 24' 54.999" W		24° 58' 52.853" N	80° 26' 18.090" W
	24° 34' 3.382" N	81° 23' 39.035" W		24° 59' 3.002" N	80° 26' 11.999" W

Area	Latitude	Longitude	Area	Latitude	Longitude
21	24° 59' 17.009" N	80° 24' 32.999" W	31	25° 3' 26.001" N	80° 19' 43.001" W
	24° 58' 41.001" N	80° 25' 21.998" W		25° 3' 26.001" N	80° 19' 54.997" W
	24° 58' 57.591" N	80° 25' 34.186" W		25° 3' 41.011" N	80° 19' 54.997" W
	24° 59' 33.598" N	80° 24' 45.187" W		25° 3' 41.011" N	80° 19' 43.001" W
22	24° 59' 44.008" N	80° 25' 38.999" W	32	25° 7' 3.008" N	80° 17' 57.999" W
	24° 59' 27.007" N	80° 25' 48.997" W		25° 7' 3.008" N	80° 18' 10.002" W
	24° 59' 32.665" N	80° 25' 58.610" W		25° 7' 14.997" N	80° 18' 10.002" W
	24° 59' 49.666" N	80° 25' 48.612" W		25° 7' 14.997" N	80° 17' 57.999" W
23	25° 1' 0.006" N	80° 21' 55.002" W	33	25° 7' 51.156" N	80° 17' 27.910" W
	25° 1' 0.006" N	80° 22' 11.996" W		25° 7' 35.857" N	80° 17' 37.091" W
	25° 1' 18.010" N	80° 22' 11.996" W		25° 7' 43.712" N	80° 17' 50.171" W
	25° 1' 18.010" N	80° 21' 55.002" W		25° 7' 59.011" N	80° 17' 40.998" W
24	25° 1' 34.997" N	80° 23' 12.998" W	34	25° 8' 12.002" N	80° 17' 9.996" W
	25° 1' 18.010" N	80° 23' 44.000" W		25° 7' 55.001" N	80° 17' 26.997" W
	25° 1' 22.493" N	80° 23' 46.473" W		25° 8' 4.998" N	80° 17' 36.995" W
	25° 1' 36.713" N	80° 23' 37.665" W		25° 8' 22.000" N	80° 17' 20.000" W
	25° 1' 46.657" N	80° 23' 19.390" W			
25	25° 1' 38.005" N	80° 21' 25.998" W	35	25° 8' 18.003" N	80° 17' 34.001" W
	25° 1' 28.461" N	80° 21' 46.158" W		25° 8' 18.003" N	80° 17' 45.997" W
	25° 1' 45.009" N	80° 21' 53.999" W		25° 8' 29.003" N	80° 17' 45.997" W
	25° 1' 54.553" N	80° 21' 33.839" W		25° 8' 29.003" N	80° 17' 34.001" W
26	25° 1' 53.001" N	80° 23' 8.995" W	36	25° 8' 45.002" N	80° 15' 50.002" W
	25° 1' 53.001" N	80° 23' 17.997" W		25° 8' 37.999" N	80° 15' 56.998" W
	25° 2' 1.008" N	80° 23' 17.997" W		25° 8' 42.009" N	80° 16' 0.995" W
	25° 2' 1.008" N	80° 23' 8.995" W		25° 8' 48.999" N	80° 15' 53.998" W
27	25° 2' 20.000" N	80° 22' 11.001" W	37	25° 8' 58.007" N	80° 17' 24.999" W
	25° 2' 10.003" N	80° 22' 50.002" W		25° 8' 58.007" N	80° 17' 35.999" W
	25° 2' 22.252" N	80° 22' 53.140" W		25° 9' 9.007" N	80° 17' 35.999" W
	25° 2' 32.250" N	80° 22' 14.138" W		25° 9' 9.007" N	80° 17' 24.999" W
28	25° 2' 29.503" N	80° 20' 30.503" W	38	25° 9' 10.999" N	80° 16' 0.000" W
	25° 2' 16.498" N	80° 20' 43.501" W		25° 9' 10.999" N	80° 16' 9.997" W
	25° 2' 24.999" N	80° 20' 52.002" W		25° 9' 20.996" N	80° 16' 9.997" W
	25° 2' 38.004" N	80° 20' 38.997" W		25° 9' 20.996" N	80° 16' 0.000" W
29	25° 2' 34.008" N	80° 21' 57.000" W	39	25° 9' 28.316" N	80° 17' 3.713" W
	25° 2' 34.008" N	80° 22' 14.997" W		25° 9' 14.006" N	80° 17' 17.000" W
	25° 2' 50.007" N	80° 22' 14.997" W		25° 9' 21.697" N	80° 17' 25.280" W
	25° 2' 50.007" N	80° 21' 57.000" W		25° 9' 36.006" N	80° 17' 12.001" W
30	25° 3' 34.570" N	80° 21' 18.767" W	40	25° 10' 0.011" N	80° 16' 6.000" W
	25° 3' 2.572" N	80° 21' 43.768" W		25° 10' 0.011" N	80° 16' 17.000" W
	25° 3' 8.999" N	80° 21' 51.994" W		25° 10' 9.995" N	80° 16' 17.000" W
	25° 3' 41.011" N	80° 21' 27.000" W		25° 10' 9.995" N	80° 16' 6.000" W

Area	Latitude	Longitude	Area	Latitude	Longitude
41	25° 10' 29.002" N	80° 15' 52.995" W	49	25° 17' 23.008" N	80° 12' 40.000" W
	25° 10' 29.002" N	80° 16' 4.002" W		25° 17' 23.008" N	80° 12' 49.997" W
	25° 10' 37.997" N	80° 16' 4.002" W		25° 17' 33.005" N	80° 12' 49.997" W
	25° 10' 37.997" N	80° 15' 52.995" W		25° 17' 33.005" N	80° 12' 40.000" W
42	25° 11' 5.998" N	80° 14' 25.997" W	50	25° 20' 57.996" N	80° 9' 50.000" W
	25° 11' 5.998" N	80° 14' 38.000" W		25° 20' 57.996" N	80° 10' 0.000" W
	25° 11' 20.006" N	80° 14' 38.000" W		25° 21' 7.005" N	80° 10' 0.000" W
	25° 11' 20.006" N	80° 14' 25.997" W		25° 21' 7.005" N	80° 9' 50.000" W
43	25° 12' 0.998" N	80° 13' 24.996" W	51	25° 21' 45.004" N	80° 9' 51.998" W
	25° 11' 43.008" N	80° 13' 35.000" W		25° 21' 38.124" N	80° 9' 56.722" W
	25° 11' 48.007" N	80° 13' 44.002" W		25° 21' 49.124" N	80° 10' 12.728" W
	25° 12' 6.011" N	80° 13' 33.998" W		25° 21' 56.004" N	80° 10' 7.997" W
44	25° 12' 18.343" N	80° 14' 32.768" W	52	25° 21' 49.000" N	80° 9' 21.999" W
	25° 12' 2.001" N	80° 14' 44.001" W		25° 21' 49.000" N	80° 9' 31.996" W
	25° 12' 7.659" N	80° 14' 52.234" W		25° 21' 58.998" N	80° 9' 31.996" W
	25° 12' 24.001" N	80° 14' 41.001" W		25° 21' 58.998" N	80° 9' 21.999" W
45	25° 15' 23.998" N	80° 12' 29.000" W	53	25° 24' 31.008" N	80° 7' 36.997" W
	25° 15' 4.676" N	80° 12' 36.120" W		25° 24' 31.008" N	80° 7' 48.999" W
	25° 15' 9.812" N	80° 12' 50.066" W		25° 24' 41.005" N	80° 7' 48.999" W
	25° 15' 29.148" N	80° 12' 42.946" W		25° 24' 41.005" N	80° 7' 36.997" W
46	25° 16' 1.997" N	80° 12' 32.996" W	54	25° 25' 14.005" N	80° 7' 27.995" W
	25° 15' 33.419" N	80° 12' 52.394" W		25° 25' 14.005" N	80° 7' 44.001" W
	25° 15' 44.007" N	80° 13' 8.001" W		25° 25' 26.008" N	80° 7' 44.001" W
	25° 16' 12.585" N	80° 12' 48.597" W		25° 25' 26.008" N	80° 7' 27.995" W
47	25° 16' 33.006" N	80° 13' 30.001" W	55	25° 35' 13.996" N	80° 5' 39.999" W
	25° 16' 33.006" N	80° 13' 41.001" W		25° 35' 13.996" N	80° 5' 50.999" W
	25° 16' 34.425" N	80° 13' 41.026" W		25° 35' 24.007" N	80° 5' 50.999" W
	25° 16' 41.850" N	80° 13' 37.475" W		25° 35' 24.007" N	80° 5' 39.999" W
	25° 16' 42.001" N	80° 13' 30.001" W			
48	25° 17' 4.715" N	80° 12' 11.305" W	56	25° 40' 57.003" N	80° 5' 43.000" W
	25° 16' 17.007" N	80° 12' 27.997" W		25° 40' 57.003" N	80° 5' 54.000" W
	25° 16' 23.997" N	80° 12' 47.999" W		25° 41' 6.550" N	80° 5' 53.980" W
	25° 17' 11.705" N	80° 12' 31.300" W		25° 41' 18.136" N	80° 5' 49.158" W
				25° 41' 18.001" N	80° 5' 43.000" W

Appendix B. Alternatives Considered but Rejected

Appendix C. Regulatory Impact Review

Appendix D. Regulatory Flexibility Analysis (RFA, economic impacts of proposed regulatory actions)

Appendix E. Bycatch Practicability Analysis

Appendix F. Other Applicable Laws

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 et seq.) provides the authority for U.S. fishery management. But fishery management decision-making is also affected by a number of other federal statutes designed to protect the biological and human components of U.S. fisheries, as well as the ecosystems within which those fisheries are conducted. Major laws affecting federal fishery management decision-making are summarized below.

Administrative Procedures Act (APA)

All federal rulemaking is governed under the provisions of the APA (5 U.S.C. Subchapter II), which establishes a "notice and comment" procedure to enable public participation in the rulemaking process. Under the APA, NOAA Fisheries is required to publish notification of proposed rules in the Federal Register and to solicit, consider and respond to public comment on those rules before they are finalized. The APA also establishes a 30-day wait period from the time a final rule is published until it takes effect. This procedure will be followed when developing proposed and final rules to implement actions in this amendment.

Coastal Zone Management Act (CZMA)

The CZMA of 1972 (16 U.S.C. 1451 et seq.) encourages state and federal cooperation in the development of plans that manage the use of natural coastal habitats, as well as the fish and wildlife those habitats support. When proposing an action determined to directly affect coastal resources managed under an approved coastal zone management program, NOAA Fisheries Service is required to provide the relevant state agency with a determination that the proposed action is consistent with the enforceable policies of the approved program to the maximum extent practicable at least 90 days before taking final action. NOAA Fisheries Service will provide the appropriate Gulf and South Atlantic state agencies with such a determination.

Data Quality Act (DQA)

The DQA (Public Law 106-443), which took effect October 1, 2002, requires the government for the first time to set standards for the quality of scientific information and statistics used and disseminated by federal agencies. Information includes any communication or representation of knowledge such as facts or data, in any medium or form, including textual, numerical, cartographic, narrative, or audiovisual forms (includes web dissemination, but not hyperlinks to information that others disseminate; does not include clearly stated opinions).

Specifically, the DQA directs the Office of Management and Budget (OMB) to issue government wide guidelines that "provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information disseminated by federal agencies." Such guidelines have been issued, directing all federal agencies to create and issue agency-specific standards to 1) ensure Information Quality and develop a pre-dissemination review process; 2) establish administrative mechanisms allowing affected persons to seek and obtain correction of information; and 3) report periodically to OMB on the number and nature of complaints received.

Scientific information and data are key components of fishery management plans and amendments, and the use of best available information is the second national standard under the

Magnuson-Stevens Act. To be consistent with the Act, fishery management plans (FMPs) and amendments must be based on the best information available, properly reference all supporting materials and data, and should be reviewed by technically competent individuals. With respect to original data generated for FMPs and amendments, it is important to ensure that the data are collected according to documented procedures or in a manner that reflects standard practices accepted by the relevant scientific and technical communities. Data should also undergo quality control prior to being used by the agency.

Endangered Species Act (ESA)

The (ESA of 1973 (16 U.S.C. Section 1531 et seq.) requires that federal agencies use their authorities to conserve endangered and threatened species, and that they ensure actions they authorize, fund, or carry out are not likely to harm the continued existence of those species or the habitat designated to be critical to their survival and recovery. The ESA requires NOAA Fisheries Service, when proposing a fishery action that "may affect" critical habitat or endangered or threatened species, to consult with the appropriate administrative agency (itself for most marine species, the U.S. Fish and Wildlife Service for all remaining species) to determine the potential impacts of the proposed action. Consultations are concluded informally when proposed actions "may affect but are not likely to adversely affect" endangered or threatened species or designated critical habitat. Formal consultations, resulting in a biological opinion, are required when proposed actions may affect and are "likely to adversely affect" endangered or threatened species or designated critical habitat. If jeopardy or adverse modification is found, the consulting agency is required to suggest reasonable and prudent alternatives.

On August 27, 2009, formal consultation was completed on the continued authorization of the spiny lobster fishery in the South Atlantic and Gulf of Mexico (NMFS 2009). The biological opinion concluded the fishery would not affect ESA-listed marine mammals, or adversely affect Gulf sturgeon and *Acropora* spp. critical habitat. The biological opinion determined the continued authorization of the fishery was likely to adversely affect sea turtles, smalltooth sawfish and *Acropora* spp., but is not likely to jeopardize the continued existence of these species. An incidental take statement authorizing a limited amount of take for these species was issued.

National Marine Sanctuaries Act

Under the National Marine Sanctuaries Act (also known as Title III of the Marine Protection, Research and Sanctuaries Act of 1972), as amended, the Secretary of Commerce is authorized to designate National Marine Sanctuaries to protect distinctive natural and cultural resources whose protection and beneficial use requires comprehensive planning and management. NOAA's National Ocean Service administers the National Marine Sanctuaries. The Act provides authority for comprehensive and coordinated conservation and management of these marine areas. The National Marine Sanctuary System currently comprises 13 sanctuaries around the country, including sites in American Samoa and Hawaii. These sites include significant coral reef and kelp forest habitats, and breeding and feeding grounds of whales, sea lions, sharks, and sea turtles. A complete listing of the current sanctuaries and information about their location, size, characteristics, and affected fisheries can be found at http://www.sanctuaries.nos.noaa.gov/oms/oms.html.

Executive Orders

E.O. 12866: Regulatory Planning and Review

Executive Order 12866, signed in 1993, requires federal agencies to assess the costs and benefits of their proposed regulations, including distributional impacts, and to select alternatives that maximize net benefits to society. To comply with E.O. 12866, NOAA Fisheries Service prepares a Regulatory Impact Review (RIR) for all fishery regulatory actions that either implement a new fishery management plan or significantly amend an existing plan. RIRs provide a comprehensive analysis of the costs and benefits to society associated with proposed regulatory actions, the problems and policy objectives prompting the regulatory proposals, and the major alternatives that could be used to solve the problems. The reviews also serve as the basis for the agency's determinations as to whether proposed regulations are a "significant regulatory action" under the criteria provided in E.O. 12866 and whether proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the RFA. A regulation is significant if it is likely to result in an annual effect on the economy of at least $100,000,000 or has other major economic effects. The proposed regulations associated with the actions in this amendment are not expected to be significant.

E.O. 12630: Takings

The Executive Order on Government Actions and Interference with Constitutionally Protected Property Rights, which became effective March 18, 1988, requires that each federal agency prepare a Takings Implication Assessment for any of its administrative, regulatory, and legislative policies and actions that affect, or may affect, the use of any real or personal property. Clearance of a regulatory action must include a takings statement and, if appropriate, a Takings Implication Assessment. Management measures limiting fishing seasons, areas, quotas, fish size limits, and bag limits do not appear to have any taking implications. There is a takings implication if a fishing gear is prohibited, because fishermen who desire to leave a fishery might be unable to sell their investment, or if a fisherman is prohibited by federal action from exercising property rights granted by a state. The actions in this amendment are not expected to have takings implications.

E.O. 13089: Coral Reef Protection

The Executive Order on Coral Reef Protection (June 11, 1998) requires federal agencies whose actions may affect U.S. coral reef ecosystems to identify those actions, utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and, to the extent permitted by law, ensure that actions they authorize, fund or carry out not degrade the condition of that ecosystem. By definition, a U.S. coral reef ecosystem means those species, habitats, and other national resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction or control of the United States (e.g., federal, state, territorial, or commonwealth waters). Actions in this amendment are expected to enhance protection to coral reefs.

E.O. 13112: Invasive Species

The Executive Order requires agencies to use authorities to prevent introduction of invasive species, respond to and control invasions in a cost effective and environmentally sound manner, and to provide for restoration of native species and habitat conditions in ecosystems that have been invaded. Further, agencies shall not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere unless a determination is made that the benefits of such actions clearly outweigh the potential harm; and that all feasible and prudent measures to minimize the risk of harm will be taken in conjunction with the actions. The actions undertaken in this amendment will not introduce, authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere.

E.O. 13132: Federalism

The Executive Order on federalism requires agencies in formulating and implementing policies that have federalism implications, to be guided by the fundamental federalism principles. The Order serves to guarantee the division of governmental responsibilities between the national government and the states that was intended by the framers of the Constitution. Federalism is rooted in the belief that issues that are not national in scope or significance are most appropriately addressed by the level of government closest to the people. This Order is relevant to FMPs and amendment given the overlapping authorities of NOAA Fisheries Service, the states, and local authorities in managing coastal resources, including fisheries, and the need for a clear definition of responsibilities. It is important to recognize those components of the ecosystem over which fishery managers have no direct control and to develop strategies to address them in conjunction with appropriate state, tribes and local entities (international too). The proposed management measures in this amendment to the Spiny Lobster FMP have been developed with the local and federal officials.

E.O. 13158: Marine Protected Areas

Executive Order 13158 (May 26, 2000) requires federal agencies to consider whether their proposed action(s) will affect any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural or cultural resource within the protected area.

E.O. 12898: Environmental Justice (EJ)

This Executive Order mandates that each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions. Federal agency responsibilities under this Executive Order include conducting programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons from participation in, denying persons the benefit of, or subjecting persons to discrimination under, such, programs policies, and activities, because of their race, color, or national origin. Furthermore, each federal agency responsibility set forth under this Executive Order shall apply equally to Native American programs.

Specifically, federal agencies shall, to the maximum extent practicable; conduct human health and environmental research and analysis; collect human health and environmental data; collect, maintain and analyze information on the consumption patterns of those who principally rely on fish and/or wildlife for subsistence; allow for public participation and access to information relating to the incorporation of EJ principals in federal agency programs or policies; and share information and eliminate unnecessary duplication of efforts through the use of existing data systems and cooperative agreements among federal agencies and with state, local, and tribal governments. The proposed actions would be applied to all participants in the fishery, regardless of their race, color, national origin, or income level, and as a result are not considered discriminatory. Additionally, none of the proposed actions are expected to affect any existing subsistence consumption patterns. Therefore, no EJ issues are anticipated and no modifications to any proposed actions have been made to address EJ issues.

Marine Mammal Protection Act (MMPA)
The MMPA established a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas. It also prohibits the importing of marine mammals and marine mammal products into the United States. Under the MMPA, the Secretary of Commerce (authority delegated to NOAA Fisheries Service) is responsible for the conservation and management of cetaceans and pinnipeds (other than walruses). The Secretary of the Interior is responsible for walruses, sea otters, polar bears, manatees, and dugongs.

In 1994, Congress amended the MMPA, to govern the taking of marine mammals incidental to commercial fishing operations. This amendment required the preparation of stock assessments for all marine mammal stocks in waters under U.S. jurisdiction; development and implementation of take-reduction plans for stocks that may be reduced or are being maintained below their optimum sustainable population levels due to interactions with commercial fisheries; and studies of pinniped-fishery interactions. The MMPA requires a commercial fishery to be placed in one of three categories, based on the relative frequency of incidental serious injuries and mortalities of marine mammals. Category I designates fisheries with frequent serious injuries and mortalities incidental to commercial fishing; Category II designates fisheries with occasional serious injuries and mortalities; and Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities. To legally fish in a Category I and/or II fishery, a fisherman must obtain a marine mammal authorization certificate by registering with the Marine Mammal Authorization Program (50 CFR 229.4), they must accommodate an observer if requested (50 CFR 229.7(c)), and comply with any applicable take reduction plans.

The 2011 List of Fisheries (LOF) classifies the Florida spiny lobster trap/pot fishery as a Category III fishery (75 FR 68468; November 8, 2010). The 2011 LOF also classifies the bully net and commercial dive portions of the fishery (called the "Atlantic Ocean, Gulf of Mexico, Caribbean shellfish dive, hand/mechanical collection" fishery) as a Category III because there has never been a documented interaction with marine mammals.

Paperwork Reduction Act (PRA)
The PRA of 1995 (44 U.S.C. 3501 et seq.) regulates the collection of public information by federal agencies to ensure that the public is not overburdened with information requests, that the federal government's information collection procedures are efficient, and that federal agencies adhere to appropriate rules governing the confidentiality of such information. The PRA requires NOAA Fisheries Service to obtain approval from OMB before requesting most types of fishery information from the public. Neither action in this amendment imposes a paperwork burden on the public.

Small Business Act
The Small Business Act of 1953, as amended, Section 8(a), 15 U.S.C. 634(b)(6), 636(j), 637(a) and (d); Public Laws 95-507 and 99-661, Section 1207; and Public Laws 100-656 and 101-37 are administered by the Small Business Association (SBA). The objectives of the Act are to foster business ownership by individuals who are both socially and economically disadvantaged; and to promote the competitive viability of such firms by providing business development assistance

including, but not limited to, management and technical assistance, access to capital and other forms of financial assistance, business training and counseling, and access to sole source and limited competition federal contract opportunities, to help the firms to achieve competitive viability. Because most businesses associated with fishing are considered small businesses, NOAA Fisheries Service, in implementing regulations, must make an assessment of how those regulations will affect small businesses. Implications to small businesses are discussed in the RIR herein (Section 7).

Magnuson-Stevens Act Essential Fish Habitat (EFH) Provisions

The Magnuson-Stevens Act includes EFH requirements, and as such, each existing, and any new, FMPs must describe and identify EFH for the fishery, minimize to the extent practicable adverse effects on that EFH caused by fishing, and identify other actions to encourage the conservation and enhancement of that EFH. Spiny lobster EFH, in both the Gulf of Mexico and South Atlantic, was identified and described for the Caribbean spiny lobster (*Panulirus argus*). The Councils and NOAA Fisheries Service have determined there are no adverse effects to EFH that may occur as a result of the actions proposed in this amendment as discussed in the Environmental Consequences section (Section 4).

Appendix G. Summary of cartography and spatial analyses.

Please see attached file.

Appendix G. Summary of cartography and spatial analyses.

Introduction

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 biological opinion (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 fishery management plan 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 Bi Op stated the fishery was not likely to adversely affect ESA-listed marine mammals, Gulf sturgeon, or designated critical habitat for elkhorn and staghorn corals. However, the Bi Op determined the spiny lobster trap fishery would adversely affect sea turtles, smalltooth sawfish, and elkhorn and staghorn corals, but would not jeopardize their continued existence.

An incidental take statement was issued for green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles, smalltooth sawfish, and both species of coral. Reasonable and prudent measures to minimize the impact of these incidental takes were specified, along with terms and conditions to implement them. Specific terms and conditions include, but are not limited to creating new or expanding existing closed areas to protect coral and implementing trap line-marking requirements. 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 traps contacting colonies even if they are moved by storms. Trap line marking requirements would allow greater accuracy in identifying fishery interactions with protected species, leading to more targeted measures to reduce the level and severity of those impacts.

The purpose of this amendment is to comply with measures to protect endangered species established under Bi Op. The need for the proposed actions is to aid in the protection and recovery of endangered and threatened species. Specifically, this document will serve as a description of the data sources and methodology employed to develop and analyze management alternatives for Action 1 in Spiny Lobster Amendment 11.

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

Alternative 1 is the no action alternative. Alternative 1 would not affect existing management or reduce existing risk for threatened species. No new closed areas would result from Alternative 1 thus, no additional analyses are necessary (Table 1).

Alternative 2 would prohibit spiny lobster fishing on all hard bottom areas in the Florida EEZ south of US 1, from Key Biscayne to Key West in water depths less than 30 meters (98 feet) (Figure 1). To estimate the size and extent of affected areas, hard bottom habitat in the Florida Keys was digitized from aerial photos (1991-1992, 1995) of south Florida including Florida Keys National Marine Sanctuary. Hard bottom was subset to only areas in the EEZ using the clip feature in ArcGIS 9.3.1. Total area affected by this closure is 71.1 mi^2 in the EEZ.

Alternative 3 would create new closed areas. Initially, known locations of *Acropora* were received from the NOAA *Acropora palmata* and *A. cervicornis* Inventories, databases maintained by FWRI staff. The NOAA *Acropora* Inventories are ArcGIS geodatabases built to provide a mechanism to view the locations of *Acropora palmata* and *A. cervicornis*. These data were provided by FWRI staff on June 6, 2011 (*A. palmata*) and June 15, 2011(*A. cervicornis*). In addition, 12 smaller datasets (Table 2) received directly from coral researchers and divers with significant knowledge of *Acropora* locations were included. The aggregate database was mapped by NMFS-SERO staff using ArcGIS and included 8,178 locations for coral colonies. However, this total included colonies 1,325 colonies in state waters that were removed from the aggregate database leaving a total of 6,853 locations with noted *Acropora* colonies. A 500 ft. buffer was superimposed over each colony using the buffer feature in ArcGiS. Using the six criteria (Table 3) proposed as guidelines for site selection, NMFS-SERO staff identified areas for proposed closure and drew straight line boundary closures. Closed areas were designed to encompass known *Acropora* spp. colonies and the 500 ft. buffer (Figure 2).

The proposed closed areas were then presented to stakeholders for feedback and comment during an industry sponsored meeting. Feedback received during that meeting indicated the *Acropora* coral nurseries should be protected. Stakeholders also provided input on ways that the proposed closed areas could be oriented to reduce potential impacts to the fishing industry and potentially increase compliance, while still achieving the conservation goal.

Following the meeting, information provided by stakeholders was addressed and incorporated into the proposed closed areas. Specifically, five coral nurseries were added to sites requiring protection, and the orientation of several or sites were changed. Overall, 56 closed areas are proposed and enclose approximately 6.7 mi^2 (Appendix 4), form only right angles (four closed areas were modified slightly so as not to extend into Florida state waters), and are drawn parallel to the reef tract to the extent possible.

Corner coordinates (i.e., latitude and longitude) of each closed area were calculated using the polygon to point function in the ET Geowizards add-on in ArcMap 9.3.1. These data are provided in Table 4. The total area of the proposed closures was calculated by determining the area of each polygon in a geographic information system (GIS) and summing the total area of the 56 individual closed areas.

Alternative 4 would establish 500 ft. diameter buffers around identified *Acropora* spp. colonies (Figure 3). Each colony (n = 6,853) would be designated by a single point, and fishermen would be responsible for remaining 500 ft. from that point. Once all known locations were plotted a 500 ft. buffer was superimposed over each colony. The total closed area would encompass approximately 6.6 mi^2. Because some colonies are closer to each other than 500 ft., overlap of the buffers will occur. This overlap may cause some confusion to fishermen trying to determine what area is closed.

Tables

Table 1. Alternatives currently under consideration in Amendment 11 to the Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and South Atlantic: Summary of cartography and spatial analyses.

Alternative 1: No Action – do not limit spiny lobster fishing in certain areas in the exclusive economic zone (EEZ) off Florida to address Endangered Species Act concerns for threatened staghorn and elkhorn corals (*Acropora* spp.)

Alternative 2: Would prohibit spiny lobster fishing on all hardbottom areas in the Florida EEZ south of US 1, from Key Biscayne to Key West in water depths less than 30 meters (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.

Alternative 3: Create new closed areas in the EEZ off Florida south of US 1, from Key Biscayne to Key West consisting of identified *Acropora* spp. colonies with straight-line boundaries.

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.

Alternative 4: Create new closed areas in the Florida EEZ south of US 1, from Key

Table 2. Sources of *Acropora* spp. information used to evaluate management alternatives under consideration. FWRI (Fish and Wildlife Research Institute), TNC (The Nature Conservancy), UNCW(University of North Carolina, Wilmington), MML (Mote Marine Laboratory), FKNMS (Florida Keys National Marine Sanctuary).

no.	Species	Source	No. Locations	No. Locations (EEZ only)
1	*A. cervicornis*	FWRI: June 15, 2011	2,782	1,781
2	*A. palmata*	FWRI: June 6, 2011	5,048	4,932
3	*A. cervicornis*	TNC: July 29, 2011	124	28
4	*Acropora spp.*	TNC: July 29, 2011	11	4
5	*A. palmata*	TNC: July 12, 2011	10	1
6	*A. palmata*	UNCW: July 19, 2011	13	9
7	*A. cervicornis*	UNCW: July 19, 2011	14	13
8	*A. cervicornis*	K. Neidmeyer: June 24, 2011	50	33
9	*A. cervicornis*	MML: July 14, 2011	34	16
10	*A. palmata*	MML: July 14, 2011	18	7
11	*A. cervicornis*	FKNMS: July 27, 2011	4	3
12	*A. palmata*	FNKMS: July 27, 2011	6	6
13	*Acropora spp.*	K. Neidmeyer: June 26, 2011	4	4
14	*A. cervicornis*	TNC: July 12, 2011	60	16
		Total	8,178	6,853

Table 3. Criteria used for site selection for potential closed areas (Alternative 3) in Spiny Lobster Amendment 11 to the Fishery Management Plan.

General Criteria Used as Guidelines

The areas proposed for closure in this amendment were chosen using six general criteria as guidelines: 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 ESA, 5) include coral nurseries 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 the help of 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 not only are such areas also relatively rare in the Florida Keys, the conservation benefit 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 for listing under the ESA. Data available for those seven species generally indicated little co-occurrence between those species, elkhorn and staghorn corals.

Stakeholders also recommended considering area closures for “*Acropora* coral nurseries” because these areas are susceptible to the same trap impacts. Based on that input, five coral nurseries are proposed for inclusion in areas closures. These nurseries are areas whose sole purpose is to take legally collected *Acropora* coral fragments, raise them to a transplantable size, and then use these corals in restoration efforts throughout the Florida Keys. All coral nurseries working with *Acropora* in the Florida Keys have prior permission for their activities from FKNMS and their activities have undergone ESA consultation.

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 size of elkhorn and staghorn corals are directly proportional to their fecundity, large super colonies represent and essential source of gamete production. Elkhorn corals with a living tissue surface area of 1,000 cm^2 could be considered “super colonies.” A similar distinction could be made for staghorn corals with a living tissue surface area of 500 cm^2.

Table 4. Latitude and longitude of corners of 56 proposed closed areas.

Proposed Closed Area	Latitude	Longitude	Proposed Closed Area	Latitude	Longitude
1	24° 31' 15.002" N	81° 31' 0.000" W	12	24° 35' 19.997" N	81° 14' 25.002" W
	24° 31' 15.002" N	81° 31' 19.994" W		24° 35' 19.997" N	81° 14' 34.999" W
	24° 31' 29.999" N	81° 31' 19.994" W		24° 35' 29.006" N	81° 14' 34.999" W
	24° 31' 29.999" N	81° 31' 0.000" W		24° 35' 29.006" N	81° 14' 25.002" W
2	24° 31' 28.914" N	81° 29' 48.869" W	13	24° 44' 37.004" N	80° 46' 47.000" W
	24° 31' 20.303" N	81° 30' 27.624" W		24° 44' 37.004" N	80° 46' 58.000" W
	24° 31' 36.302" N	81° 30' 31.174" W		24° 44' 47.002" N	80° 46' 58.000" W
	24° 31' 44.913" N	81° 29' 52.419" W		24° 44' 47.002" N	80° 46' 47.000" W
3	24° 31' 50.996" N	81° 28' 39.999" W	14	24° 49' 53.946" N	80° 38' 17.646" W
	24° 31' 50.996" N	81° 29' 3.002" W		24° 48' 32.331" N	80° 40' 15.530" W
	24° 31' 56.998" N	81° 29' 3.002" W		24° 48' 44.389" N	80° 40' 23.879" W
	24° 31' 56.998" N	81° 28' 39.999" W		24° 50' 6.004" N	80° 38' 26.003" W
4	24° 32' 20.014" N	81° 26' 20.390" W	15	24° 53' 49.040" N	80° 32' 17.817" W
	24° 32' 13.999" N	81° 26' 41.999" W		24° 53' 8.006" N	80° 33' 2.002" W
	24° 32' 27.004" N	81° 26' 45.611" W		24° 53' 32.972" N	80° 33' 25.183" W
	24° 32' 33.005" N	81° 26' 23.995" W		24° 54' 14.006" N	80° 32' 40.998" W
5	24° 32' 30.011" N	81° 24' 47.000" W	16	24° 54' 6.000" N	80° 31' 33.995" W
	24° 32' 23.790" N	81° 24' 56.558" W		24° 54' 6.000" N	80° 31' 45.002" W
	24° 32' 45.997" N	81° 25' 10.998" W		24° 54' 36.006" N	80° 31' 45.002" W
	24° 32' 52.218" N	81° 25' 1.433" W		24° 54' 36.006" N	80° 31' 33.995" W
6	24° 32' 46.834" N	81° 27' 17.615" W	17	24° 56' 21.104" N	80° 28' 52.331" W
	24° 32' 41.835" N	81° 27' 35.619" W		24° 56' 17.012" N	80° 29' 5.995" W
	24° 32' 54.003" N	81° 27' 38.997" W		24° 56' 26.996" N	80° 29' 8.996" W
	24° 32' 59.002" N	81° 27' 21.000" W		24° 56' 31.102" N	80° 28' 55.325" W
7	24° 33' 10.002" N	81° 25' 50.995" W	18	24° 56' 53.006" N	80° 27' 46.997" W
	24° 33' 4.000" N	81° 26' 18.996" W		24° 56' 21.887" N	80° 28' 25.367" W
	24° 33' 17.253" N	81° 26' 21.839" W		24° 56' 35.002" N	80° 28' 36.003" W
	24° 33' 23.254" N	81° 25' 53.838" W		24° 57' 6.107" N	80° 27' 57.626" W
8	24° 33' 22.004" N	81° 30' 31.998" W	19	24° 57' 35.001" N	80° 27' 14.999" W
	24° 33' 22.004" N	81° 30' 41.000" W		24° 57' 28.011" N	80° 27' 21.000" W
	24° 33' 29.008" N	81° 30' 41.000" W		24° 57' 33.999" N	80° 27' 27.997" W
	24° 33' 29.008" N	81° 30' 31.998" W		24° 57' 40.200" N	80° 27' 21.106" W
9	24° 33' 33.004" N	81° 30' 0.000" W	20	24° 58' 58.154" N	80° 26' 3.911" W
	24° 33' 33.004" N	81° 30' 9.998" W		24° 58' 48.005" N	80° 26' 10.001" W
	24° 33' 41.999" N	81° 30' 9.998" W		24° 58' 52.853" N	80° 26' 18.090" W
	24° 33' 41.999" N	81° 30' 0.000" W		24° 59' 3.002" N	80° 26' 11.999" W
10	24° 33' 50.376" N	81° 23' 35.039" W	21	24° 59' 17.009" N	80° 24' 32.999" W
	24° 33' 27.003" N	81° 24' 51.003" W		24° 58' 41.001" N	80° 25' 21.998" W
	24° 33' 40.008" N	81° 24' 54.999" W		24° 58' 57.591" N	80° 25' 34.186" W
	24° 34' 3.382" N	81° 23' 39.035" W		24° 59' 33.598" N	80° 24' 45.187" W
11	24° 34' 0.003" N	81° 19' 29.996" W	22	24° 59' 44.008" N	80° 25' 38.999" W
	24° 34' 0.003" N	81° 20' 4.994" W		24° 59' 27.007" N	80° 25' 48.997" W
	24° 34' 24.997" N	81° 20' 4.994" W		24° 59' 32.665" N	80° 25' 58.610" W
	24° 34' 24.997" N	81° 19' 29.996" W		24° 59' 49.666" N	80° 25' 48.612" W

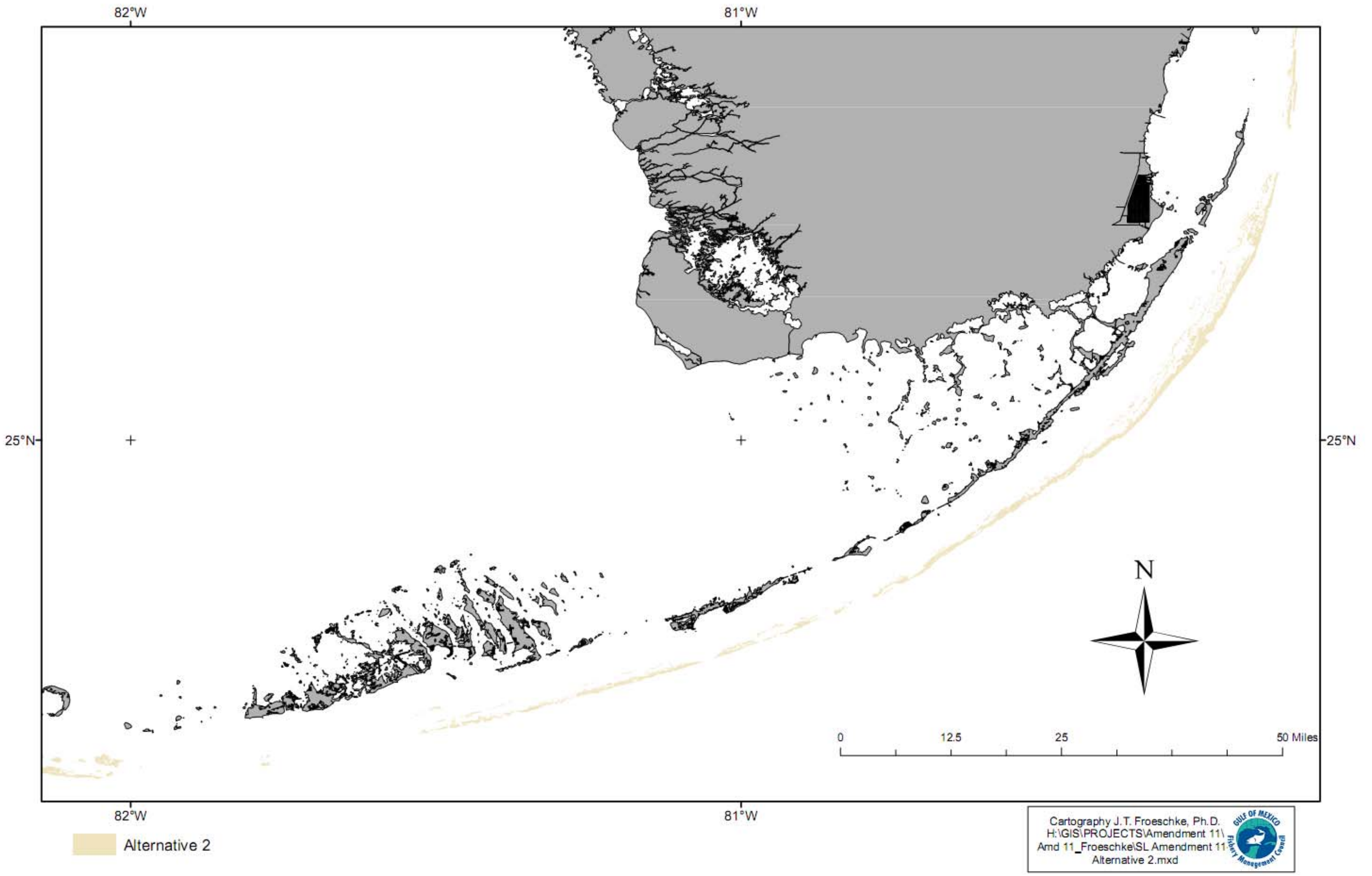
Table 4 continued. Latitude and longitude of corners of 56 proposed closed areas.

Proposed Closed Area	Latitude	Longitude	Proposed Closed Area	Latitude	Longitude
23	25° 1'0.006" N	80° 21'55.002" W	34	25° 8'12.002" N	80° 17'9.996" W
	25° 1'0.006" N	80° 22'11.996" W		25° 7'55.001" N	80° 17'26.997" W
	25° 1'18.010" N	80° 22'11.996" W		25° 8'4.998" N	80° 17'36.995" W
	25° 1'18.010" N	80° 21'55.002" W		25° 8'22.000" N	80° 17'20.000" W
24	25° 1'34.997" N	80° 23'12.998" W	35	25° 8'18.003" N	80° 17'34.001" W
	25° 1'18.010" N	80° 23'44.000" W		25° 8'18.003" N	80° 17'45.997" W
	25° 1'22.493" N	80° 23'46.473" W		25° 8'29.003" N	80° 17'45.997" W
	25° 1'36.713" N	80° 23'37.665" W		25° 8'29.003" N	80° 17'34.001" W
	25° 1'46.657" N	80° 23'19.390" W			
25	25° 1'38.005" N	80° 21'25.998" W	36	25° 8'45.002" N	80° 15'50.002" W
	25° 1'28.461" N	80° 21'46.158" W		25° 8'37.999" N	80° 15'56.998" W
	25° 1'45.009" N	80° 21'53.999" W		25° 8'42.009" N	80° 16'0.995" W
	25° 1'54.553" N	80° 21'33.839" W		25° 8'48.999" N	80° 15'53.998" W
26	25° 1'53.001" N	80° 23'8.995" W	37	25° 8'58.007" N	80° 17'24.999" W
	25° 1'53.001" N	80° 23'17.997" W		25° 8'58.007" N	80° 17'35.999" W
	25° 2'1.008" N	80° 23'17.997" W		25° 9'9.007" N	80° 17'35.999" W
	25° 2'1.008" N	80° 23'8.995" W		25° 9'9.007" N	80° 17'24.999" W
27	25° 2'20.000" N	80° 22'11.001" W	38	25° 9'10.999" N	80° 16'0.000" W
	25° 2'10.003" N	80° 22'50.002" W		25° 9'10.999" N	80° 16'9.997" W
	25° 2'22.252" N	80° 22'53.140" W		25° 9'20.996" N	80° 16'9.997" W
	25° 2'32.250" N	80° 22'14.138" W		25° 9'20.996" N	80° 16'0.000" W
28	25° 2'29.503" N	80° 20'30.503" W	39	25° 9'28.316" N	80° 17'3.713" W
	25° 2'16.498" N	80° 20'43.501" W		25° 9'14.006" N	80° 17'17.000" W
	25° 2'24.999" N	80° 20'52.002" W		25° 9'21.697" N	80° 17'25.280" W
	25° 2'38.004" N	80° 20'38.997" W		25° 9'36.006" N	80° 17'12.001" W
29	25° 2'34.008" N	80° 21'57.000" W	40	25° 10'0.011" N	80° 16'6.000" W
	25° 2'34.008" N	80° 22'14.997" W		25° 10'0.011" N	80° 16'17.000" W
	25° 2'50.007" N	80° 22'14.997" W		25° 10'9.995" N	80° 16'17.000" W
	25° 2'50.007" N	80° 21'57.000" W		25° 10'9.995" N	80° 16'6.000" W
30	25° 3'34.570" N	80° 21'18.767" W	41	25° 10'29.002" N	80° 15'52.995" W
	25° 3'2.572" N	80° 21'43.768" W		25° 10'29.002" N	80° 16'4.002" W
	25° 3'8.999" N	80° 21'51.994" W		25° 10'37.997" N	80° 16'4.002" W
	25° 3'41.011" N	80° 21'27.000" W		25° 10'37.997" N	80° 15'52.995" W
31	25° 3'26.001" N	80° 19'43.001" W	42	25° 11'5.998" N	80° 14'25.997" W
	25° 3'26.001" N	80° 19'54.997" W		25° 11'5.998" N	80° 14'38.000" W
	25° 3'41.011" N	80° 19'54.997" W		25° 11'20.006" N	80° 14'38.000" W
	25° 3'41.011" N	80° 19'43.001" W		25° 11'20.006" N	80° 14'25.997" W
32	25° 7'3.008" N	80° 17'57.999" W	43	25° 12'0.998" N	80° 13'24.996" W
	25° 7'3.008" N	80° 18'10.002" W		25° 11'43.008" N	80° 13'35.000" W
	25° 7'14.997" N	80° 18'10.002" W		25° 11'48.007" N	80° 13'44.002" W
	25° 7'14.997" N	80° 17'57.999" W		25° 12'6.011" N	80° 13'33.998" W
33	25° 7'51.156" N	80° 17'27.910" W	44	25° 12'18.343" N	80° 14'32.768" W
	25° 7'35.857" N	80° 17'37.091" W		25° 12'2.001" N	80° 14'44.001" W
	25° 7'43.712" N	80° 17'50.171" W		25° 12'7.659" N	80° 14'52.234" W
	25° 7'59.011" N	80° 17'40.998" W		25° 12'24.001" N	80° 14'41.001" W

Table 4 continued. Latitude and longitude of corners of 56 proposed closed areas.

Proposed Closed Area	Latitude	Longitude	Proposed Closed Area	Latitude	Longitude
45	25° 15' 23.998" N	80° 12' 29.000" W	51	25° 21' 45.004" N	80° 9' 51.998" W
	25° 15' 4.676" N	80° 12' 36.120" W		25° 21' 38.124" N	80° 9' 56.722" W
	25° 15' 9.812" N	80° 12' 50.066" W		25° 21' 49.124" N	80° 10' 12.728" W
	25° 15' 29.148" N	80° 12' 42.946" W		25° 21' 56.004" N	80° 10' 7.997" W
46	25° 16' 1.997" N	80° 12' 32.996" W	52	25° 21' 49.000" N	80° 9' 21.999" W
	25° 15' 33.419" N	80° 12' 52.394" W		25° 21' 49.000" N	80° 9' 31.996" W
	25° 15' 44.007" N	80° 13' 8.001" W		25° 21' 58.998" N	80° 9' 31.996" W
	25° 16' 12.585" N	80° 12' 48.597" W		25° 21' 58.998" N	80° 9' 21.999" W
47	25° 16' 33.006" N	80° 13' 30.001" W	53	25° 24' 31.008" N	80° 7' 36.997" W
	25° 16' 33.006" N	80° 13' 41.001" W		25° 24' 31.008" N	80° 7' 48.999" W
	25° 16' 34.425" N	80° 13' 41.026" W		25° 24' 41.005" N	80° 7' 48.999" W
	25° 16' 41.850" N	80° 13' 37.475" W		25° 24' 41.005" N	80° 7' 36.997" W
	25° 16' 42.001" N	80° 13' 30.001" W			
48	25° 17' 4.715" N	80° 12' 11.305" W	54	25° 25' 14.005" N	80° 7' 27.995" W
	25° 16' 17.007" N	80° 12' 27.997" W		25° 25' 14.005" N	80° 7' 44.001" W
	25° 16' 23.997" N	80° 12' 47.999" W		25° 25' 26.008" N	80° 7' 44.001" W
	25° 17' 11.705" N	80° 12' 31.300" W		25° 25' 26.008" N	80° 7' 27.995" W
49	25° 17' 23.008" N	80° 12' 40.000" W	55	25° 35' 13.996" N	80° 5' 39.999" W
	25° 17' 23.008" N	80° 12' 49.997" W		25° 35' 13.996" N	80° 5' 50.999" W
	25° 17' 33.005" N	80° 12' 49.997" W		25° 35' 24.007" N	80° 5' 50.999" W
	25° 17' 33.005" N	80° 12' 40.000" W		25° 35' 24.007" N	80° 5' 39.999" W
50	25° 20' 57.996" N	80° 9' 50.000" W	56	25° 40' 57.003" N	80° 5' 43.000" W
	25° 20' 57.996" N	80° 10' 0.000" W		25° 40' 57.003" N	80° 5' 54.000" W
	25° 21' 7.005" N	80° 10' 0.000" W		25° 41' 6.550" N	80° 5' 53.980" W
	25° 21' 7.005" N	80° 9' 50.000" W		25° 41' 18.136" N	80° 5' 49.158" W
				25° 41' 18.001" N	80° 5' 43.000" W

Figures


82°W
81°W
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Alternative 2
Cartography J.T. Froeschke, Ph.D.
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Alternative 2.mxd

Figure 1. Alternative 2, hard bottom habitat (beige) that would be closed to spiny lobster fishing encompassing 71.1 mi^2.

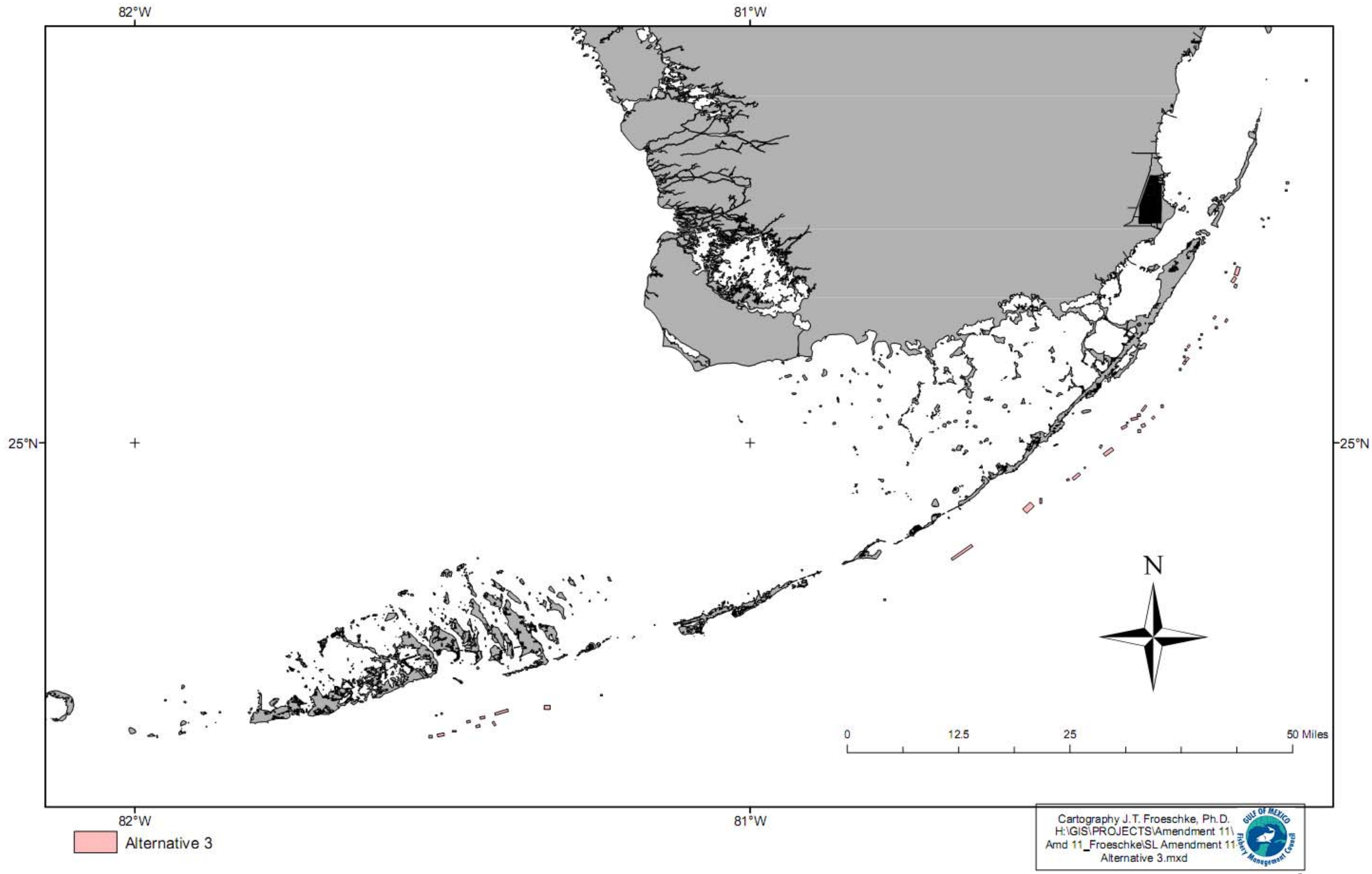

Figure 2. Alternative 3, proposed hard closed areas (n = 56) that would be closed to spiny lobster fishing encompassing 6.7 mi^2.

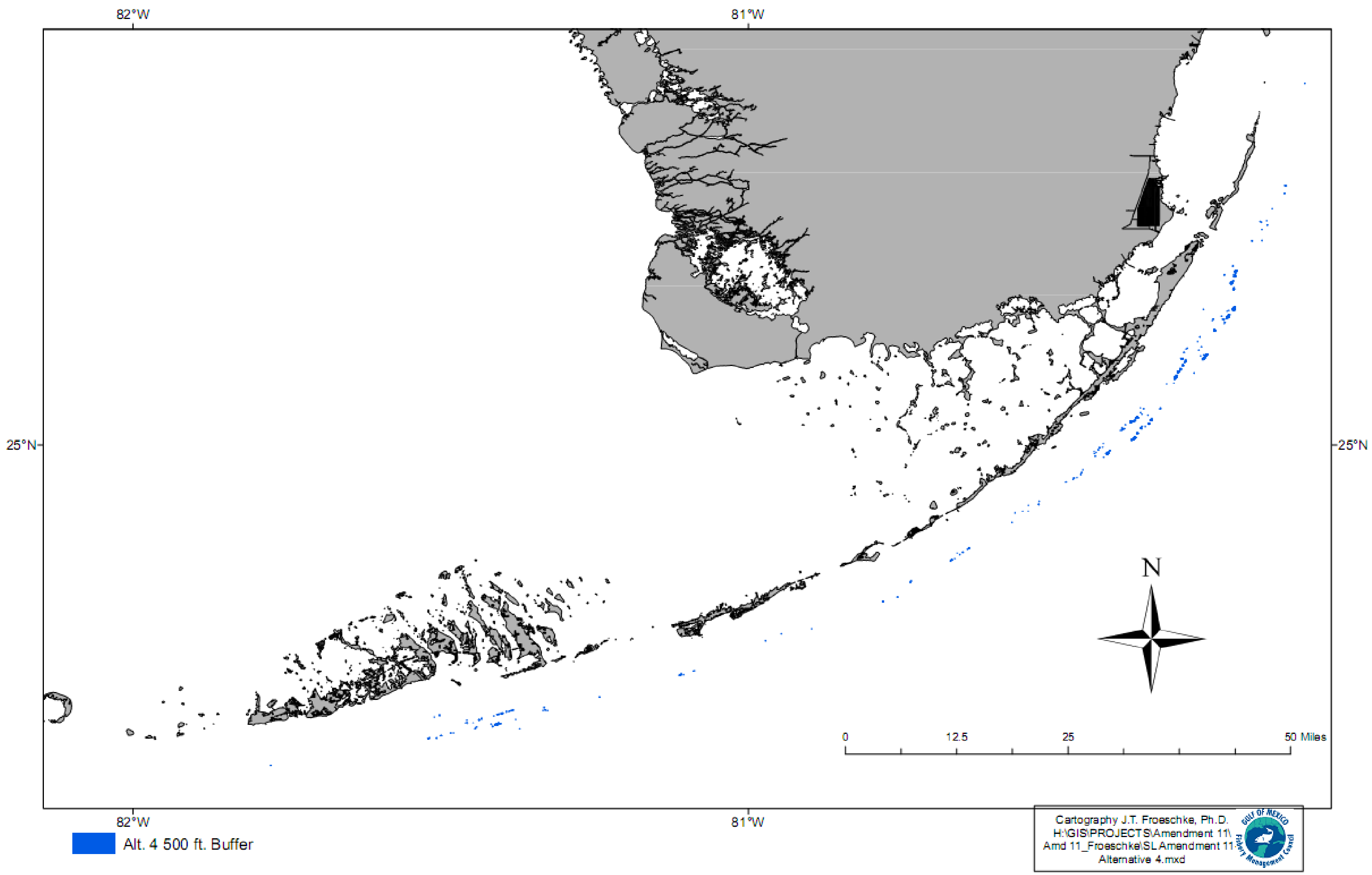

Figure 3. Alternative 4, proposed hard closed areas (n = 56) that would be closed to spiny lobster fishing