Finding of No Significant Impact (FONSI) for Authorizing Testing Traps to Target Lionfish in the Gulf of Mexico (Gulf) and South Atlantic, including within the Florida Keys National Marine Sanctuary, evaluated in the Programmatic Environmental Assessment (PEA)

National Marine Fisheries Service (NMFS)
April 2018

The Council on Environmental Quality (CEQ) Regulations state that the determination of significance using an analysis of effects requires examination of both context and intensity, and lists ten criteria for intensity (40 CFR 1508.27). In addition, the Companion Manual for National Oceanic and Atmospheric Administration Administrative Order 216-6A provides sixteen criteria, the same ten as the CEQ Regulations and six additional, for determining whether the impacts of a proposed action are significant. Each criterion is discussed below with respect to the proposed action and considered individually as well as in combination with the others.

1. Can the proposed action reasonably be expected to cause both beneficial and adverse impacts that overall may result in a significant effect, even if the effect will be beneficial?

Testing of traps to target invasive lionfish is not expected to result in significant beneficial or adverse impacts. The proposed action would allow limited testing of various trap types to determine the effectiveness of capturing lionfish. The action is not expected to have significant adverse impacts on non-target species, protected species, or habitat, including habitat designated as critical under the Endangered Species Act. The preferred alternatives have been selected to reduce impacts to protected species and habitats to the greatest extent possible while allowing trap testing to occur (see Chapter 4). Positive effects, including improved knowledge of potential lionfish removal techniques and removal of invasive lionfish itself, could be expected from this action, but they are not expected to be significant (see section 4.5).

2. Can the proposed action reasonably be expected to significantly affect public health or safety?

The action is not expected to have any adverse impacts on public health or safety. Trap testing to target lionfish will be conducted by qualified researchers or experienced commercial fishermen. The action of fishing with experimental traps is not expected to result in any more effects to public health or safety than those that already occur when fishermen are fishing from their vessels.

3. Can the proposed action reasonably be expected to result in significant impacts to unique characteristics of the geographic area, such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?

The action is not expected to result in significant impacts to unique or ecologically critical areas (see Chapter 3 and Chapter 4). In the Atlantic, areas of unique habitat exist such as the Oculina Bank and large expanses of deepwater coral; however, regulations are currently in place to protect these areas, and the applicants will not be exempted from these regulations. The U.S.S. Monitor, Gray's Reef, and Florida Keys National Marine Sanctuaries (FKNMS) are within the geographic area of the proposed actions. Additionally, there are several notable shipwrecks along the Atlantic coast and Gulf of Mexico (referenced in FONSI response #8). The Atlantic and Gulf coastlines (from Maine to Texas) are also home to numerous marshes and wetland ecosystems; however, these sensitive ecological environments do not extend into federal waters. No impacts are expected to these areas because permit conditions will require that these sensitive areas and other ecologically critical areas be avoided during trap testing.

Office of National Marine Sanctuaries (ONMS), as a co-preparer of the PEA, has carefully considered the effects of the alternatives proposed in this document on the resources managed by the National Marine Sanctuaries. ONMS will continue to review any activities proposed within FKNMS or other national marine sanctuaries under relevant authorities and will condition activities that are eligible for permits, as applicable, to ensure that activities do not result in adverse impacts to sanctuary resources or qualities. While the proposed action will occur within the submerged lands of the FKNMS, significant effects to FKNMS resources are not expected (see Chapter 4). The proposed action will occur within waters of FKNMS deeper than 30 meters, where commercial fishing with traps occurs. The testing of traps to target lionfish would be limited to the specific design of the traps and time of year they are deployed, consistent with the preferred alternatives in the PEA and as specified in the permit.

4. Are the proposed action's effects on the quality of the human environment likely to be highly controversial?

The effects of the proposed action on the quality of the human environment are not expected to be highly controversial. However, not allowing testing of which gear types are most effective at removing invasive lionfish could be perceived by the public as not taking appropriate action to explore options to address the lionfish invasion (see Chapters 1, 3, and 4).

5. Are the proposed action's effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

The proposed action's effects on the human environment are not likely to be highly uncertain or involve unique or unknown risks (Chapters 2 and 4). Commercial fishing with traps already occurs by experienced fishermen, including the applicants, and the containment trap testing contemplated is similar to those currently in use. Limited testing of non-containment traps has occurred through other scientific research programs. The proposed action would further that research with experienced fishermen and determine the feasibility of deployment on a larger scale. The risks of limited testing of non-containment traps are not highly uncertain and do not involve unique or unknown risks.

6. Can the proposed action reasonably be expected to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

The proposed action cannot reasonably be expected to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration. NMFS and ONMS review permit applications on a case-by-case basis. Any future application for a permit to allow testing of traps to target lionfish would first be reviewed within the scope of actions and alternatives analyzed in the PEA (Chapters 2 and 4). Any proposals that fall outside the scope of the PEA would be analyzed as required by the National Environmental Policy Act.

7. Is the proposed action related to other actions that when considered together will have individually insignificant but cumulatively significant impacts?

The proposed action is not related to other actions that when considered together will have individually insignificant but cumulatively significant impacts. The proposed action is summarized in Chapter 2 of the PEA. Detailed discussions of the magnitude and significance of the impacts of the preferred alternatives on the human environment appear in Chapter 4 of the PEA. The maximum number of traps allowed for trapping would represent less than 1% of the total number of traps currently fished in the southeast. None of the impacts of these actions, in combination with past, present, and future actions have been determined to be significant (see section 4.5, Cumulative Effects).

8. Can the proposed action reasonably be expected to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources?

The proposed action is not expected to adversely affect or cause loss or destruction of significant scientific, cultural, or historical resources. Several notable shipwrecks can be found in federal and state waters including in the South Atlantic and Gulf: Loftus (eastern Florida), SS Copenhagen (Southeast Florida), Half-Moon (Southeast Florida), Hebe (Myrtle Beach), Georgiana (Charleston, South Carolina), Monitor (Cape Hatteras, North Carolina), Huron (Nags Head, North Carolina), and Metropolis (Corolla, North Carolina); and the U.S.S. Hatteras (Texas). The U.S. Monitor, Gray's Reef, and Florida Keys National Marine Sanctuaries are also within the boundaries of the South Atlantic EEZ. Fishing activity already occurs in the vicinity of these sites without adverse effect or loss or destruction of these resources, and this action is only limited trap testing, and therefore is not expected to result in appreciable impacts to these resources.

9. Can the proposed action reasonably be expected to have a significant impact on endangered or threatened species, or their critical habitat as defined under the Endangered Species Act of 1973?

The proposed action is not expected to have a significant impact on endangered or threatened species, or their critical habitat. In an Endangered Species Act (ESA) section 7 consultation dated April 13, 2018, NMFS determined the proposed action is not likely to adversely affect ESA-listed marine species or their critical habitat. Additionally, as stated in Chapter 2 and analyzed in detail in Chapters 4 and 5, conditions will be added to the authorizations (EFPs and ONMS permits) to avoid and minimize potential effects to ESA-listed species and their habitat. These mitigation measures include excluding areas from trap testing and gear limitations to reduce the risk of entanglements and mortality (see Chapter 5).

10. Can the proposed action reasonably be expected to threaten a violation of Federal, state, or local law or requirements imposed for environmental protection?

The proposed action is not expected to threaten a violation of Federal, state, or local law or requirements imposed for environmental protection (see Chapter 3). The EFPs analyzed in the PEA will exempt the applicants from federal regulations at 50 CFR 622.9(c). Similarly, projects found eligible for permit(s) to be issued by ONMS would allow activities that are otherwise prohibited by 15 CFR 922.163(a).

11. Can the proposed action reasonably be expected to adversely affect stocks of marine mammals as defined in the Marine Mammal Protection Act (MMPA)?

The proposed action is not expected to adversely affect stocks of marine mammals (see Chapters 3 and 4, and Appendix B). The proposed action would test traps to target lionfish, including traps and/or pots that are otherwise used in the spiny lobster, golden crab, stone crab, blue crab, and black sea bass fisheries, as well as additional traps that are not used in a classified fishery in the Southeast region (e.g., American lobster pots which are used in the northeast, pinfish traps, shrimp traps which are allowed in Florida state waters, and non-containment traps). The 2018 Final MMPA List of Fisheries (83 FR 5349) was published on February 7, 2018 and characterizes the listed federal trap fisheries as follows.

Category III (remote likelihood of serious injury or mortality)
- Gulf and South Atlantic spiny lobster trap fishery
- Gulf blue crab trap/pot fishery
- southeastern U.S. Atlantic golden crab trap/pot fishery
- Gulf golden crab trap/pot fishery

Category II (occasional serious injury or mortality)
- southeastern U.S. Atlantic stone crab trap fishery
- southeastern Gulf stone crab trap fishery
- Atlantic blue crab trap/pot fishery
- southeastern U.S. Atlantic black sea bass pot component of the snapper-grouper fishery is considered a Category II under the conglomerate of trap/pot fisheries "Atlantic mixed species trap/pot"

The proposed action involves a limited amount of traps (up to 10,000 in the Gulf of Mexico, up to 5,000 in the South Atlantic, and up to 3,000 in the Florida Keys), which is only a portion of that involved in the fisheries above, so we would expect the effects of the testing to be less than the effects of these fisheries. While traps have the potential to negatively impact marine mammals, as described in Chapter 2 and analyzed in detail in Chapters 4 and 5, conditions will be added to the permit to reduce potential effects to marine mammals. These mitigation measures include excluding areas from trap testing and gear limitations to reduce the risk of entanglements and/or serious injury (see Chapter 5).

12. Can the proposed action reasonably be expected to adversely affect managed fish species?

The proposed action is not expected to adversely affect species usually targeted with the proposed traps (spiny lobster, stone crab, black sea bass) or co-occurring finfish species such as white grunt, gray triggerfish, greater amberjack, red porgy, gag, and red snapper (see Chapters 3 and 4). Observed bycatch in the commercial trap fisheries in the action area is low, and the proposed trap testing here uses similar methods, but involves fewer traps (less effort). Furthermore, applicants are proposing to modify trap funnel size to further reduce the potential for bycatch of co-occurring species and test non-containment traps. If bait is used during trap testing (Action 4), the potential for bycatch increases, but would not be significant. Lionfish are known to be attracted to structure, so bait may not be a necessary attractant for the target species. As stated in Chapters 2 and 3, and analyzed in Chapter 4, the proposed action is not anticipated to result in substantial bycatch of co-occurring species.

13. Can the proposed action reasonably be expected to adversely affect essential fish habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act)?

The proposed action is not expected to adversely affect essential fish habitat (EFH). The action is not expected to substantially alter fishing methods or activities already occurring in the Gulf of Mexico and South Atlantic Regions (see Chapters 3 and 4). Additionally, preferred alternatives analyzed in the PEA include conditions that would mitigate any impacts to EFH (see Chapters 4 and 5).

As specified in the Magnuson-Stevens Act, an EFH consultation is required for federal actions which may adversely affect EFH. NMFS Southeast Regional Office (SERO) Sustainable Fisheries Division has determined the proposed actions could adversely affect EFH; however, those effects are not likely to be significant. NMFS SERO Habitat Conservation Division has reviewed the actions and agrees with this determination as stated in Appendix C. Further consultation on this matter is not necessary unless future modifications are proposed and such actions may result in adverse impacts to EFH.

14. Can the proposed action reasonably be expected to adversely affect vulnerable marine or coastal ecosystems, including but not limited to, deep coral ecosystems?

The proposed action is not expected to adversely affect vulnerable marine or coastal ecosystems including deep coral ecosystems (see Chapters 2, 3, and 4 and Appendix B [ESA consultation], and response to No. 13 of this FONSI). Preferred alternatives analyzed in the PEA include conditions that would mitigate any impacts to deep coral ecosystems.

15. Can the proposed action reasonably be expected to adversely affect biodiversity or ecosystem functioning (e.g., benthic productivity, predator-prey relationships, etc.)?

Based on the analysis in Chapters 3 and 4, the proposed action is not expected to adversely affect biodiversity and/or ecosystem function within the affected area. The trap testing involves similar fishing gear and/or fishing practices that are currently used throughout the Gulf and South Atlantic regions (fishing with traps), and the traps would not be modified in such a manner that would affect benthic productivity or predator-prey relationships. Potential positive effects to ecosystem functioning could result from removal of invasive lionfish.

16. Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

The proposed action is not reasonably expected to introduce or spread any non-indigenous species. The purpose of the action is to determine if traps are effective in removing invasive lionfish, which are now found in the U.S. exclusive economic zone in the Gulf and South Atlantic Regions. As discussed in Chapters 2 and 4, the proposed action could provide useful information in determining the best way to remove lionfish from the southeast. Also, because no activity such as increased ballast water discharge from foreign vessels is proposed, the introduction or spread of non-indigenous species is not expected to occur.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Programmatic Environmental Assessment prepared for "Testing Traps to Target Lionfish in the Gulf of Mexico and South Atlantic, including within the Florida Keys National Marine Sanctuary," it is hereby determined that the action, testing traps to target lionfish, will not significantly impact the quality of the human environment as described above and in the supporting PEA. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an environmental impact statement for this action is not necessary.

For Roy E. Crabtree, Ph.D.
Regional Administrator
National Marine Fisheries Service, Southeast Regional Office

4/13/18
Date

TESTING TRAPS TO TARGET LIONFISH IN THE GULF OF MEXICO AND SOUTH ATLANTIC, INCLUDING WITHIN THE FLORIDA KEYS NATIONAL MARINE SANCTUARY

FINAL PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

April 13, 2018

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Abbreviations and Acronyms Used in the Document

ACCSP	Atlantic Coastal Cooperative Statistics Program
BOEM	Bureau of Ocean Energy Management
CFR	Code of Federal Regulations
CMP	Coastal Migratory Pelagics
CPUE	Catch per unit effort
DPS	Distinct Population Segment
DW	Dolphin-Wahoo
EA	Environmental Assessment
EEZ	Exclusive economic zone
EFH	Essential fish habitat
EFP	Exempted Fishing Permit
EIS	Environmental Impact Statement
E.O.	Executive Order
ESA	Endangered Species Act
FAC	Florida Administrative Code
FAD	Fish Aggregation Device
FGBNMS	Flower Garden Banks National Marine Sanctuary
FKNMS	Florida Keys National Marine Sanctuary
FMP	Fishery Management Plan
FWC	Florida Fish and Wildlife Conservation Commission
FR	Federal Register
GMFMC	Gulf of Mexico Fishery Management Council
GPS	Global Positioning System
GRNMFS	Gray's Reef National Marine Sanctuary
Gulf	Gulf of Mexico
Gulf Council	Gulf of Mexico Fishery Management Council
HAPC	Habitat Areas of Particular Concern

HMS	Highly Migratory Species
IPCC	Intergovernmental Panel on Climate Change
ITS	Incidental Take Statement
KM	King Mackerel
LC	Spiny Lobster
LOA	Letter of Acknowledgement
LOF	List of Fisheries
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MCE	Mesophotic Coral Ecosystems
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
NARW	North Atlantic Right Whale
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRFCC	National Recreational Fisheries Coordination Council
OMB	Office of Management and Budget
ONMS	Office of National Marine Sanctuaries
PEA	Programmatic Environmental Assessment
PRA	Paperwork Reduction Act
RF	Reef Fish
South Atlantic Council	South Atlantic Fishery Management Council
SAFMC	South Atlantic Fishery Management Council

SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
SG	Snapper-Grouper
SM	Spanish Mackerel
SMZ	Special Management Zone
UME	Unusual Mortality Event
U.S.	United States
USGS	United States Geological Survey

Programmatic Environmental Assessment – Testing Traps to Target Lionfish in the Gulf of Mexico and South Atlantic, including within the Florida Keys National Marine Sanctuary

Proposed actions:	Testing of various trap types and design modifications across multiple areas to determine their effectiveness at catching lionfish.
Lead agency:	Programmatic Environmental Assessment – National Marine Fisheries Service (NMFS), Southeast Regional Office

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Chapter 1. Introduction

1.1 Proposed Action

NOAA's National Marine Fisheries Service (NMFS) Southeast Regional Office (SERO) proposes to issue exempted fishing permits (EFPs) for the testing of otherwise prohibited fishing gear and for compensation/exploratory fishing in the Gulf of Mexico and South Atlantic, including the Florida Keys National Marine Sanctuary (FKNMS). NMFS has received an application for an EFP to test whether certain trap types would be effective at capturing lionfish while minimizing bycatch of other species and effects to the environment, and expects to receive additional proposals. In addition, NOAA's Office of Marine Sanctuaries (ONMS) has received one permit application to test lionfish traps in the FKNMS. NMFS and ONMS anticipate that some future permit applications may propose testing within the waters of FKNMS, thus ONMS is acting as a co-lead on this Programmatic Environmental Assessment (PEA). In particular, ONMS proposes to issue general use permits to future permit applicants for alterations of the seafloor due to placement of traps to target lionfish on the seafloor. EFPs are required for the testing of fishing gear and for compensation/exploratory fishing that would otherwise be prohibited under federal fishing regulations.

Federal regulations prohibit the use or possession of a fish trap in federal waters in the Gulf and South Atlantic, except in certain fisheries with approved traps (50 CFR 622.2 and 622.9(c)). Similarly, a general permit from ONMS would be required because placement of fish traps is a prohibited alteration of the seafloor within the waters of FKNMS (15 CFR 922.163(a)(3)).

NOAA is taking a programmatic approach for National Environmental Policy Act (NEPA) compliance to examine the environmental impacts of authorizing limited testing of various trap designs and configurations for capturing lionfish under an EFP and/or ONMS general permit. The PEA analyzes the potential effects of anticipated future permit requests to test gear types and methods to harvest lionfish in the Gulf and South Atlantic, including within waters of FKNMS. The procedure for using this PEA for future applications is discussed in section 1.5. Analyses contained within this PEA and results obtained from any EFPs and ONMS general permits issued could provide useful information if the Gulf of Mexico and South Atlantic Fishery Management Councils (Gulf and South Atlantic Councils) seek to develop management measures for a directed harvest of lionfish via traps or otherwise regulate lionfish harvest in the future. As specific permit applications are submitted to NOAA, SERO and ONMS will prepare a compliance or inclusion memo, respectively, if the proposed action falls within the scope of this PEA.

1.2 Background

The Lionfish Problem

Invasive species, defined as being non-native to an ecosystem and likely to cause economic or environmental harm, have increased in abundance and range over the last century (Mack et al. 2000; Olden et al. 2004). Introduced non-native species, whether intentional or unintentional, are capable of causing negative ecological and economic impacts through competition with native species, habitat alteration, and reduction in biodiversity (Mack et al. 2000; Olden et al. 2004). The frequency of bio-invasions has increased, primarily due to the high interconnectivity of the global economy. Marine and fresh water bio-invasions are well documented and nearly impossible to eradicate once established. According to the U.S. Geological Survey (USGS), 68 marine introductions have occurred in Florida, the Caribbean, and the Gulf of Mexico (Gulf) from 1887 to 2009 (USGS 2009). Indo-Pacific lionfish are a prime example of an invasive species that has gained a foothold in waters of the southeast United States.

Two species of lionfish, *Pterois miles* and *P. volitans*, were introduced into the western Atlantic Ocean, with first reports being recorded in the mid-1980s (Courtenay 1995; Semmens et al. 2004). The two species are indistinguishable by external examination (Hamner et al. 2007) and will be referred to as lionfish in the rest of this document. Since the start of the invasion, lionfish have established populations in the southeastern United States, the Bahamas, and the Caribbean, although sightings have been as far north as Massachusetts and as far south as Brazil (Ferreira et al. 2015; Jud and Layman 2012; Meisner et al. 2005; Ruiz-Carus et al. 2006; Schofield 2010; USGS 2009) (Figure 1.1.1). Lionfish inhabit a range of water depths (from very shallow (2-3 feet) to depths over 1,000 feet) and have been observed in most, if not all marine habitat types including mangroves, seagrass beds, hard bottom, coral reefs, and artificial reefs (Morris and Green 2012). These fish are native to the Indian Ocean, Western and Central Pacific Ocean, and Western Australia (Schultz 1986). Lionfish are capable of becoming sexually mature within their first year of life and will spawn throughout the year every three to four days, producing upwards of two million eggs annually (Morris et al. 2009). Larval dispersal during a 20-35 day planktonic stage is facilitated through oceanic currents and is likely responsible for the rapid range expansion lionfish have demonstrated over the last 15 years (Ahrenholz and Morris 2010; Hare and Whitfield 2003; Kitchens et al. 2017; Kulbicki et al. 2012; Vasquez-Yeomans et al. 2011). Research has shown increased levels of lionfish have had negative impacts on reef fish populations (Albins and Hixon 2008; Barbour et al. 2011; Green et al. 2012). Adult lionfish are opportunistic carnivores and feed on nearly all small reef fish including those of commercial, recreational, and ecological importance (Albins and Hixon 2008; Cote et al. 2013; Green et al. 2012; Morris and Akins 2009). Juvenile lionfish have been found in the stomach contents of several groupers and sharks; however, scientists are unsure if predation on lionfish is common (Diller et al. 2014; Malijkovic et al. 2008; Mumby et al. 2011).

Figure 1.1.1. Lionfish reported sightings, outside of their native range, as of 2016.
Source: USGS nonindigenous aquatic species webpage January 29, 2018.

Lionfish densities and their range have steadily increased since the beginning of the invasion (Morris et al. 2009; Whitfield et al. 2007), which can be attributed in part to low occurrences of natural predation, life history traits of the species, and the ability for lionfish to acclimatize to a wide range of physical habitats (Bernadsky and Goulet 1991; Morris et al. 2009; Morris and Green 2012). The expanding range and increased densities of lionfish are adding pressure to already highly stressed coral reef ecosystems. Lionfish have the capacity to reduce abundance and species richness of native reef fish populations, including recreationally and commercially valuable species (Chagaris et al. 2017). Competition with lionfish can also reduce resiliency and slow the recovery of reef fish populations in the southeast due to competition and predation pressures. Ecologically important reef fish species, such as parrotfish, also have high site fidelity (Afonso et al. 2008; Meyer et al. 2010; Welsh and Bellwood 2012). Predation by lionfish on species such as parrotfish can slow recovery of reef habitat by removing the species that keep algae growth in check thereby allowing for coral larvae settlement (Mumby et al. 2006; Mumby et al. 2014). Additionally, socio-economic impacts of the lionfish invasion are currently not well quantified.

Lionfish Removal Techniques

Because lionfish have few natural predators in their invasive range, an option for controlling populations is to establish directed fisheries for the species by allowing directed trap harvest for this non-fishery management plan (FMP) species in federal waters. There are not currently any federal regulations in place regarding the harvest of lionfish in the South Atlantic or Gulf federal waters, nor is there a federal FMP for lionfish. However, trap harvest of a non-FMP finfish species is prohibited. Furthermore, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires that species be sustainably managed and actions be taken to prevent overfishing. Thus, federal management is not appropriate for an invasive species that should be eradicated. However, control practices are currently being used or in the process of being developed in state waters. Florida has implemented the following measures to address the lionfish invasion: prohibited importation of live lionfish or hybrids or eggs; prohibited transport and release of live lionfish; removed the need for a recreational fishing license if lionfish are fished by hand held net, pole spear, Hawaiian sling, or any other spearing device specifically designed towards lionfish; allowed lionfish harvest with no commercial or recreational bag limit or size limit; allowed harvest of lionfish while using a rebreather; allowed participants of approved tournaments and other organized events to spear lionfish in areas where spearfishing is not currently allowed; and allowed an extra spiny lobster to be harvested during mini season if a certain number of lionfish is also harvested. More recently, Florida has begun a lionfish harvest program where it incentivizes dive charters to conduct lionfish harvesting trips by reimbursing them for some of their trip costs. Spearing and netting by divers are the primary active lionfish removal techniques used in the southeast. However, both are limited to suitable diving depths. While the number of lionfish-specific fishing derbies has increased in recent years, harvest is similarly constrained by safe diving depths. Derbies have been shown to be an effective means of suppression, but only in localized areas (Green et al. 2017). Derbies do not provide for regular harvest levels of lionfish on a continued basis. Trapping provides a passive method of harvest and has potential to increase removal of lionfish. In areas with trap fisheries, particularly spiny lobster, stone crab, and blue crab, lionfish incidental catch frequently occurs, especially at deeper depths. However, currently authorized trap fisheries are subject to seasonal closures; thus, reducing lionfish harvest to zero during these times. Since commercial lionfish harvest began in 2011, demand for lionfish in restaurants and grocery stores has been increasing, with current supply not meeting the need.

Exempted Fishing Permits and Office of National Marine Sanctuaries Permits

Exempted fishing permits (EFPs), issued by NMFS are required for the testing of fishing gear and for compensation/exploratory fishing that would otherwise be prohibited under federal fishing regulations. In addition, ONMS has the authority to issue general permits for activities that are otherwise prohibited in any national marine sanctuary (15 CFR 922.166(a)). Placing fishing gear (such as traps) on the sea floor of FKNMS that was not defined in the original environmental impact statement for FKNMS as a "traditional fishing activity" is prohibited by FKNMS regulations (15 CFR 922.163(a)(3)).[1] Under FKNMS regulations, general permits may

[1] Alteration of the seabed is prohibited unless incidental to traditional fishing activities. "Traditional fishing activities" are defined at 15 CFR 922.162 as those activities identified in the 1996 final environmental impact statement (FEIS) for FKNMS, which does not include use of traps to target lionfish (NOAA 1996).

be granted for the purpose of research, education, and management. In addition, FKNMS must find that the value of the activity to the furtherance of Sanctuary goals and purposes outweighs any potential adverse impacts on FKNMS resources and qualities from the conduct of the activity, and that it is necessary for the activity to occur within the FKNMS. Further criteria for granting a General Permit in FKNMS may be found at 15 CFR 922.166(a).

Applications to test traps to target lionfish (EFPs and ONMS Permits)

NMFS received three applications for EFPs to target lionfish with traps. One of the applicants also sought an ONMS general permit. However, since that time, two of those applications have been withdrawn, including the application that also sought the ONMS permit. Nonetheless, given the scope of the lionfish invasion and the interest in determining the most effective means of eradicating the species, NMFS expects to receive additional applications (see Section 1.4 for more information). The withdrawn applications cover a range of testing locations and gear types that could be used in future research, and thus are described below for context for understanding expected future applications and for the analyses in this PEA.

On June 10, 2015, the Florida Keys Commercial Fishermen's Association (Association) submitted a letter to NMFS seeking an EFP for their proposed project to test the efficiency and effectiveness of four trap designs to target lionfish. The application was revised and resubmitted on July 13, 2015 and July 21, 2016. An application was also submitted to ONMS on February 22, 2017, for testing traps to capture lionfish in waters of FKNMS. Sampling would occur twice per month over the course of a year in each of four regions: off Murrell's Inlet, South Carolina; Ponce Inlet, Florida; Tampa, Florida; and the Florida Keys (waters between Alligator and Sombrero Reefs). The Association is seeking to test traps within the waters of the FKNMS, and thus submitted an application to ONMS on February 22, 2017, to conduct testing in this region. This study would derive biological and life history information to improve lionfish control. In addition, the project would utilize an outreach and education program to inform the public about the status of lionfish as an invasive species, efforts to control the spread of the population, and assess lionfish as a consumer food source. As outlined in their letter, 25 units of four different trap designs to include spiny lobster wood traps, spiny lobster wire traps, rectangular wire traps, and black sea bass pots (400 traps total, 100 traps max per region) would be deployed in depths ranging from 65-300 feet (20-91 m) for a maximum two week soak[2] period. All traps would have modified funnel designs to reduce the bycatch of co-occurring species. The Association indicated it would like to conduct sampling over the course of a year from the date of issuance. On April 1, 2018, the Association withdrew its application.

On April 6, 2017, Salty Bones Fisheries Inc. submitted a letter to NMFS seeking an EFP for their proposed project to test the effectiveness of three trap designs to target lionfish and do it sustainably with minimal impacts to co-occurring species, essential fish habitat, or endangered species. The application was revised and resubmitted on January 10, 2018 and February 26, 2018. Proposed trap designs include two traps that are currently in use for crustacean fisheries in the Gulf and South Atlantic, and the third is a prototype "curtain trap," that includes a fish aggregation device (FAD). Sampling would occur in two regions off the lower Florida Keys in the Atlantic and in the Gulf, up to four times per month in each region during part of the spiny

[2] Time traps are in the water between being retrieved.

lobster closed season, from April 1 through July 31. Testing would not occur within the FKNMS. This study would also collect gear configuration and fishing effort data including: trap loss and movement; protected species interactions; bycatch species, amount, and disposition; and lionfish catch data. As outlined in their letter, the traps would be deployed in depths ranging from 150-300 feet (46-91 m). Multiple spiny lobster trap designs that include all wire traps, and wood and wire traps (1,000 of each design in the Gulf and 500 of each design in the South Atlantic, 3,000 total traps) and up to 120 of the prototype purse trap (80 in Gulf and 40 in South Atlantic) would be deployed with a maximum ten day soak period. All lobster traps would have modified funnel designs to reduce the bycatch of co-occurring species. All traps would be deployed via a trawl system with up to 40 traps being part of each trawl with one buoyed vertical line to the surface. Salty Bones Fisheries Inc. indicated it would like to conduct sampling from April 1 through July 31, 2018 and April 1 through July 31, 2019. On April 12, 2018, Salty Bones Fisheries withdrew its application.

On May 7, 2017, ReefSavers submitted a letter to NMFS seeking an EFP for their proposed project to test the effectiveness of a prototype "curtain trap," that includes a FAD, to target lionfish while limiting bycatch. ReefSavers revised its request on January 15, 2018. ReefSavers proposed to conduct sampling over the course of the year in six regions: off Louisiana; Alabama; Pensacola, Florida; Tampa, Florida; Jacksonville, Florida; and South Carolina. This study, would also collect gear configuration and fishing effort data including trap loss and movement; bottom impacts; bycatch data; protected species interactions; lionfish catch data; and lionfish biological and life history information. As outlined in their letter, the traps would be deployed in depths ranging from 90-500 feet (27-152 m). Up to 500 of the prototype, purse trap would be deployed in each region with a maximum two-week soak period. Methods based on the American lobster pot fishery would be utilized to mitigate entanglement of protected species. ReefSavers indicated it would like to conduct sampling from July 1, 2018 to July 1, 2020.

History of Lionfish Trap Testing Permit Actions

NMFS granted an EFP to the Eastern Carolina Artificial Reef Association to research traps that could be used for capturing invasive lionfish off eastern North Carolina artificial reefs and hard bottom areas. Additionally, the applicant was interested in assessing consumers' preference for lionfish as an exotic food source in a restaurant setting to determine if coastal North Carolina would support a consumer market for the species. The EFP was effective March 2015 through December 2016. The applicant tested five American lobster pots, crab pot Christmas trees, and geometric reef balls, connected by a chain with no buoy lines to the surface. These trap configurations were deployed by divers near/adjacent to designated hard and soft bottom features. Trap deployment occurred year-round along the North Carolina coast in federal waters up to 360 feet in depth. The traps/devices were deployed for at least 48 hours and no longer than three weeks. After soaking, divers counted and identified the number of fish in and around each trap or device type, and recorded video images of the devices and surrounding area prior to retrieving the equipment. The applicant was unable to complete the fieldwork within the approved timeframe and subsequently applied for a new EFP to complete the work. The second EFP was granted in May 2017 and expires in December 2018. Data from the project are not yet available.

Lionfish are routinely collected by divers in waters of FKNMS following current state and federal fishing regulations. Lionfish derbies, where teams of divers focus removal efforts in concentrated areas on a specific date, have been occurring approximately twice a year for the past five years in FKNMS. Derbies often require an ONMS permit if prohibited gear is requested for use (e.g., using spears in no-spear zones). Approximately five ONMS permits have been issued to date for lionfish derbies. ONMS has also issued general permits aimed at lionfish research activities in FKNMS that did not include trap or gear testing.

Letters of Acknowledgement (LOAs) / History of LOA Actions and ONMS Permit

NMFS issues letters acknowledging scientific research activities conducted by scientific research vessels as activities that are not considered fishing under the Magnuson-Stevens Act. *See* 16 U.S.C. 1802(16) (defining fishing); 50 CFR 600.745(a) (scientific research activity); *id.* 600.10 (defining fishing). These letters are referred to as letters of acknowledgement (LOAs). NMFS has received letters from scientific research institutions requesting LOAs recognizing projects to experiment with trap gear for the purpose of removing lionfish as scientific research activities.

On August 20, 2015, the University of South Florida (USF) submitted a letter to NMFS seeking recognition that its proposed project to collect lionfish by a prototype bin trap, for life history analysis between Boca Grande and Pensacola, Florida, was a scientific research activity conducted from a scientific research vessel. As outlined in their letter, the research would test capture rates of lionfish and non-targeted species using two different size trap throat openings and baited vs. unbaited traps. The project proposed stated to deploy traps in depths from 100-225 feet with most sampling taking place adjacent to natural reef ledges and artificial reefs. One hundred traps were to be deployed over a 2-7 day soak period. The traps were to be constructed of plastic enclosed on top with wire mesh, and were stated to be negatively buoyant. Traps were to be deployed in a trawl formation with up to 16 traps per line and an inflatable buoy with a high flyer attached. The up-current end of the trap line was to be anchored with a 5lb grapnel attached to a 3-foot chain with a breakaway. The down-current end of the line was to be held on the bottom with a 5lb sash weight. USF indicated it would conduct sampling from September 2015 to August 2016. On August 26, 2015, NMFS provided the requested LOA, which applies to activities conducted through August 2016. Data from the project are not yet available.

On March 14, 2016, the University of Georgia submitted a letter to NMFS seeking recognition that its proposed project to deploy a prototype "curtain trap," and a lionfish “bear trap” off Pensacola, Florida to further test whether the trap is effective at catching lionfish, was a scientific research activity conducted from a scientific research vessel. The University of Georgia indicated it would conduct sampling from September 2015 to December 2017. On November 14, 2016, NMFS provided the requested LOA, which applies to activities conducted through December 31, 2017. Data from the project are not yet available.

On October 3, 2016, the University of Miami submitted a letter to NMFS seeking recognition that its proposed project to collect lionfish in federal waters inside and outside the FKNMS was a scientific research activity conducted from a scientific research vessel. On October 14, 2016, NMFS provided the requested LOA. The project proposed to deploy two Antillean-Z traps during each research cruise; one at each of two sites (one within the FKNMS and one outside) with a soak time of between 24 and 48 hours. Traps were to be deployed on flat sandy bottoms at different depths, as to not place traps on top of coral reefs. The traps were to be constructed of wooden poles, river cane and string, and weighted with rebar and dive weights. Traps deployed at depths over 60 feet (18 m) had a Styrofoam subsurface buoy attached. The traps were un-baited. Sampling occurred from October to December 2016. Data from the project are not yet available.

On February 8, 2017, the Great Lakes Institute for Environmental Research (Institute) submitted a letter to NMFS seeking recognition that its proposed project to harvest lionfish using a prototype purse trap developed by NOAA ONMS, and to obtain samples from lionfish and grouper, was a scientific research activity conducted from a scientific research vessel. The Institute was seeking to collect data for use in studies on lionfish and grouper biology, behavior, ecology, learning, and feeding. Only lionfish were to be collected via the purse trap. The Institute intended to deploy six purse traps set at a depth range of 40-120 feet (12-37 m) with a soak time of two to six weeks throughout the southwest Florida shelf. As outlined in their letter, the Institute also planned to use hand nets to obtain the grouper and lionfish samples. On March 1, 2017, amended May 4, 2017, and August 11, 2017, NMFS provided the requested LOA, which applied to activities expected between March and December 2017. Sampling via the purse trap was conducted from August to December 2017. The applicant was unable to complete the fieldwork within the timeframe in the LOA due to hurricanes that impacted the Gulf and subsequently requested that the LOA be revised to note the revised timeframe to complete the work. NMFS provided an amended LOA on November 30, 2017, which applies to activities conducted through August 2018. Data from the project are not yet available.

On May 23, 2017, the Coast Watch Alliance (Alliance) submitted a letter to NMFS seeking recognition that its proposed project to deploy a prototype "curtain trap," along with a fish attracting device (FAD), off Pensacola, Florida to further test whether the trap is effective at catching lionfish, is a scientific research activity conducted from a scientific research vessel. As outlined in their letter, the curtain traps and FADs will be deployed in typical scuba working depths ranging up to 130 feet. Six trap frames, without netting, will be deployed over a three-week soak period. Float lines will be equipped with breakaway gear, or weak links as described in the Atlantic Large Whale Take Reduction Plan. The Alliance indicated it would conduct sampling from June 2017 to December 2018. On June 13, 2017, NMFS provided the requested LOA, which applies to activities conducted through December 2018. Data from the project are not yet available.

On March 20, 2018, the University of Florida (UF) submitted a letter to NMFS seeking recognition that its proposed project to deploy a prototype "curtain trap," along with a FAD, off Destin, Florida to test lionfish recruitment to the structure and to collect lionfish biological life history samples, is a scientific research activity conducted from a scientific research vessel. As outlined in their letter, the curtain traps and FADs will be deployed in depths ranging from 98 to 197 feet. Twelve curtain traps will be deployed over a two-week soak period. UF indicated it would conduct sampling from April 2018 to June 2019. On March 26, 2018, NMFS provided the requested LOA, which applies to activities conducted through June 15, 2019.

On April 4, 2018, an ONMS scientist submitted a letter to NMFS seeking recognition that its proposed project to observe if image-based fish recognition can determine if lionfish have entered a trap funnel and a Fish Trap Extension Kit (FTEK) “smart trap” outfitted trap is subsequently successful at opening the door to the trap to let only lionfish in, thereby eliminating bycatch of non-target species and observing how lionfish will react in the presence of the electronic and mechanical equipment associated with the system, is a scientific research activity conducted from a scientific research vessel. As outlined in their letter, a single FTEK enabled spiny lobster trap will be connected to up to 15 spiny lobster traps not instrumented with the FTEK, and deployed in a trawl configuration. Two surface buoys will be attached to the trawl line. Traps are to be deployed in depths no shallower than 130 feet within FKNMS near Alligator Reef Light and near Sombrero Reef Light. Traps will also be set in depths from 300-350 feet outside of FKNMS Tennessee Reef Light. All traps are to have a maximum soak time of ten days throughout the study area. Due to a general permit being needed to sample within FKNMS, an application was also submitted to ONMS on April 4, 2018, for conducting the same testing in waters of FKNMS. ONMS indicated it would conduct sampling from April 2018 to September 2019. Both the LOA and ONMS general permit are still pending approval.

1.3 Purpose and Need

The purpose of the actions proposed is to test traps and targeting strategies to determine which are most effective at capturing invasive lionfish in the Gulf of Mexico, South Atlantic, including within the Florida Keys National Marine Sanctuary, while avoiding and/or minimizing impacts to non-target species, protected species, and habitats. The need for the action proposed is to respond to the lionfish invasion.

NMFS and ONMS are conducting a programmatic review to ensure that the underlying activities would not adversely impact essential fish habitat, protected species, non-target species, or Florida Keys National Marine Sanctuary resources. In addition, information generated from conducting the research under the exempted fishing permits and/or ONMS permits will enable NMFS, ONMS, and other fisheries managers to determine which traps and targeting strategies can effectively target lionfish populations in the Gulf of Mexico, South Atlantic, and Florida Keys National Marine Sanctuary.

1.4 Scope of PEA

The PEA analyzes a range of alternatives for testing different trap types and quantities in different locations, with and without bait. The PEA analyzes the potential effects of authorizing the various amounts of effort, to guide decision making when applications are received. NMFS expects that the Gulf and South Atlantic Councils could use the information learned as a result of the trap testing to develop criteria for allowable gear types to harvest lionfish. Although the outcome of the experiments proposed in the EFP and ONMS permit could inform future efforts to manage lionfish harvest this PEA does not analyze the potential effects of managing lionfish or establishing a directed lionfish fishery in Federal waters. Instead, it is limited to evaluating the effects of issuing EFPs and ONMS permits to test traps to target lionfish.

The PEA analyzes a range of gear types, locations, and effort. As noted above, NMFS received two applications for EFPs that have since been withdrawn. Although withdrawn, these applications discussed a range of potential trap types and locations that could be used in future testing, and were used in establishing the scope of this PEA. One application for an EFP is currently pending before NMFS, and one permit application is pending before ONMS, and this PEA analyzes the effort and gear types under those applications, as well. It is possible that NMFS and ONMS may receive permit applications to test additional traps, different trap types (e.g. golden crab pots), and other design modifications (e.g., optical recognition technology). These changes to experimental design may be necessary to answer questions about the trap types, locations, and testing strategies that are best able to capture invasive lionfish, or to minimize effects to other species and habitats. As is noted above, NMFS has processed several requests for EFPs or LOAs concerning lionfish and, given statements made to NMFS staff and discussions at meetings of the Gulf and South Atlantic Councils, as well as applications submitted to NMFS and ONMS that have since been withdrawn, NMFS and ONMS expect to receive requests for EFPs and ONMS general permits to target lionfish. Researchers at NOVA Southeastern University and United States Geological Survey, for example, have contacted NMFS staff in regards to testing different technological modifications that would allow traps to capture only lionfish, while preventing other non-target species from entering into the trap. NMFS is also aware that at least one golden crab fisherman is interested in testing if gear used to harvest golden crab (golden crab pots) could effectively capture lionfish. In order to fully inform stakeholders and decision makers of the potential consequences of authorizing gear testing activities, this PEA fully analyzes the potential effects of a range of potential efforts requested by the original applicants and current applications, and takes a hard look at the cumulative of these activities in combination with past, present, and reasonably foreseeable future activities.

The PEA establishes procedures, based on NEPA Advanced Planning Procedures described in NMFS' revised and updated NEPA procedures for Magnuson-Stevens Act fishery management actions and the Council on Environmental Quality guidance at 40 CFR 1502.20, for how NMFS and ONMS will evaluate EFP and ONMS permit applications that can be supported by the analysis in this PEA (see Section 1.5).

Effectiveness

One purpose of experimenting with different lionfish targeting strategies is to determine the effectiveness of various trap types and design configurations (e.g., funnel size and shape) at capturing lionfish while also avoiding and/or minimizing impacts to non-target species, protected species, and habitats. As used in this PEA, effectiveness refers to the ability of a trap and various design modifications of a trap to capture lionfish while also avoiding or minimizing effects to non-target species, protected species, such as species protected under the Endangered Species Act and the Marine Mammal Protection Act, critical habitat, and essential fish habitat. Effectiveness also relates to the ability of a gear type to harvest enough of the target species to make it a viable option for a commercial fisherman, if traps are used at the appropriate scale. While the testing allowed under any EFPs or ONMS permit may be limited, the testing could provide insight into which strategies, if scaled up, could be commercially viable. A trap that can catch enough lionfish to be commercially viable with the least time and resources committed, and has no potential to impact protected resources and sensitive habitats and capture non-target species, would be considered the most effective.

Effort

As used in this PEA, effort is the amount of gear that would be potentially used in the experiments authorized in the current and anticipated future EFPs and ONMS permits, including the spatial and temporal component of where and when these gear types might be used. Essentially, effort is the amount of traps in the water being fished at any given time over some specific area (see Action 2 for description of the areas assessed, and Action 3 for a description of the number of traps considered in a particular area). To properly assess the potential environmental consequences of authorizing these current and expected future activities, several assumptions have to be made about the potential effects of various gear types, as well as the timing of when, and locations where, the gear might be deployed. These assumptions regarding potential gear types are explained in the opening discussion of Action 1. The assumptions regarding trap-testing locations are explained in the opening discussion of Action 2. The assumptions regarding the number of traps in a particular area are explained in the opening discussion for Action 3.

1.5 NEPA Advanced Planning Procedures

As discussed above, in addition to assessing the impacts of the pending EFP application, and one ONMS permit application, this PEA evaluates the potential effects of a range of effort to account for future applications for EFPs and/or ONMS permits. This section establishes procedures for how future applications for EFPs and/or ONMS permits concerning trap and design modification testing to harvest lionfish that fit within the scope of this PEA will be handled.

In particular, any future applications will be evaluated to determine if they fit within the scope of analysis in this PEA, thus making it appropriate to rely on this PEA to support any decision regarding those applications. Scope in this context includes the type of gear, habitat, geographic location, seasons, methodology, and any other information necessary for an impacts analysis. This determination would be documented in a memo[3], which would evaluate the potential effects of any future application and determine whether they are within the scope of the effects analysis in this PEA. If it is determined that the future application does not fall within the scope of analysis, then the PEA cannot be relied upon to support the decision on that application and further NEPA analysis would be conducted. When evaluating future applications, NMFS and/or ONMS will also determine and document if the assumptions made in this PEA are still valid such that it is still reasonable to continue to rely on this analysis. If no new or significant circumstances had arisen that could invalidate the conclusions in the PEA, then it is appropriate to continue to rely on the PEA. If the future action does not fall within the scope, then additional NEPA analyses would be needed for any site specific or project specific information. For more information on factors NOAA considers when using existing environmental analyses, including "tiering" off programmatic documents, see NOAA NAO 216-6A's companion manual, Section 5.[4]

[3] NMFS will prepare a NEPA Compliance Memo, and ONMS will prepare an inclusion memo.
[4] http://www.nepa.noaa.gov/docs/NOAA-NAO-216-6A-Companion-Manual-01132017.pdf

Chapter 2. Actions and Alternatives

As noted in Chapter 1, the purpose of this programmatic environmental assessment (PEA) is to examine various traps and targeting strategies to determine which are most effective at capturing invasive lionfish in the Gulf of Mexico (Gulf), South Atlantic, and within the Florida Keys National Marine Sanctuary (FKNMS) while avoiding and/or minimizing impacts to non-target species, protected species, and habitats. The exempted fishing permit (EFP) and Office of National Marine Sanctuaries (ONMS) permit applications received to date suggest a variety of gear types for testing, in different locations and at different times of year, with varying numbers of traps and types of bait. As is noted above, although two of the EFP applications have been withdrawn, NMFS expects to receive additional applications; the withdrawn applications discussed a range of potential trap types and locations that could be used in future testing, and were used in establishing the scope of this PEA. This PEA presents four discrete actions: allowable trap types, allowable testing locations/times of year, number of traps, and bait. A range of alternatives under each of the four actions is provided to capture the activities and level of effort expected.

The four actions and their alternatives include trap-testing activities that may occur in the Gulf, South Atlantic, and Florida Keys regions, including waters of FKNMS. Because FKNMS represents a small subset of the overall action area, ONMS only considers in this PEA those alternatives within Actions 1, 2, 3 and 4 that are specific to FKNMS or would apply in FKNMS. In addition, National Marine Fisheries Service (NMFS) and ONMS each identify their preferred alternatives throughout this PEA. While the preferred alternatives for Actions 1 and 2 are different for NMFS and ONMS, the two alternatives are consistent with one another; the ONMS preferred alternative in Action 1 and 2 simply represents the action at a scale specific to FKNMS.

2.1 Action 1. Allowable trap types

2.1.1 Alternatives

Alternative 1 (No Action). No permits issued for experimental testing of traps to target lionfish. Therefore, no traps or trap modifications will be tested.

NMFS Preferred Alternative 2. Allow testing with the following traps or trap modifications.

- Spiny lobster trap with or without modified funnels (as described below)
- American lobster pot
- Pinfish trap
- Black sea bass pot
- Any other trap type constructed of similar material, with similar dimensions, fished in a similar manner as the traps listed above.
- Non-containment trap (e.g., purse trap)

Alternative 3. Allow testing with the following types of traps.

- Spiny lobster trap
- Black sea bass pot
- Stone crab trap
- Golden crab trap

Alternative 4. Allow testing with any non-containment trap(s) (e.g., purse trap).

ONMS Preferred Alternative 5. Within Florida Keys National Marine Sanctuary:

Option a. Allow testing of traps currently approved for use within the waters of the Florida Keys National Marine Sanctuary with or without modifications, as described below.

ONMS Preferred Option b. Allow testing of traps, whether or not currently approved for use within the waters of Florida Keys National Marine Sanctuary, with or without modifications, as described below.

2.1.2 Discussion

Alternative 1 (No Action) would result in no EFPs or ONMS permits being issued, therefore, no traps or trap modifications would be tested. Applicants would still be subject to the fish trap prohibition (50 CFR 622.2 and 622.9(c)) and (15 CFR § 922.163(a)(3)) and would not be able to test the effectiveness of the various trap designs at capturing lionfish. Applicants would not gain any additional knowledge about which traps are more effective at capturing lionfish nor would applicants obtain any information about how certain design modifications could reduce potential effects to non-target species, protected species, and/or habitats.

NMFS Preferred Alternative 2 would allow testing of trap types and modifications similar to those that have been proposed for testing (including in the withdrawn applications) or that have been previously tested under the EFPs and letters of acknowledgement (LOAs) discussed in

Chapter 1 (Figure 2.1.1). These include spiny lobster traps with or without modified funnels, American lobster pots, pinfish traps, black sea bass pots, and non-containment traps (e.g., purse trap). The funnel modifications are limited to those described later in this paragraph and those that do not increase the potential for bycatch (e.g., limited to smaller funnels than currently allowed and/or more or larger escape gaps). It also includes other trap types similar to the specific ones listed above, but that might be called by a different name. These other trap types must be constructed of a similar material as the listed trap types, meaning that the traps must be made of wire mesh, wood panels, or rigid plastic. These other trap types need to be of similar dimensions of the listed trap types, meaning that they will be no larger than 5 foot height, or 5 foot wide, or 5 foot tall, and would not have mesh or slats with openings smaller than 1 inch or larger than 3 inches. These other traps must also be fished in a similar manner as the other listed trap types, meaning they will be either fished individually with no more than a single vertical line, or fished in a trawl with no more than two interconnecting ground lines.

Under applicable law, standard wood (allowed in state or federal waters), plastic (allowed in state or federal waters), and wire basket (allowed in federal waters only) spiny lobster traps must have a volume not greater than 12 cubic feet and a minimum throat size of 6 inches x 3.5 inches (most throats are 6 in x 5 in) or 5.5 inches x 5.5 inches (square) or round with a 5.5 inch diameter (50 CFR 622.405; FAC 68B-24.006). The withdrawn applications proposed testing of standard spiny lobster traps (meaning traps that would meet NMFS and the Florida Fish and Wildlife Conservation Commission (FWC) requirements), with modified plastic funnels (6 in x 3 in and 7 in x 5 in) with degradable panels. The applicants proposed to deploy the spiny lobster traps in a trawl (multiple traps connected by sinking lines and one vertical line/buoy to the surface). This alternative would cover those modifications and methods. NMFS has authorized testing of American lobster pots in the South Atlantic through previous EFPs (Fleming et al. 2016). One withdrawn application proposed testing the effectiveness of legal, commercial black sea bass pots and pinfish traps at capturing lionfish. Black sea bass pots used to fish for black sea bass are authorized gear in the South Atlantic (50 CFR 622.189). Pinfish traps are allowable gear in Florida state waters and are rectangular wire traps with throats not exceeding 3 inches by ¾ in, with a maximum volume of eight cubic feet (FAC 68B-4.020). All containment traps would be deployed in a trawl. One project proposes testing exclusively non-containment purse traps designed by Dr. Stephen Gittings of the ONMS (Figure 2.1.2). The Gittings purse trap has a 6-foot diameter “hinged jaw” frame and includes an embedded collapsible fish aggregation device (FAD). The trap is designed to fold up when retrieved, potentially capturing lionfish attracted to the FAD structure. The traps would be deployed singularly, with one vertical line to the surface. The purse trap has undergone small scale testing and is currently being modified. One goal of a proposed EFP is to determine if the purse trap can be successfully deployed in a trawl, similar to the other trap types.

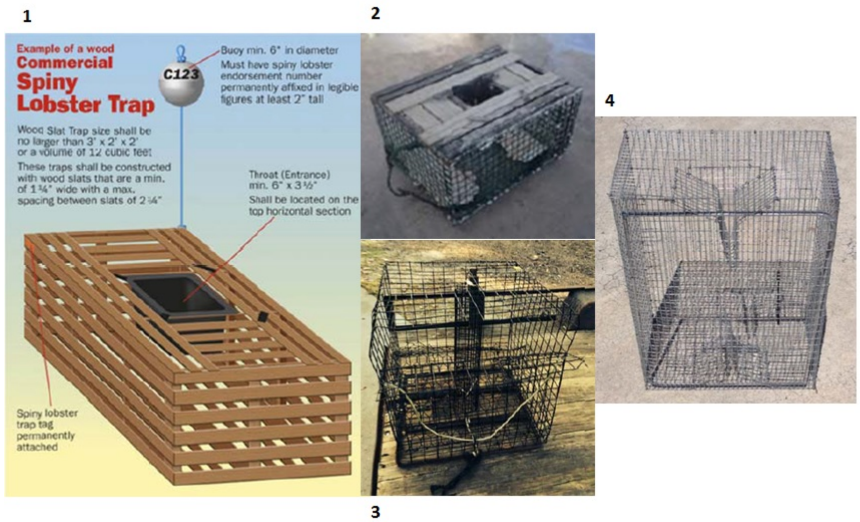

Figure 2.1.1. Proposed lionfish traps: 1) standard wooden spiny lobster trap (shown without proposed modifications), 2) standard wire spiny lobster trap (without modifications), 3) black sea bass pot, and 4) pinfish trap.

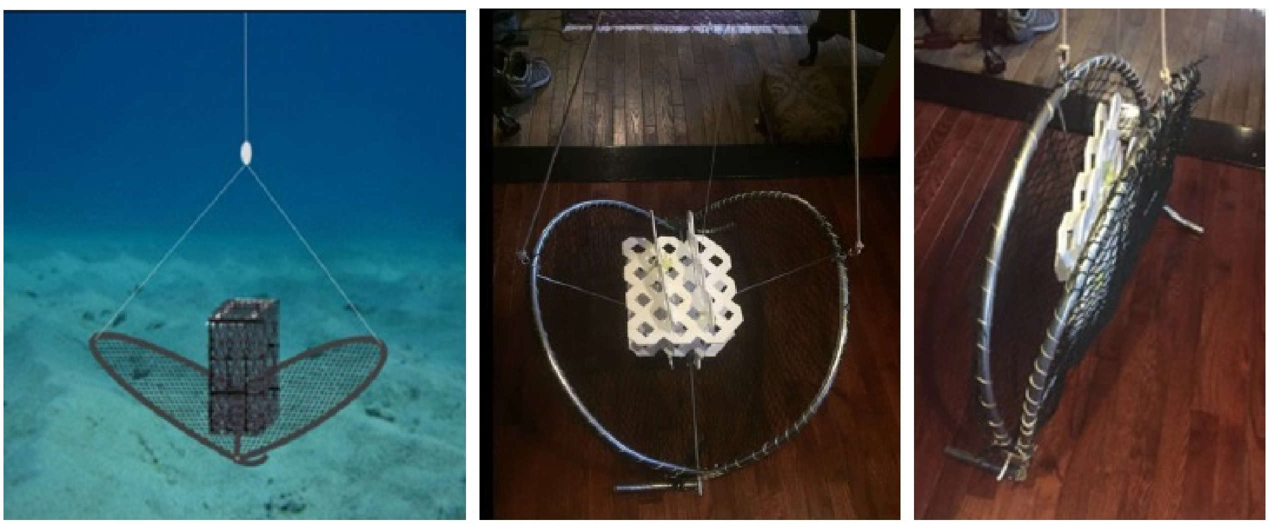

Figure 2.1.2. Experimental non-containment purse trap designed by Dr. Gittings. Source: ONMS.

Alternative 3 would only allow testing of certain trap types currently approved by NMFS or FWC for use in the Gulf of Mexico (Gulf) or South Atlantic, including spiny lobster traps, black sea bass pots, stone crab traps, and golden crab traps. Spiny lobster traps and black sea bass pots are described above. Stone crab traps can be constructed of wood, plastic, or wire and can be no larger than eight cubic feet (FAC 68B-13.008) (Figure 2.1.3). Throat size is variable based on area fished and plastic and wire traps must contain a degradable panel (FAC 68B-13.008). Wire traps must also contain at least three unobstructed escape rings (FAC 68B-13.008). The golden crab fishery is prosecuted in federal waters deeper than 700 feet in the South Atlantic (SAFMC 1995). Golden crab traps may not exceed 64 cubic feet in the northern zone or 48 cubic feet in the middle and southern zones (50 CFR 622.249). Fishing zones were established in the Fishery Management Plan for the Golden Crab Fishery of the South Atlantic Region as conditions of the golden crab limited entry program (SAFMC 1995), and are described in 50 CFR 622.241(b)(1). Traps must have escape gaps, rings, or panels (50 CFR 622.249).

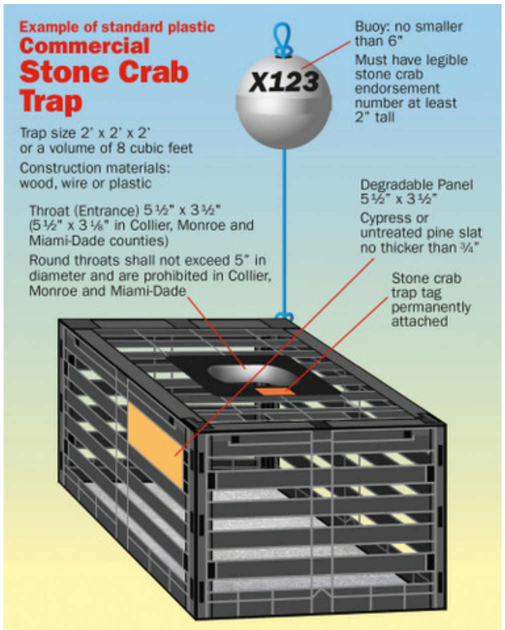

Figure 2.1.3. Standard stone crab trap (FWC).

Alternative 4 would allow testing of non-containment traps, such as the purse traps designed by Dr. Stephen Gittings of ONMS (Figure 2.1.2; Gittings et al. 2017). The trap is designed to fold up when retrieved, potentially capturing lionfish that were attracted to the FAD structure. The purse trap has undergone small scale testing in the Gulf and Caribbean, but more testing is necessary across different conditions. This alternative includes other non-containment trap designs, whether or not they rely on a FAD, which have a similar footprint and are otherwise built to have a similar potential for movement.

ONMS Preferred Alternative 5 addresses testing of specific traps within the waters of the FKNMS, since ONMS has its own authorities and regulations in addition to those of NMFS and FWC. **Option a** would allow traps already approved for use in the waters of the FKNMS by federal (NMFS) and state (FWC) fishery managers. These include state- and federally-approved spiny lobster traps, state-approved stone crab traps, state-approved blue crab traps, state-approved pinfish traps, and state-approved shrimp traps. A description of the construction and dimensions of spiny lobster traps, stone crab traps, and pinfish traps is provided in **Alternatives 2** and **3** above. Blue crab traps are 8 cubic feet maximum size and are typically constructed of wire mesh 1.5 inch or larger (FAC 68B-45.004). State-approved shrimp traps cannot exceed 3 feet long by 2 feet wide by 1 foot high (FAC 68B-31.007). While golden crab traps may be used in the Florida Keys, federal requirements restrict this fishery to depths of 700 feet or greater (50 CFR 622.246(a), specifying the depth restrictions for golden crab traps in the southern golden crab zone; see 622.241(b)(1) for specification of the golden crab zones). The only area of FKNMS that contains waters deeper than 700 feet is the Tortugas South Ecological Reserve, a deep-water protected zone in the western part of the sanctuary where fishing is not allowed (15 CFR 922.164(d)). Spiny lobster traps would adhere to state or federal design requirements (described in **Alternative 2**), as would stone crab (described in **Alterative 3**) and pinfish traps (described in **Alternative 2**), but applicants may propose to modify trap size; trap materials; funnel size; number, size and placement of escape gaps; and/or add optical recognition devices. Modifications would be limited to those that do not increase the overall footprint of the trap, do not increase potential for movement, and do not increase the potential for bycatch (e.g., limited to smaller funnels than currently allowed and/or more or larger escape gaps). **ONMS Preferred Option b** would allow traps already approved for use in the waters of the FKNMS, such as spiny lobster traps and others as described above, and/or other traps not currently approved for use in the waters of FKNMS, as follows. Applicants could use traps approved for use elsewhere in the southeast region under state or federal regulations (e.g., black sea bass pots, which are allowed in South Atlantic waters north of the Florida Keys), and traps that are approved for use in other managed fisheries (e.g., American lobster pot). Applicants may propose to modify trap size, trap materials, funnel size, number, size and placement of escape gaps, and/or add optical recognition devices. Modifications would be limited to those that do not increase the overall footprint of the trap, do not increase potential for movement, and do not increase the potential for bycatch (e.g., limited to smaller funnels than currently allowed and/or more or larger escape gaps). Under **ONMS Preferred Option b**, certain experimental trap designs (e.g., non-containment trap) could also be tested. **ONMS Preferred Alternative 5**, **Option b** would encompass the trap types listed in **NMFS Preferred Alternative 2**, therefore, both alternatives are consistent with each other and could both be picked at the same time.

2.2 Action 2. Allowable testing locations / times of year

2.2.1 Alternatives

Alternative 1 (No Action). No permits issued for experimental testing of traps to target lionfish. Therefore, no locations or times of year will be established for trap testing.

Alternative 2. Allow testing of traps anywhere in federal waters of the Gulf of Mexico and South Atlantic, at any time.

NMFS Preferred Alternative 3. Allow testing of traps anywhere in the Gulf of Mexico and South Atlantic at any time, excluding the following areas and times:

- Off North Carolina (Table 2.2.2.1, Figure 2.2.2.1), year round.
- From November 1 through April 30, in the area that is closed to black sea bass pot fishing south of North Carolina border from December 1 to March 31[5] (coordinates in Table 2.2.2.1).
- Bryde's whale Habitat Area (Table 2.2.2.2, Figure 2.2.2.2), year round.
- Waters shallower than 30 meters within the Florida Keys including Florida Keys National Marine Sanctuary (Figure 2.2.2.3), year round.
- Additional areas and times where fishing is restricted (Appendix D).
- Areas and times where there is potential for significant conflicts with shrimp and stone crab fisheries.

ONMS Preferred Alternative 4. Allow testing in waters deeper than 30 meters in the Florida Keys National Marine Sanctuary.

Option a. From August 6 to May 15 only, which encompasses the open seasons for both the spiny lobster and stone crab fisheries off Florida.
ONMS Preferred Option b. Year round.

2.2.2 Discussion

Alternative 1 (No Action) would result in no EFPs or ONMS permits being issued for trap testing to target lionfish. Applicants would still be subject to the trap prohibition (50 CFR 622.9(c)) and FKNMS regulations (15 CFR § 922.163(a)(3)) and would not be able to test the effectiveness of the various trap designs at capturing lionfish. Applicants would not gain additional knowledge about which traps and locations where trap testing is most effective at capturing lionfish or avoiding and minimizing potential effects to non-target species, protected species, and/or habitats.

Alternative 2 would allow trap testing anywhere within federal waters of the Gulf of Mexico (Gulf) and South Atlantic, at any time. Potential testing locations, based on previous applications as well as the pending and withdrawn applications, include federal waters in the

[5] Federal regulations prohibit black sea bass pot fishing in a given area from December 1 through March 31. 50 CFR 622.183(b)(6)(ii). The EFPs would not allow testing of traps to target lionfish in this area for two additional months, from November 1 through April 30.

Gulf off Louisiana, Alabama, Pensacola, Florida and Tampa, Florida; federal waters off the Florida Keys in both the Gulf and South Atlantic; and, federal waters in the South Atlantic off Ponce Inlet, Florida and Murrell's Inlet, South Carolina. One of the reasons for testing traps is because traps can be deployed and harvested in depths inaccessible to recreational and commercial divers. Thus, using traps to capture lionfish opens up additional waters currently inaccessible, given the prohibition on using fish traps in federal waters.

NMFS Preferred Alternative 3 would allow trap testing anywhere within federal waters in the Gulf and South Atlantic with certain area exclusions that address conservation needs. **NMFS Preferred Alternative 3** would exclude trap testing in federal waters off North Carolina, year round. New data from passive acoustic monitoring suggest that North Atlantic right whales (NARWs) may be present in North Carolina waters year round (Davis et al. 2017). NARW are susceptible to entanglement, so limiting the EFPs in this way would provide year round protection for NARWs. The South Atlantic Fishery Management Council (South Atlantic Council) and NMFS implemented restrictions from November 1 to April 30 on the use of black sea bass pots (SAFMC 2013) (78 FR 58249, September 23, 2013). Those areas were later adjusted to cover where NARWs are typically present (Farmer et al. 2016) (SAFMC 2016a; 82 FR 11156, February 21, 2017). The western NARW ranges primarily from calving grounds in coastal waters of the southeastern U.S. The coastal waters of the southeastern U.S. are a wintering and sole known calving area for NARWs. NARW concentrations are highest in the core calving area (Georgia and Florida) from November through April (71 FR 36299, June 26, 2006); on rare occasions, NARWs have been spotted as early as September and as late as July (Taylor et al. 2010). **NMFS Preferred Alternative 3** would exclude testing of traps to target lionfish in the NARW habitat encompassing waters inshore of points 1-17 listed in Table 2.2.2.1; approximately Cape Canaveral, Florida, to the South Carolina/North Carolina border (Figure 2.2.2.1) from November 1 to April 30.

Table 2.2.2.1. Eastern boundary coordinates for the black sea bass pot closure for December 1 through March 31 under federal regulations at 50 CFR 622.183(b)(6)(ii). Under NMFS Preferred Alternative 3, NMFS would not allow testing of traps to target lionfish in this area from November 1 to April 30.

Point	N. Latitude	W. Longitude	Point	N. Latitude	W. Longitude
1	33° 21'	State/EEZ boundary	10	31° 39'	80° 27'
2	33° 12'	78° 20'	11	30° 58'	80° 47'
3	33° 05'	78° 22'	12	30° 13'	81° 01'
4	33° 01'	78° 38'	13	29° 32'	80° 39'
5	32° 40'	79° 01'	14	29° 22'	80° 44'
6	32° 36'	79° 18'	15	28° 50'	80° 22'
7	32° 19'	79° 22'	16	28° 21'	80° 18'
8	32° 16'	79° 37'	17	28° 21'	State/EEZ boundary
9	32° 03'	79° 48'			

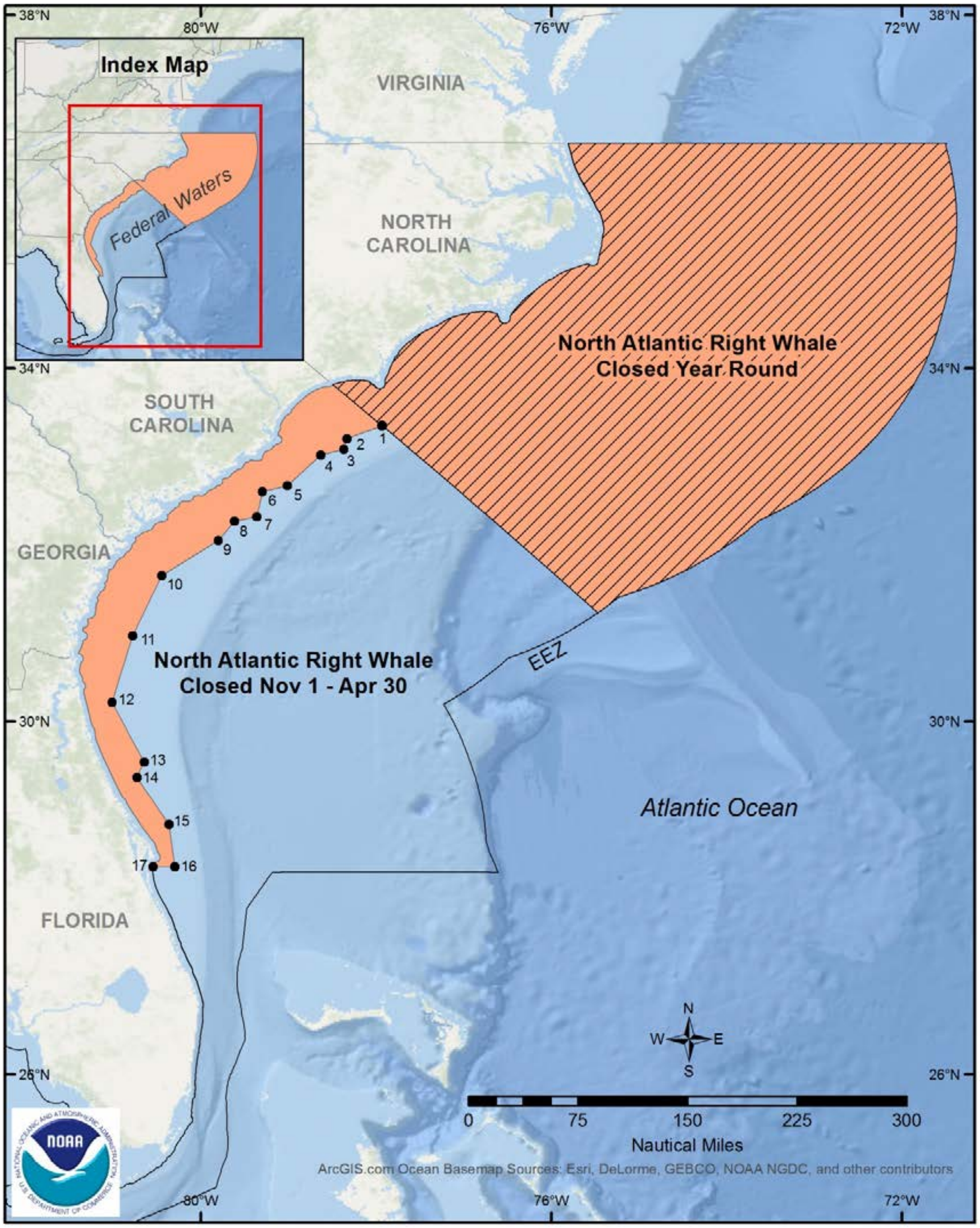

Figure 2.2.2.1. Area excluded from testing of traps to target lionfish year round (crosshatched orange shaded) and from November 1 through April 30 (solid orange shaded) under **NMFS Preferred Alternative 3**.
Source: Amanda Frick, NMFS SERO

NMFS Preferred Alternative 3 would also exclude trap testing in the Gulf Bryde's whale habitat area, year round (Figure 2.2.2). The abundance of these whales in the Gulf is very low, estimated to be fewer than 100 individuals, with 50 or fewer being mature (Rosel et al. 2016). The Bryde's whale's range is a small area in the northeastern Gulf near the De Soto Canyon (Rosel et al. 2016). The Bryde's whale Habitat Area was identified in published literature as waters between 100 and 300 m depth along the continental shelf break (LaBrecque et al. 2015). However, there have been sightings at 302 and 309 m depth in this region and west of Pensacola, Florida, and thus we believe the habitat area is better defined out to the 400 m depth contour and to Mobile Bay, Alabama, to provide some buffer around the deeper water sightings and to include all sighting locations in the northeastern Gulf, respectively (Rosel et al. 2016). This larger area is what we mean when we refer to the Bryde's whale habitat area. The proposed action would exclude trap testing in the Bryde's whale habitat area, which approximates the 150 m isobaths on the eastern edge and the surrounding buffer area to 410 m on the western edge (Patty Rosel, NMFS SEFSC, pers. comm. 2018). The small population size and restricted distribution alone place Gulf Bryde's whales at high risk of extinction. NMFS has proposed to list the Bryde's whale as endangered under the Endangered Species Act (ESA); NMFS solicited public comments on the proposed rule and is developing a final rule (81 FR 88639, December 8, 2016). The coordinates of this area are listed in Table 2.2.2.2.

Table 2.2.2.2. Coordinates of Bryde's whale habitat area in the Gulf. Under **NMFS Preferred Alternative 3**, testing traps to target lionfish would be excluded from this area.

Point	N. Latitude	W. Longitude	Point	N. Latitude	W. Longitude
1	29° 58'	87° 09'	9	28° 34'	86° 20'
2	29° 58'	87° 00'	10	28° 56'	86° 34'
3	29° 15'	85° 54'	11	29° 11'	86° 38'
4	28° 04'	84° 45'	12	29° 28'	86° 49'
5	27° 50'	84° 47'	13	29° 29'	87° 08'
6	27° 36'	84° 55'	14	29° 22'	87° 27'
7	27° 41'	85° 04'	15	29° 29'	87° 34'
8	28° 00'	85° 18'			

Source: Amanda Frick, NMFS SERO

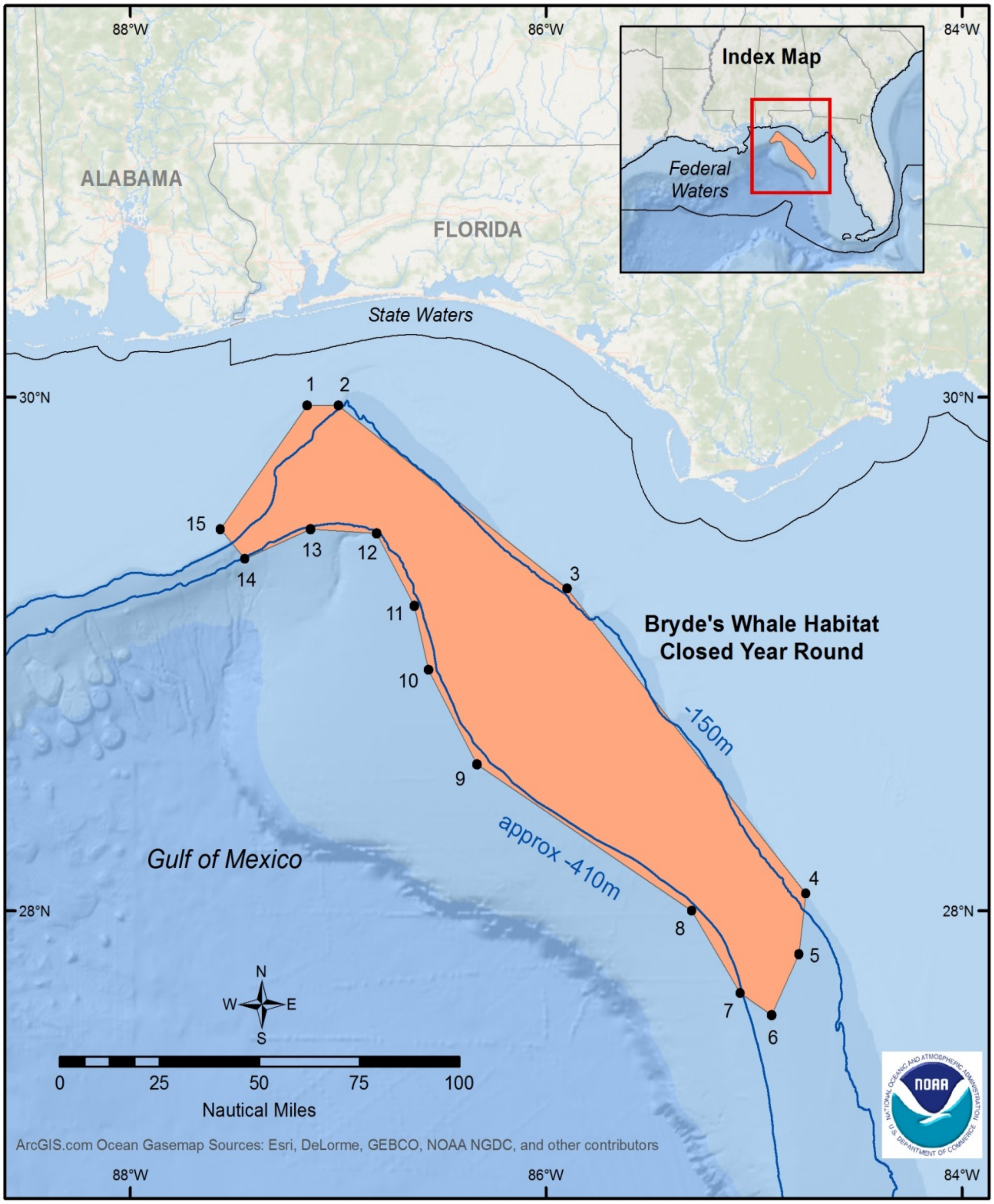

Figure 2.2.2.2. The map shows an important habitat area for the small, resident Bryde's whale (*Balaenoptera edeni*) population in the Gulf; first identified by LaBrecque et al. (2015) and revised based on additional sightings. Under **NMFS Preferred Alternative 3**, testing traps to target lionfish would be excluded from this area.
Source: Amanda Frick, NMFS SERO

NMFS Preferred Alternative 3 would additionally exclude trap testing in federal waters shallower than 30 m in the Florida Keys, including waters of FKNMS (Figure 2.2.2.3). Seven coral species listed as threatened under the ESA occur in the Florida Keys to a maximum depth of 30 m, although some of these species may be present in depths as great as 90 m in other locations throughout their range. These species are considered absent in depths greater than 30 m in the Florida Reef Tract based on literature searches and communication with other researchers, which together revealed a lack of documented occurrence at these depths (Jennifer Moore, NMFS, pers. comm. 2017). There are other non-listed coral species and invertebrates that inhabit waters deeper than 30 meters in the area. There is only one protected zone in the Florida Keys in water deeper than 30 meters, the Tortugas South section of the Tortugas Ecological Reserve. No trap testing would be allowed in this protected zone.

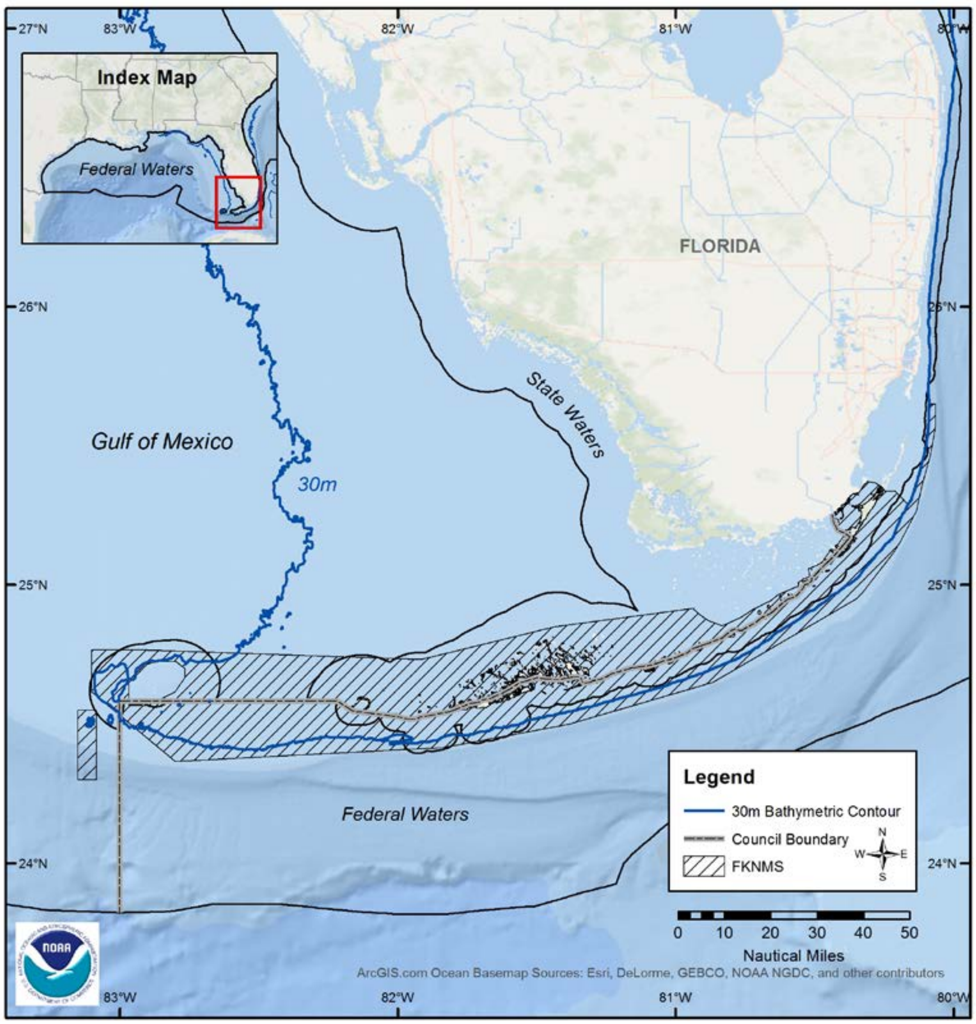

Figure 2.2.2.3. Jurisdictional boundaries in the Florida Keys and the 30 m contour. Under **NMFS Preferred Alternative 3**, testing traps to target lionfish would be excluded from this area.
Source: Amanda Frick, NMFS SERO

NMFS Preferred Alternative 3 would also exclude trap testing in federal waters closed to bottom tending fishing gear such as marine protected areas, special management zones (SMZ), and any other areas where fishing is not allowed. These areas were created by the Gulf of Mexico and South Atlantic Fishery Management Councils (Gulf and South Atlantic Councils) to protect ecologically important areas in the Gulf and South Atlantic (Appendix D).

NMFS Preferred Alternative 3 would further exclude trap testing in federal waters where potential significant conflicts with the shrimp and stone crab fisheries could occur. The Gulf Council determined that the use of traps in some proposed areas could interfere with shrimp trawling activities (Figure 2.2.2.4). Additional conflicts with the stone crab fishery could also occur.

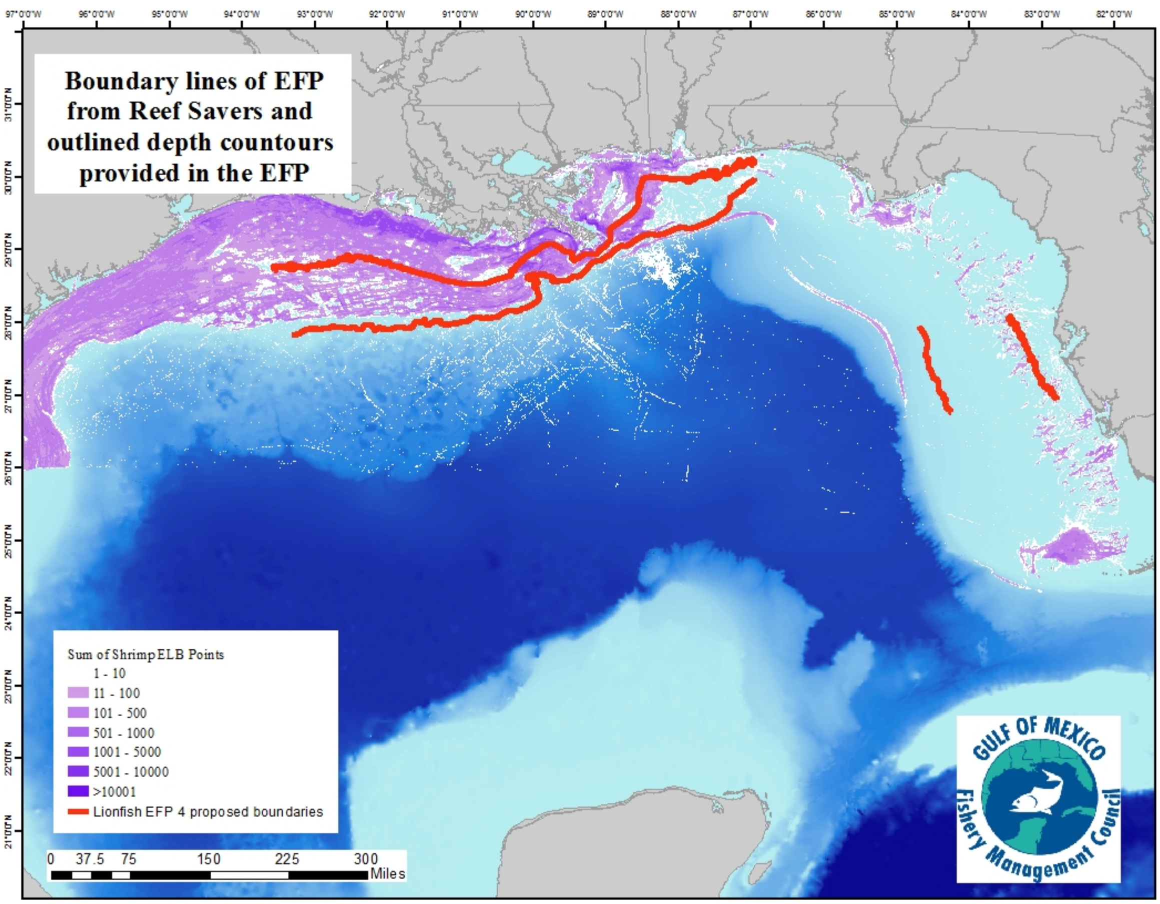

Figure 2.2.2.4. Areas of potential conflicts with other fisheries. Areas in purple represent historic shrimp trawling grounds (data taken from electronic logbooks). Under **NMFS Preferred Alternative 3**, testing traps to target lionfish would be excluded from these areas.
Source: Gulf Council

ONMS Preferred Alternative 4 would address areas in FKNMS where testing traps to target lionfish would be allowed. Trap testing in FKNMS would only be allowed at depths greater than 30 m (Figure 2.2.2.3). The purpose of the depth restriction is to avoid potential impacts to ESA-listed coral species. The Tortugas South section of the Tortugas Ecological Reserve occurs in the Florida Keys in water deeper than 30 meters. This zone prohibits fishing (15 CFR 922.164(d)), as such no trap testing would be allowed in this zone. Under **Option a**, trap testing would only occur during the open trap fishing seasons for spiny lobster and stone crab, combined, which are the two most prevalent trap types used in waters of FKNMS. The commercial spiny lobster trap fishery is open from August 6 to March 31. The commercial and recreational stone crab trap fishery is open from October 15 to May 15. **Option a** would therefore allow testing of traps to target lionfish from August 6 to May 15, when traps are already being used in the FKNMS. Testing would not be allowed between May 16 and August 5. Under **ONMS Preferred Option b**, traps could be tested year round, including when traps currently are not fished in the FKNMS.

2.3 Action 3. Number of traps

2.3.1 Alternatives

Sub-Action 3.1: South Atlantic Region*

Alternative 1 (No Action). No permits issued for experimental testing of traps to target lionfish. Therefore, zero traps are allowed to be tested in the South Atlantic Region.

Alternative 2. Allow up to 2,200 total traps per year

NMFS Preferred Alternative 3. Allow up to 5,000 total traps per year

Sub-Action 3.2: Florida Keys Region; including all of the Florida Keys National Marine Sanctuary*

Alternative 1 (No Action). No permits issued for experimental testing of traps to target lionfish. Therefore, zero traps are allowed to be tested in the Florida Keys Region.

Alternative 2. Allow up to 1,600 total traps per year

NMFS and **ONMS Preferred Alternative 3.** Allow up to 3,000 total traps per year

Sub-Action 3.3: Gulf of Mexico Region*

Alternative 1 (No Action). No permits issued for experimental testing of traps to target lionfish. Therefore, zero traps are allowed to be tested in the Gulf of Mexico Region.

Alternative 2. Allow up to 5,600 total traps per year

NMFS Preferred Alternative 3. Allow up to 10,000 total traps per year

*For the purpose of this document, regions in the various alternatives are defined as:

- **South Atlantic Region** - U.S. exclusive economic zone (EEZ) waters from the Virginia/North Carolina border to the Broward/Miami-Dade county line in Florida, FWC Marine Fisheries trip ticket area codes 631-741 (Figure 2.3.1.1 and 2.3.1.2).
- **Florida Keys Region –** Includes within all of the boundaries of FKNMS and U.S. EEZ waters from the Broward/Miami-Dade county line to a line extending west from the top of Florida Bay, approximately 25.1º N. latitude, FWC Marine Fisheries trip ticket area codes 744-2 (Figure 2.3.1.2).
- **Gulf of Mexico Region** - U.S. EEZ waters from a line extending west from the top of Florida Bay, approximately 25.1º N. latitude, to the Texas/Mexico border, FWC Marine Fisheries trip ticket area codes 3-21 (Figure 2.3.1.2 and 2.3.1.3).

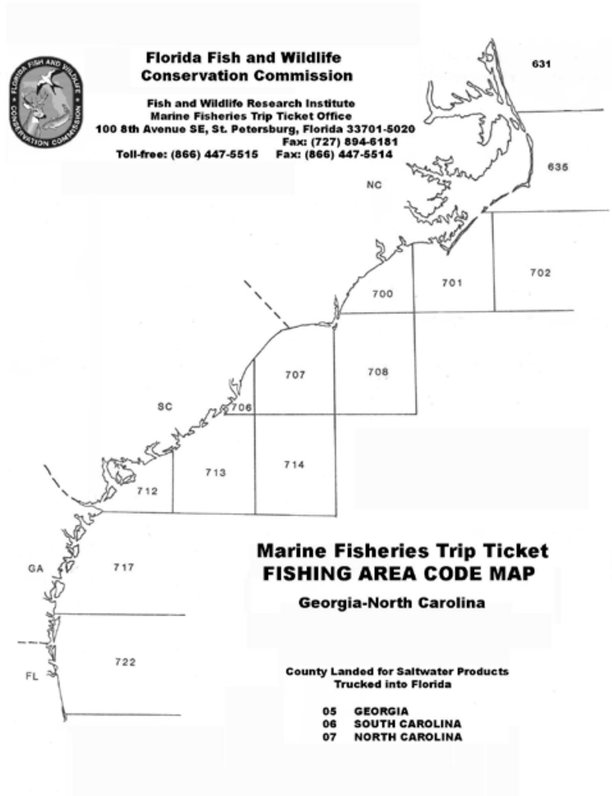

Figure 2.3.1.1. Northern portion of the South Atlantic Region (FWC Marine Fisheries trip ticket area codes 631-722).

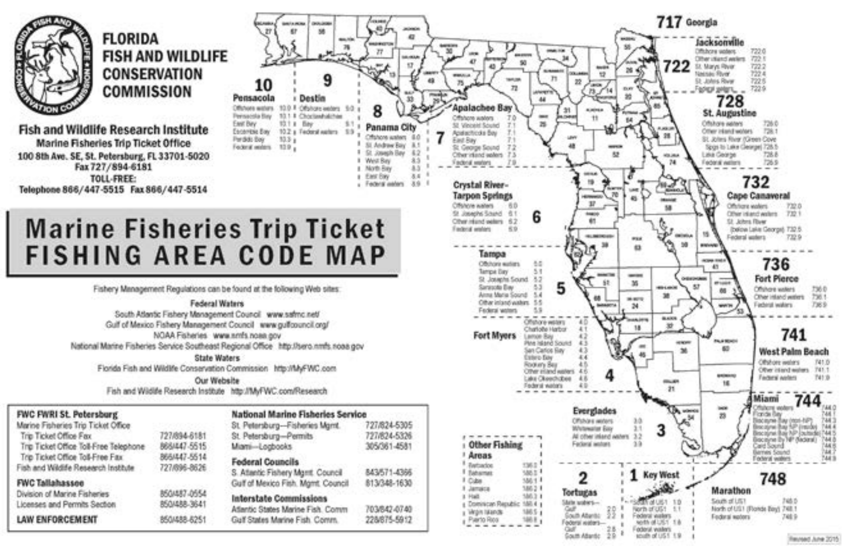

Figure 2.3.1.2. Southern portion of the South Atlantic Region (FWC Marine Fisheries trip ticket area codes 717-741), Florida Keys Region (FWC Marine Fisheries trip ticket area codes 744-2), and eastern portion of area the Gulf of Mexico Region (FWC Marine Fisheries trip ticket area codes 3-10).

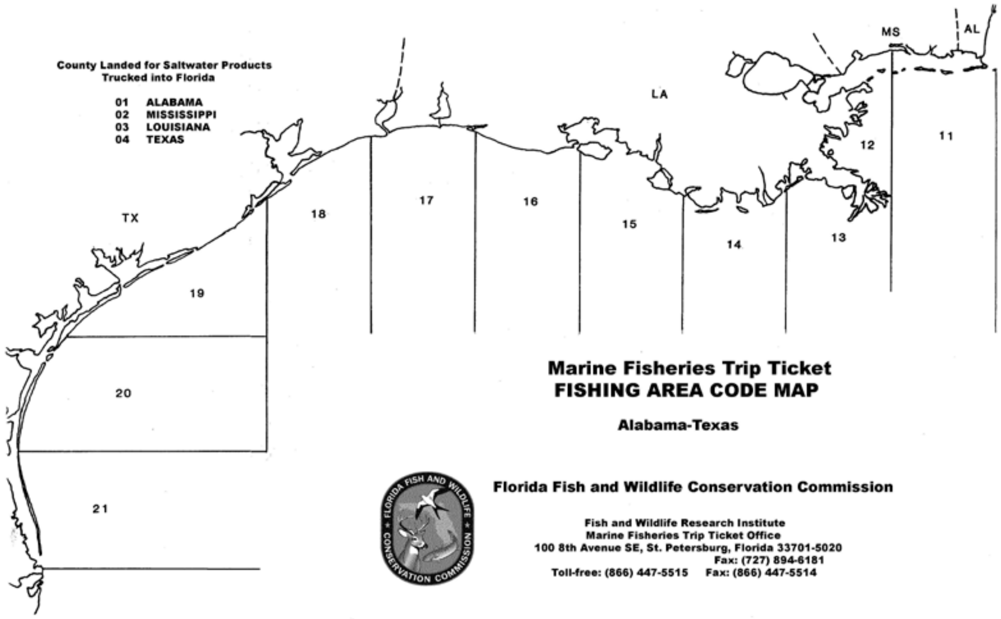

Figure 2.3.1.3. Western portion of the Gulf of Mexico Region (FWC Marine Fisheries trip ticket area codes 11-21).

2.3.2 Discussion

Action 3 concerns the effort in terms of total numbers of traps that would be allowed in certain regions, during any given year, for trap testing to harvest lionfish.

Commercial spiny lobster traps, stone crab traps, and American lobster pots are currently under non-federal, trap reduction programs. Recreational American lobster pot use is also limited and monitored. Recreational stone crab trap use is limited to five per person, however, number in use is not monitored. Commercial golden crab traps and black sea bass pots are not under a trap reduction program, however, federal permits are under limited access programs with only 11 valid golden crab permit holders and 32 valid black sea bass pot endorsement holders as of December 1, 2017. Golden crab permit holders are not restricted to how many traps they can use, although, black sea bass pot users are limited to 35 pots per endorsement. Non-containment finfish traps are currently prohibited in all Gulf and South Atlantic waters. Pinfish traps are only allowed in state waters and there is no regulation limiting the number a person can have.

Currently, spiny lobster and stone crab traps are deployed off southeast and southwest Florida including within all of the FKNMS (exclusive of the spiny lobster trap exclusion zones established by Spiny Lobster Amendment 11[6] and the FKNMS protected zones; see Appendix D). Golden crab traps are restricted to deployment in South Atlantic waters only from North Carolina to the Florida Keys, although must be fished in waters deeper than 700 ft or 900 ft, depending on area. Black sea bass pots are also restricted to deployment in the South Atlantic only, but are further restricted to waters from North Carolina to east central Florida. American

[6] http://sero.nmfs.noaa.gov/sustainable_fisheries/policy_branch/rules/gulf_sa/lobster/2012/am11_fr_072712.pdf

lobster pots are deployed off all states from Maine to North Carolina. The majority of these fisheries have area closures, with some having seasonal closures.

For the 2016 or 2016/2017 fishing year (depending on fishery), there were 466,168 spiny lobster tags issued; 1,025,921 stone crab tags issued (recreational not included); 3,400 golden crab tags issued; 1,233 black sea bass tags issued; and 267,607 American lobster total tags available (recreational not included) for the entire region each fishery is conducted.

The traps mentioned in Action 3 may be in addition to those already in the Action 3 Regions.

Sub-Action 3.1: South Atlantic Region

Alternative 1 (No Action) would not issue permits for experimental testing of traps to target lionfish. Therefore, zero traps are allowed to be tested in the South Atlantic Region. This would prevent applicants from testing which gear types are most effective at harvesting lionfish in this Region. It would also prevent applicants from gathering information regarding the effectiveness of design modifications at avoiding and minimizing impacts to non-target species, protected species and habitats. **Alternative 2** would allow for the testing of up to 2,200 total traps per year in the South Atlantic Region. Up to 2,200 traps per year in this Region is the approximate level of effort requested by the original EFP applications. Although applications involving some of this effort have been withdrawn, NMFS expects to receive additional applications and is using this amount of effort as a starting place for comparison. **NMFS Preferred Alternative 3**, allowing up to 5,000 total traps per year in the South Atlantic Region, is approximately double the effort requested by the original EFP applications. **NMFS Preferred Alternative 3** accounts for reasonably expected future EFP applications seeking to test the effectiveness of harvesting lionfish by trap while avoiding and minimizing impacts to natural resources within the South Atlantic Region. Given the interest in addressing the lionfish invasion, we expect to receive additional applications for EFPs to test additional traps throughout the South Atlantic Region. Future EFPs may seek to test different design modifications (alternative funnel size, for example) or different locations within the region, not only to determine which traps capture lionfish, but which strategies have the least impacts to other resources. Therefore, **NMFS Preferred Alternative 3** would allow additional effort for future EFPs to help fill any information gaps or additional questions that might arise from the results of the various experiments. **Alternative 2** and **NMFS Preferred Alternative 3** would allow fishers to test various trap types and design modifications (as discussed in Action 1) at catching lionfish within the South Atlantic Region. Based on NMFS's preferred alternatives under Actions 1 (trap type) and 2 (allowable locations), **Alternative 2** and **NMFS Preferred Alternative 3** would allow trap designs not currently fished to be tested, and that testing would also occur during periods when traps would normally be prohibited. These tests could inform future efforts by the South Atlantic Council to manage lionfish by wanting to allow traps for their harvest.

Sub-Action 3.2: Florida Keys Region, including waters within FKNMS

Alternative 1 (No Action) would not issue permits for experimental testing of traps to target lionfish. Therefore, zero traps are allowed to be tested in the Florida Keys Region. This would prevent applicants from testing which gear types are most effective at harvesting lionfish in this Region. It would also prevent applicants from gathering information regarding the effectiveness of design modifications at avoiding and minimizing impacts to non-target species, protected species and habitats. **Alternative 2** would allow for the testing of up to 1,600 total traps per year in the Florida Keys Region. Up to 1,600 traps per year in this Region is the approximate level of effort requested by the original EFP applications. Although applications involving some of this effort have been withdrawn, NMFS expects to receive additional applications and is using this amount of effort as a starting place for comparison. **NMFS** and **ONMS Preferred Alternative 3**, up to 3,000 total traps per year in the Florida Keys Region, is approximately double the effort requested by the original EFP applications. **NMFS** and **ONMS Preferred Alternative 3** accounts for reasonably expected future EFP and ONMS applicants seeking to test the effectiveness of harvesting lionfish by trap while avoiding and minimizing impacts to natural resources within the Florida Keys Region. Given the interest in addressing the lionfish invasion, we expect to receive additional applications for EFPs to test additional traps throughout the Florida Keys Region. Future applicants may seek to test different design modifications (alternative funnel size, for example) or different locations within the region, not only to determine which traps capture lionfish, but which strategies have the least impacts to other resources. Therefore, **NMFS** and **ONMS Preferred Alternative 3** would allow additional effort for future experiments to help fill any information gaps or additional questions that might arise. **Alternative 2** and **NMFS** and **ONMS Preferred Alternative 3** would allow fishers to test the effectiveness of various trap types, and design modifications (as discussed in Action 1) at catching lionfish in the Florida Keys Region. Based on NMFS's and ONMS's preferred alternatives under Actions 1 (trap type) and 2 (allowable locations and times of year), **Alternative 2** and **NMFS** and **ONMS Preferred Alternative 3** would allow trap designs not currently fished to be tested, and that testing would also occur during periods when traps would normally be prohibited. These tests could inform future efforts by the Gulf and South Atlantic Councils, and FKNMS to manage lionfish by wanting to allow traps for their harvest.

Sub-Action 3.3: Gulf of Mexico Region

Alternative 1 (No Action) would not issue permits for experimental testing of traps to target lionfish. Therefore, zero traps are allowed to be tested in the Gulf of Mexico Region. This would prevent applicants from testing which gear types are most effective at harvesting lionfish in this Region. It would also prevent applicants from gathering information regarding the effectiveness of design modifications at avoiding and minimizing impacts to non-target species, protected species and habitats. **Alternative 2** would allow for the testing of up to 5,600 total traps per year in the Gulf of Mexico Region. Up to 5,600 traps per year in this Region is the approximate level of effort requested by the original EFP applications. Although applications involving some of this effort have been withdrawn, NMFS expects to receive additional applications and is using this amount of effort as a starting place for comparison. **NMFS Preferred Alternative 3**, up to 10,000 total traps per year in the Gulf of Mexico Region, is approximately double the effort requested by the original EFP applications. **NMFS Preferred**

Alternative 3 accounts for reasonably expected future EFP applications seeking to test the effectiveness of harvesting lionfish by trap while avoiding and minimizing impacts to natural resources within the Gulf of Mexico Region. Given the interest in addressing the lionfish invasion, we expect to receive additional applications for EFPs to test additional traps throughout the Gulf of Mexico Region. Future EFPs may seek to test different design modifications (alternative funnel size, for example) or different locations within the region, not only to determine which traps capture lionfish, but which strategies have the least impacts to other resources. Therefore, **NMFS Preferred Alternative 3** would allow additional effort for future EFPs to help fill any information gaps or additional questions that might arise. **Alternative 2** and **NMFS Preferred Alternative 3** would allow fishers to test the effectiveness of various trap types, and design modifications (as discussed in Action 1) at catching lionfish in the Gulf of Mexico Region. Based on NMFS' preferred alternatives under Actions 1 (trap type) and 2 (allowable locations), **Alternative 2** and **NMFS Preferred Alternative 3** would allow trap designs not currently fished to be tested, and that testing would also occur during periods when traps would normally be prohibited. These tests could inform future efforts by the Gulf Council to manage lionfish by wanting to allow traps for their harvest.

2.4 Action 4. Bait

2.4.1 Alternatives

Alternative 1 (No Action). No permits issued for experimental testing of traps to target lionfish. Therefore, no traps will be tested, whether baited or not.

Alternative 2. Allow testing of traps to target lionfish without bait.

NMFS and **ONMS Preferred Alternative 3.** Allow testing of traps to target lionfish with any type of bait.

2.4.2 Discussion

Alternative 1 (No Action) would not allow any testing of traps to target lionfish via any EFPs or ONMS permits. Applicants would not be able to test the effectiveness of the various trap designs at capturing lionfish and would not gain any additional knowledge about which traps or bait are more effective at capturing lionfish.

Alternative 2 would allow testing without the use of bait. Based on observed lionfish behavior and observations from fishermen, it is reasonable to conclude that lionfish are attracted to structure, potentially showing a preference for artificial structure.

Preferred Alternative 3 would allow any bait type to be tested or used in traps including, but not limited to, cowhide strips, live lionfish, female lionfish gonads, and fish heads. Fish heads/whole fish are commonly used in multiple trap fisheries. Cowhide strips are sometimes utilized in the spiny lobster fishery. Live lionfish and lionfish gonads are thought to attract lionfish. The effects of bait on lionfish attraction/capture would be tested through this alternative. This information is relevant to determining if and which types of bait are more effective at attracting lionfish, as well as which types of bait reduce or exacerbate capture of non-target species.

2.5 Summary of proposed actions and preferred alternatives

The actions and alternatives presented in Chapter 2 include trap-testing activities that will not occur in isolation but in combination with one another to determine the most effective methods for capturing lionfish. For example, while a certain trap type might be tested (Action 1), that testing will occur using various numbers of traps (Action 3), in different locations (Action 2), and with or without bait (Action 4). Table 2.5.1 provides a summary of NMFS and ONMS preferred alternatives within the Actions in this PEA.

Table 2.5.1. Summary of actions and alternatives analyzed in this PEA. NMFS preferred alternatives are shown in *italics*. ONMS preferred alternatives are shown in **bold**. Preferred alternatives shared by NMFS and ONMS are shown in ***bold italics***.

Alternatives	Action 1: Allowable trap types	Action 2: Allowable testing locations / times	Action 3.1: Number of traps - South Atlantic Region	Action 3.2: Number of traps - Florida Keys	Action 3.3: Number of traps - Gulf of Mexico	Action 4: Bait
1	No action	No action	No action	No action	No action	No action
2	*Specified traps or trap modifications*	Anywhere in Gulf and South Atlantic at any time	≤ 2,200 traps	≤ 1,600 traps	≤ 5,600 traps	No bait
3	Certain traps approved for use in the Gulf of Mexico and South Atlantic	*Gulf and South Atlantic with specified exclusions*	*≤ 5,000 traps*	***≤ 3,000 traps***	*≤ 10,000 traps*	***Any bait***
4	Any non-containment trap	A: in waters deeper than >30m in FKNMS from Aug. 6 to May 15				
		B: in waters deeper than>30m in FKNMS year round				
5	A: Traps approved for use in waters of the FKNMS					
	B: Approved and other described traps in waters of the FKNMS					

Chapter 3. Affected Environment

This section describes the affected environment in the proposed project area. The affected environment is divided into five major components, including a detailed description of affected trap fisheries, physical environment, biological and ecological environment, economic and social environment impacted by lionfish and the proposed testing of traps to target lionfish. The affected environment of the proposed actions in this programmatic environmental assessment (PEA) is described further in Florida Keys National Marine Sanctuary (FKNMS) site characterization documents, and the Gulf of Mexico Fishery Management Council (Gulf Council) and South Atlantic Fishery Management Council (South Atlantic Council) fishery management plans (FMP) and associated amendments. These documents and amendments include:

- Florida Keys National Marine Sanctuary Condition Report 2011 (ONMS 2011)
- Florida Keys National Marine Sanctuary revised management plan (NOAA 2007)
- Florida Keys National Marine Sanctuary Final Management Plan/Environmental Impact Statement (NOAA 1996)
- Amendment 49 to the FMP for the Reef Fish Fishery of the Gulf of Mexico (GMFMC 2018)
- Amendment 17B to the FMP for the Shrimp Fishery of the Gulf of Mexico, U.S. Waters (GMFMC 2017)
- Generic Annual Catch Limits/Accountability Measures Amendment (GMFMC 2011)
- Generic Essential Fish Habitat (EFH) Amendment (GMFMC 2004)
- Regulatory Amendment 4 to the FMP for Spiny Lobster in the Gulf of Mexico and South Atlantic (GMFMC and SAFMC 2017)
- Amendment 11 to the FMP for Spiny Lobster in the Gulf of Mexico and South Atlantic (GMFMC and SAFMC 2012)
- Comprehensive Ecosystem-Based Management Amendment 2 (SAFMC 2011b)
- Amendment 37 to the FMP for the Snapper-Grouper Fishery of the South Atlantic Region (SAFMC 2016b)
- Amendment 9 to the FMP for the Shrimp Fishery of the South Atlantic Region (SAFMC 2012b)

The information in the above-referenced documents incorporated here by reference, summarized and updated below.

3.1 Trap Fishery Descriptions

Spiny Lobster

The Gulf of Mexico (Gulf) and South Atlantic spiny lobster fishery is co-managed by the Gulf Council, South Atlantic Council, and Florida. The commercial use of spiny lobster traps is allowed off all Gulf and South Atlantic states although most fishing occurs around Florida, including within the waters of FKNMS. The spiny lobster fishery is currently under a trap reduction program by Florida that has been ongoing since 1992. At that time, 727,313 trap certificates were available. For the 2016/2017 fishing year, there were 470,244 trap certificates available of which 466,168 were issued. Spiny lobster traps may be fished anywhere in these regions if they hold a valid certificate, but all traps with certificates may not be fished. Fishermen may retain back-up traps on shore, which must also have valid certificates.

Trap certificates can be sold or transferred by each owner, but each trap being fished must have an accompanying certificate. For the 2016-2017 fishing year, there were 429 accounts holding spiny lobster certificates. If traps are sold or transferred outside of the immediate family, the number of trap certificates is reduced by 10% and those certificates are retired from the fishery. Failure to pay certificate fees and other charges will also result in a 10% reduction of an individual's trap certificate numbers. This trap reduction program is expected to continue until only 400,000 trap certificates remain, at which time there would be no further reduction in the number of lobster trap certificates issued each year, except those forfeited.

The commercial and recreational fishing season for spiny lobster in the exclusive economic zone (EEZ) off Florida and the Gulf states other than Florida begins on August 6 and ends March 31. South Atlantic states, other than Florida, have year-round spiny lobster fishing for both commercial and recreational fishermen with a two-lobster per person trip limit. Recreational trap use is not allowed in South Atlantic waters. Lobster traps may be worked during daylight hours only and no spiny lobster can be harvested in excess of the bag limit by diving at night. Traps are typically set in waters up to 300 feet (100 m; B. Kelly, Florida Keys Commercial Fisherman's Association, pers. comm. 2017). Specifications for commercial requirements, traps and buoys, identification requirements, and prohibitions are detailed in sections within the Code of Federal Regulations (CFR), which incorporates by reference the Florida Administrative Code (FAC). No person can harvest by trap, 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 in the Gulf and off Florida. Lionfish landings have been recorded as "harvested as incidental take" by spiny lobster traps since 2011.

Stone Crab

Florida took over federal waters management of stone crab in 2011 due to 99% of harvest coming from its respective state waters, including within the waters of FKNMS. The use of stone crab traps is allowed off all Gulf and South Atlantic states although as with the spiny lobster fishery, most fishing occurs around Florida. The commercial stone crab fishery is currently under a trap reduction program that has been ongoing since 2002. At that time, 1,308,695 trap certificates were available. Trap certificates can be sold or transferred by each owner but each trap being fished must have an accompanying certificate. For the 2016/2017 fishing year, 1,025,921 trap certificates were issued. Similar to spiny lobster, stone crab traps may be fished anywhere in these regions if they hold a valid certificate, but all traps with certificates may not be fished.

Trap certificates are being reduced on the following schedule. If more than 1 million, but fewer than 1.25 million certificates are available, there shall be an 18.5% reduction in the number of certificates received by the purchaser. If more than 0.75 million, but fewer than 1 million certificates are available, there shall be a 15% reduction in the number of certificates received by the purchaser. If more than 600,000, but fewer than 0.75 million certificates are available, there shall be a 10% reduction in the number of certificates received by the purchaser. This reduction is currently at the 18.5% status where 18.5% of total sold or transferred certificates are retired from the fishery if sold or transferred outside of the immediate family. Failure to pay certificate fees and other charges will also result in a reduction of an individual's trap certificates. This trap reduction program will continue until only 600,000 trap certificates remain at which time, there shall be no further reduction in the number of stone crab trap certificates issued each year except those forfeited. Unlike the spiny lobster fishery, recreational stone crab trap use is allowed. The recreational stone crab fishery is not under a trap reduction program, nor are they required to have a trap tag, although each recreational angler is limited to five traps. However, records are not kept by Florida as to how many recreational fishermen use stone crab traps (T. Matthews, Florida Fish and Wildlife Conservation Commission [FWC], pers. comm. 2017).

The commercial and recreational fishing season for stone crab off Florida begins on October 15 and ends May 15. Seasonal closures to stone crab trap use occur throughout its fishing year (Figure 3.1.1). Stone crab traps may be worked during daylight hours only. Traps are typically set only in state waters although federal water sets are allowed. Specifications for commercial and recreational requirements, traps and buoys, identification requirements, and prohibitions are detailed in sections within the FAC. No person can harvest by trap, attempt to harvest, or have in his possession, regardless of where taken, any stone crab during the closed season of May 16 through October 14 of each year. Lionfish landings have been recorded as "harvested as incidental take" by stone crab traps since 2011.

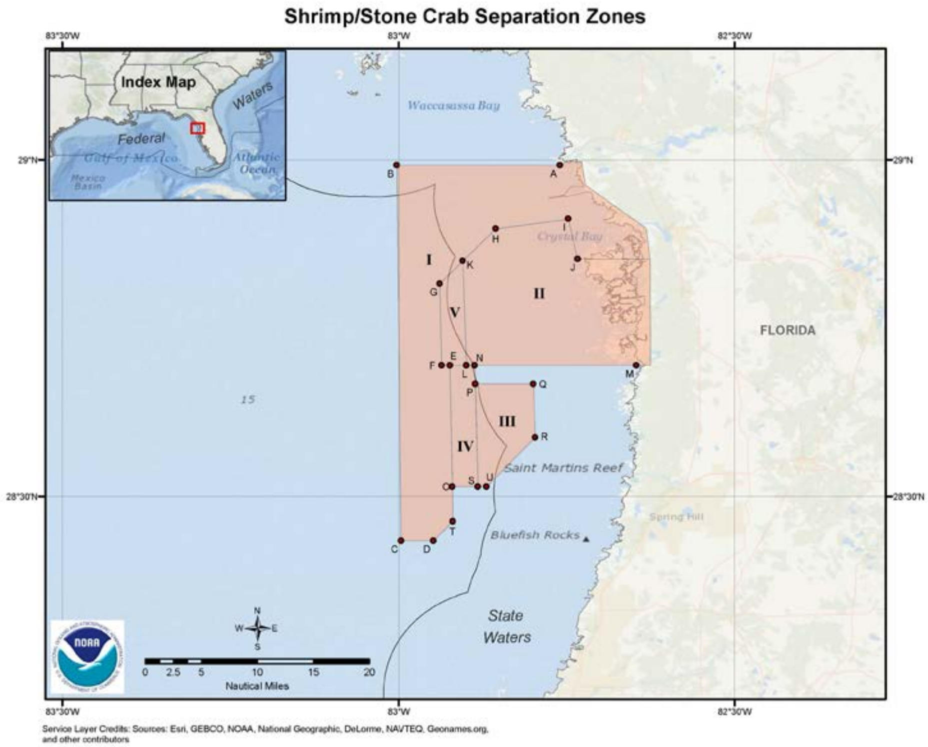

Figure 3.1.1. Seasonal stone crab trap prohibitions.
Note: It is unlawful to place a stone crab trap in that part of Zone IV that is in the EEZ from October 5 through December 1 and from April 2 through May 20, each year or in EEZ waters of Zone V from October 5 through November 30 and from March 16 through May 20, each year.

American Lobster

American lobster pot design is limited in size and scope by regulation. The American lobster fishery is co-managed with the Atlantic States Marine Fisheries Commission, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Florida although American lobster is not harvested off of South Carolina, Georgia, or Florida. The American lobster commercial fishery is currently under a trap reduction program and a permit moratorium. All traps are reduced annually by 5% in certain areas and trap transfers are subject to a 10% conservation tax where 10% of total transferred traps are retired from the fishery. For the 2017 fishing year, 267,607 commercial trap tags were available for all areas. Regulations under the Atlantic Coastal Fisheries Cooperative Management Program limit how many total traps can be within each designated area off each cooperative state. This ranges from 800 to 1,945 traps per permit. Trap tags can be transferred and each trap being fished must have an accompanying tag.

The commercial and recreational fishing season for American lobster varies between each state and within each state's respective areas. As with stone crab, non-commercial American lobster trap use is allowed. It is unknown if lionfish landings have been recorded as harvested by American lobster pot.

Black Sea Bass

The black sea bass fishery is managed by South Atlantic Council and is only allowed in South Atlantic federal waters from a line due east of Cape Hatteras Light, North Carolina to a line due east of the National Aeronautics and Space Administration (NASA) vehicle assembly building, Cape Canaveral, Florida. Black sea bass pot use is allowed in Florida state waters from the 27 degrees North latitude. Black sea bass pot use is prohibited in all other federal South Atlantic waters and in all federal and state Gulf waters. Black sea bass pots are not under a pot reduction program; however, Amendment 18A to the Snapper-Grouper FMP (Amendment 18A; SAFMC 2012a) implemented restrictions on the number of allowable pots (35) per deployment and a prohibition on overnight soaking of pots (leaving them in the water). Amendment 18A also added an endorsement to limit participation in the pot sector, reducing the number of active fishermen from approximately 55-60 to 32 valid or renewable endorsements.

The use of black sea bass pots in the South Atlantic is prohibited between November 1 and April 30, except for certain areas shown in Figure 3.1.2. Recreational trap use is not allowed. Black sea bass pots may be worked during daylight or nighttime hours, however overnight soaking is not allowed. Specifications for commercial trap requirements, identification requirements, and prohibitions are detailed in sections within the CFR. Currently, no lionfish landings have been recorded as harvested by black sea bass pot. This could be due to the limited area where black sea bass pots are allowed, or the short soak time required of this gear.

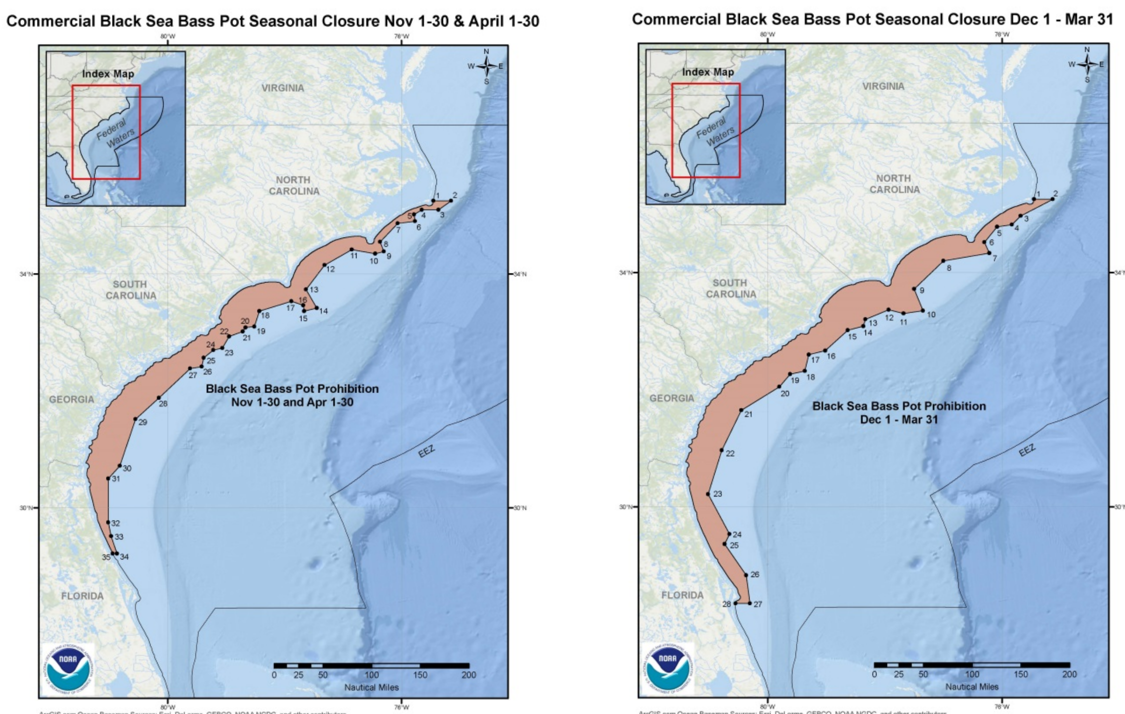

Figure 3.1.2. Seasonal black sea bass pot prohibitions. Note the Dec. 1 – Mar. 31 seasonal closure has an extended geographical area.

Golden Crab

The golden crab fishery is managed by South Atlantic Council and only occurs in South Atlantic waters from the North Carolina/South Carolina border to the South Atlantic Council/Gulf Council jurisdictional boundary by the Dry Tortugas, Florida (Figure 3.1.3), in federal waters deeper than 700 feet (50 CFR 622.246(a)). Golden crab trap use is prohibited in all other South Atlantic waters and all Gulf waters. Within FKNMS, golden crab trapping does not occur because the only area that contains waters deeper than 700 feet is the Tortugas South Ecological Reserve, a deep-water protected zone in the western part of the sanctuary where no fishing is allowed (15 CFR 922.164(d)). Harvest of golden crab is separated into three fishing zones. The Northern Zone is defined as the U.S. EEZ north of 28 degrees North latitude. The Middle Zone is contained within the EEZ between 25 degrees North and 28 degrees North latitude. The Southern Zone extends south from 25 degrees North latitude. Federal permits are issued for a specific zone and fishing is allowed only in that zone for which the permit is issued. Golden crab traps are not under a trap reduction program, however they are under a limited access program with only 11 active golden crab permit holders in 2016. For the 2016 fishing year, there were 3,400 trap tags issued. Trap tags can only be sold or transferred to an immediate family member and each trap being fished must have an accompanying tag.

The commercial fishing season for golden crab in the South Atlantic is year round. Recreational trap use is not allowed. Golden crab traps may be worked during daylight or nighttime hours. Traps are typically set in waters deeper than 700 feet (213 m) due to area restrictions and the habitat use of golden crab (Figure 3.1.3). Traps must be identified with a permit number and are set in trawls. Trawls are set south to north with the current in areas of soft mud and the location of deployment noted using global positioning system as traps are lineless and retrieved via a grapple due to depths set. Due to the strong currents the string of traps may settle on the seabed a considerable distance from where they hit the water surface upon deployment. Although buoys are allowed by the regulations, no buoy system is practical in the Gulf Stream, where virtually 100% of golden crab fishing takes place. Currently, no lionfish landings have been recorded as harvested by golden crab trap. This could be due to the limited area where golden crab traps are allowed.

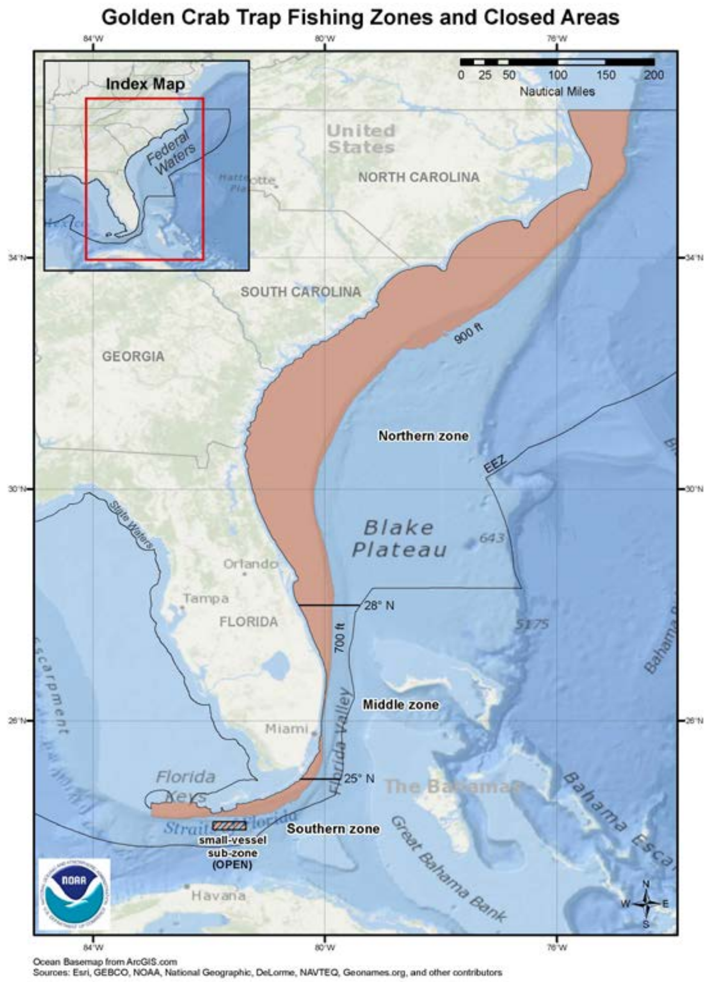

Figure 3.1.3. Golden crab trap closed areas.

Pinfish

Pinfish trap use in all South Atlantic and Gulf federal waters is prohibited. Florida manages pinfish harvest by trap in state waters, where these traps are allowed, including within FKNMS. Pinfish trap design is limited in size and scope by regulation. No trap tags are required and there is no limit on the amount of traps individuals can possess. Records are not kept as to how many recreational and commercial fishermen use pinfish traps although Florida is currently working on regulatory changes for pinfish trap use making them more consistent with the blue crab fishery (D. Ellinor, FWC, pers. comm. 2017). Currently, no lionfish landings have been recorded as harvested by pinfish trap. This could be due to the fact that fish trap use for harvest of unmanaged fish species is prohibited in Gulf and South Atlantic waters and if lionfish have entered a pinfish trap, they would most likely not be reported as doing so.

Historical fish trap use (except for pinfish traps and black sea bass pots)

Fish trap use, except for pinfish traps and black sea bass pots, has been prohibited in Florida state waters since 1980, from South Atlantic federal waters, except for black sea bass pots, since 1992 with the implementation of Snapper-Grouper Amendment 4 (SAFMC 1991), and from Gulf federal waters since 2007 with the end of the ten year phase out program implemented in 1997 with Reef Fish Amendment 14 (GMFMC 1996).

3.2 Biological and Ecological Environment

The biological and ecological environments of the Gulf, South Atlantic, and Florida Keys are diverse and complex, providing some of the richest and most productive marine habitat in the United States. These areas support 59 federally managed snapper-grouper species in the South Atlantic, 31 reef fish species in the Gulf, and one lobster species and five shrimp species in the Gulf and South Atlantic. The documents referenced at the beginning of Chapter 3 describe the ecological and fishery characteristics of these areas in detail; that information is not repeated here. A detailed discussion of essential fish habitat features, marine protected areas with special significance, protected species and climate change within the proposed action areas is provided below. Because existing trap fisheries may affect the biological and ecological environment through bycatch, a description of known bycatch data associated with those fisheries is also provided. Bycatch associated with limited trap testing, as analyzed in this PEA, is expected to be less than that associated with the fisheries described in section 3.2.2. NMFS and ONMS expects to learn more about bycatch from reports on the actions taken under EFPs and ONMS permits, as discussed in the effects analysis in Chapter 4.

3.2.1 Lionfish Biology and Landings

Two species of lionfish, *Pterois miles* and *P. volitans*, were introduced into the western Atlantic Ocean with first reports being recorded in the mid-1980s (Carus et al. 2006; Courtenay 1995; Ruiz- Schoefield 2010; Semmens et al. 2004). The two species are indistinguishable by external examination (Hamner et al. 2007). Since the start of the invasion, lionfish have established populations in the southeastern United States, the Bahamas, and the Caribbean although sightings have been as far north as Massachusetts and as far south as Brazil (Ferreira et al. 2015; Jud and Layman 2012; Meisner et al. 2005; Ruiz-Carus et al. 2006; Schoefield 2010; USGS 2009) (Figure 1.1.1). Lionfish inhabit a range of water depths (from very shallow (2-3 feet) to depths over 1,000 feet) and have been observed in most, if not all marine habitat types including mangroves, seagrass beds, hardbottom, coral reefs, and artificial reefs (Morris and Green 2012). These fish are native to the Indian Ocean, Western and Central Pacific Ocean, and Western Australia (Schultz 1986). Lionfish are capable of becoming sexually mature within their first year of life and will spawn throughout the year every three to four days, producing upwards of two million eggs annually (Morris et al. 2009). Larval dispersal is facilitated through oceanic currents (Hare and Whitfield 2003). Adult lionfish are opportunistic carnivores and feed on nearly all small reef fish including those of commercial, recreational, and ecological importance (Albins and Hixon 2008; Cote et al. 2013; Green et al. 2012; Morris and Akins 2009).

Lionfish stock status is not currently defined as it is for managed species with an overfished or overfishing status because lionfish are not regulated under a fishery management plan. Population growth is estimated from study observations of lionfish per area and reports of lionfish. The ability of lionfish to reproduce every 3-4 days is also taken into consideration when making the determination that the population is still growing and is currently too high to be able to fully eradicate it out of the invasive territory.

Commercial lionfish landings began being reported in 2011. Landings have steadily increased with the most recent three-year overall landings averaging around 74,000 lbs whole weight (ww) (Table 3.3.1). Initially, incidental harvest in authorized crustacean trap fisheries was the dominant mode for lionfish landings, although in recent years, with the increase in lionfish derbies, most commercial harvest is now from diving.

Table 3.2.1. Total lionfish landings and trap specific landings in the Gulf, Florida Keys and South Atlantic from 2011-2016 (lbs ww).

Fishing Year	Total Landings by all Gear	Total Gulf Landings by all Gear	Total South Atlantic Landings by all Gear	Total Florida Keys Landings by all Gear	Total Gulf Trap Landings	Total South Atlantic Trap Landings	Total Florida Keys Trap Landings
2011	4,787.03	*	*	*	*	*	*
2012	14,087**	*	2,618	11,469	*	*	9,615
2013	18,701	335	4,302	14,064	*	*	10,617
2014	28,870	658	16,255	11,957	*	*	8,259
2015	77,204	5,794	56,980	14,430	*	*	4,838
2016	114,239	29,331	69,250	15,658	*	*	5,564

Note: Cells with a "*" contain confidential data and thus cannot be disclosed. **Gulf data not included due to confidentiality issues. Source: ACCSP data as of January 31, 2018. For the purposes of this PEA, and particularly the pots/traps component of the lionfish fishery, the fishery has been segmented into three "Regions": the South Atlantic, the Florida Keys, and the Gulf.[7] The Florida Keys Region is located in statistical areas 1, 2, 748, and 744. The South Atlantic Region includes all statistical areas north of statistical area 744 along the US eastern seaboard, while the Gulf Region includes all statistical areas in U.S. waters north and west of statistical area 2 in the Gulf.

[7] Data for the Gulf Region only covers landings on the Gulf coast of Florida as no landings were reported in states further west.

3.2.2 Bycatch

Bycatch[8] information gathered from known trap fisheries can be used to understand the potential bycatch from the trap testing analyzed in this PEA. These data are used in Chapter 4 to explore potential effects to co-occurring species from testing of traps to target lionfish.

Spiny Lobster Fishery

Studies have documented low bycatch and bycatch mortality of finfish by the commercial spiny lobster trap fishery for both wooden and plastic traps (Matthews et al. 1994; Matthews and Donahue 1997). Most of the finfish caught in commercial spiny lobster traps are juveniles and all escape within 48 hours (Matthews and Donahue 1997). Stone crabs were the most dominant bycatch species caught in two studies of lobster traps (Matthews et al. 1994; Matthews and Donahue 1997). The total discard rate of finfish and invertebrates for the spiny lobster fisheries is generally between 8-15% and it is unlikely any one species comprises more than 5% of the catch (Seafood Watch 2015). While finfish, including lionfish and invertebrates, including stone crab, are occasionally caught, these species will typically be landed and sold as incidental take[9] if the season is open, the correct permits/licenses are in hand, and the individuals are legal-sized (not applicable for lionfish). Due to this fact, mortality of commercially and recreationally important finfish that are not harvested, is negligible (Matthews and Donahue 1997). Little is known about the status of many finfish (e.g., grunts, cowfish, porgies) and invertebrate (e.g., spider crabs, urchins) species that are bycatch in lobster traps in the greatest numbers. None of these species have undergone (or are likely to undergo) formal stock assessments, because most are not targeted in commercial or recreational fisheries.

Stone Crab Fishery

The stone crab fishery is not considered to have any bycatch other than undersized targeted stone crabs. Any bycatch such as small fish and invertebrates are expected to be returned alive to the ocean and survive. While blue crabs, spiny lobsters, and lionfish are occasionally caught, these species will typically be landed as incidental take as is done for the spiny lobster fishery. Landings of these species in the stone crab fishery are negligible (Seafood Watch 2013a).

American Lobster Fishery

Bycatch within the American lobster fishery is not considered a large problem so there is little research available about the species and quantity caught. The most common types of bycatch found in American lobster traps are juvenile lobsters, crabs and finfish (e.g., flounder, scup, tautog), although discard rates appear to be low. (Seafood Watch 2012). Results from the American lobster pot testing for harvest of lionfish showed bycatch to include small quantities of slipper lobsters, spiny lobsters, small groupers, and snails (Fleming et al. 2016).

[8] Bycatch is the catch of a non-targeted, co-occurring species that is not harvested. The bycatch is either thrown back or discarded dead.

[9] Incidental take is the catch of a non-targeted, co-occurring species that is harvested. The catch is sold once landed.

Black Sea Bass Fishery

Black sea bass pots are used exclusively to target black sea bass, though incidental take of other snapper-grouper species is allowed. The black sea bass pot fishery is considered selective for the target species. Black sea bass accounts for over 90% of the total landings by weight from pot harvest (Seafood Watch 2013b). The pots have mesh size, material, and construction restrictions to facilitate bycatch reduction (SAFMC 2011a).

Golden Crab Fishery

The total bycatch of finfish is considered low due to depth and size of trap openings. Bycatch of invertebrates consists mostly of isopods with a few other crab species. While other crab species are occasionally caught, these species will typically be landed as incidental take if the season is open and the individuals are legal-sized (SAFMC 2009).

Historical Fish Trap Fishery (other than black sea bass pot)

Not much data currently exists for bycatch studies in pinfish traps even though they are similar in design to historic fish traps. Furthermore, the National Marine Fisheries Service (NMFS) thought it important to provide bycatch data for the historical fish trap fishery as lionfish, a type of finfish, will be targeted.

Mortality of undersized target and bycatch species taken in Gulf fish traps was considered minimal in comparison to mortality associated with otter trawls and likely in comparison to other gear used in the reef fish fishery (both in terms of lower gear mortality rates and less gear deployed at the start time of the fish trap moratorium). A NMFS observer study conducted in 1995 (NMFS 1995) for the Gulf reef fish trap fishery indicated the release mortality for all finfish was 2.8% and for red grouper (the primary target species) was 2.6%. The release mortality for red grouper was lowest in this fishery as compared to the bandit rig fishery (10.6%) and the longline fishery (12.2%). Similarly, the release mortality for all finfish (2.8%) in the trap fishery was lower than in the longline fishery (13.7%). Therefore, it could be concluded that the trap fishery had less of an ecological impact on the fishery stocks in terms of bycatch as compared to other gear used in the reef fish fishery. A smaller number of species (63 taxa) were caught in traps as compared to on longlines (85 taxa), but a greater percentage of fish caught were kept (55.9%) in the longline fishery than in the trap fishery (35.2%). In both fisheries most of the fish caught and most of the fish kept were target species of grouper and snapper, 81.9% caught and 87.7% kept in the longline fishery versus 59.7% caught and 69.5% kept for the trap fishery. This indicated in both fisheries, fishermen could successfully target the higher valued species without major bycatch of non-targeted species as many of the non-targeted species were retained for sale as incidental take and some utilized for bait. In 1991, red grouper made up 92% of grouper landings and dominant snapper landings included lane, mutton, vermilion, yellowtail and gray. Red snapper accounted for about 1% of 1991 snapper landings. Non-targeted species generally made up 37% of catch by 1991 with the dominant species being grunts, porgies, sea bass, and triggerfish (GMFMC 1993). The NMFS observer study concluded that lawfully fished traps compared favorably to other fishing methods although traps could have an adverse impacts if traps were fished along with other gear deployed in deeper waters or if fished near coral reefs where incidental catch of non-target species is typically higher. Data from Gulf Reef Fish logbooks for 1993-1994 showed red grouper accounted for 42.9% of trap harvest, black sea bass accounted for 13.5%, unclassified grunts (*Haemulon* spp.) accounted for 10.1%, white grunt (*Haemulon plumieri*) accounted for 8.6%, and mutton snapper accounted for 3.05%.

During the development of the Gulf and South Atlantic fish trap prohibition documents, representatives of the ornamental fish industry argued that bycatch of spawning size ornamental fish in fish traps had a deleterious impact on those stocks. However, scientific evidence did not exist in the late 1980s or early 1990s to conclusively either support or refute that claim. Furthermore, since wire sided traps can be used in the blue crab, spiny lobster, and stone crab trap fisheries, any impacts on ornamental species from reductions in the fish trap fishery may be at least partially offset by increases in other wire sided trap fisheries.

A NMFS study was conducted in May and June 1990 on commercial vessels off south Florida to document finfish trap catch and bycatch in water depths of 100 to 270 feet (30 – 82 m). A total of 1,772 fish representing 78 species were released from the 353 trap hauls representing a bycatch release rate for fishes averaging 5.0 fish per trap haul. In the 189 trap hauls completely sampled, targeted fish represented 83% of total weight and 65% by number with an average trap yield of 5.9 kg and 7.5 individuals (Harper et al. 1990). Although seventy-eight (78) species were observed to be released during this study, seven species accounted for most (52.7%) of the total releases. These species along with their corresponding numbers and percentage of total releases were: *Lactophrys triqueter*, smooth trunkfish (190, 10.7%); *Priacanthus arenatus*, bigeye (176, 9.9%); *Diodon holocanthus*, balloonfish (140, 7.9%); *Scorpaena plumieri*, scorpion fish (118, 6.7%); *Monacanthus hispidus*, planehead filefish (111, 6.3%); *Haemulon aurolineatum* tomtate (102, 5.8%); and vermilion snapper (95, 5.4%) (Harper et al. 1990). Nearly 80% of the released fish swam away upon release.

A study conducted by Mote Marine Laboratory in 1991 monitored fish trap catches off Collier and Lee Counties, Florida. In that 10-day trip 92 traps were continuously deployed and retrieved with soak times ranging from 3 to 20 hours. Of the 3,681 finfish caught but not retained for landing (i.e., bycatch and undersized target species), 7 were dead, 1,024 were used as bait, and 2,650 were discarded overboard. Of the discards, 97% swam down and less than 0.1% were observed to have been eaten by birds. Butterflyfish and angelfish constituted only 0.6% of trap catch. All of these species were alive when harvested and swam down, except for one fish eaten by birds.

A study conducted in the South Atlantic waters of the Florida Keys showed that 0.9% of all fish were dead when fish traps were pulled. Fifteen percent of angelfish and butterflyfish were injured but none of these species were dead on retrieval of traps (Taylor and McMichael 1983). Taylor and McMichael (1983) also observed a 53% swim down rate for released species. However, a study conducted by Sutherland and Harper (1983) reported a mortality rate of 2.9% of the trap caught fish, or an average of 1 dead for every 3.2 traps hauled off Key Biscayne, Florida. Mortalities averaged 1.8% during eight months of the study and 7.5% during a two month period when fish kills were reported in southeastern Florida. Bohnsack et al. (in press, as cited in Sutherland, 1989) found 2.2% of the fish caught off Key Biscayne, Florida in their studies dead at the time of capture. A different NMFS study found that 6.4% of fish were released dead and 78.5% swim down rate was observed for released species from Miami, Florida south around the Keys to west of the Dry Tortugas, Florida (Harper et al. 1994).

3.2.3 Essential Fish Habitat and Other Habitats

The Magnuson-Stevens Fishery Conservation and Management Act requires NMFS and the regional fishery management councils to identify and describe essential fish habitat (EFH), minimize to the extent practicable the adverse effects of fishing on EFH, and identify other actions to encourage the conservation and enhancement of EFH. The area affected by this PEA has been identified as EFH for all FMPs under the authority of both the Gulf and South Atlantic Councils as well as by the NMFS for Atlantic Highly Migratory Species (HMS). EFH identifications and descriptions are found in the Gulf Council's 2005 Generic EFH Amendment 3 (GMFMC 2005) and associated Environmental Impact Statement (GMFMC 2004), the South Atlantic Council's EFH User Guide[10] and Final Amendment 10 to the 2006 Consolidated Atlantic HMS FMP (NMFS 2017b). The South Atlantic Council provides a habitat Atlas that includes EFH and Habitat Areas of Particular Concern (HAPC)[11]. The Gulf Council[12] and NMFS HMS[13] also provide spatial representations of EFH.

Whether designated EFH or not, high and diverse concentrations of biota are found where habitat is abundant. High densities of fish resources are associated with particular habitat types (e.g., seagrass, coral reefs, mangroves, etc.) depending on life stage. Coral reefs, seagrass beds, and mangrove ecosystems are the most productive of the habitat types found in the southeastern U.S., but other areas such as soft-bottom lagoons, algal hard grounds or hard bottom, mud flats, salt ponds, sandy beaches, and rocky shores are also important in overall productivity. These diverse habitats support a variety of floral and faunal populations. Coral reefs and other coral communities provide some of the most important ecological and economic coastal resources in the southeast. Seagrass beds are highly productive ecosystems that are quite extensive; some of the largest seagrass beds in the world lie within Gulf and Atlantic waters of the Florida Keys. Outer shelf regions also provide important habitat for various species' life stages of snapper grouper and reef fish. Lionfish are also found in all of these habitats.

[10] http://safmc.net/download/SAFMCEFHUsersGuideFinalNov16.pdf
[11] http://www.safmc.net/ecosystem-management/mapping-and-gis-data
[12] http://portal.gulfcouncil.org/EFHreview.html
[13] http://www.nmfs.noaa.gov/sfa/hms/documents/fmp/am10/index.html

3.2.3.1 Florida Keys National Marine Sanctuary

FKNMS[14] is a 2900 square nautical mile marine protected area that extends approximately 220 nautical miles southwest from the southern tip of the Florida peninsula. The FKNMS boundary extends southward on the Atlantic Ocean side of the Florida Keys from the northeastern most point of Biscayne National Park to the Dry Tortugas, encompassing all marine waters from the shoreline to the 300 foot depth contour. On the Gulf of Mexico side of the Florida Keys, the FKNMS boundary lies adjacent to that of Everglades National Park then extends westward into the Gulf of Mexico to the Dry Tortugas, with the Florida Bay and Gulf of Mexico shorelines as its landward boundary (Figure 2.2.2.3). FKNMS was designated by Congress in 1990, and is administered by NOAA and jointly managed with Florida. Approximately 60% of FKNMS is in Florida state waters and 40% is federal waters. FKNMS overlaps four national wildlife refuges, six state parks, three state aquatic preserves and has incorporated two of the earliest national marine sanctuaries to be designated, Key Largo and Looe Key National Marine Sanctuaries. Three national parks with separate jurisdiction share a boundary with the FKNMS.

FKNMS protects mangrove, seagrass, hard bottom, and coral reef habitats, including the third largest living coral barrier reef system in the world. The area includes one of the largest seagrass communities in this hemisphere, and supports over 6,000 species of marine plants, fishes, and invertebrates. Several of these species are protected by state and federal laws, including seven species of stony coral listed as threatened under the Endangered Species Act[15] and protected marine mammals, sea turtles, fish (see Section 3.2.4 for a detailed description of these species). FKNMS also contains some of the most significant maritime heritage and historical resources of any coastal community in the nation. Attracted by this tropical diversity, tourists spend more than thirteen million visitor days in the Florida Keys each year. In addition, the region's natural and man-made resources provide recreation and livelihoods for approximately 80,000 residents. Lionfish have been observed in most, if not all, marine habitat types of the FKNMS including mangroves, seagrass beds, hardbottom, coral reefs, and artificial reefs, from very shallow depths (2-3 feet) to over 1,000 feet.

The goal of FKNMS is to protect the marine resources of the Florida Keys. FKNMS also aims to interpret the Florida Keys marine environment for the public and to facilitate human uses of the area that are consistent with the primary objective of sanctuary resource protection. A comprehensive management plan guides FKNMS priorities and various regulations are in effect to protect sanctuary resources. These include multiple sanctuary-wide regulations such as prohibitions on and hydrocarbon exploration, mining, and other activities that otherwise alter the seabed; these prohibitions include placing fishing gear (such as traps) on the sea floor of FKNMS that was not defined in the original environmental impact statement for FKNMS as a "traditional fishing activity" (15 CFR 922.163(a)(3)).[16] Protections to coral from anchoring vessels and substrate collection are also in place to reduce habitat impacts. The entire FKNMS is

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[14] https://floridakeys.noaa.gov/

[15] http://sero.nmfs.noaa.gov/protected_resources/coral/index.html

[16] Alteration of the seabed is prohibited unless incidental to traditional fishing activities. "Traditional fishing activities" are defined at 15 CFR 922.162 as those activities identified in the 1996 final environmental impact statement (FEIS) for FKNMS, which does not include use of traps to target lionfish (NOAA 1996).

a “no discharge zone” to safeguard water quality. Smaller, discrete marine zones within the larger FKNMS have been designated to separate conflicting uses and provide further protection to species and habitats. Through its regulatory framework, FKNMS has the ability to issue permits for activities that are otherwise prohibited by regulations if those activities further sanctuary goals and objectives and meet specific criteria (15 CFR 922.166).

Recreational and commercial fishing in FKNMS, including fishing by trap for spiny lobster, stone crab, and pinfish, are regulated in state waters by the Florida Fish and Wildlife Conservation Commission and in federal waters by the South Atlantic and Gulf Councils. These traditional fishing activities are exempt from the sanctuary prohibition on altering the seabed. As noted above, some areas are closed to fishing in order to protect habitat, avoid conflicts between user groups such as divers and anglers, and to balance commercial and recreational interests with the need for a healthy ecosystem.

There are multiple pressures on the marine resources of the FKNMS, including commercial and recreational fishing, disturbances to wildlife, coastal development, harmful algal blooms, marine debris, vessel groundings, vessel traffic, and the introduction and proliferation of non-indigenous species, such as the lionfish (ONMS 2011). Human driven factors such as climate change, sea level rise and ocean acidification are large-scale issues that also affect FKNMS resources. For example, seasonal and yearly seawater temperature extremes and increasing UV penetration in the water column may trigger coral disease and bleaching events, which have increased in frequency, duration and range, coinciding with the 10 warmest years on record (1999 to 2009) (ONMS 2011). In addition, a devastating coral disease event that began in 2014 is currently affecting multiple coral species in Florida’s coral reef tract, including reefs in FKNMS. The origination, causal organism(s), transmission, extent, and potential methods of control for this disease are currently unknown. Ocean acidification also affects coral reefs in FKNMS, compromising the growth ability of corals and other organisms with calcium carbonate skeletons.

The current conditions in FKNMS are exacerbated by historical over-exploitation of the Florida Keys’ marine resources during the past century, more so than the relatively short time frame that these resources have been managed at the current geographic scale. However, there are positive signs that some ecosystem services are responding to FKNMS management actions, most notably in the form of recovering fish spawning aggregations, and increasing sizes and abundances of economically important fisheries species inside the protected ecological reserves (ONMS 2011).

3.2.3.2 Flower Garden Banks National Marine Sanctuary and Gray’s Reef National Marine Sanctuary

The action area of this PEA envelops the Flower Garden Banks and Gray’s Reef National Marine Sanctuaries; however, neither NMFS nor ONMS propose to undertake any actions in these areas. Therefore, this PEA does not analyze effects of trapping in these sanctuaries.

3.2.4 Protected Species

NMFS manages marine protected species in the Southeast region under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA). There are 29 ESA-listed species or Distinct Population Segments (DPSs) of marine mammals, sea turtles, fish, and corals that may occur in the EEZ of the South Atlantic or Gulf. There are 91 stocks of marine mammals managed within the Southeast region plus the addition of the stocks such as North Atlantic right whales (NARWs), and humpback, sei, fin, minke, and blue whales that regularly or sometimes occur in Southeast region managed waters for a portion of the year (Hayes et al. 2017). All marine mammals in U.S. waters are protected under the MMPA.

Five of the marine mammals (sperm, sei, fin, blue, and NARWs) protected under the MMPA are also listed as endangered under the ESA and may occur in either the South Atlantic or the Gulf. Gulf Bryde's whales are currently proposed for listing as endangered under the ESA. Manatees, listed as threatened under the ESA, also occur in the South Atlantic and Gulf and are the only marine mammal species in these areas managed by the U.S. Fish and Wildlife Service.

Sea turtles, fish, and corals that are listed as threatened or endangered under the ESA and occur in the South Atlantic or the Gulf include the following: six species of sea turtles (Kemp's ridley, Northwest Atlantic DPS of loggerhead, North Atlantic DPS of green, South Atlantic DPS of green, leatherback, and hawksbill); eleven species of fish (New York Bight Atlantic sturgeon DPS, Chesapeake Bay Atlantic sturgeon DPS, Carolina Atlantic sturgeon DPS, South Atlantic sturgeon DPS, Gulf of Maine Atlantic sturgeon DPS, Gulf sturgeon, shortnose sturgeon, U.S. DPS of smalltooth sawfish, Nassau grouper, oceanic whitetip shark and giant manta ray); and seven species of coral (elkhorn, staghorn, lobed star, mountainous star, boulder star, pillar, and rough cactus).

Portions of designated critical habitat for NARWs, the Northwest Atlantic DPS of loggerhead sea turtles, and *Acropora* (elkhorn and staghorn) corals occur within the EEZ of the South Atlantic Region. Critical habitat designated under the ESA for smalltooth sawfish, Gulf sturgeon, and the Northwest Atlantic Ocean DPS of loggerhead sea turtles occur in the Gulf, though only loggerhead critical habitat occurs in federal waters.

NMFS completed a Section 7 consultation on the effects of issuing permits to allow for testing of traps to target lionfish throughout the Gulf and South Atlantic, including within the waters of the FKNMS. NMFS determined the trap testing, as contemplated in the preferred alternatives in this PEA, may affect but is not likely adversely affect the following species or critical habitat: Blue, sei, sperm, fin, Bryde's, and North Atlantic right whales; Northwestern Atlantic DPS of loggerhead, North Atlantic and South Atlantic DPSs of green, hawksbill, Kemp's ridley, and leatherback sea turtles; the U.S. DPS of smalltooth sawfish; Nassau grouper; elkhorn, staghorn, rough cactus, pillar, lobed star, mountainous star, and boulder star coral; elkhorn and staghorn coral critical habitat, and Northwest Atlantic DPS of loggerhead sea turtle critical habitat (see Appendix B).

The following sections provide a brief overview of the general life history characteristics of the coral, sea turtles, fish and marine mammals that may be present in the proposed action area and current threats to these species from trap fishing.

3.2.4.1 ESA-Listed Coral

As mentioned above, seven ESA-listed coral species (elkhorn, staghorn, rough cactus, pillar, lobed star, mountainous star, and boulder star) occur within the South Atlantic and Gulf. In this section, we present a brief overview of the general life history characteristics of the coral found in the both of these regions. These corals are subject to many threats including coral bleaching, disease, land based pollution, ocean acidification, and physical damage from anchors, divers, and storms (NMFS 2015). More information on these species can be found on NMFS' website.[17]

Elkhorn Coral

Elkhorn coral (*Acropora palmata*) was listed as threatened under the ESA in May 2006 (71 FR 26852). In December 2012, NMFS proposed changing its status from threatened to endangered (77 FR 73219). On September 10, 2014, NMFS determined that elkhorn coral should remain listed as threatened (79 FR 53851). Elkhorn coral colonies have frond-like branches, which appear flattened to near round, and typically radiate out from a central trunk and angle upward. Branches are up to approximately 20 in (50 cm) wide and range in thickness from about 1.5-2 in (4 to 5 cm). Individual colonies can grow to at least 6.5 ft (2 m) in height and 13 ft (4 m) in diameter (*Acropora* Biological Review Team 2005). Colonies of elkhorn coral can grow in nearly single-species, dense stands and form an interlocking framework known as thickets.

Elkhorn coral is distributed throughout the western Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. The northern extent of the range in the Atlantic is Broward County, Florida, where it is relatively rare (only a few known colonies), but fossil elkhorn coral reef framework extends into Palm Beach County, Florida. There are two known colonies of elkhorn coral, which were discovered in 2003 and 2005, at the Flower Garden Banks, which is located 100 miles (161 km) off the coast of Texas in the Gulf (Zimmer et al. 2006). The species has been extirpated from many localized areas throughout its range (Jackson et al. 2014).

Staghorn Coral

Staghorn coral (*Acropora cervicornis*) was listed as threatened under the ESA in May 2006 (71 FR 26852). In December 2012, NMFS proposed changing its status from threatened to endangered (77 FR 73219). On September 10, 2014, NMFS determined that staghorn coral should remain listed as threatened (79 FR 53851). Staghorn coral is characterized by antler-like colonies with straight or slightly curved, cylindrical branches. The diameter of branches ranges from 0.1-2 in (0.25-5 cm; Lirman et al. 2010), and linear branch growth rates have been reported to range between 1.2-4.5 in (3-11.5 cm) per year (*Acropora* Biological Review Team 2005). The

[17] http://sero.nmfs.noaa.gov/protected_resources/coral/index.html

species can exist as isolated branches, individual colonies up to about 5 ft (1.5 m) diameter, and thickets comprised of multiple colonies that are difficult to distinguish from one another (*Acropora* Biological Review Team 2005).

Staghorn coral is distributed throughout the Caribbean Sea, in the southwestern Gulf, and in the western Atlantic Ocean. The fossil record indicates that during the Holocene epoch, staghorn coral was present as far north as Palm Beach County in southeast Florida (Lighty et al. 1978), which is also the northern extent of its current distribution (Goldberg 1973). Staghorn coral commonly occurs in water ranging from 16 to 65 ft (5 to 20 m) in depth, though it occurs in depths of 16-30 m at the northern extent of its range, and has been rarely found to 60 m in depth throughout its range. As with all stony corals, staghorn coral is subject to coral bleaching, disease, ocean acidification, and physical damage from anchors, divers, and storms.

Rough Cactus Coral

Rough cactus coral, *Mycetophyllia ferox*, was listed as threatened under the ESA on September 10, 2014 (79 FR 53851). Rough cactus coral occurs in southeast Florida and throughout the greater Caribbean. It forms a thin, encrusting plate that is weakly attached to substrate. It generally inhabits reef environments in water depths of 16-295 feet (5-90 m), including shallow and mesophotic habitats (e.g., > 100 ft [30 m]); however, it is not found deeper than 30 m in the Florida Keys (Jennifer Moore, NMFS, pers. comm. 2017). It is one of the least common coral species observed in monitoring studies. Low encounter rate and percent cover coupled with the tendency to survey *Mycetophyllia* spp. at the genus level make it difficult to discern population trends from monitoring data. Available data indicate rough cactus coral has experienced significant declines in Florida. It is a hermaphroditic brooding species with colony size greater than 100 cm^2 at first reproduction. Recruitment of rough cactus coral appears to be very low, even in studies from the 1970s. The species' low recruitment and size at reproductive maturity limits the capacity for recovery.

Pillar Coral

Pillar coral, *Dendrogyra cylindrus*, was listed as threatened under the ESA on September 10, 2014 (79 FR 53851), and was also categorized as "vulnerable" in 2008 under the International Union for the Conservation of Nature Red List (Aronson et al. 2008).). Pillar coral occurs throughout the Caribbean and off the southeast coast of Florida. It forms cylindrical columns on top of encrusting bases. Pillar coral inhabits most reef environments in water depths ranging from approximately 3-75 ft (1-25 m), but it is most common in water between approximately 15-45 feet (5-15 m) deep (Acosta and Acevedo 2006; Cairns 1982; Goreau and Wells 1967). Pillar coral is not found deeper than 30 m in the Florida Keys (Jennifer Moore, NMFS, pers. comm. 2017). It is uncommon and appears as scattered, isolated colonies, though it is rarely found in aggregations. The low abundance and infrequent encounter rate make it difficult to determine population trends. It is a gonochoric (separate sexes) broadcast spawning species with relatively low annual egg production relative to its large size. Sexual recruitment of this species is low, but it can propagate by fragmentation following storms or other physical disturbance. The combination of gonochoric spawning with persistently low population density hinders successful sexual reproduction, therefore limiting genetic mixing. The Florida reef tract population of pillar coral has catastrophically declined due to mass coral bleaching events in 2014 and 2015 and associated disease outbreaks, with over 90 percent of genotypes lost in certain areas (K. Neely, pers. comm. 2017).

Star Corals

Three species (*Orbicella annularis*, *O. faveolata*, and *O. franksi*) were listed as threatened under the ESA on September 10, 2014 (79 FR 53851).The star corals in the *Orbicella* species complex historically dominated coral reefs throughout the Caribbean both by abundance and cover. They formed dense assemblages of large, hundreds-of-years old colonies interspersed with few small colonies (Bruckner 2012). Over the last twenty years, major declines between 50 to 95% have been reported in many locations, due to coral bleaching, disease, and physical damage; a few locations report stable or increasing coverage. Since the 1980's decline of *Acropora* spp., total coral cover decline in the Caribbean has been associated with the decline of the star corals.

Star corals (*Orbicella* spp.) have slow growth rates, late reproductive maturity, and low recruitment rates. Colonies can grow very large and live for centuries. Partial mortality of large colonies is common on modern reefs and can result in the production of genetically identical ramets with accompanying shifts to smaller size class distributions. These large colonies of star corals have been able to maintain populations over time, but recent population declines and partial colony mortality is resulting in smaller colonies with less reproductive output and even lower replenishment potential. The historical presence of few small colonies coupled with observation of few recruits in the presence of large gamete production from the large colonies suggests recruitment events are rare, and were less important for the survival of the *Orbicella* species complex in the past than today (Bruckner 2012). Due to the critical declines in this coral, three species (*Orbicella annularis*, *O. franksi*) were listed as threatened under the ESA on September 10, 2014 (79 FR 53851).

Acropora Critical Habitat

The physical or biological feature of *Acropora* critical habitat essential to their conservation (typically referred to as the primary constituent element) is substrate of suitable quality and availability to support larval settlement and recruitment, and reattachment and recruitment of asexual fragments. Substrate of suitable quality and availability is defined as consolidated hard bottom or dead coral skeleton that is free from fleshy macroalgae cover and sediment cover, occurring in water depths from the mean high water line to 30 meters (98 feet). This feature has been identified in four locations within the jurisdiction of the U.S.: Florida, Puerto Rico, St. Thomas/St. John, and St. Croix.

Current Threats to Corals from Trap Fishing

Traps and/or trap lines can adversely affect coral via fragmentation or abrasion. Traps may affect *Acropora* via fragmentation and abrasion if they become mobilized during storm events and collide with colonies. The deployment of traps may adversely affect coral 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 coral during storm events or normal fishing activities.

On July 27, 2012, NMFS published a final rule, effective August 27, 2012, that limited spiny lobster trap fishing in certain areas distributed throughout the South Atlantic EEZ off the Florida Keys to protect threatened coral colonies of elkhorn and staghorn coral to address the requirements of the 2009 biological opinion on the spiny lobster fishery (77 FR 44168). A correction to coordinates in this rule was published on August 22, 2012 (77 FR 50642). The final rule prohibited spiny lobster trap fishing in 60 closed areas covering a total of 5.9 mi^2 (15.3 km^2) that were chosen due to their high conservation value and areas of high coral density. These closed areas also provide protection for the newly listed coral species because they have similar life history and habitat requirements.

3.2.4.2 ESA-Listed Sea Turtles

Green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are all highly migratory and travel widely throughout the Gulf and South Atlantic regions. In this section we present a brief overview of the general life history characteristics of the sea turtles found in the both of these regions. Several volumes exist that cover the biology and ecology of these species more thoroughly (i.e., Lutz and Musick 1997; Lutz et al. 2002). These sea turtles are subject to many threats including destruction and alteration of nesting and feeding habitats, incidental capture (bycatch) in commercial and recreational fisheries, entanglement in marine debris, and vessel strikes. More information on each of these species can be found on NMFS' website.[18]

North Atlantic and South Atlantic DPSs of Green Sea Turtle

NMFS published a final rule (81 FR 20058, April 6, 2016) listing 11 DPSs of green sea turtles (*Chelonia mydas*); the North Atlantic and South Atlantic DPSs of green sea turtles are listed as threatened. Green sea turtles are the largest of the hardshell marine turtles, growing to a weight of 350 lb (159 kg) with a straight carapace length of greater than 3.3 ft (1 m). Hatchlings are thought to occupy pelagic areas of the open ocean and are often associated with Sargassum rafts (Carr 1987; Walker 1994). At approximately 20 to 25 cm carapace length, juveniles migrate from pelagic habitats to benthic foraging areas in nearshore tropical and subtropical waters (Bjorndal 1997). As juveniles move into benthic foraging areas a diet shift towards herbivory occurs. They consume primarily seagrasses and algae, but are also known to consume jellyfish, salps, and sponges (Bjorndal 1980, 1997; Mortimer 1981, 1982; Paredes 1969). The diving abilities of all sea turtles species vary by their life stages. The maximum diving depth of green sea turtles is estimated at 110 m (360 ft) (Frick 1976), but they are most frequently making dives of less than 20 m (65 ft) (Walker 1994). The time of these dives also varies by life stage. The maximum dive length is estimated at 66 minutes with most dives lasting from 9 to 23 minutes (Walker 1994).

[18] http://www.nmfs.noaa.gov/pr/species/turtles/

Hawksbill Sea Turtle

The hawksbill sea turtle (*Eretmochelys imbricata*) was listed as endangered throughout its entire range on June 2, 1970 (35 FR 8491), under the Endangered Species Conservation Act of 1969, a precursor to the ESA. Hawksbill sea turtles are small- to medium-sized (99-150 lb on average [45-68 kg]) although females nesting in the Caribbean are known to weigh up to 176 lb (80 kg) (Pritchard et al. 1983). Hatchlings have a pelagic stage lasts from the time they leave the nesting beach until they are approximately 22-25 cm in straight carapace length (Meylan 1988; Meylan and Donnelly 1999). The pelagic stage is followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Hawksbill sea turtles have a circumtropical distribution and usually occur between latitudes 30°N and 30°S in the Atlantic, Pacific, and Indian Oceans. In the western Atlantic, hawksbills are widely distributed and can be found off the coasts of Florida and Texas in the continental U.S. Little is known about the diet of pelagic stage hawksbills. Adult foraging typically occurs over coral reefs, although other hard bottom communities and mangrove-fringed areas are occupied occasionally. Hawksbills show fidelity to their foraging areas over several years (van Dam and Diéz 1998). The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan 1988). Gravid females have been noted ingesting coralline substrate (Meylan 1984) and calcareous algae (Anderes Alvarez and Uchida 1994), which are believed to be possible sources of calcium to aid in eggshell production. The maximum diving depths of these animals are not known, but the maximum length of dives is estimated at 73.5 minutes. More routinely, dives last about 56 minutes (Hughes 1974).

Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle (*Lepidochelys kempii*) was listed as endangered on December 2, 1970, under the Endangered Species Conservation Act of 1969, a precursor to the ESA. Kemp's ridley are the smallest of all sea turtles. Adults generally weigh less than 100 lb (45 kg) and have a carapace length of around 2.1 ft (65 cm). The primary range of Kemp's ridley sea turtles is within the Gulf basin, though they also occur in coastal and offshore waters of the U.S. Atlantic Ocean. Hatchlings are pelagic during the early stages of life and feed in surface waters (Carr 1987; Ogren 1989). After the juveniles reach approximately 20 cm carapace length they move to relatively shallow (less than 50 m) benthic foraging habitat over unconsolidated substrates (Márquez-M. 1994). They have also been observed transiting long distances between foraging habitats (Ogren 1989). Kemp's ridley sea turtles feeding in these nearshore areas primarily prey on crabs, though they are also known to ingest mollusks, fish, jellyfish, marine vegetation, and shrimp (Shaver 1991). The fish and shrimp Kemp's ridley sea turtles ingest are not thought to be a primary prey item but instead may be scavenged opportunistically from bycatch discards or discarded bait (Shaver 1991). Given their predilection for shallower water, Kemp's ridley sea turtles most routinely make dives of 50 m or less (Byles 1988; Soma 1985). Their maximum diving range is unknown. Depending on the life stage a Kemp's ridley sea turtles may be able to stay submerged anywhere from 167 minutes to 300 minutes, though dives of 12.7 minutes to 16.7 minutes are much more common (Byles 1988; Mendonca and Pritchard 1986; Soma 1985). Kemp's ridley sea turtles may also spend as much as 96% of their time underwater (Byles 1988; Soma 1985).

Leatherback Sea Turtle

The leatherback sea turtle (*Dermochelys coriacea*) was listed as endangered throughout its entire range on June 2, 1970 (35 FR 8491) under the Endangered Species Conservation Act of 1969. Leatherbacks are the largest, most pelagic, and most vulnerable to entanglement in fishing gear of all ESA-listed sea turtles. They spend most of their time in the open ocean although they will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated (Heppell et al. 2003). Curved carapace length (CCL) often exceeds 5 ft (150 cm) and front flippers that can span almost 9 ft (270 cm) (NMFS and USFWS 1998). Mature males and females can reach lengths of over 6 ft (2 m) and weigh close to 2,000 lb (900 kg). Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Because leatherbacks' ability to capture and eat jellyfish is not constrained by size or age, they continue to feed on these species regardless of life stage (Bjorndal 1997). Leatherbacks are the deepest diving of all sea turtles. It is estimated that these species can dive in excess of a half-mile (Eckert et al. 1989) but more frequently dive to depths of 50 m to 84 m (Eckert et al. 1986). Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Eckert et al. 1986; Eckert et al. 1989; Keinath and Musick 1993; Standora et al. 1984). Leatherbacks may spend 74% to 91% of their time submerged (Standora et al. 1984).

Northwest Atlantic Loggerhead Sea Turtle

NMFS published a final rule (76 FR 58868, September 22, 2011) listing nine distinct DPSs of loggerhead sea turtles (*Caretta caretta*); the Northwest Atlantic loggerhead sea turtle DPS is listed as threatened. Loggerhead sea turtles inhabit continental shelf and estuarine environments throughout the U.S. Atlantic, Gulf, and Caribbean Sea (Dodd Jr. 1988). Hatchlings forage in the open ocean and are often associated with Sargassum rafts (Bolten and Balazs 1995; Carr 1987; Hughes 1974; Walker 1994). The pelagic stage of these sea turtles are known to eat a wide range of things including salps, jellyfish, amphipods, crabs, syngnathid fish, squid, and pelagic snails (Brongersma 1972). Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm straight-line carapace length, they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic (Witzell 2002). Here they forage over hard and soft-bottom habitats for crabs, mollusks, jellyfish, and vegetation (Carr 1986; Dodd Jr. 1988). Adults in the southeast U.S. average about 3 ft (92 cm) long, measured as a straight carapace length, and weigh approximately 255 lb (116 kg) (Ehrhart and Yoder 1978). Adult loggerheads eat a variety of invertebrates with crabs and mollusks being an important prey source (Burke et al. 1993). Estimates of the maximum diving depths of loggerheads range from 211 m to 233 m (692-764 ft.) (Limpus and Nichols 1988; Thayer et al. 1984). The lengths of loggerhead dives are frequently between 17 and 30 minutes (Lanyon et al. 1989; Limpus and Nichols 1988, 1994; Thayer et al. 1984) and they may spend anywhere from 80 to 94% of their time submerged (Lanyon et al. 1989; Limpus and Nichols 1994).

Northwest Atlantic Loggerhead DPS Critical Habitat

On July 10, 2014, NMFS designated critical habitat for the Northwest Atlantic DPS of loggerhead sea turtles in the South Atlantic and the Gulf of Mexico, effective August 11, 2014

(79 FR 39855). Specific areas designated include 38 occupied marine areas within the range of the Northwest Atlantic Ocean DPS. These areas contain one or a combination of habitat types: Nearshore reproductive habitat, winter area, breeding areas, constricted migratory corridors, and/or *Sargassum* habitat. More information on Northwest Atlantic DPS of loggerhead critical habitat can be found on NMFS' website.[19]

Current Threats to Sea Turtles from Trap Fishing

Sea turtles may be affected by traps via entanglement and forced submergence. Forcible submergence may occur through an entanglement event, where the sea turtle is unable to reach the surface to breathe. Forced submergence could also occur if a sea turtle becomes entangled in a trap line below the surface and the line is too short and or the trap is too heavy to be brought up to the surface by the swimming sea turtle. Captured sea turtles can be released alive or can be found dead upon retrieval of the gear as a result of 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. Trap interactions with sea turtles may be affected by soak time. The longer the soak time, the greater the chances a foraging sea turtle may encounter the gear, and the longer a sea turtle may be exposed to the entanglement risk.

In addition, sea turtles become entangled in commercial trap gear with long soak times (e.g., 1+ days) likely because longer soak times increase the likelihood that invertebrate animals will grow on trap lines, attracting sea turtles. Records of entanglements in the spiny lobster and stone crab fisheries, both prey species of loggerhead sea turtles, indicate that sea turtle entanglement is associated with fisheries that either target or bait with sea turtle prey items. Bait characteristics (e.g., the type, size, and texture of the bait) may also influence the likelihood and frequency of certain sea turtle species becoming entangled. Sub-adult and adult loggerheads are primarily coastal dwelling and typically prey on benthic invertebrates such as mollusks and decapod crustaceans in hard bottom habitats. Kemp's ridley sea turtles also feed on these species. Thus, loggerhead and Kemp's ridley sea turtles may be the species attracted to gear baited with these prey items. Green, hawksbill, and leatherback turtles may also be attracted to fishing bait and have been caught on fishing hooks, but their feeding habits make it less likely. Green sea turtles become herbivorous as they mature, feeding on algae and sea grasses, but also occasionally consume jellyfish and sponges. The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan 1988). Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates, so they are less likely to pursue baited gear.

Different life stages of sea turtles are associated with different habitat types and water depths. For example, pelagic stage loggerheads are found offshore closely associated with *Sargassum* rafts. As loggerheads mature they begin to live in coastal inshore and nearshore waters foraging over hard- and soft-bottom habitats of the continental shelf (Carr 1986; Witzell 2002). Therefore, gear set closer to these areas is more likely to encounter adult loggerheads. Leatherbacks and juvenile loggerheads are more likely to be found further offshore in deeper, colder water.

[19] http://www.nmfs.noaa.gov/pr/species/turtles/criticalhabitat_loggerhead.htm

3.2.4.3 ESA-Listed Marine Fish

Nassau Grouper

NMFS published a final rule (81 FR 42268, June 29, 2016) listing Nassau grouper (*Epinephelus striatus*) as threatened under the ESA. The Nassau grouper's confirmed distribution currently includes "Bermuda and Florida, throughout the Bahamas and Caribbean Sea" (e.g., Heemstra and Randall 1993). The occurrence of Nassau grouper from the Brazilian coast south of the equator as reported in Heemstra and Randall (1993) is "unsubstantiated" (Craig et al. 2011). The Nassau grouper has been documented in the Gulf of Mexico, at Arrecife Alacranes (north of Progreso) to the west off the Yucatan Peninsula, Mexico, (Hildebrand et al. 1964). Nassau grouper is generally replaced ecologically in the eastern Gulf by red grouper (*E. morio*) in areas north of Key West or the Tortugas (Smith 1971). They are considered a rare or transient species off Texas in the northwestern Gulf (Gunter and Knapp 1951 in Hoese and Moore 1998). The first confirmed sighting of Nassau grouper in the Flower Garden Banks National Marine Sanctuary, which is located in the northwest Gulf approximately 180 km southeast of Galveston, Texas, was reported by K.A. Foley et al. (2007). Many earlier reports of Nassau grouper up the Atlantic coast to North Carolina have not been confirmed. The Biological Report (Hill and Sadovy de Mitcheson 2013) provides a detailed description of their distribution.

Nassau grouper is primarily a shallow-water, insular fish species that has long been valued as a major fishery resource throughout the wider Caribbean, South Florida, Bermuda, and the Bahamas (Carter et al. 1994). As juveniles grow, they move progressively to deeper areas and offshore reefs (Colin et al. 1997; Tucker et al. 1993). Smaller juveniles occur in shallower inshore waters (3.7-16.5 m) and larger juveniles are more common near deeper (18.3-54.9 m) offshore banks (Bardach 1958; Cervigón 1966; Radakov et al. 1975; Silva Lee 1974; Thompson and Munro 1978; Cervigón 1994). Adult Nassau grouper also tend to be relatively sedentary and are commonly associated with high-relief coral reefs or rocky substrate in clear waters to depths of 130 m. Generally, adults are most common at depths less than 100 m (Hill and Sadovy de Mitcheson 2013) except when at spawning aggregations where they are known to descend to depths of 255 m (Starr et al. 2007).

The most serious threats to the status of Nassau grouper today are fishing at spawning aggregations and inadequate law enforcement. These threats are currently affecting the status of Nassau grouper, putting it at a heightened risk of extinction. More information on Nassau grouper can be found on NMFS' website.[20]

<u>Current Threats to Nassau grouper from Trap Fishing</u>

Nassau grouper may accidentally be caught as bycatch in traps. Nassau grouper have been documented to swim in and out of lobster traps. The FWC managed a spiny lobster trap observer program from the 1990s through 2001 and is the best available source of Nassau grouper bycatch information for this fishery. There has been limited bycatch of juvenile Nassau groupers

[20] https://www.fisheries.noaa.gov/species/nassau-grouper

observed in this fishery (T. Matthews, FWC, pers. comm. 2017). The majority of this catch is believed to be from state waters.

Smalltooth Sawfish

On April 1, 2003, NMFS listed the U.S. DPS of smalltooth sawfish (*Pristis pectinata*) as endangered under the ESA (68 FR 15674). Historically the smalltooth sawfish in the U.S. ranged from New York to the Mexico border. Their current range is poorly understood but believed to have come from these historical areas. In the South Atlantic region, they are most commonly found in Florida, primarily off the Florida Keys (Simpfendorfer and Wiley 2004). Only two smalltooth sawfish have been recorded north of Florida since 1963; the first was captured off North Carolina in 1963 and the other off Georgia in 2002 (National Smalltooth Sawfish Database, Florida Museum of Natural History). Historical accounts and recent encounter data suggest that immature individuals are most common in shallow coastal waters less than 25 meters (Adams and Wilson 1995; Bigelow and Schroeder 1953), while mature animals occur in waters in excess of 100 meters (Simpfendorfer, pers. comm. 2006). Smalltooth sawfish feed primarily on fish. Mullet, jacks, and ladyfish are believed to be their primary food sources (Simpfendorfer 2001). Smalltooth sawfish also prey on crustaceans (mostly shrimp and crabs) by disturbing bottom sediment with their saw (Bigelow and Schroeder 1953; Norman and Fraser 1938). More information on this species can be found on NMFS' website.[21]

Current Threats to Smalltooth Sawfish from Trap Fishing

Traps may affect smalltooth sawfish via entanglement. Entangled smalltooth sawfish may suffer impaired swimming or foraging abilities, altered migratory behavior, and altered breeding or reproductive patterns. There are no historic or recent reports of smalltooth sawfish entangled in finfish or lobster pot/trap lines. The rope is generally thicker than the space between individual teeth on a smalltooth sawfish's rostrum, so the rope is unlikely to become tangled in its teeth.

3.2.4.4 ESA-Listed Marine Mammals

A list of marine mammal stocks that occur in the Gulf and South Atlantic and information on their population and status are available in the annual NMFS stock assessment reports (Hayes et al. 2017). The most recent stock assessment reports can be found on NMFS' website.[22]

The marine mammal species within the study area of Gulf and South Atlantic that are the greatest risk for trap/pot entanglements: bottlenose dolphins, NARWs, and humpback whales. The majority of trap/pot fishery effort is within bays, sounds, or estuaries or nearshore coastal waters in the Southeastern United States. If effort were expanded to offshore waters, it is likely that other species, such as Bryde's whale would have an increased potential for entanglement risk. More information on each of these species is provided below.

[21] http://sero.nmfs.noaa.gov/protected_resources/sawfish/index.html
[22] http://www.nmfs.noaa.gov/pr/sars/region.htm.

Bottlenose Dolphin

Bottlenose dolphins (*Tursiops truncatus*) in the Gulf of Mexico are separated into demographically independent populations called stocks. Bottlenose dolphins are currently managed by NMFS as 36 distinct stocks within the Gulf. These include 31 bay, sound and estuary stocks, three coastal stocks, one continental shelf stock, and one oceanic stock (Hayes et al. 2017). Additional climatic and oceanographic boundaries delineate the three coastal stocks such that the Eastern Coastal Stock ranges from 84ºW to Key West, Florida, the Northern Coastal Stock ranges from 84ºW to the Mississippi River Delta, and the Western Coastal stock ranges from the Mississippi River Delta to the Texas/Mexico border. Marine Mammal Stock Assessment Reports and additional information on these species in the Gulf are available on the NMFS Office of Protected Species website[23]. In the Atlantic, there are currently 16 stocks of bottlenose dolphins, including one offshore morphotype, five coastal, and 10 bay, sound, and estuarine stocks (Hayes et al. 2017). Ten of these stocks are considered strategic under the MMPA because the level of direct human-caused mortality exceeds the potential biological removal level. These 10 strategic stocks are managed under the Bottlenose Take Reduction Plan (80 FR 6925, February 9, 2015). Bottlenose dolphin stocks in the Atlantic range from Long Island, New York to Southeast Florida (Hayes et al. 2017).

Bottlenose dolphin adults range from 6 to 9 feet (1.8 to 2.8 m) long and weigh typically between 300 to 600 lbs (136 to 272 kg). Females and males reach sexual maturity between ages 5 to 13 and 9 to 14, respectively. Once mature, females give birth once every 3 to 6 years. Maximum known lifespan can be 50 years for males and greater than 60 years for females (Reynolds 2000).

North Atlantic Right Whale

In U.S. waters, North Atlantic Right Whales (*Eubalaena glacialis*, NARWs) were determined to be in danger of extinction in all or a significant portion of their range due to commercial over-utilization. As a result, they were listed as endangered under the Endangered Species Conservation Act in June 1970, the precursor to the ESA. The species was subsequently listed as endangered under the ESA in 1973 and, thus, designated as "depleted" under the Marine Mammal Protection Act (MMPA).

NARWs generally have a stocky body, black coloration (although some have white patches on their bellies), no dorsal fin, a large head (about 1/4 of the body length), strongly bowed lower lip, and callosities (raised patches of roughened skin) on their head. Two rows of long (up to eight feet) dark baleen plates hang from their upper jaw, with about 225 plates on each side. Their tail is broad, deeply notched, and all black with a smooth trailing edge. NARW life expectancy is unclear, but one individual is known to have reached 65+ years of age (Hamilton et al. 1998; Kenney 2002). Adult NARWs are generally between 13 and 16 m long and can weigh up to 71 metric tons. Females are larger than males. The maximum lifespan of the NARW is unknown, but recent modelling supports females having a shorter life expectancy than

[23] http://www.nmfs.noaa.gov/pr/sspecies/

males (Corkeron 2017). As of 2016, females were estimated to have a life expectancy of 27 to 28 years, while males are expected to live well into their 40s (Corkeron 2017).

Gestation is approximately one year, after which calves typically nurse for around a year (Kenney 2009; Kraus et al. 2007; Lockyer 1984). Pregnant NARWs migrate south, through the mid-Atlantic region of the U.S., to low latitudes during late fall where they overwinter and give birth in shallow, coastal waters (Kenney 2009). During spring, these females migrate back north with their new calves to high latitude foraging grounds where they feed on large concentrations of copepods, primarily *Calanus finmarchicus*, using their baleen plates (NMFS 2017a). Some non-reproductive NARWs (males, juveniles, non-reproducing females) also migrate south along the mid-Atlantic region, although at more variable times throughout the winter, while others appear to not migrate south, and instead remain in the northern feeding grounds year round or go elsewhere (Bort et al. 2015; Morano et al. 2012; NMFS 2017a). Little is known about NARW habitat use in the mid-Atlantic, but recent acoustic data indicate near year round presence of at least some whales off the coasts of New Jersey, Virginia, and North Carolina (Davis et al. 2017; Hodge et al. 2015; Salisbury et al. 2016; Whitt et al. 2013). While it is generally not known where NARWs breed, some evidence suggests that breeding may occur in the northern feeding grounds (Cole et al. 2013; Matthews et al. 2014).

In the western North Atlantic, there were estimated to be a minimum of 440 individuals in 2012 based directly on photo-identification data, which NMFS has historically relied on for estimating abundance of NARWs (Hayes et al. 2017). A more recent estimate based on a Bayesian mark–recapture open population model, which accounts for individual differences in the probability of being photographed, produced a population estimate of 458 individuals based on data through November 2015 (95% credible intervals 444–471, Pace et al. 2017). While photographic data for 2016 are still being processed, using this same Bayesian methodology with the available data as of September 1, 2017, gave an estimate of 451 individuals for 2016 (Pettis et al. 2017a). Accurate pre-exploitation abundance estimates are not available for either population of the species.

Since 2010 the population has been in decline, with a 99.99% probability of a decline of just under 1% per year (Pace et al. 2017). Between 1990 and 2015, survival rates appeared to be relatively stable, but differed between the sexes, with males having higher survivorship than females (males: 0.985 ± 0.0038; females: 0.968 + 0.0073) leading to a male-biased sex ratio (approximately 1.46 males per female, Pace et al. 2017). During this same period, calving rates varied substantially, with low calving rates coinciding with all three periods of decline or no growth (Pace et al. 2017).

While data are not yet available to statistically estimate the population’s trend beyond 2015, three lines of evidence indicate the population is still in decline. First, calving rates in 2016 and 2017 were low, with only five new calves being documented in 2017 (Pettis et al. 2017a), well below the number needed to compensate for expected mortalities (Pace et al. 2017). Long-term photographic identification data indicate new calves rarely go undetected, so these years likely represents a continuation of the low calving rates that began in 2012 (Kraus et al. 2007; Pace et al. 2017). Second, as noted above, the preliminary abundance estimate for 2016 is 451 individuals, down approximately 1.5% from 458 in 2015. Third, since June 2017, at least 15

NARWs have died in what has been declared an Unusual Mortality Event[24] (UME), and at least one calf died prior to this in April 2017 (NMFS 2017a). Twelve whales died in Canada in the Gulf of St. Lawrence area and four off the New England coast of the U.S. In addition, on November 26, 2017 another NARW washed up dead off the New England coast possibly bringing the total 2017 mortalities up to 17 (List 2017). To date, two mortalities have been attributed to entanglement in fishing gear and five showed signs of blunt force trauma consistent with vessel strikes, the two major known human causes of mortality (Daoust et al. 2017; DFO pers. comm. 2017; Fauquier pers. comm. 2017; Pettis et al. 2017a). The remaining causes of death could not be, or have yet to be, determined.

Substantial progress has been made in mitigating vessel strikes by regulating vessel speeds (78 FR 73726) (Conn and Silber 2013), but entanglement in fishing gear remains a major threat (Kraus et al. 2016). The population is currently experiencing an UME that appears to be related to both vessel strikes and entanglement in fishing gear (Daoust et al. 2017). On top of this, recent modeling efforts indicate that low female survival, a male biased sex ratio, and low calving success are contributing to the population's current decline (Pace et al. 2017). While there are likely a multitude of factors involved, low calving has been linked to poor female health (Rolland et al. 2016) and reduced prey availability (Meyer-Gutbrod and Greene 2014; Meyer-Gutbrod and Greene 2017). Furthermore, entanglement in fishing gear appears to have substantial health and energetic costs that could affect both survival and reproduction (Pettis et al. 2017b; Rolland et al. 2017; van der Hoop et al. 2017). In fact, there is evidence of a population wide decline in health since the early 1990s, the last time the population experienced a population decline (Moore et al. 2017; NMFS 2017a; Rolland et al. 2016). Given this status, the species resilience to future perturbations is considered very low. Recent modelling efforts by Meyer-Gutbrod and Greene (2017), indicate that that the species may decline towards extinction if prey conditions worsen, as predicted under future climate scenarios, and anthropogenic mortalities are not reduced (Grieve et al. 2017).

Humpback Whale

Humpback whales (*Megaptera novaeangliae*) are well known for their long pectoral fins, which can be up to 15 feet long. These long fins give them increased maneuverability; they can be used to slow down or even go backwards. Similar to all baleen whales, adult females are larger than adult males, reaching lengths of up to 60 feet. Their body coloration is primarily dark grey, but individuals have a variable amount of white on their pectoral fins and belly. This variation is so distinctive that the pigmentation pattern on the undersides of their "flukes" is used to identify individual whales, similar to a human fingerprint.

Like right whales, humpback whales follow a general annual pattern of migration between low latitude winter calving grounds (in the West Indies) and high latitude summer foraging grounds. Humpback whales feed during spring, summer, and fall in the Gulf of Maine, the Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland. Small numbers of individuals may be present in New England waters year-round, including the waters of Stellwagen Bank (Clapham et al. 1993). In winter, humpback whales calve primarily in the West Indies,

[24] http://www.nmfs.noaa.gov/pr/health/mmume/2017northatlanticrightwhaleume.html

specifically in the Antilles, primarily on Silver and Navidad Banks, north of the Dominican Republic (Clapham et al. 1993; Katona and Beard, 1990; Palsboll et al. 1997; Stevick et al. 1998). The primary winter range also includes the Virgin Islands and Puerto Rico.

Humpback whales are assumed to use the Mid-Atlantic as a migratory pathway to and from the calving/mating grounds. The Mid-Atlantic may also be an important winter feeding area for juveniles. Since 1989, observations of juvenile humpbacks in the Mid-Atlantic have been increasing during the winter months, peaking from January through March (Swingle et al. 1993). Biologists theorize that non-reproductive animals may be establishing a winter feeding range in the Mid-Atlantic since they are not participating in reproductive behavior in the Caribbean (Barco et al. 2002). Swingle et al. (1993) identified a shift in distribution of juvenile humpback whales in the nearshore waters of Virginia, primarily in winter months. Strandings of humpback whales have increased between New Jersey and Florida since 1985, consistent with the increase in Mid-Atlantic whale sightings. Strandings were most frequent from September through April in North Carolina and Virginia waters, and involved primarily juvenile humpback whales of no more than 35 feet long (Wiley et al. 1995).

It is generally believed that copulation and calving take place on the winter range in the Greater and Lesser Antilles. The gestation period in humpback whales is 12 months and females give birth every 2 to 3 years, usually between December and May (Clapham and Mayo 1987).

Current data suggest that the Gulf of Maine humpback whale stock is steadily increasing in size (Hayes et al. 2017). With respect to the North Atlantic population overall, there are indications of increasing abundance. Potential Biological Removal for the Gulf of Maine humpback whale stock is 13 whales per year (Hayes et al. 2017). The minimum population size for the Gulf of Maine stock is 823 whales (Hayes et al. 2017).

Currently, humpback whales along the Atlantic Coast are experiencing an Unusual Mortality Event (UME). Since January 2016, elevated humpback whale mortalities have occurred from Maine to Florida. Partial or full necropsy examinations were conducted on approximately half of the whales. Of the whales examined at necropsy about 50% had evidence of human interaction, either ship strike or entanglement. As part of the UME investigation process, an independent team of scientists (Investigative Team) is being assembled to coordinate with the Working Group to review the data collected and to determine potential next steps. The Investigative Team will develop the investigative plan. The Investigative Team will also coordinate its investigation with other on-going UME investigations. The investigation may require months, or even years of data collection, analysis, and interpretation. More information is available on the Humpback Whale UME webpage[25].

Bryde's Whale

The Gulf Bryde's whale is the only year-round baleen whale in the Gulf. It has been found to be genetically distinct from the other two recognized subspecies of Bryde's whales worldwide, Eden's whale (*Balaenoptera edeni edeni*) and Bryde's whale (*Balaenoptera edeni brydei*) (Rosel and Wilcox 2014). Rosel and Wilcox (2014) summarized body length information from 14 Gulf

[25] http://www.nmfs.noaa.gov/pr/health/mmume/2017humpbackatlanticume.html

Bryde's whale strandings and concluded that Bryde's whales may have a size range intermediate to the currently recognized subspecies; the largest Bryde's whale was a lactating female that was 12.65 m and the next four largest ranged between 11.2 and 11.6 m. Following Rice (1998), adult *B.e. edeni* rarely exceed 11.5 m total length and adult *B.e. brydei* reach approximately 14 to15 m. Bryde's whales in the Gulf are currently restricted to a small area in the northeastern Gulf near De Soto Canyon in waters between 150 – 410 m depth along the continental shelf break, though information in the southern Gulf is sparse (P. Rosel, NOAA SEFSC, pers. comm. 2018). The abundance estimate for Gulf Bryde's whales in 2009 was 33 (Hayes et al. 2017).

The Gulf Bryde's whales' small population size, life history characteristics, extremely limited distribution, and vulnerability to existing threats lead to their high risk of extinction. On September 18, 2014, NMFS received a revised petition from the Natural Resource Defense Council to list the Gulf Bryde's whale as an endangered DPS. On April 6, 2015, NMFS found the petitioned action may be warranted and convened a Status Review Team to prepare a status review report. On December 8, 2016, NMFS published a proposed rule to list the Gulf Bryde's whale as endangered and solicited public comments (81 FR 88639). This species is already considered strategic under the MMPA (Hayes et al. 2017).

The most significant threats to Bryde's whales, in combination with their small population size and restricted geographic range, are energy exploration, development, and production, oil spills and response, vessel strikes, fishing gear entanglement, and anthropogenic noise (81 FR 88639).

List of Fisheries

The MMPA requires that each commercial fishery be classified by the number of marine mammals they seriously injure or kill. NMFS's List of Fisheries (LOF) classifies U.S. commercial fisheries into three categories based on the number of incidental mortality or serious injury they cause to marine mammals. More information about the LOF and the classification process is available on the LOF webpage[26].

The LOF includes three classifications:

1. Category I fisheries are those with frequent serious injury or mortality to marine mammals;
2. Category II fisheries are those with occasional serious injury or mortality; and
3. Category III fisheries are those with remote likelihood of serious injury or mortality to marine mammals.

The 2018 MMPA LOF was proposed on October 10, 2017 (82 FR 47424). The Gulf and South Atlantic spiny lobster trap fishery and the southeastern U.S. Atlantic, Gulf golden crab trap/pot are classified as Category III (remote likelihood of serious injury or mortality to marine mammals). The American lobster trap fishery is classified as Category I (frequent serious injury or mortality to marine mammals) due to the frequency of marine mammal entanglements in the

[26] http://www.nmfs.noaa.gov/pr/interactions/fisheries/lof.html

Northeast U.S. The southeastern U.S. Atlantic, Gulf stone crab trap fishery is classified as Category II (occasional serious injury or mortality). The southeastern U.S. Atlantic black sea bass is considered a Category II under the conglomerate of trap/pot fisheries "Atlantic mixed species trap/pot." Vessel owners or operators, or fishermen, in Category I, II, or III fisheries must report all incidental mortalities and serious injuries of marine mammals during the course of commercial fishing operations to NMFS within 48 hours.

Current Threats to Marine Mammals from Trap Fishing

Documenting marine mammal take from specific trap/pot fisheries is difficult given that only partial, unmarked gear is typically recovered or the entangled animal is never seen again. Information on bottlenose dolphin, NARW, and humpback whale interactions with trap/pot gear is discussed below.

Trap/pot fisheries are the main commercial fishery interacting with bay, sound, and estuarine stocks of dolphins in most areas within the Gulf and South Atlantic Region. Bottlenose dolphin entanglements in trap pot gear occur throughout the region. From 2007-2016, 80 bottlenose dolphins within the Gulf or along Atlantic Coast were reported entangled in trap/pot gear or gear consistent with trap/pot gear (NOAA National Marine Mammal Health and Stranding Response Database and Southeast Region, unpublished data). Dolphins most commonly become entangled around the fluke insertion (NOAA National Marine Mammal Health and Stranding Response Database and Southeast Region, unpublished data). The mechanism for how dolphins become entangled is still unclear; in some areas, it is likely related to a behavior known as pot tipping to retrieve bait and in others, it may be due to dolphins foraging near the pot (Burdett and McFee 2004; Noke and Odell 2002).

Entanglement mortality and its effects on the NARW population are likely underestimated because some entanglements are undocumented or unreported and it is likely that carcasses from offshore are not detected or recovered (Cole et al. 2005). From 2006 through 2010, 9 of 15 records of mortality or serious injury involved entanglement or fishery interactions (Waring et al. 2012). Entanglement records from 1990 through 2010 (NMFS, unpublished data) included 74 confirmed right whale entanglements, including right whales in weirs, gillnets, and trailing line and buoys. Knowlton et al. (2012) report that approximately 83% of all right whales have been entangled at least once, and 60% of those animals had been entangled multiple times. The authors further clarify that this is a minimum estimate (Knowlton et al. 2012). Further research using the North Atlantic Right Whale Catalogue has indicated that, annually, between 14% and 51% of right whales are involved in entanglements (Knowlton et al. 2005). Over time, there has been an increasing trend in entanglement rates, including an increase in the proportion of serious entanglements (Knowlton et al. 2005). More recently, from 2010-2014, there were 55 entanglement events for NARWs (Henry et al. 2016).

Information from a NARW entanglement event often does not include the detail necessary to assign the entanglements to a particular fishery or location. Johnson et al. (2005) analyzed entanglements of 31 right whales and found that all types of fixed fishing gear and any part of the gear was involved in entanglements. When gear type was identified, pot gear and gillnet gear represented 71% and 14% of entanglements, respectively (Johnson et al. 2005). The authors pointed out that buoy lines were involved in 51% of entanglements and suggested that entanglement risk is elevated by any line that rises in the water column. Mouth entanglements for right whales were the most common point of entanglement (77.4%) and were particularly deadly; 55.6% of right whales seen with mouth entanglements died (Johnson et al. 2005). Mouth entanglements likely occur when a whale's mouth is open giving rise to speculation that entanglements occur when whales are feeding (Johnson et al. 2005). Occasionally, right whales with open mouths are observed in the southeastern U.S. calving area (Jackson et al. 2011; Jackson et al. 2012). In a recent compilation of data from 2007-2014, there were 17 entangled whales and none of these were attributed to a specific fishery (Waring et al. 2014). As evidenced by these compilations, information from an entanglement event often does not include the detail necessary to assign the entanglements to a particular fishery or location, and scarring studies suggest the vast majority of entanglements are not observed (Waring et al. 2014).

Calves and juvenile NARWs become entangled more frequently than adults and are more likely to suffer deep wounds (> 8cm) from entanglement. Knowlton et al. (2011) studied ropes that were removed from entangled right whales (dead and alive) and suggested that a whale's ability to break free of entangling gear is related to its age. Breaking strength of rope also influences a whale's ability to break free of entangling gear. Adults appear to be able to break free of ropes with a breaking strength of less than 1,700 pounds, but calves and juveniles cannot and are more prone to drowning (Knowlton et al. 2016). Given their smaller size and naive swimming abilities, right whale calves would likely need a line breaking strength less than 1,700 pounds in order to have some chance of breaking free (Knowlton et al. 2016).

Gear trailing behind a right whale creates substantial drag and may inhibit foraging (van der Hoop et al. 2013). Entanglements may also reduce a whale's ability to maneuver, making it more susceptible to ship strikes (NMFS 2006).

As with right whales, the major known sources of human-caused mortality and injury of humpback whales are commercial fishing gear entanglements and ship strikes. Sixty percent of closely investigated Mid-Atlantic humpback whale mortalities showed signs of entanglement or vessel collision (Wiley et al. 1995). From 2008 through 2012, there were at least seven reports of mortalities as a result of collision with a vessel and 41 serious injuries and mortalities attributed to entanglement (80 FR 4881, January 29, 2015).

Robbins (2009) found that 64.9% of the North Atlantic humpback whale population had entanglement scarring, which corresponds to approximately 66 entanglement cases per year. These estimates are based on sightings of free swimming animals that initially survive the encounter. Some whales may drown immediately, others may be too decomposed for analysis, and some may never be examined. For these reasons, it is likely the actual number of interactions with fishing gear is higher than recorded (Waring et al. 2006). Based on studies of humpback whale caudal peduncle scars, Robbins and Mattila (2001) reported that calves (approximately 0-1 year) had a lower entanglement risk than yearlings (1year old), juveniles, and mature whales; the latter three maturational classes exhibited comparable levels of high probability scarring. Based on these data as well as evidence that animals acquire new injuries when mature, the authors concluded that actively feeding whales may be at greater risk of entanglement. In any case, juveniles seemed to be at the most risk, possibly due to their relative inexperience.

3.2.5 Climate Change

Global climate changes could have significant effects on Gulf and South Atlantic fisheries and could affect the trap testing at issue in the PEA, though the limited timeframe limits the potential for effects. In addition, the extent of these effects on the ongoing fisheries is not known at this time. Kennedy et al. (2002), Link et al. (2015), and Osgood (2008) have suggested global climate change could affect temperature changes in coastal and marine ecosystems that can influence organism metabolism and alter ecological processes such as productivity and species interactions; changes in precipitation patterns and a rise in sea level which could change the water balance of coastal ecosystems; altering patterns of wind and water circulation in the ocean environment; and influencing the productivity of critical coastal ecosystems such as wetlands, estuaries, and coral reefs. These changes are likely to affect plankton biomass and fish larvae abundance that could adversely impact fish, marine mammals, seabirds, and ocean biodiversity. These changes in precipitation patterns cause a rise in sea level which could change the water balance of coastal ecosystems; altering patterns of wind and water circulation in the ocean environment; and influence the productivity of critical coastal ecosystems such as wetlands, estuaries, and coral reefs. The NOAA Climate Change Web Portal[27] indicates the average sea surface temperature in the Gulf will increase by 1-3ºC for 2010-2070 compared to the average over the years 1950-2010. For reef fishes, Burton (2008) speculated climate change could cause shifts in spawning seasons, changes in migration patterns, and changes to basic life history parameters, such as growth rates. It is unclear if reef fish distribution in the Gulf has been affected. The smooth puffer and common snook are examples of species for which there has been a distributional trend to the north in the Gulf. For other species such as red snapper and the dwarf sand perch, there has been a distributional trend towards deeper waters. For other reef fish species, such as the dwarf goatfish, there has been a distributional trend both to the north and to deeper waters. These changes in distributions have been hypothesized as a response to environmental factors such as increases in temperature.

The distribution of native and exotic species, the prevalence of disease in keystone animals such as corals and the occurrence and intensity of toxic algae blooms may also change with increased water temperature. Hollowed et al. (2013) provided a review of projected effects of climate change on the marine fisheries and dependent communities. Integrating the potential effects of climate change into the fisheries assessment is currently difficult due to the time scale differences (Hollowed et al. 2013). The fisheries stock assessments rarely project through a time span that would include detectable climate change effects.

Greenhouse gases

The IPCC has indicated greenhouse gas emissions are among the most important drivers of recent changes in climate. Wilson et al. (2017) inventoried the sources of greenhouse gases in the Gulf from sources associated with oil platforms and those associated with other activities

[27] http://www.esrl.noaa.gov/psd/ipcc/ocn/

such as fishing. A summary of the results of the inventory are shown in Table 3.3.5.1 with respect to total emissions and from fishing. Commercial fishing and recreational vessels make up a small percentage of the total estimated greenhouse gas emissions from the Gulf (2.04% and 1.67%, respectively).

Table 3.2.5.1. Total Gulf greenhouse gas 2014 emissions estimates (tons per year [tpy]) from oil platform and non-oil platform sources, commercial fishing, and percent greenhouse gas emissions from commercial fishing vessels of the total emissions.

Emission source	CO_2	Greenhouse CH_4	Gas N_2O	Total CO_{2e}**
Oil platform	5,940,330	225,667	98	11,611,272
Non-platform	14,017,962	1,999	2,646	14,856,307
Total	**19,958,292**	**227,665**	**2,743**	**26,467,578**
Commercial fishing	531,190	3	25	538,842
Recreational fishing	435,327	3	21	441,559
Percent commercial fishing	2.66%	>0.01%	0.91%	2.04%
Percent recreational fishing	2.18%	>0.01%	0.77%	1.67%

*Compiled from Tables 6-11, 6-12, and 6-13 in Wilson et al. (2017). **The CO_2 equivalent (CO_2e) emission estimates represent the number of tons of CO_2 emissions with the same global warming potential as one ton of another greenhouse gas (e.g., CH_4 and N_2O). Conversion factors to CO_{2e} are 21 for CH_4 and 310 for N_2O.

3.3 Physical Environment

Descriptions of the physical environment of federal and state waters of the Gulf and South Atlantic and FKNMS can be found in the documents referenced at the beginning of Chapter 3. The descriptions include detailed information about the physical properties (e.g. temperature, depth), water quality (e.g. hypoxic zones, dissolved oxygen), habitat types, habitat quality, environmental sites of special interest, shipwrecks, and EFH. Many of the documents referenced above provide additional links and references to other sources of information about the physical environment of federal and state waters of the Gulf and South Atlantic and waters of FKNMS.

3.4 Economic and Social Environment

The purpose of this section is to describe the economic and social characteristics of the affected environment within the context of the actions and alternatives considered in this PEA. The lionfish fishery is not currently managed (see section 1.1) and, as described in sections 3.4.2 through 3.4.4, is commercial in nature only because: (1) no data are available on the recreational harvest of lionfish and (2) harvest from "recreational" derbies or similar activities that is sold is considered commercial harvest, and would therefore be captured in the economic and social description of the commercial fishery. The considered actions and alternatives would be expected to generate: (1) direct economic and social effects on the entities and their cooperators that have already submitted or intend to submit EFP or ONMS permit applications in order to test traps for the purpose of harvesting lionfish, (2) indirect economic and social effects on the entities that already participate in the lionfish fishery, and (3) indirect economic and social effects on the fisheries that interact with the lionfish fishery because the entities that participate in the lionfish fishery also participate in other fisheries. Because the lionfish fishery is still in its early stages of development and few entities rely primarily or solely on the harvest of lionfish, the vast majority of the entities currently in the lionfish fishery primarily participate in other fisheries. We also note that lionfish can directly affect other fisheries, but we do not find that the considered actions and alternatives would remove sufficient lionfish to benefit those fisheries.

3.4.1 EFP Applicants and Cooperators

To date, NMFS has received proposals from three "entities" to test certain types of traps whose purpose is to target lionfish. One of these applicants also submitted a permit application to ONMS to test certain trap types in waters of FKNMS. Although two of these proposals have been withdrawn, additional proposals or applications are likely to be submitted in the future. The expectation is that other entities that submit or cooperate with future proposals are likely to be similar in nature to the entities that have already submitted proposals to test the use of traps for targeting lionfish, or have submitted proposals to conduct similar types of research in the past. In general, these entities fall under the following categories: (1) environmental non-profit organizations, (2) non-profit business associations, (3) commercial fishing businesses,[28] (4) seafood dealers, (5) state or federal agencies/governmental jurisdictions, or (6) academic institutions.

The pending EFP application is from an environmental non-profit organization that is primarily focused on the protection of coral reefs and unifying the work of organizations that want to protect coral reef ecosystems from the adverse effects of invasive lionfish. However, according to its website, this organization is also very interested in creating "a steady supply and demand" and "centralized marketplace" for lionfish, which is consistent with its goal of developing "a potential trap fishery for lionfish," consistent with statements in the proposal. Thus, its operations will likely have a commercial aspect (i.e., revenue generating activities).

This applicant also owns two fishing vessels that are proposed to be used for commercial fishing purposes, as the applicant intends to use them to test traps off the coasts of multiple states (Florida, Alabama, Louisiana, and South Carolina). However, these vessels' activities must be relegated to operating in state managed fisheries or fisheries that are not managed, such as lionfish,[29] as neither of them have permits for any federally managed fishery in the Southeast Region. Further, the applicant does not own other vessels that have permits to operate in any federally managed fishery in the Southeast. The applicant is located in central Florida, though the two vessels are harbored in Suwanee, Florida. The applicant does not have a federal dealer permit, but presumably has a dealer license to sell in one or more states or a relationship with an

[28] An applicant may also be involved and possibly primarily involved in for-hire fishing.
[29] Though not managed, these entities cannot use traps to target lionfish, as traps are a prohibited gear in federal waters, and thus they seeking an EFP. 50 CFR 622.9(c).

entity that does possess a dealer permit or license. However, it is not possible to discern with certainty where the lionfish would be landed and sold given available information, though they could be landed and sold in the communities of Steinhatchee, Horseshoe Beach, or Cedar Key, Florida based on the locations of known seafood dealers near Suwanee, Florida.

One of the withdrawn applicants runs his own commercial fishing business composed of four vessels and is affiliated with another commercial fishing business that owns another vessel. These five commercial fishing vessels have federal permits to operate in several federally managed commercial fisheries, including South Atlantic snapper-grouper (SG), Gulf reef fish (RF), Spanish mackerel (SM), king mackerel (KM), Atlantic dolphin-wahoo (DW), and spiny lobster (LC). However, the applicant is only using one of his commercial fishing vessels to test traps for harvesting lionfish. Two other vessels owned by two separate businesses are also being used to test traps. One of the vessels is also owned by a commercial fishing business and has permits to operate in the SM, South Atlantic SG, LC, KM, Atlantic DW, and Gulf RF fisheries. The other vessel also has SM and Atlantic DW commercial permits, but appears to primarily operate as a for-hire fishing business as it has Atlantic DW, South Atlantic SG, and South Atlantic pelagics charter/headboat permits as well as Gulf RF and Gulf pelagics charter/headboat permits.

This withdrawn proposal indicates that the applicant intends to catch and market (sell) the harvested lionfish, and this would occur during the closed season for spiny lobster (i.e., April through July). More specifically, the proposal indicates that lionfish will be sold to a federally permitted seafood dealer (wholesaler) in Marathon, Florida. This business is vertically integrated as it also owns and operates a seafood market, restaurant, and marina in addition to the wholesale component of its operation.

Another since withdrawn application was submitted by a non-profit business association. This entity's primary purpose is to represent the interests of commercial fishing businesses in the state and federal fisheries management process. It is also involved in community-based programs and thereby serves as a liaison between the commercial fishing industry and the communities with which the industry is associated. This particular applicant appears to primarily function as a coordinator within the context of the proposal that was submitted as this applicant does not own any commercial fishing vessels, does not function as a seafood dealer, and has solicited the assistance of numerous cooperators.

Several collaborators are commercial fishing businesses that own one or more vessels and also operate as or are affiliated with seafood dealers. One collaborator is a commercial/for-hire fishing business that owns two fishing vessels, both of which are federally permitted to operate in commercial fisheries (e.g., spiny lobster) as well as the commercial and the for-hire sectors of multiple fisheries (e.g., South Atlantic SG, Atlantic DW, SM, and KM). Only one of these vessels was identified in the application as being used to test traps for the purpose of targeting lionfish. This collaborator is also affiliated with a seafood dealer. These businesses and their owners are located and operate in Ponce Inlet or Ormond Beach, Florida. Lionfish landings would likely be landed and sold in these communities.

Another collaborator is very similar except that it operates solely as a commercial fishing business. This business is composed of two fishing vessels that have commercial permits to operate in the SM, KM, Atlantic DW, and South Atlantic SG fisheries, and one vessel also operates in the spiny lobster fishery. Only one of these vessels was identified in the application as being used to test traps for the purpose of targeting lionfish. This collaborator is also affiliated with a seafood dealer. These businesses and their owners are located and operate in communities in the Florida Middle Keys (Islamorada and Conch Key). Lionfish landings would likely be landed and sold in these communities.

One of the other collaborators is a commercial fishing business made up of one fishing vessel that has permits to commercially operate in the South Atlantic SG, KM, and Atlantic DW fisheries, as well as the directed shark fishery. Although this business is not affiliated with a specific dealer, it is located in McClellanville, South Carolina, and thus lionfish landings would likely be landed and sold in this community. Another collaborator is a commercial fishing business that owns two fishing vessels, though only one is currently active. The active vessel has permits to operate in the Gulf RF and KM fisheries. The inactive vessel no longer possesses any federal fishing permits in the Southeast. Though the owner of this business is not a seafood dealer, the business is located in Madeira Beach, Florida and, because there are multiple seafood dealers in that community, some lionfish landings would likely be landed and sold in Madeira Beach.

An additional cooperator with this proposal is primarily a seafood dealer in Murrell's Inlet, South Carolina that also manages several commercial fishing vessels which operate in the South Atlantic SG fishery. Presumably, some lionfish would be landed with and bought from this dealer.

Another cooperator with this applicant is a business that primarily operates in the Public Relations and Publicity industry within the Engineering, Accounting, Research, and Management Services sector. Based on publicly available data, this business has been operating for approximately 35 years, is estimated to generate $300,000 in annual revenues, and employs approximately five people.

The other coordinators with this proposal are state agencies that are primarily responsible for managing fisheries in their respective jurisdictions (i.e., South Carolina Department of Natural Resources and FWC). Their interest in the proposed work is from the perspective of informing fisheries management decisions as opposed to an economic or financial interest.

Although these applications have been withdrawn, we expect similarly situated entities to submit applications in the future.

3.4.2 Commercial Lionfish Fishery

As previously stated, lionfish is not a federally managed species, but lionfish is bought and sold. From an economic perspective, the harvest and sale of fish constitutes a commercial fishery. Based on data provided by the Atlantic Coastal Cooperative Statistics Program ACCSP (J. Simpson, Jan. 31, 2018), the commercial lionfish fishery is a relatively new and developing fishery. As illustrated in Table 3.4.2.1, the commercial fishery was in an infancy stage from 2012-2014 with landings and revenues being relatively low. During these years, lionfish was mostly caught incidentally rather than as the result of targeting. Average price per pound was relatively high in 2012 but then declined noticeably in 2013 and in 2014 to a lesser extent. However, landings and revenues increased by nearly three-fold from 2014 to 2015 as lionfish began to be more frequently targeted by fishermen using certain gear types. Landings increased by an additional 48% in 2016 while revenues increased even more (66%) as a result of a 10% increase in the average ex-vessel price. Given the significant increase in landings, the ex-vessel price increase in 2016 suggests that the demand for lionfish is increasing and the market is expanding.

Table 3.4.2.1. Commercial Lionfish Landings, Revenue, and Average Price by Year, 2012-2016. Real values[30] are in 2016 dollars.

Year	Landings (whole lbs)	Nominal Revenue	Nominal Average Price	Real Revenue	Real Average Price
2012	14,093	$73,710	$5.23	$78,108	$5.54
2013	18,700	$83,681	$4.47	$87,374	$4.67
2014	28,870	$127,045	$4.40	$130,767	$4.53
2015	77,203	$342,292	$4.43	$346,779	$4.49
2016	114,239	$567,040	$4.96	$567,040	$4.96

Lionfish are harvested by many types of gear and fishing methods. For ease of presentation and to illustrate the gear/methods that are predominantly used, these gear types/methods have been condensed into the following four categories: (1) vertical line (includes all types of hook and line gear except longlines), (2) spears/by hand (including when diving gear is and is not used), (3) pots and traps (incidental harvest in fisheries where these gear types are allowed), and (4) other (includes all other gear, such as chemicals, various types of nets, longlines, and trawls). In 2012 and 2013, lionfish were predominantly harvested incidentally using pots and traps. In 2014, lionfish began to be targeted more frequently by using spears or harvesting by hand, sometimes using diving gear. The targeting of lionfish by these gear types/methods increased considerably in 2015 and 2016 and also expanded to vertical line gear. Thus, these two gear types are now the predominant methods to harvest lionfish, whereas incidental harvest by pots and traps has declined in its relative share of the landings in recent years.

With respect to ex-vessel prices, in general, the ex-vessel price of lionfish harvested by vertical lines, spears/by hand, and pots/traps have been about the same and followed similar patterns from 2012-2016. Conversely, the ex-vessel price for lionfish harvested using "other"

[30] Real values are adjusted for inflation.

gear has consistently been higher than the ex-vessel price for lionfish harvested by the other gear. It appears this is likely due to the fact that most fish harvested by the "other" gear are sold for the aquarium trade while most fish harvested by vertical lines, spears/by hand, and pots/traps are sold in the seafood market. From 2012 through 2016, the average ex-vessel price for lionfish sold in the aquarium trade was $7.74 per pound while the average ex-vessel price for lionfish harvested for consumption purposes was only $4.75. Still, the amount of fish harvested by "other" gear is relatively small compared to the other gear types during these years, and the same is true for lionfish sold for aquarium trade purposes (about 3% of total landings) as opposed to the seafood market (97% of total landings).

Table 3.4.2.2. Commercial Lionfish Landings, Revenue, and Average Price by Gear Category and Year, 2012-2016. Real values are in 2016 dollars.

Gear Category	Year	Landings (whole lbs)	Nominal Revenue	Nominal Average Price	Real Revenue	Real Average Price
Vertical Line	2012	644	$2,221	$3.45	$2,353	$3.66
	2013	1,795	$7,025	$3.91	$7,335	$4.09
	2014	2,451	$12,908	$5.27	$13,286	$5.42
	2015	20,909	$94,031	$4.50	$95,264	$4.56
	2016	23,498	$110,559	$4.71	$110,559	$4.71
Spears/By Hand	2012	3,147	$19,294	$6.13	$20,446	$6.50
	2013	5,082	$23,963	$4.72	$25,021	$4.92
	2014	17,183	$69,484	$4.04	$71,520	$4.16
	2015	49,752	$214,658	$4.31	$217,472	$4.37
	2016	83,009	$414,605	$4.99	$414,605	$4.99
Pots and Traps	2012	9,620	$46,717	$4.86	$49,505	$5.15
	2013	10,670	$46,307	$4.34	$48,351	$4.53
	2014	8,279	$38,295	$4.63	$39,417	$4.76
	2015	5,005	$22,794	$4.55	$23,092	$4.61
	2016	5,650	$29,622	$5.24	$29,622	$5.24
Other	2012	682	$5,478	$8.03	$5,805	$8.51
	2013	1,153	$6,386	$5.54	$6,668	$5.78
	2014	957	$6,358	$6.64	$6,544	$6.84
	2015	1,536	$10,810	$7.04	$10,951	$7.13
	2016	2,082	$12,254	$5.88	$12,254	$5.88

For the purposes of this PEA, and particularly the pots/traps component of the lionfish fishery, the fishery has been segmented into three regions: the South Atlantic, the Keys, and the

Gulf.[31] The Keys region is located in statistical areas 1, 2, 748, and 744. The South Atlantic region includes all statistical areas north of statistical area 744 along the U.S. eastern seaboard, while the Gulf region includes all statistical areas in U.S. waters north and west of statistical area 2 in the Gulf of Mexico. Table 3.4.2.3 illustrates how landings and ex-vessel revenues are distributed across these three regions.

Table 3.4.2.3. Commercial Lionfish Landings, Revenue, and Average Price by Region and Year, 2012-2016. Real values are in 2016 dollars.

Region	Year	Landings (whole lbs)	Nominal Revenue	Nominal Average Price	Real Revenue	Real Average Price
Gulf	2012	*	*	*	*	*
	2013	335	$636	$1.90	$665	$1.99
	2014	658	$2,344	$3.57	$2,413	$3.67
	2015	5,794	$24,812	$4.28	$25,137	$4.34
	2016	29,331	$142,569	$4.86	$142,569	$4.86
Keys	2012	11,469	$56,731	$4.95	$60,116	$5.24
	2013	14,064	$63,013	$4.48	$65,794	$4.68
	2014	11,957	$58,932	$4.93	$60,658	$5.07
	2015	14,430	$68,195	$4.73	$69,089	$4.79
	2016	15,658	$82,065	$5.24	$82,065	$5.24
South Atlantic	2012	2,618	$16,949	$6.47	$17,960	$6.86
	2013	4,302	$20,031	$4.66	$20,915	$4.86
	2014	16,255	$65,769	$4.05	$67,696	$4.16
	2015	56,980	$249,286	$4.37	$252,554	$4.43
	2016	69,250	$342,406	$4.94	$342,406	$4.94

Note: Cells with a "*" contain confidential data and thus cannot be disclosed.

In 2012 and 2013, most lionfish landings occurred in the Keys region and, in general, landings have been relatively stable in this region from 2012 through 2016. Conversely, the component of the fishery in the South Atlantic region started to grow in 2014 when landings in the region exceeded landings in the Keys region. Landings in the South Atlantic region continued to grow significantly in 2015 and 2016. The component of the fishery in the Gulf region was basically non-existent until 2015, but then saw significant growth in 2016. Though still much smaller in size, the Gulf component of the fishery grew by more both absolutely and relatively than the South Atlantic.

[31] Data for the Gulf region only covers landings on the Gulf coast of FL as no landings were reported in states further west. Generating estimates at the more refined sub-area level (e.g., federal vs state waters) is problematic because paper trip tickets typically only allow a single sub-area to be reported for a trip even if fishing occurred in multiple sub-areas that could cross federal and state water boundaries. As such, allocating trips and their associated landings and revenues to federal vs state waters will likely lead to inaccurate estimates. Further, breaking the data down to sub-areas will likely lead to additional and significant confidentiality issues, thereby precluding the data from being reported in any case.

As illustrated in Table 3.4.2.4, the primary gear types used in the three regions differ in some respects, as do the gear types that have fueled the recent expansions in the Gulf and South Atlantic regions. Specifically, the Keys region was dominated by landings using pots and traps from 2012 through 2014. However, landings by that gear type declined in 2015 while landings using spears/by hand increased such that spears/by hand has become the dominant gear type in the Keys. Pots and traps are rarely used to harvest lionfish in the South Atlantic or Gulf regions as only 332 pounds were harvested in total from 2012-2016. However, similar to the Keys, landings using spears/by hand increased in the Gulf beginning in 2015 and particularly in 2016 and is the dominant gear type in that region. Harvest using spears/by hand has also been the primary source of increased landings in the South Atlantic since 2013, though landings by vertical lines also increased significantly in 2015. Ex-vessel prices are basically consistent across gear types and regions, with the exception of lionfish harvested by "other" gear in the South Atlantic and particularly the Keys that are being sold in the aquarium trade for the most part.

Table 3.4.2.4. Commercial Lionfish Landings, Revenue, and Average Price by Region, Gear Category, and Year, 2012-2016. Real values are in 2016 dollars.

Region	Gear Category	Year	Landings (whole lbs)	Nominal Revenue	Nominal Average Price	Real Revenue	Real Average Price
Gulf	Vertical Line	2014	20	$71	$3.59	$73	$3.69
		2015	112	$429	$3.84	$435	$3.89
		2016	3,625	$16,598	$4.58	$16,598	$4.58
	Spears/By Hand	2014	477	$1,894	$3.97	$1,949	$4.09
		2015	5,362	$23,102	$4.31	$23,405	$4.37
		2016	25,174	$123,603	$4.91	$123,603	$4.91
	Other	2014	141	$310	$2.19	$319	$2.26
		2015	193	$836	$4.33	$847	$4.39
		2016	452	$1,992	$4.41	$1,992	$4.41
Keys	Vertical Line	2012	233	$525	$2.25	$556	$2.39
		2013	1,223	$4,509	$3.69	$4,708	$3.85
		2014	1,037	$7,176	$6.92	$7,386	$7.12
		2015	638	$2,497	$3.91	$2,529	$3.96
		2016	1,943	$9,523	$4.90	$9,523	$4.90
	Spears/By Hand	2012	1,184	$5,540	$4.68	$5,870	$4.96
		2013	1,555	$7,467	$4.80	$7,797	$5.01
		2014	2,039	$8,603	$4.22	$8,855	$4.34
		2015	8,209	$37,826	$4.61	$38,322	$4.67
		2016	7,337	$37,284	$5.08	$37,284	$5.08

Region	Gear Category	Year	Landings (whole lbs)	Nominal Revenue	Nominal Average Price	Real Revenue	Real Average Price
	Pots and Traps	2012	9,615	$46,687	$4.86	$49,473	$5.15
		2013	10,617	$46,167	$4.35	$48,205	$4.54
		2014	8,259	$38,225	$4.63	$39,344	$4.76
		2015	4,838	$22,186	$4.59	$22,477	$4.65
		2016	5,564	$29,222	$5.25	$29,222	$5.25
	Other	2012	437	$3,980	$9.11	$4,217	$9.65
		2013	669	$4,870	$7.28	$5,085	$7.60
		2014	622	$4,928	$7.92	$5,072	$8.16
		2015	745	$5,686	$7.63	$5,760	$7.73
		2016	815	$6,036	$7.41	$6,036	$7.41
South Atlantic	**Vertical Line**	2012	411	$1,696	$4.13	$1,797	$4.38
		2013	572	$2,516	$4.40	$2,627	$4.59
		2014	1,394	$5,662	$4.06	$5,828	$4.18
		2015	20,159	$91,105	$4.52	$92,300	$4.58
		2016	17,930	$84,438	$4.71	$84,438	$4.71
	Spears/By Hand	2012	1,963	$13,755	$7.01	$14,576	$7.43
		2013	3,435	$15,993	$4.66	$16,699	$4.86
		2014	14,667	$58,987	$4.02	$60,716	$4.14
		2015	36,182	$153,730	$4.25	$155,745	$4.30
		2016	50,497	$253,718	$5.02	$253,718	$5.02
	Other	2012	245	$1,498	$6.12	$1,588	$6.48
		2013	241	$1,382	$5.74	$1,443	$5.99
		2014	194	$1,120	$5.77	$1,153	$5.94
		2015	598	$4,288	$7.17	$4,344	$7.26
		2016	816	$4,227	$5.18	$4,227	$5.18

Note: Landings deemed confidential for particular region, gear category, and year combinations are not presented.

3.4.3 Participants in the Commercial Lionfish Fishery

Participants involved in the lionfish fishery can be broken down into four groups: fishermen/fishing businesses, vessels, seafood dealers, and communities. Although there is some overlap between the first three groups as some fishermen and fishing businesses are also vessel owners and sometimes seafood dealers as well, that is not universally true. Those who harvest the fish do not always own the vessels, while some fishing businesses own multiple vessels, and some entities that operate as seafood dealers are not at all involved in the harvesting sector. Communities have relationships with one or more entities in the first three groups.

Fishermen/Fishing Businesses

As would be expected based on the information in section 3.4.2, the fishery's growth has been driven by an increase in the number of commercial fishing businesses[32] participating in the fishery. As illustrated in Table 3.4.3.1, the number of commercial fishing businesses participating in the lionfish fishery increased in each year from 2012 through 2016. The annual rate of growth has also been relatively high during this time, running between 33% and 50% from 2012 to 2015, though declining slightly to 25% in 2016. These rates are consistently greater than the annual rate of growth in total landings and revenues. Also, although total landings and revenues have increased with respect to lionfish and all species for the businesses in the fishery, average (mean) and median landings and revenues per fishing businesses have steadily declined since 2013. Conversely, the percentage of each businesses' revenue that is accounted for by lionfish landings has increased, only slightly so when measured at the median but significantly so at the mean (average).

These statistics suggest that the vast majority of the new entrants to the fishery from 2014 to 2016 tend to be much smaller operations and target lionfish more relative to those that were participating in 2012 and 2013. This finding is consistent with findings in section 3.4.2 indicating that lionfish were predominantly harvested incidentally by gear/methods that were targeting other species in 2012 and 2013 (e.g., pots and traps), while targeting of lionfish through the use of spears and by hand increased significantly from 2014 through 2016. In general, fishing businesses that use spears or harvest fish by hand would be expected to be smaller operations relative to those that use other gear/methods with greater fishing power (i.e., harvesting via spears and by hand is very labor dependent while use of other gear is much less so). They would also be expected to be more dependent on the specific species they are targeting. Lastly, the mean values are consistently much greater than the median values. This suggests that the distribution of lionfish landings and revenues and dependence on such is highly skewed, meaning that a relatively small number of fishing businesses are responsible for a relatively high percentage of the landings and revenues and are also highly dependent on those landings and revenues, while most businesses are still only incidentally involved in and dependent on the fishery (i.e., landings and revenues from other fisheries are more important to their operations). Section 3.4.4 discusses which fisheries those are in more detail.

Vessels

In general, based on the information in Table 3.4.3.2, the trends in the lionfish fishery from the perspective of commercial fishing vessels are mostly comparable to the trends from the perspective of commercial fishing businesses. This is partly because many fishing businesses are composed of a single vessel. However, because some businesses are composed of multiple vessels, the number of active vessels in each year would be expected to be slightly higher than the number of active commercial fishing businesses. While that is true in 2014, it is not true in

[32] A commercial fishing business can be one of many types, e.g., sole proprietorship, partnership, or a specific type of corporation. Businesses were identified based on the name of the business as that is unique across states.

the other years from 2012-2016 based on the available data. However, the number of active vessels in Table 3.4.3.2 is likely an underestimate of the actual number of active vessels in each year because between 9% and 13% of the lionfish landings and ex-vessel revenues in each year cannot be assigned to a vessel because the landing vessel's Coast Guard documentation number or state registration number is missing in the state trip ticket data.[33] Thus, the total lionfish landings and ex-vessel revenues in each year are also underestimated and, more significantly, the ex-vessel revenue from other species is likely underestimated significantly in Table 3.4.3.2. It is not clear how these confounding factors affect the absolute value of the mean (average) and median estimates. In comparing estimates for fishing businesses and vessels, the estimates associated with ex-vessel revenues from other species, total ex-vessel revenues, and the percentage of ex-vessel revenues from lionfish landings in 2012 and 2013 at the vessel level appear to be most affected by this issue and so should viewed with caution.

[33] Because the lionfish fishery is mostly prosecuted in waters off of Florida, this problem mostly occurs in the Florida trip ticket data. Further, if a vessel is not identified as having landed lionfish in a given year, it is not possible to identify any non-lionfish landings and revenues the missing vessel may have accrued in that year.

Table 3.4.3.1. Selected Statistics for Fishing Businesses in the Commercial Lionfish Fishery, 2012-2016. Real values are in 2016 dollars.

Year	Number of Businesses	Statistic	Landings (whole lbs)	Nominal Revenue Lionfish	Nominal Revenue Other Species	Nominal Revenue Total	Real Revenue Lionfish	Real Revenue Other Species	Real Revenue Total	Percent Revenue Lionfish
2012	63	Total	14,093	$73,710	$8,570,304	$8,644,013	$78,108	$9,081,764	$9,159,873	
		Median	30	$154	$51,073	$51,403	$163	$54,121	$54,471	0.5
		Mean	224	$1,170	$136,037	$137,207	$1,240	$144,155	$145,395	5.3
2013	95	Total	18,700	$83,681	$14,025,839	$14,109,520	$87,374	$14,644,937	$14,732,311	
		Median	26	$110	$68,393	$69,989	$115	$71,412	$73,078	0.3
		Mean	197	$881	$147,640	$148,521	$920	$154,157	$155,077	3.2
2014	127	Total	28,870	$127,045	$18,534,146	$18,661,191	$130,767	$19,077,154	$19,207,921	
		Median	26	$111	$49,166	$49,358	$114	$50,606	$50,804	0.4
		Mean	227	$1,000	$145,938	$146,939	$1,030	$150,214	$151,243	7.8
2015	183	Total	77,203	$342,292	$16,305,533	$16,647,826	$346,779	$16,519,288	$16,866,067	
		Median	41	$190	$23,876	$24,805	$192	$24,189	$25,130	1.3
		Mean	422	$1,870	$89,101	$90,972	$1,895	$90,269	$92,164	19.4
2016	228	Total	114,239	$567,040	$17,405,639	$17,972,679	$567,040	$17,405,639	$17,972,679	
		Median	50	$232	$20,563	$21,774	$232	$20,563	$21,774	1.3
		Mean	501	$2,487	$76,341	$78,828	$2,487	$76,341	$78,828	23.6

Table 3.4.3.2. Selected Statistics for Fishing Vessels in the Commercial Lionfish Fishery, 2012-2016. Real values are in 2016 dollars.

Year	Number of Vessels	Statistic	Landings (whole lbs)	Nominal Revenue Lionfish	Nominal Revenue Other Species	Nominal Revenue Total	Real Revenue Lionfish	Real Revenue Other Species	Real Revenue Total	Percent Revenue Lionfish
2012	59	Total	12,521	$67,142	$4,832,748	$4,899,890	$71,149	$5,121,158	$5,192,307	
		Median	29	$154	$22,681	$22,831	$163	$24,034	$24,194	1.2
		Mean	212	$1,138	$81,911	$83,049	$1,206	$86,799	$88,005	17.5
2013	93	Total	16,952	$76,813	$10,880,675	$10,957,488	$80,203	$11,360,946	$11,441,150	
		Median	28	$135	$67,802	$67,862	$141	$70,795	$70,857	0.3
		Mean	182	$826	$116,997	$117,822	$862	$122,161	$123,023	8.0
2014	129	Total	23,955	$107,874	$15,591,336	$15,699,210	$111,034	$16,048,126	$16,159,160	
		Median	20	$95	$50,162	$50,666	$98	$51,631	$52,150	0.3
		Mean	186	$836	$120,863	$121,699	$861	$124,404	$125,265	7.0
2015	162	Total	67,404	$302,115	$15,939,880	$16,241,995	$306,076	$16,148,841	$16,454,917	
		Median	35	$173	$27,553	$28,441	$175	$27,914	$28,814	1.0
		Mean	416	$1,865	$98,394	$100,259	$1,889	$99,684	$101,574	12.8
2016	203	Total	98,211	$493,244	$16,696,043	$17,189,288	$493,244	$16,696,043	$17,189,288	
		Median	37	$185	$23,358	$26,611	$185	$23,358	$26,611	0.8
		Mean	484	$2,430	$82,247	$84,676	$2,430	$82,247	$84,676	17.9

Dealers

Like commercial fishing businesses and vessels in the harvesting sector, seafood dealers that purchase lionfish landings are also involved in the lionfish fishery. However, because they are a step removed from the harvesting sector, at most, they would only be indirectly affected by the actions and alternatives being considered in this EA and most of those affects would likely occur well in the future. Seafood dealers tend to be much larger operations on average than commercial fishing businesses and individual fishing vessels and thus, in general, relatively more significant changes in the fishery are needed before this sector experiences noticeable effects.[34] The operations of seafood dealers are more broadly described in one or more of the documents describing the more established fisheries (e.g., the Gulf RF fishery) as discussed in section 3.4.4. The following material only describes their participation in the lionfish fishery rather than the entirety of their operations across all fisheries. Table 3.4.3.3 provides some basic statistics describing the participation of seafood dealers in the lionfish fishery.

Table 3.4.3.3. Selected Statistics for Dealers in the Commercial Lionfish Fishery, 2012-2016. Real values are in 2016 dollars.

Year	Number of Dealers	Statistic	Landings (whole lbs)	Nominal Sales Lionfish	Nominal Average Price	Real Sales Lionfish	Real Average Price
2012	44	Total	14,093	$73,710	$5.23	$78,108	$5.54
		Median	33	$165	$5.00	$175	$5.30
		Mean	320	$1,675	$5.23	$1,775	$5.54
2013	56	Total	18,700	$83,681	$4.47	$87,374	$4.67
		Median	62	$341	$5.51	$356	$5.75
		Mean	334	$1,494	$4.47	$1,560	$4.67
2014	77	Total	28,870	$127,045	$4.40	$130,767	$4.53
		Median	63	$315	$5.00	$324	$5.15
		Mean	375	$1,650	$4.40	$1,698	$4.53
2015	99	Total	77,203	$342,292	$4.43	$346,779	$4.49
		Median	145	$570	$3.93	$577	$3.98
		Mean	780	$3,457	$4.43	$3,503	$4.49
2016	109	Total	114,239	$567,040	$4.96	$567,040	$4.96
		Median	136	$720	$5.29	$720	$5.29
		Mean	1,048	$5,202	$4.96	$5,202	$4.96

In general, the trends at the dealer level largely mimic those seen in the harvesting sector, particularly for commercial fishing businesses, which by necessity they must because every pound of lionfish landed is bought by a dealer and every dollar of revenue to a commercial

[34] The exception to this general statement is commercial fishing businesses that have dealer licenses and also operate as their own dealer.

fishing business represents an equivalent purchase by a dealer. And, as expected, because they operate on larger volumes, there are only about half as many dealers in the fishery as there are fishing businesses and vessels. However, although the mean (average) values per dealer generally exceed the median values for landings and revenue/sales variables, which is not always the case for prices. In fact, it is more often the case that the median sales price exceeds the mean (average) price. This suggests that, although a relatively small number of dealers may be responsible for purchasing a relatively large percentage of the landings, there are a relatively large number of, most likely, smaller dealers who are willing to pay a higher price than their larger counterparts. These dealers likely have access to particular markets that sell to customers/consumers with a higher willingness to pay, perhaps because they are receiving a higher quality product, thereby allowing the dealer to pay the fishermen more for the product. This could be another sign of developing markets, where separate markets are forming to serve customers who are willing to pay different prices for lionfish.

Communities

In established fisheries, it is preferable to identify a "community" at a relatively fine geographic scale such as a city or zip code. However, in a still relatively small and developing fishery like the lionfish fishery, that is not possible due to confidentiality issues (i.e., practically all cities where lionfish are landed/sold and where dealers, fishing businesses, and vessels operate from, one or more of their numbers are less than three and thus the data cannot be disclosed). Thus, in this case, as in other small fisheries, the data has been compiled at the county level to discern which counties are most closely associated and highly engaged in the lionfish fishery. More complete descriptions of these counties (communities) and their relationships with federally managed fisheries can be found in the social descriptions of the documents references in section 3.4.4.

In a developing and expanding fishery, the number of communities associated with that fishery would be expected to increase over time just like the number of dealers, fishing businesses, and vessels. Based on the information in Table 3.4.3.4, that has indeed been the case as the number of communities associated with the fishery has increased from 3 in 2012 to 11 in 2016. From 2012 through 2016, all of the counties (communities) strongly associated with the fishery were in Florida. From 2012 through 2014, Monroe County (i.e., the Keys) was the community most closely associated with the lionfish fishery. In fact, there really was no other community closely associated with the fishery until 2015 when the association between the fishery and Brevard County and particularly Volusia County grew considerably, at least with respect to ex-vessel landings and revenues. Both of these communities are on the Atlantic coast of Florida. Further growth in the lionfish fishery was evidenced in all three of these communities in 2016, but growth was also seen in Palm Beach County on the Atlantic coast, as well as in multiple counties in the Panhandle area of Florida (Escambia, Bay, Duval, and Okaloosa). This change in the spatial distribution of the fishery indicates general growth in the fishery from an economic and social perspective, but may also reflect an expanding population into other areas, particularly on the Gulf coast of Florida.

Table 3.4.3.4. Landings, Revenues, Number of Dealers, Fishing Businesses, and Vessels in the Commercial Lionfish Fishery by County and Year, 2012-2016. Real values are in 2016 dollars.

Year	County	Landings (whole lbs)	Nominal Sales Lionfish	Real Sales Lionfish	Number of Dealers	Number of Fishing Businesses	Number of Vessels
2012	Broward	1,125	$5,698	$6,038	4	3	3
2012	Monroe	11,646	$57,265	$60,682	31	42	39
2012	Palm Beach	479	$2,055	$2,178	4	7	5
2013	Broward	345	$1,436	$1,500	4	6	6
2013	Charleston	11	$25	$26	3	3	3
2013	Monroe	13,873	$62,473	$65,231	34	57	56
2013	Palm Beach	771	$3,402	$3,552	6	9	10
2014	Brevard	2,447	$9,390	$9,665	6	12	12
2014	Broward	2,248	$7,892	$8,123	7	7	8
2014	Indian River	2,715	$10,009	$10,302	4	5	4
2014	Monroe	10,664	$54,983	$56,594	32	53	54
2014	Miami-Dade	59	$270	$278	4	4	4
2014	New Hanover	995	$4,380	$4,508	4	4	4
2014	Palm Beach	1,518	$5,295	$5,450	3	9	7
2014	Pinellas	344	$1,245	$1,281	7	13	15
2014	Volusia	1,073	$4,286	$4,412	4	4	2*
2015	Brevard	16,641	$76,853	$77,860	7	19	13
2015	Broward	2,391	$11,360	$11,508	7	7	5
2015	Georgetown	2,370	$12,479	$12,643	3	13	12
2015	Monroe	13,140	$64,075	$64,915	36	69	68
2015	Miami-Dade	304	$1,248	$1,265	7	7	7
2015	Palm Beach	5,090	$22,174	$22,465	11	18	17
2015	Pasco	528	$2,606	$2,640	5	4	5
2015	Pinellas	1,856	$8,994	$9,112	6	21	17
2015	Volusia	21,906	$90,651	$91,839	10	11	10
2016	Bay	7,215	$35,704	$35,704	3	20	16
2016	Brevard	16,557	$91,097	$91,097	6	21	16
2016	Broward	1,623	$7,724	$7,724	8	11	9
2016	Duval	6,246	$31,609	$31,609	3	3	3
2016	Escambia	9,388	$45,142	$45,142	8	10	5
2016	Monroe	15,126	$80,232	$80,232	39	64	69
2016	Miami-Dade	392	$1,774	$1,774	6	8	6
2016	Okaloosa	5,492	$29,711	$29,711	8	8	5
2016	Palm Beach	8,106	$42,597	$42,597	6	21	17
2016	Pinellas	3,541	$16,311	$16,311	9	27	26
2016	Volusia	27,176	$121,060	$121,060	8	13	11

*There were two vessels associated with two fishing businesses whose IDs were missing in the data. Thus, the actual number of fishing vessels in this case is four even though the number is reported as two.

3.4.4 Economic Impacts of the Lionfish Fishery

The commercial harvest and subsequent sales and consumption of fish generates business activity as fishermen expend funds to harvest the fish and consumers spend money on goods and services, such as lionfish purchased at a local fish market and served during restaurant visits. These expenditures spur additional business activity in the region(s) where the harvest and purchases are made, such as jobs in local fish markets, grocers, restaurants, and fishing supply establishments. In the absence of the availability of a given species for purchase, consumers would spend their money on substitute goods and services. As a result, the analysis presented below represents a distributional analysis only; that is, it only shows how economic impacts may be distributed through regional markets and should not be interpreted to represent the impacts if these species are not available for harvest or purchase.

Estimates of the U.S. average annual business activity associated with the commercial harvest of lionfish were derived using the model[35] developed for and applied in NMFS (2016a) and are provided in Table 3.4.4.1. This business activity is characterized as full-time equivalent jobs, income impacts (wages, salaries, and self-employed income), and output (sales) impacts (gross business sales). Income impacts should not be added to output (sales) impacts because this would result in double counting. Rather than using an average over multiple years, these impact estimates reflect the expected impacts from annual gross revenues generated by landings of lionfish in 2016 only because the fishery is expanding and thus previous years' annual gross revenues do not reflect the current state of the fishery nor its state in the foreseeable future.

The results provided should be interpreted with caution and demonstrate the limitations of these types of assessments. These results are based on average relationships developed through the analysis of many fishing operations that harvest many different species. Separate models for individual species are not available. In 2016, landings of lionfish resulted in approximately $570,000 in gross revenue. In turn, this revenue generated employment, income, value-added, and output impacts of 76 jobs, $2.1 million, $2.9 million, and $5.6 million, respectively. Also, these impact estimates are based on multipliers associated with the Gulf RF and South Atlantic SG fisheries as they seemed most comparable to the markets and industries associated with the lionfish fishery.

[35] A detailed description of the input/output model is provided in NMFS (2011a).

Table 3.4.4.1. Economic impacts of the Commercial Lionfish fishery. All monetary estimates are in thousands of 2016 dollars and employment is measured in full-time equivalent jobs.

Industry sector	Direct	Indirect	Induced	Total
Harvesters				
Employment impacts	13	2	3	18
Income impacts	$306	$57	$137	$500
Total value-added impacts	$326	$205	$235	$766
Output Impacts	$567	$461	$457	$1,485
Primary dealers/processors				
Employment impacts	3	1	2	6
Income impacts	$100	$92	$87	$279
Total value-added impacts	$106	$117	$164	$388
Output impacts	$322	$242	$320	$884
Secondary wholesalers/distributors				
Employment impacts	1	0	1	3
Income impacts	$60	$18	$63	$140
Total value-added impacts	$63	$30	$107	$200
Output impacts	$159	$58	$208	$425
Grocers				
Employment impacts	5	1	1	7
Income impacts	$122	$41	$61	$225
Total value-added impacts	$130	$66	$104	$300
Output impacts	$209	$106	$204	$520
Restaurants				
Employment impacts	34	2	6	42
Income impacts	$491	$149	$281	$921
Total value-added impacts	$523	$266	$474	$1,264
Output impacts	$957	$417	$935	$2,309
Harvesters and seafood industry				
Employment impacts	57	6	13	76
Income impacts	$1,079	$356	$630	$2,065
Total value-added impacts	$1,150	$684	$1,084	$2,918
Output impacts	$2,214	$1,285	$2,124	$5,623

3.4.5 Other Affected Fisheries

As discussed in section 1.1, lionfish are thought to have adverse effects on populations of reef fish. Assuming the presence of lionfish does cause reef fish populations to be lower than they would be otherwise, their presence would in turn be expected to have adverse effects on the fishermen, fishing vessels/businesses, and fishing communities that are engaged in or are dependent on those species. Removing lionfish via trap as contemplated in the proposed action could also have an effect on those fisheries. With respect to federally managed fisheries, the Gulf RF fishery and the South Atlantic SG fishery are expected to be adversely affected by the presence of lionfish and could benefit the most from lionfish removal.

Also, as discussed in section 3.4.2, with the exception of some participants that harvest lionfish using spears or by hand, most participants in the lionfish fishery harvest lionfish incidentally and thus primarily depend on revenues generated by the harvest of other species. More specifically, South Atlantic fishermen who harvest lionfish are primarily involved in four fisheries: spiny lobster, SG, stone crab, and king mackerel (which is managed under the Gulf and South Atlantic FMP for Coastal Migratory Pelagics (CMPs)). From 2012-2016, these fisheries accounted for 43.4%, 31.8%, 4.4%, and 2.3% of their non-lionfish commercial fishing revenues, respectively, with the other 18.1% coming from a wide variety of other fisheries that are, for the most part, not federally managed.

Gulf fishermen who harvest lionfish are also primarily involved in four fisheries: RF, spiny lobster, stone crab, and shrimp. From 2012-2016, these fisheries accounted for 46.8%, 20.3%, 11.6%, and 10.9% of their non-lionfish commercial fishing revenues, respectively, with the other 10.4% coming from numerous other fisheries that are, for the most part, not federally managed. The most recent description of the economic and social environments for the spiny lobster fishery in the Gulf and South Atlantic is contained in Regulatory Amendment 4 to the FMP.[36] The most recent description of the economic and social environments for the commercial sector of the South Atlantic SG fishery is contained in Regulatory Amendment 27 to the FMP.[37] The most recent description of the economic and social environments for the commercial sector of the Gulf RF fishery is contained in Amendment 49 to the FMP[38], though Amendment 36A[39] contains a more in-depth description of the Individual Transferable Quota programs that include most of the species targeted in the commercial sector. The stone crab fishery occurs in waters off the state of Florida. The stone crab fishery in South Atlantic waters has never been federally managed and the FMP for stone crab in Gulf waters was repealed by the Gulf Council in September 2011. The most recent description of the economic environment for the Florida stone crab fishery is contained in Vondruska (2010). The most recent description of the economic and social environments for the commercial sector of the king mackerel fishery is contained in Framework Amendment 5 to the Gulf and South Atlantic FMP for CMPs. Lastly, the most recent description of the economic and social environments for the Gulf shrimp fishery is contained in Amendment 17B to the FMP[40]. The economic and social descriptions of the Gulf and South Atlantic fisheries noted above are incorporated here by reference.

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[36] http://gulfcouncil.org/wp-content/uploads/Final-SpinyRegAm4_July-2017.pdf
[37] http://safmc.net/fishery-management-plans-amendments/snapper-grouper-fishery-management-plan/
[38] http://gulfcouncil.org/wp-content/uploads/E-6-Public-Hearing-Draft-Sea-Turtle-Release-Gear-and-Framework-Procedure-1_16_18BB.pdf
[39] http://gulfcouncil.org/wp-content/uploads/RF36A-Post-Final-Action-5-25-2017-with-bookmarks.pdf
[40] http://gulfcouncil.org/wp-content/uploads/Final-Shrimp-Amendment-17B.pdf

Chapter 4. Environmental Consequences and Comparison of Alternatives

Commercial fishermen utilize traps as the primary gear in several southeast fisheries (spiny lobster, stone crab, golden crab, and black sea bass). Effort in these trap fisheries is controlled through individual trap endorsements (spiny lobster, stone crab, black sea bass) and/or by a limited entry program (spiny lobster, black sea bass, golden crab). These programs keep fishing effort at levels appropriate for minimizing the effects of bycatch and habitat. Potential effects of commercial trapping on marine life and habitat were analyzed in fishery management plan (FMP) amendments for the fisheries referenced above. Effects specific to testing various traps and design modifications for lionfish capture, as described in the proposed actions, are covered here.

To assess the potential effects of the various trap types it was assumed that the potential effects to non-target species, protected species, and habitats would be similar for all trap types with the exception of non-containment traps. Non-containment traps when deployed in the water do not passively capture fish. They only close, and prevent a fish's escape, upon retrieval. They are effective in capturing lionfish because of lionfish's behavior. Lionfish are known to be attracted to and congregate around structures. They do not flee in the face of threats and are not startled by abrupt movements, which is opposite behavior that is seen in other finfish species. For these reasons, the National Marine Fisheries Service (NMFS) believes that is highly unlikely that non-containment traps would capture any fish species other than lionfish.

All of the other proposed containment trap types are anticipated to have the same potential effects to non-target species, protected species, and habitats. For example, a potential effect to sea turtles and marine mammals might be possible entanglement in trap lines. NMFS assumes that the entanglement risk to a sea turtle from a black sea bass pot would be the same as a spiny lobster trap, because the risk of entanglement is from the vertical line attached to the trap, and not from the design of the trap itself. It is also assumed the potential effects to habitat would be similar for the various trap types because the main route of effect to habitat from a trap is physical damage if the trap or trap lines come into contact with habitat. NMFS assumed traps are likely to be weighted similarly and deployed in a similar fashion across the various trap types. This PEA contemplates the issuance of EFPs and ONMS permits to test trap types in areas where and at times when they have not been used. Therefore, NMFS and ONMS do not have specific data on how those traps have previously affected those areas. As such, NMFS and ONMS used the data available for traps in similar areas or for different times of year to evaluate potential effects. This analysis is based on the best information available.

4.1 Action 1. Allowable trap types

4.1.1 Biological and Physical Effects

Biological Effects

This section examines the potential biological effects of the various trap types and modifications. The number of traps and location where they will be fished also are factors to consider in evaluating effects, and they will be considered when we evaluate Actions 2 and 3.

> ***Action 1 Alternatives****
>
> Alt. 1 (No Action). No permits issued, therefore no allowable traps.
> **NMFS Pref Alt. 2**. Specified traps (based on proposed traps/modifications).
> Alt. 3. Certain NOAA-approved traps.
> Alt. 4. Non-containment traps.
> **ONMS Pref Alt. 5**. Within FKNMS:
> Option a. Already-approved traps.
> **ONMS Pref Option b**. Approved and not approved traps.
>
> * See Chapter 2 for detailed description of alternatives

Expected Effects on the Biological Environment from Removal of Lionfish

The lionfish invasion has had negative biological effects on marine ecosystems of the southeast U.S. (Albins and Hixon 2008; Barbour et al. 2011; Green et al. 2012). The expansion of their range and their increased densities are adding pressure to already highly stressed coral reef ecosystems, and competition with lionfish could reduce the resiliency and slow the recovery of exploited reef fish populations. **Alternative 1 (No Action)**, which would not result in the issuance of permits for testing traps to target lionfish, would be expected to result in no information about the effectiveness of different trap types or design modifications to traps in the capture of lionfish. Further, information would not be gathered about the potential avoidance and minimization of impacts to non-target species, protected species, or habitats. Under **Alternative 1 (No Action)**, permitted traps would not be deployed specifically to target lionfish, which would likely result in less pressure on lionfish. This would prevent any benefits to the biological environment from removing lionfish (reduced competition with lionfish for prey species, potential for increased abundance of prey species that lionfish may have removed).

NMFS Preferred Alternative 2 through **ONMS Preferred Alternative 5** would allow testing the effectiveness of various traps and design modifications at capturing lionfish. **NMFS Preferred Alternative 2** through **ONMS Preferred Alternative 5** are expected to improve knowledge of how to effectively harvest lionfish and/or avoid and minimize unintended biological impacts to non-target species, protected species, and habitats. These alternatives differ in determining which trap types and design modifications would be allowed. **ONMS Preferred Alternative 5**, **Option a** and **Preferred Option b** would determine which trap types would be allowed to gain knowledge about the effectiveness of traps to harvest lionfish within the Florida Keys National Marine Sanctuary (FKNMS).

Some benefits to local ecosystems from removing lionfish, such as reduced competition between native fish species with lionfish for prey and increased abundance of prey species that lionfish may have removed, could result if trap testing proves to be effective at removing lionfish from the action area. However, the extent of the potential benefits is indeterminate. We do not yet know which trap type would be the most effective at targeting and removing lionfish in the greatest numbers.

Expected Effects to Co-Occurring Species

Biological effects from testing of traps to target lionfish could result from bycatch of commercially, recreationally, and ecologically important species, such as spiny lobster, snapper-grouper, and other reef fish. Traps that are lost or move can have the potential to ghost fish[41], which could result in prolonged periods of bycatch. **Alternative 1 (No Action)** would not result in any impacts to co-occurring species among the alternatives considered, as permits would not be issued and therefore applicants would not be allowed to test various trap types or design modifications to target lionfish (no potential for bycatch). However, **Alternative 1 (No Action)** would also not allow any applicant to gain knowledge about the traps and strategies that ultimately could prove to be effective at capturing lionfish while avoiding and minimizing impacts to non-target species.

Containment traps proposed for testing in **NMFS Preferred Alternative 2** and **Alternative 3** could result in bycatch of species other than lionfish. However, it is expected that finfish and shellfish bycatch would be minimal based on data from areas similar traps are used as part of approved fisheries. Studies have documented low bycatch and bycatch mortality of finfish by the commercial spiny lobster trap fishery for both wooden and plastic traps (Matthews et al. 1994; Matthews and Donahue 1997). Most of the finfish caught in commercial spiny lobster traps are juveniles and all escape within 48 hours (Matthews and Donahue 1997). Stone crabs were the most dominant species caught in two studies of lobster traps (Matthews et al. 1994; Matthews and Donahue 1997). Bycatch species resulting from the testing the effectiveness of American lobster pots to capture lionfish (Fleming 2016) included small quantities of slipper lobsters, spiny lobsters, small groupers, and snails. Landings of species other than black sea bass from the commercial black sea bass pot portion of the snapper-grouper fishery consist of white grunt, gray triggerfish, greater amberjack, red porgy, gag, and red snapper. However, species other than black sea bass constituted small proportions of landings showing that the black sea bass pot sector exhibits low bycatch. Discarded bycatch includes black sea bass, spottail pinfish, gray triggerfish, white grunt, and scup, the greatest number being small black sea bass (SAFMC 2016a). The stone crab fishery is not considered to have any substantial bycatch other than undersized stone crabs (Seafood Watch 2013). Pinfish traps are currently not authorized for use in federal waters, however it could be expected that some small finfish and shellfish bycatch could occur. Historic fish trap use, other than black sea bass pots, showed that bycatch was minimal in the Gulf of Mexico (Gulf) and around the Florida Keys as all species landed of legal size were most likely harvested. Because bycatch for these commercial trap fisheries is very low, it is expected bycatch associated with the testing of traps under **NMFS Preferred Alternative 2** and **Alternative 3** would be similar between traps and also be very low.

Additionally, proposed trap modifications under **NMFS Preferred Alternative 2** include reduced funnel sizes that could lessen the potential capture of non-target finfish and spiny lobster. For some traps, the addition of optical recognition devices programmed to activate a

[41] Ghost traps are traps that fishermen cannot locate and retrieve or that are abandoned, but still capable of catching fish. See the Cumulative Effects Analysis for more information on ghost fishing.

funnel opening allowing for ingress by lionfish only could reduce the extent of bycatch during testing.

NMFS Preferred Alternative 2 and **Alternative 4** propose testing of non-containment traps (e.g., purse traps). Non-containment traps are fished unbaited and exploit the tendency of lionfish to aggregate around structures. Preliminary testing of these devices has resulted in no finfish or shellfish bycatch (Gittings et al. 2017).

ONMS Preferred Alternative 5 proposes two options within waters of FKNMS. These include testing traps already approved for use in the area (**Option a**) and testing both approved and other traps (**Preferred Option b**). **Option a** has the potential to result in the same type of bycatch as the trap fisheries currently allowed in FKNMS. Refer to **NMFS Preferred Alternative 2** and **Alternative 3**, above, for a discussion of impacts to co-occurring species from gear types that are currently in use in approved fisheries in the FKNMS (e.g., spiny lobster, stone crab). **ONMS Preferred Option b** would allow testing of trap types that are approved for use elsewhere in the southeast region under state or federal regulations (e.g., black sea bass pots, which are allowed in South Atlantic waters north of the Florida Keys, golden crab traps), and traps that are approved for use in other managed fisheries (e.g., American lobster pot). There is no data on the potential bycatch of these traps in the waters of the FKNMS as they are not currently in use in the FKNMS; however, effects would likely be based on the quantity and duration of trap deployments. In addition, even though the size, shape, and construction materials may vary, these traps are anticipated to have the same effects to non-target species as approved traps. However, **ONMS Preferred Option b** would also promote testing of non-containment traps. As noted above, preliminary testing of these devices has resulted in no finfish or shellfish bycatch.

Allowing the testing of the trap gear in **Alternative 3** would result in the greatest negative biological effect from bycatch due to the lack of bycatch reducing modifications, followed by **NMFS Preferred Alternative 2** and **ONMS Preferred Alternative 5, Option b** (with proposed modifications), and no anticipated bycatch to co-occurring species from **Alternative 4** or **Alternative 1 (No Action)**.

Expected Effects to Protected Species

Alternative 1 (No Action) would result in the greatest positive biological effects to protected species among the alternatives considered, as the alternative would not allow trap testing. Testing traps creates the potential for interactions with protected species, including entanglement, bycatch, and direct interactions with traps. Entanglement in fixed fishing gear is a leading cause of North Atlantic right whale (NARW) mortality (Knowlton et al. 2012) and is also a risk to other large whales (e.g., humpback, Bryde's whale), bottlenose dolphins, sea turtles, and smalltooth sawfish. Traps/pots that are moved by extreme weather events can also damage sensitive coral colonies. **Alternative 1 (No Action)** would not allow trap testing, avoiding entanglement, bycatch risk, and interactions with corals. However, knowledge would not be gained regarding about the effectiveness of various trap types and design modifications at avoiding and minimizing potential effects to protected resources.

NMFS Preferred Alternative 2 through **ONMS Preferred Alternative 5**, **Option b** could increase the potential for gear interactions with protected species and all would have negative biological effects on protected species. Most of the proposed trapping gear in **NMFS Preferred Alternative 2** through **ONMS Preferred Alternative 5**, **Option b** are currently utilized in the commercial sector in the southeast or have been in the past. Negative impacts from these gear types have been analyzed in other fishery management plans and described in Chapter 3. Negative biological effects could increase based on trap testing location, effort, and bait (Actions 2 through 4). Impacts include entanglement of protected species, such as sea turtles, dolphins, and whales; bycatch of protected species, such as Nassau grouper; and impacts to hard bottom such as corals.

NMFS Preferred Alternative 2 through **ONMS Preferred Alternative 5**, **Option b** could increase the risk of entanglement of protected species. These alternatives have similar negative biological effects for potential entanglement unless lineless traps are used. Trawl traps would potentially result in less vertical line in the water than single traps depending on the level of effort and may decrease the potential risk of entanglement; however, if an animal is entangled, the drag and weight of multiple traps could increase negative biological effects and likely increase the probability of serious injury or mortality. Weak links and designed break-aways between traps configured in a trawl could potentially help to mitigate these impacts, if an animal were to become entangled in a vertical trap line. Experimental trap gear could also be uniquely marked to help identify the trap as a non-containment trap should any entanglement occur.

The most effective method to prevent or reduce protected species entanglement risk when traps are used is to limit where they are placed (outside areas where protected species are present) or by removing vertical line from with water column by use of lineless gear. A summary of these mitigation measures along with additional recommendations on reducing trap gear impacts on protected species is provided below. More information on these mitigation measures is available in Chapter 5.

Trap gear proposed for testing included in **NMFS Preferred Alternative 2**, **Alternative 3,** and **ONMS Preferred Alternative 5**, **Option b** could also result in bycatch of species other than lionfish. **Alternative 4** proposes testing non-containment traps for lionfish capture and would likely result in the least negative biological effects to Nassau grouper bycatch after **Alternative 1 (No Action)**.

Traps also have the potential to interact with stationary protected species, such as ESA-listed corals. Any use of a wire trap in **Preferred Alternative 2** through **Preferred Alternative 5**, **Option b** would result in less potential impacts to Endangered Species Act (ESA)-listed corals because wire traps have been documented to move less distance during a storm event. Therefore, any use of wood traps under **Preferred Alternative 2** through **Preferred Alternative 5**, **Option b** may increase the potential negative biological effects to ESA-listed coral if they move during a storm. Additional specific discussion regarding location of trap placement is included in Section 4.2.1, and information on mitigation is included in Section 5.1.

Physical Effects

Traps are often used to harvest species associated with coral and hard bottom habitat and, thus may negatively impact and degrade corals and hard bottom habitat as a result of interactions between the traps and the environment. Traps can collide with the environment, causing breaking or abrading corals or otherwise damaging the bottom. Lionfish also are associated with coral and hard bottom habitat and thus trapping to capture lionfish could have similar effects on habitat as trapping to capture other species. More studies have been conducted on the impacts of traps on corals than on hard bottom or other bottom types. Gomez et al. (1987) noted the incidental breakage of corals occurs when traps fall or settle upon them.

Van der Knapp (1993) noted that fish traps set on staghorn coral easily damaged the coral. The greatest impact is caused when the trap's frame hits the coral formation directly. It appeared that in all observed cases of injury due to traps, the staghorn coral regenerated completely, although the time for regeneration varied from branch to branch. In general, when hard coral is impacted or injured, algae growth can prevent regeneration in the damaged portion of the coral. Damaged gorgonians have been reported to recover completely within a month (Van der Knapp 1993).

Appeldoorn et al. (2000) commented that traps may physically damage live organisms, such as corals, gorgonians, and sponges, which provide structure and, in some cases, nutrition for reef fish and invertebrates. Damage may include flattening of habitats, particularly by breaking branching corals and gorgonians; injury may lead to reduced growth rates or death, either directly or through subsequent algal overgrowth or disease infection. During initial hauling, a trap may be dragged over more substrate until it lifts off the bottom. Traps set in trotlines can cause further damage from the trotline being dragged across the bottom, potentially shearing off at their base those organisms most important in providing topographic complexity. Traps that are lost or set unbuoyed are often recovered by dragging a grappling hook across the bottom. This practice can result in dragging-induced damage from all components (grappling hook, trap, trotline). The area swept by trotlines upon trap recovery is orders of magnitude greater than the cumulative area of the traps themselves. Appeldoorn et al. (2000) documented that single-buoyed fish traps off La Parguera, Puerto Rico, have an impact footprint of approximately $1/m^2$ on hard bottom or reef. Trap hauling resulted in 30% of the traps inflicting additional damage to the substrate. While traps are typically weighted, storms can carry them long distances potentially damaging important seagrass or coral reef habitat (Uhrin 2016). Buoyed and sinking line from deployed and lost gear can also pose entanglement risks with sensitive habitat (Adimey et al. 2014; Knowlton et al. 2012, 2016).

Alternative 1 (No Action) would provide the least negative effects to the physical environment among the alternatives considered, as the alternative would not allow testing traps to target lionfish. Allowing the testing of trap gear and modifications in **Preferred Alternative 2**, **Alternative 3**, and **Alternative 4** could result in gear interactions with sensitive habitat. Most of the proposed gear in **Preferred Alternative 2** and **Alternative 3** are currently utilized in commercial fisheries in the southeast or have been in the past, and are expected to have similar effects. Proposed modifications to the traps are not likely to affect how the gear interacts with the bottom.

Barnette (2001) used over 600 papers compiled by Rester (2000a, 2000b, 2001) to examine fishing impacts in the Southeast Region. Both the Gulf of Mexico Fishery Management Council (Gulf Council) and South Atlantic Fishery Management Council (South Atlantic Council) relied heavily on Barnette (2001) in their evaluations of the effects of fishing gear and activities on habitat. Those analysis are found in the Gulf Council's 2005 Generic EFH Amendment #3 and associated environmental impact statement (GMFMC 2004) and the South Atlantic Council's 1998 Generic EFH Amendment and associated Habitat Plan for the South Atlantic Region (SAFMC 1998) and Fishery Ecosystem Plan (SAFMC 2009). Specifically, Section 3.5.2.1.8 of GMFMC (2005) and Section 6.2.2.2 (SAFMC 2009) are incorporated by reference.

Under **ONMS Preferred Alternative 5**, allowing testing of already-approved traps in FKNMS (**Option a**) has the potential to result in the same type of impact to the physical environment of FKNMS as the trap fisheries currently allowed in FKNMS (e.g., spiny lobster traps, stone crab traps), because the effects are largely known. This is not to say that those effects would be negligible or discountable; on the contrary, spiny lobster traps are known to move in the shallow-water environments of the sanctuary during high wind and wave events, damaging nearby sensitive seagrass, hard bottom, and corals (Lewis et al. 2009). However, as noted above, impacts from these approved gear types have been analyzed in existing fishery management plans as referenced, and since approved trap types would be used, their effects would be expected to be similar to those experienced in the commercial fishery. Impacts to the physical environment of the FKNMS under **ONMS Preferred Option b,** as compared to **Option a**, are somewhat unknown. There is no data on how trap types not currently approved for use in the FKNMS, such as black sea bass pots, golden crab traps, and American lobster pots, might interact with sensitive seabed communities found in the FKNMS. It may be postulated that those effects would be comparable to approved traps with the same or similar footprint, line/buoy configuration, and weighting as non-approved traps because the size, footprint, weight, and lines configurations are the factors that influence how the traps move and interact with the physical environment. **Option a** would not allow for testing of any other trap types beyond designs currently allowed in FKNMS. Because lionfish are extremely prolific in number in the waters of FKNMS and because FKNMS contains habitat and combinations thereof (e.g., seagrass beds and coral reefs) found minimally outside the FKNMS, testing various trap designs for their effectiveness at lionfish removal is essential. Under **Option a,** NMFS and ONMS would not gain any additional knowledge about the effectiveness of alternative trap types or design modifications at capturing lionfish, and/or reducing impacts to non-target species, protected species and habitats within FKNMS.

Various requirements on trap design that could further mitigate the risks to habitat, non-target species, and protected species are discussed in Chapter 5.

4.1.2 Economic and Social Effects

Alternative 1 (No Action) under Action 1 would not result in the issuance of permits for the testing of traps to target lionfish and thus maintains the status quo. As such, it would forego the opportunity to gather information about the potential use of traps to target lionfish, which in turn could be used to further expand the trap component of the lionfish fishery. The collection of information is not without costs, particularly to applicants and their cooperators, but also to fisheries and environmental managers if the information collected is used to inform future management actions in the Gulf and South Atlantic.

NMFS Preferred Alternative 2 through **ONMS Preferred Alternative 5, Option b**, would allow for testing of various trap types, which would allow applicants to gather information. The benefits of collecting the information are uncertain.

In general, having more choices or options is preferable to fewer from an economic and social effects perspective as it allows for the collection of more data that could be used to determine the "best" method for targeting lionfish using traps with respect to maximizing catch per unit effort (CPUE), landings, revenues, minimizing costs, and/or maximizing profits. The "what kind of trap" aspect of that determination is the subject of Action 1. In addition, the costs of using "experimental" traps or trap modifications for testing purposes would likely be higher than using traps that are already used for commercial fishing purposes because they would have to be produced. Using traps that have already been produced, or modifying existing traps, would avoid or reduce those production costs.

With respect to **NMFS Preferred Alternative 2**, **Alternative 3**, and **Alternative 4, Alternative 4** would likely generate the least net economic and social benefits, in part, because it would only allow for a single, albeit very general, type of trap to be tested for targeting lionfish: any experimental non-containment trap, such as a purse trap. This general type of trap is just one of the trap types that would be allowed under **NMFS Preferred Alternative 2.** Further, **Alternative 4** would not allow any of the traps under **NMFS Preferred Alternative 2** or **Alternative 3** that are already used in other fisheries to be used for testing purposes. Thus, **Alternative 4** allows the fewest choices of these three alternatives. In addition, because non-containment traps are not already being used in commercial fisheries, they would have to be produced, which would be more costly relative to using or modifying traps that have already been produced and are in use.

Between **NMFS Preferred Alternative 2** and **Alternative 3**, **NMFS Preferred Alternative 2** would likely generate greater net economic and social benefits, particularly in the long-term. **Alternative 3** would limit the trap types to those that have already been approved for harvesting four species in the Southeast: spiny lobster, black sea bass, stone crab, and golden crab. Although applicants would be expected to avoid the costs associated with having to produce new traps under **Alternative 3**, this list is more restrictive with respect to the choices available to applicants relative to the options under **NMFS Preferred Alternative 2**. If none of these currently used traps are shown to be effective at targeting lionfish, applicants would end up not generating any new information that would potentially expand the trap component of the commercial lionfish fishery and there would no alternative trap types available for additional testing.

Conversely, **NMFS Preferred Alternative 2** would allow a combination of traps that are already used in commercial fisheries (spiny lobster without modifications, American lobster, black sea bass, and pinfish traps/pots) and "experimental" trap types (spiny lobster with modifications and non-containment traps) to be tested for targeting lionfish. Thus, applicants would be allowed to do their own net benefit assessment between trap types already used in commercial fisheries, which would incur no additional production costs for current participants planning to use or modify their existing gear, and those not already used in commercial fisheries, which would incur such costs. Also, compared to **Alternative 3**, although it would not allow two (2) types of traps currently used to target golden crab or stone crab to be used for testing, it would allow three (3) trap types currently used in commercial fishing to also be used for testing (i.e., American lobster, black sea bass, and pinfish traps/pots). **NMFS Preferred Alternative 2** would also allow spiny lobster traps with modified funnels and non-containment traps to be used for testing purposes, not only by current but also future NMFS and ONMS permit applicants. Because there could be any number of ways to modify the spiny lobster funnels (as long as the modifications do not increase the potential for bycatch), as well as any number of non-containment traps developed in the future, **NMFS Preferred Alternative 2** would allow for a wider choice set and greater flexibility with respect to the types of traps that could be used for testing now and in the future. Thus, **NMFS Preferred Alternative 2** would likely to lead to greater net economic and social benefits relative to **Alternative 3**, particularly in the long-term.

Similar conclusions apply to the comparison of **Option a** and **ONMS Preferred Option b** under **ONMS Preferred Alternative 5**. Specifically, **Option a** would limit the types of traps that could be used for testing only to those that have already been approved for use in the FKNMS (i.e., spiny lobster traps, stone crab traps, blue crab traps, pinfish traps, and recreational shrimp traps). Conversely, **ONMS Preferred Option b** would allow currently approved trap types to be used, but would also allow traps (with or without modifications) to be used that are not approved for use in the FKNMS. Thus, **Option a** limits applicants to an effectively fixed set of five (5) specific trap types whereas **ONMS Preferred Option b** allows the possibility of additional trap types being used for testing purposes, some of which could be already be used in other fisheries, but some could be "experimental" in nature as well. Again, **Option a** would be expected to avoid the production costs associated with trap types that are not currently in use. But, more choices leads to greater flexibility with respect to determining which method is "best" for targeting lionfish, specifically within FKNMS in this case. **ONMS Preferred Option b** allows for the possibility of any number of currently used and experimental trap types to be used for testing, subject to ONMS approval, and potential applicants could evaluate the net benefits from their perspective of proposing to use currently used or experimental trap types for testing purposes. Thus, **ONMS Preferred Option b** would be expected to generate greater net economic and social benefits relative to **Option a**, particularly in the long-term should new trap types be developed.

4.2 Action 2. Allowable testing locations / time of year

4.2.1 Biological and Physical Effects

> ***Action 2 Alternatives***
>
> Alt. 1 (No Action). No permits issued for experimental lionfish trap testing.
> Alt. 2. Anywhere in the Gulf and South Atlantic at any time.
> **NMFS Pref Alt. 3**. Anywhere in the Gulf and South Atlantic at any time with exclusions.
> **ONMS Pref Alt. 4**. In waters >30 m within the FKNMS:
> Option a. From Aug. 6-May 15.
> **ONMS Pref Option b**. Year round.
>
> * See Chapter 2 for detailed description of alternatives

<u>Biological Effects</u>

Expected Effects on the Biological Environment from Removal of Lionfish

Alternative 1 (No Action) would not issue permits for testing of traps to target lionfish anywhere and at any time, and would not result in added effects to the biological environment, and thus no locations or times of year would be tested. However, applicants also would not gain any knowledge regarding the effectiveness of various traps and design modifications at capturing lionfish, and avoiding and minimizing impacts to the biological and physical environments. Under **Alternative 1 (No Action)**, traps would not be deployed specifically to target lionfish, which would likely result in less pressure on lionfish. This would prevent any benefits to the biological environment from removing lionfish (reduced competition with lionfish for prey species, potential for increased abundance of prey species that lionfish may have removed).

Alternative 2, **NMFS Preferred Alternative 3**, and **ONMS Preferred Alternative 4** would allow the testing in specified areas in the Gulf, South Atlantic, and FKNMS at various times of year. All of the alternatives could reasonably be expected to help reduce lionfish populations in the specific area, however, Alternative 2, which allows testing anywhere within federal waters of the Gulf and South Atlantic, at any time of year, could potentially allow for the greatest lionfish reduction, and the greatest potential benefits to the biological environment from that reduction. Potential benefits of lionfish removal include reduced competition between native fish species and lionfish for prey and increased abundance of prey species that lionfish may have removed. **Alternative 2**, **NMFS Preferred Alternative 3**, and **ONMS Preferred Alternative 4** are also expected to expand the current knowledge of the effectiveness of various trap types and design modifications at capturing lionfish, and/or avoiding and minimizing potential effects to non-target species, protected species, and habitats. However, **Alternative 2** could allow for the maximum amount of information to be gained about where and when the various trap types and design modifications are most/least effective at capturing lionfish.

Expected Effects to Co-occurring Species

Biological effects from testing of traps to target lionfish in the locations and at the time of year contemplated in Action 2 could result from bycatch of commercially important species, such as spiny lobster, snapper-grouper, and reef fish. **Alternative 1 (No Action)** would result in the least amount of impacts to co-occurring species among the alternatives considered, as no permits would be issued so no location or timing would be tested. However, applicants also would not gain any knowledge regarding the best locations and times of year for capturing lionfish, and avoiding and minimizing impacts to non-target species.

Lionfish associate with hard bottom habitat and have been found to prefer artificial reefs (Smith 2010). **Alternative 2**, **NMFS Preferred Alternative 3**, and **ONMS Preferred Alternative 4** include areas with hard bottom, likely to have lionfish present. These habitat types are important for co-occurring species such as snapper-grouper, reef fish, and spiny lobster. Trap testing in these areas could result in bycatch of non-target species (species other than lionfish); however, it is expected that finfish and shellfish bycatch would be minimal based on observed bycatch rates for the commercial trap fisheries and additional studies referenced herein. Additionally, **Alternative 2**, **NMFS Preferred Alternative 3**, and **ONMS Preferred Alternative 4** would result in similar effects to non-target fish species from barotrauma[42], which may result in injury or mortality due to targeting lionfish in deep depths.

Allowing the testing throughout the Gulf of Mexico and South Atlantic at all times of year under **Alternative 2** poses the greatest risk to non-target species, simply because it allows trap testing in the largest area and during the longest time period. It would not restrict trap testing in areas that are already restricted to fishing. Many of these areas have fishing restrictions to protect sensitive habitats and spawning areas. Allowing trap testing in these areas could be contrary to the purpose of those fishing restrictions, and may not be necessary to determine if the various trap types and design modifications are effective. However, it would also be helpful to know what lionfish population densities are like in the areas where fishing is restricted. Not allowing testing of various trap types and design modifications in this broad area could limit knowledge regarding ways to effectively capture lionfish from these areas while also avoiding and minimizing impacts to those areas. There may be ways to allow testing in these areas while mitigating risks to the resources the areas were established to protect. For example, if trap gear were required to be fished with minimal soak times (e.g. 24 hours), then any non-target species captured could potentially be released unharmed. There may also be smaller areas within these areas restricted for fishing, where some limited amount of trap testing could be allowed without potentially risking impacts to those natural resources that area is designed to protect. More information on these mitigation measures is available in Chapter 5.

NMFS Preferred Alternative 3 poses a risk to non-target species, but less so then **Alternative 2**. **NMFS Preferred Alternative 3** aims to reduce potential effects by excluding testing from several sensitive areas, including areas where fishing is restricted. Many of the areas where fishing is restricted throughout the Gulf and South Atlantic are in place to protect managed species and/or sensitive habitats. For example, there are special management zones in place in the South Atlantic to protect areas where snapper-grouper species are known to spawn. By preventing trap testing in these areas, any potential impact to these non-target species would be mitigated. However, applicants also would not gain any knowledge about lionfish or the effectiveness of testing traps in these areas. **NMFS Preferred Alternative 3** would also exclude trap testing in areas where there are potential for substantial user conflicts with other fisheries, such as shrimp trawlers. Placing traps in areas frequently fished by shrimp trawlers could cause

[42] Barotrauma due to decreasing pressure as a fish is brought to the surface may affect deep water fish, resulting in injury or death.

user conflicts and endanger fisherman safety. To mitigate this potential risk, **NMFS Preferred Alternative 3** would exclude these areas from trap testing.

ONMS Preferred Alternative 4 would allow testing in waters deeper than 30 m in the FKNMS only during August 6 to May 15 (which coincides with the open trap fishing seasons for spiny lobster and stone crab, combined, **Option a**), or year round (**ONMS Preferred Option b**). **Option a** would be expected to result in the least amount of bycatch of co-occurring species because traps would only be used during the open fishing seasons for spiny lobster and stone crab. The bycatch effects of approved gear during these fishing seasons have been analyzed in existing fishery management plans and were found to be minimal. It would be expected that the traps contemplated in this PEA to have comparable rates of bycatch as those already being fished, and thus also have minimal effects. **Preferred Option b** would result in greater impacts to co-occurring species through bycatch because traps could be deployed in waters of the sanctuary for a longer duration (year round), thereby increasing the potential for bycatch. However, if other trap types have similar rates of bycatch of non-target species, it is likely that the additional amount of effort would also be minimal. **Option a** and **ONMS Preferred Option b** would result in similar effects to non-target fish species from barotrauma[43], which may result in injury or mortality.

Expected Effects to Protected Species

Alternative 1 (No Action) would result in the least amount of negative effects to co-occurring species among the alternatives considered, no permits would be issued and therefore traps would not be tested anywhere in the Gulf or South Atlantic. However, applicants also would not gain any knowledge regarding the effectiveness of various traps and design modifications at different locations and timing in reducing effects to protected species.

Alternative 2 would have the greatest negative biological effects on protected species. **Alternative 2** would put NARWs at a greater risk for entanglement because it would allow for trap testing in locations ranging from North Carolina to Florida that overlap their occurrence. Entanglement in fixed fishing gear (e.g., trap/pot) is a leading cause of NARW mortality (Knowlton et al. 2012; NMFS 2005). The coastal waters of the southeastern U.S. are a wintering and sole known calving area for NARWs. NARW concentrations are highest in the core calving area (Georgia and Florida) from November through April (71 FR 36299, June 26, 2006); on rare occasions, NARWs have been spotted as early as September and as late as July (Taylor et al. 2010). New data from passive acoustic monitoring suggests that NARWs may be present in North Carolina waters year round (Davis et al. 2017). Other species, such as Bryde's whale, may also be impacted by **Alternative 2** because testing would be allowed anywhere in the Gulf and traps may be deployed in the Bryde's whale habitat area where they could interact with this species. Bryde's whale distribution in the Gulf is currently restricted to a small area in the northeastern Gulf near the De Soto Canyon in waters between 150 and 410 m depth along the continental shelf break (Rosel et al. 2016).

[43] Barotrauma due to decreasing pressure as a fish is brought to the surface may affect deep water fish, resulting in injury or death.

Alternative 2 would have the greatest potential for negative biological effects to ESA-listed corals. ESA-listed corals are found less than 30 m deep in the Florida Keys. If trap testing is allowed at these depths in the Florida Keys, the traps may adversely affect ESA-listed coral. **Alternative 2** would also have the greatest negative biological effects to sea turtles and sawfish if the traps were set in shallower waters because, in general, these species are more likely to be concentrated in nearshore waters. **Alternative 2** may have the less negative biological effects to Nassau grouper because more adult Nassau grouper inhabit deeper waters than juvenile Nassau grouper and embolism mortality may increase if Nassau grouper are retrieved from deeper waters.

NMFS Preferred Alternative 3 and **ONMS Preferred Alternative 4** have the least negative biological effect to protected species after **Alternative 1 (No Action)**. **NMFS Preferred Alternative 3** or **ONMS Preferred Alternative 4** would have the least negative biological effects on NARWs and Bryde's whales given that experimental lionfish trap/pot fishing would be excluded from areas that overlap with and potentially impact these species, therefore, greatly reducing the risk of entanglement. **NMFS Preferred Alternative 3** would exclude trap testing in federal waters off North Carolina, year round. New data from passive acoustic monitoring suggests that NARWs may be present in North Carolina waters year-round (Davis et al. 2017). This would provide year round protection for NARWs in this area. **NMFS Preferred Alternative 3** would exclude trap testing in the NARW habitat encompassing waters inshore of points 1-17 listed in Table 2.2.2.1; approximately Cape Canaveral, Florida, to the South Carolina/North Carolina border (Figure 2.2.2.1), from November 1 to April 30. This would provide protection for NARWs during their calving season. **NMFS Preferred Alternative 3** would exclude trap testing in the Bryde's whale habitat area, year round (Figure 2.2.2.2). This would provide protection for Bryde's whales.

NMFS Preferred Alternative 3 and **ONMS Preferred Alternative 4** would exclude trap testing in waters shallower than 30 m in all areas, including off the Florida Keys. There is only one protected zone in the Florida Keys in water deeper than 30 m, the Tortugas South section of the Tortugas Ecological Reserve, where fishing is not allowed (15 CFR 922.164(d)). No trap testing would be allowed in this protected zone. The seven ESA-listed coral species occur in the Florida Keys to a maximum depth of 30 m, although some of these species may be present in depths as great as 90 m in other locations throughout their range. These species are considered absent deeper than 30 m in the Florida Reef Tract. Thus, traps set in deep water could have less impact on ESA-listed coral than traps set in depths less than 30 m. **NMFS Preferred Alternative 3** and **ONMS Preferred Alternative 4** would be expected to have the least negative biological effect after **Alternative 1 (No Action)** to ESA-listed coral because they require traps to be placed at depths greater than these corals are located in the area of the proposed actions. **NMFS Preferred Alternative 3** and **ONMS Preferred Alternative 4** would also have the least negative biological effect after **Alternative 1 (No Action)** to sea turtles and sawfish because the traps are located in deeper waters and these species tend to be less highly concentrated in deeper offshore waters. However, leatherbacks and juvenile loggerheads are more likely to be found offshore in deeper, colder water compared to other sea turtle species. **NMFS Preferred Alternative 3** and **ONMS Preferred Alternative 4** may have greater negative biological effect than **Alternative 2** to Nassau grouper because more adult Nassau grouper inhabit deeper waters than juvenile Nassau grouper and embolism mortality may increase if Nassau grouper are retrieved from deeper waters.

Within **ONMS Preferred Alternative 4**, **Option b** would be expected to result in greater negative effects to protected species than **Option a** due to the additional days that trap gear could be deployed in waters of FKNMS, thereby increasing the chances for entanglement or other interactions with mobile marine protected species such as sea turtles.

Physical Effects

As mentioned in Section 4.1.1, due to their use to harvest species associated with coral and hard bottom habitat, traps and pots may impact and degrade habitat including habitats identified and described as EFH. While traps are typically weighted, storms can carry them long distances, potentially damaging important seagrass or coral reef habitat (Uhrin 2016). Buoyed and sinking line from deployed and lost gear can also pose entanglement risks with sensitive habitat (Adimey et al. 2014; Knowlton et al. 2012, 2016).

Not issuing permits for trap testing under **Alternative 1 (No Action)** would result in the least negative effects to the physical environment among the alternatives considered, as the alternative would not allow testing anywhere within the Gulf or South Atlantic, including within the waters of the FKNMS. Allowing the testing of trap gear in areas specified in **Alternative 2**, **NMFS Preferred Alternative 3**, and **ONMS Preferred Alternative 4** creates the potential for gear interactions with sensitive habitat.

Under **ONMS Preferred Alternative 4**, traps would only be deployed at depths greater than 30 m. A study by Lewis et al. (2009) showed that traps in deeper water tend to move less during storm events. **Option a**, allowing traps to be deployed only between August 6 and May 15, would result in the lesser impact to the physical environment of the FKNMS than **Preferred Option b**, which would allow traps to be deployed at depths greater than 30 m year round. Traps such as spiny lobster traps are known to impact sensitive FKNMS habitats such as seagrasses, hard bottoms, and coral reefs (Lewis et al. 2009). Both **Option a** and **Preferred Option b** would restrict trap deployments to greater depths, which would reduce interaction with some habitat types such as seagrass habitats, which generally occur above 35 feet (10 m) depth in the Florida Keys (Humann 1993). However, corals and hard bottom habitats and their invertebrate constituents may exist in waters well below 30 m in the FKNMS (S. Miller, pers. comm. 2018). Unfortunately, data on mesophotic coral ecosystems, located at 30 - 100 m depths, is lacking but has been recognized as a management need to address protection of these unique deep-water habitats and communities. The Gulf and east and west Florida shelves together have over 178,000 km^2 habitat identified as potential mesophotic coral habitat (Locker et al. 2010). A temporal increase in deployed traps (**ONMS Preferred Option b**) could reasonably be expected to result in additional, direct negative physical impacts to deeper water habitats of FKNMS. In addition, **ONMS Preferred Option b** would result in additional traps being deployed during the entirety of the Atlantic hurricane season. Currently, the first two months of the hurricane season (June and July) intersect with the closed commercial spiny lobster and stone crab fisheries, resulting in no traps in water until the season opens on August 6.

Based on experiences from Hurricanes Dennis, Wilma, and most recently, Irma, there could be increased impacts to physical reef habitats from traps damaged or displaced during storm events.

Allowing the testing under **Alternative 2** could result in the greatest negative impacts to the physical environment because it allows testing anywhere, without exclusions. Fewer impacts could result from **NMFS Preferred Alternative 3** and **ONMS Preferred Alternative 4, Option b** due to the proposed exclusions, and no anticipated habitat impacts from **Alternative 1 (No Action)**.

4.2.2 Economic and Social Effects

Alternative 1 (No Action) would not allow traps to be tested for targeting lionfish in the exclusive economic zones (EEZs) of the Gulf and South Atlantic. In short, if traps cannot be tested anywhere in the Southeast, the issue of where and when traps could have been used for testing becomes moot. Thus, **Alternative 1 (No Action)** would eliminate the expected direct economic and social benefits to the current applicants that have proposed to test traps for targeting lionfish, or future applicants. It would also eliminate the expected indirect economic and social benefits under Action 1 for other participants in the harvesting and dealer sectors of the commercial lionfish fishery and the communities with which they are associated.

When considering **Alternative 2** and **NMFS Preferred Alternative 3**, **Alternative 2** would provide the largest area and times of the year in which traps could be tested for targeting lionfish and thus the most choices. In general, it is assumed that more choices means greater flexibility and a greater opportunity to collect information regarding the "best" method to harvest lionfish, including where and when to harvest them (e.g., where and when are they most abundant and available to trap gear). Thus, it would appear that **Alternative 2** would generate greater direct economic and social benefits to any applicants, and greater indirect effects to the lionfish harvesting sector, dealer sector, and associated communities. Under **Alternative 2** and **NMFS Preferred Alternative 3,** there would be indirect economic and social effects on the fisheries that interact with the lionfish fishery because it is still in its early stages of development and few entities rely primarily or solely on the harvest of lionfish. The vast majority of the entities currently in the lionfish fishery primarily participate in other fisheries.

NMFS Preferred Alternative 3 lists numerous areas where testing of traps to harvest lionfish would not be allowed if that alternative is chosen. While the list of areas (see Appendix D) is long and fairly encompassing (i.e., the list represents a significant reduction in the amount of area that could be used for testing), these areas are already closed to trap fishing of one type or another, or fishing in general. Thus, NMFS would not exempt trap testing in these areas, consistent with decisions the Gulf and South Atlantic Councils and NMFS have already made. Even if testing of traps were to be allowed in these areas in the short-term, as **Alternative 2** envisions, because of the reasons these areas were already closed to traps or fishing in general and those reasons have not changed or gone away (e.g., traps would threaten endangered species, likely to damage critical habitat, significantly interfere with the operations of already established fisheries in those areas, etc.), it is likely that traps would not be approved for targeting lionfish in these areas under potential future decisions to manage lionfish. Current fishery management suggests that the costs of approving the use of traps to target lionfish may exceed the benefits in these areas (i.e., net benefits might not be maximized and in fact are likely negative), and that determination is not expected to change regardless of what the potential testing shows.

As such, allowing the testing of traps in areas where they have little to no chance of being approved for potential use in the directed commercial fishery would be a waste of time, effort, and money on the part of the applicants, their cooperators as it would not generate any additional useful information. Thus, in a very real sense, **Alternative 2** offers the illusion of greater net economic and social benefits relative to **NMFS Preferred Alternative 3**, but in fact would likely lead to just the opposite.

NMFS Preferred Alternative 3 would likely lead to greater indirect net economic and social benefits relative to **Alternative 2** because it would focus testing resources on the areas where, and times when, traps have a high probability of being approved for use in the future management, depending on the results of the testing. The testing results would be expected to identify the "best" method for targeting lionfish with traps, specifically with respect to the "where" and "when" aspect of that determination within the context of Action 2.

Option a and **ONMS Preferred Option b** under **ONMS Preferred Alternative 4** only focus on the issue of when traps could be tested for targeting lionfish in waters greater than 30 m in depth within the FKNMS to remain congruent with **NMFS Preferred Alternative 3**. Based on the following analysis, **ONMS Preferred Option b** would be expected to generate greater net economic and social benefits relative to **Option a** because it allows for year-round testing**.**

ONMS Preferred Option b would allow testing to be done at any time of the year in this area, and thus provides the widest range of choices to NMFS and/or ONMS permit applicants. More choices means greater flexibility, more opportunities with respect to the specific times in the year the gear could be tested, and thus the collection of more data to determine the "best" method for targeting lionfish with traps; specifically, addressing the "when" aspect of that determination in the FKNMS. The rationale is very similar to the rationale for using catch share programs to eliminate derby fishing conditions. When fishermen have more choices about when to fish and seasons are lengthened, net economic and social benefits generally increase.

Under **Option a**, testing would only be allowed when traps can be used to harvest spiny lobster or stone crab in this area. Therefore, applicants could only test traps from August 6 through May 15 (i.e., trap testing under an ONMS permit would not be allowed in the area from May 16-August 5, or for about 12 weeks). While **Option a** would still leave applicants with about 75% of the year to conduct their testing, they may also be put in the position of choosing whether to conduct their testing or participate in the fishery(ies) on which they primarily depend at present during the "open season." This concern is particularly acute if they participate in both the spiny lobster and stone crab fisheries. In turn, the economic and social benefits associated with this testing would be reduced for them and any other entities with whom they have business relationships in those fisheries. Further, because the collection of potentially useful information would be prohibited during about three months of the year, less temporal information would be collected, and thus net economic and social benefits would be likely be less under **Option a** relative to **ONMS Preferred Option b**.

4.3 Action 3. Number of traps

Effort:

The term effort is used throughout this document. Effort refers to the amount of traps in the water at any given time. This section evaluates the effects of different amounts of traps fished in different regions. Days of deployment do not help to inform this effects analysis unless an applicant can state when those days would be. Many factors, not the least of which is weather, influence when a fisher might set their traps. If an applicant requests to be able to set their traps year round, the potential effects to the environment could occur at any time during that year. This has implications because there are many resources that are seasonally present throughout the Gulf and South Atlantic, including FKNMS. Therefore, in this environmental effects analysis, it is assumed that traps would be in the water year round, regardless of how many days an applicant requests to deploy their traps. This approach is conservative and allows for full consideration of the potential effects to any/all resources that may only be seasonally present in Regions of the Gulf, South Atlantic and the Florida Keys.

Action 3 Alternatives*

Sub-Action 3.1: South Atlantic Region
Alt. 1 (No Action). No permits issued for experimental testing of traps to target lionfish. Therefore, zero traps are allowed to be tested in the South Atlantic Region.
Alt. 2. Allow up to 2,200 total traps per year.
NMFS Preferred Alt. 3. Allow up to 5,000 total traps per year.

Sub-Action 3.2: Florida Keys Region; including within FKNMS
Alt. 1 (No Action). No permits issued for experimental testing of traps to target lionfish. Therefore, zero traps are allowed to be tested in the Florida Keys Region.
Alt. 2. Allow up to 1,600 total traps per year.
NMFS and ONMS Preferred Alt. 3. Allow up to 3,000 total traps per year.

Sub-Action 3.3: Gulf of Mexico Region
Alt. 1 (No Action). No permits issued for experimental testing of traps to target lionfish. Therefore, zero traps are allowed to be tested in the Gulf of Mexico Region.
Alt. 2. Allow up to 5,600 total traps per year.
NMFS Preferred Alt. 3. Allow up to 10,000 total traps per year.

* See Chapter 2 for detailed description of alternatives

4.3.1 Biological and Physical Effects

Sub-Action 3.1: South Atlantic Region

This sub-action looks at the effects of different numbers of traps within the South Atlantic Region. In Chapter 3, we discussed the affected environment, including the trap fisheries that operate within the South Atlantic. Here we note the number of traps in those fisheries within the South Atlantic Region as context for understanding the effects of setting additional traps within this region. Within the South Atlantic Region, there are approximately 267,000 commercial traps between Maine and North Carolina that are part of the American lobster fishery, and 5,000 commercial traps between North Carolina and east Florida that are from the black sea bass portion of snapper-grouper, golden crab, spiny lobster, and stone crab fisheries. These numbers do not necessarily mean all are in use, but potentially could be. These numbers also do not take into account recreational trap use. Finfish trap harvest, other than for black sea bass and allowable incidental take in the black sea bass pot, spiny lobster trap, and stone crab trap fisheries, has been prohibited in federal waters of the

South Atlantic since 1992. Incidental take of finfish is also allowed for the golden crab trap fishery, although not many finfish are observed. In addition, finfish trap harvest has been prohibited in state waters off Florida since 1980, except for pinfish traps and black sea bass pots north of 27^{o} north latitude in the South Atlantic.

To reiterate, NMFS received applications for EFPs proposing to test the following number and type of traps within the South Atlantic Region: 50 spiny lobster wood traps with modified funnels, 50 spiny lobster wood and wire traps with modified funnels, 50 wire pinfish traps with modified funnels, 50 black sea bass pots with modified funnels, and 2,000 non-containment purse traps. Although applications involving some of this effort have been withdrawn, NMFS expects to receive additional applications proposing to test similar amounts of traps, as explained elsewhere in the document.

Biological Effects

Expected Effects on the Biological Environment from Removal of Lionfish

Alternative 1 (No Action), not issuing permits for trap testing to target lionfish, would mean no traps would be set to target lionfish in the South Atlantic Region, and therefore no additional pressure on the lionfish population in the South Atlantic Region. Thus, the lionfish population is expected to remain at current levels, if not increase as time progresses. This would prevent any beneficial effects to the biological environment from removing lionfish (e.g. reduced competition with lionfish for prey species, potential for increased abundance of prey species that lionfish may have removed, reduced predation of lionfish on commercially, recreationally, and ecologically important species, etc.). **Alternative 1 (No Action)** also would not allow NMFS and any applicants to gain any knowledge about the effectiveness of various trap types and design modifications at capturing lionfish, while avoiding and minimizing impacts to non-target species, protected species, and habitats in the South Atlantic Region. However, without the additional removal of any lionfish from the South Atlantic Region **Alternative 1 (No Action)** is expected to have the greatest positive effect on lionfish. **Alternative 2** and **NMFS Preferred Alternative 3,** both allow for the removal of lionfish from a specific area over time. This effort could have an indirect positive effect to the biological environment by removing invasive lionfish from these areas with **NMFS Preferred Alternative 3** expected to have more of an indirect positive effect then **Alternative 2**. Again, **NMFS Preferred Alternative 3** would be expected to result in the removal of more lionfish, than **Alternative 2**, simply because it proposes a greater effort. **NMFS Preferred Alternative 3** would allow up to 5,000 traps whereas **Alternative 2** would allow up to 2,200 traps. Thus, the greatest negative effects are expected to occur for lionfish under **NMFS Preferred Alternative 3** as more traps mean more opportunity for potential for capture and removal from the environment. In addition, **NMFS Preferred Alternative 3** also could allow for more knowledge about a larger array of trap types and design modifications. This could also improve knowledge and understanding of how to effectively capture lionfish and/or avoid and minimize potential effects to the biological environment.

Expected Effects to Co-Occurring Species

Negative biological effects from trap use could result from bycatch mortality of commercially important species, such as undersized spiny lobster, snapper-grouper, and reef fish species. **Alternative 1 (No Action)** would not result in any biological effect to co-occurring species, in terms of bycatch, among the alternatives considered, as the alternative would not allow any trap testing within the South Atlantic Region. However, not allowing additional removal of invasive lionfish from the South Atlantic Region over time could have a negative effect on native species because lionfish compete with them in their natural habitat. **Alternative 2** and **NMFS Preferred Alternative 3** are expected to have the greatest potential for negative biological effects to co-occurring species, with **NMFS Preferred Alternative 3** (up to 5,000 traps) having more potential for negative effects than **Alternative 2** (up to 2,200 traps). Lost traps can ghost fish[44] with potential to impact non-target species well into the future. A study by Craig (1976) found that trap loss approached 20% for a period of six months off Boca Raton, Florida, with at least some of this loss due to theft. Depending on the amount of traps actually lost to theft versus just lost resulting in ghost fishing, bycatch of co-occurring species would be anticipated to increase. However, since the amount of effort expected for trap testing is only a small fraction of the effort in the commercial trap fisheries, whose bycatch is considered negligible (see Section 3.1.1) and the majority of proposed trap types are non-containment traps, whose bycatch has been shown to be non-existent, we expect the biological effects to co-occurring species from trap testing to be minimal. The use of degradable panels or wire on a trap would remove the ability of a containment trap to ghost fish after these features degraded, but the trap would still have habitat impacts as a derelict trap[45]. Based on NMFS's preferred alternatives under Actions 1 and 2, **Alternative 2** and **NMFS Preferred Alternative 3** would allow the effectiveness of trap designs not currently fished to be tested, and that testing would also occur during periods when some trap types would normally be prohibited. **NMFS Preferred Alternative 3** would have the greatest potential for lost traps, simply because it proposes the greatest amount of effort. Large winds and waves during storm events can move traps miles away from where they were originally deployed, making it difficult for fishers to find them. In addition, storm events can relocate traps even when not in the water. Strong winds, and large waves can carry traps stacked on docks and in marinas out to sea. For example during Hurricane Irma hundreds of thousands of lobster traps were lost, some of which were originally on land, and then washed out to sea[46]. **NMFS Preferred Alternative 3** could potentially add up to 5,000 additional traps into the South Atlantic environment. One way to limit the potential for lost traps that could ghost fish is to require traps used in these experiments to already have an existing stamp, certification and/or endorsement; in this way, no new traps would be introduced that could be lost (the universe of traps that could be lost remains the same), although the risk of loss could change depending on where the traps are set and how they are stored. Another way to limit the potential for ghost fishing is to fish with degradable panels or wire on the containment trap or use non-containment type traps. Non-containment traps are highly unlikely to catch finfish species other than lionfish, because species can move freely into and out of the trap, and

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[44] Ghost traps are traps that fishermen cannot locate and retrieve or that are abandoned, but still capable of catching fish.

[45] Derelict traps are lost or abandoned traps that are incapable of catching fish due to structural damage or deterioration.

[46] http://www.flkeysnews.com/news/local/article182028936.html

are not likely to remain in place as the trap is pulled up and closed. Preliminary studies showed lionfish stayed with the structure a prototype non-containment trap type provided while other finfish species swam away, as the trap was retrieved and closed (S. Gittings, National Ocean Service, pers. comm. 2017). The same is likely true for spiny lobster, but more testing of these traps would be necessary to make that determination. Given the trap types and amounts of effort currently requested, it is reasonable to presume that as much as 50% of the 5000 traps to be tested in this Region could be non-containment type traps. This would be presumed to further reduce potential effects to non-target, co-occurring species.

Alternative 2 and **Preferred Alternative 3** both have the potential to remove lionfish from a specific area over time, which has the potential to positively affect co-occurring species that lionfish may prey on or outcompete for food. **Preferred Alternative 3** has the greatest potential to remove the most lionfish from the South Atlantic Region over time, simply because it proposes the greatest amount of effort. **Alternative 1 (No Action)** would not allow for the removal of any additional lionfish from this Region over time, and thus would not have any positive effect to endemic, co-occurring species in terms of removing this invasive, competing species.

Expected Effects to Protected Species

Alternative 1 (No Action) would not have any additional biological effects from current fishing practices in terms of protected species interactions and bycatch as no trap testing to target lionfish would be allowed in the South Atlantic Region. Among the alternatives considered, the greatest potential for negative effects to the protected species would occur under **NMFS Preferred Alternative 3** simply because it proposes the greatest number of traps. Negative biological effects to protected species from entanglement would be expected to increase with increased trap testing effort and are expected to be similar, regardless of trap type, as long as the trap uses lines. The probability for entanglement of marine mammals, sea turtles, and smalltooth sawfish increases with the number of traps given the increased potential for encounters with gear, specifically the vertical lines. Non-containment type traps are expected to have similar potential effects related to entanglement of protected species from vertical buoy lines as containment traps. The use of traps in a trawl configuration proposed under the types of traps analyzed under Action 1 decreases the amount of trap line in the water, thus decreases the risk of entanglement of these species (Knowlton et al. 2012). However, trap pot trawls do increase risk for serious injury or mortality for protected species given the stronger line and heavier weight of additional traps. Lineless gear would eliminate risk of entanglement of protected species, specifically for whales, dolphins, sea turtles, and smalltooth sawfish and is being considered as mitigation (see Chapter 5). In the South Atlantic Region, bycatch of Nassau grouper is unlikely because the range of Nassau grouper do not overlap with this Region; therefore, **Alternatives 1 (No Action)** through **NMFS Preferred Alternative 3** would have the same effect on the bycatch of Nassau grouper. There are no other protected species that are anticipated to be caught in the trap as bycatch. In addition, while there are ESA-listed coral in the South Atlantic Region, traps allowed in this Region will be set deeper than ESA-listed coral are known to exist as a condition of the EFPs (see Chapter 5), so it is believed any adverse effects are highly unlikely. Negative effects of traps to coral would be expected if this mitigation was not required. More information on this can be found in Section 3.2.4.1. Therefore, **Alternative 1 (No Action)** through **NMFS**

Preferred Alternative 3 would have the same effect on ESA-listed coral. **NMFS Preferred Alternative 3** increases the risk of ghost fishing, which increases bycatch mortality and entanglement risks when traps are "lost" due to weather or gear failure. Data on other trap fisheries and protected species interactions is provided in Chapter 3 (see Sections 3.3.4.2, 3.3.4.3, and 3.3.4.4). The effects to protected species from **Alternative 2** would fall between those resulting from **Alternatives 1 (No Action)** and **NMFS Preferred Alternative 3**. However, none of the potential negative effects to protected species would be expected to be significant. Please see the Section 7 ESA consultation conducted for this project in Appendix B, for more detailed information.

Physical Effects

As mentioned in Section 4.1.1, because the traps and pots will be used to harvest species associated with coral and hard bottom habitat, traps and pots may impact and degrade habitat including habitats identified and described as EFH. Although each individual trap has a relatively small footprint, the damage can be substantial due to the number of traps deployed, including if those traps are lost and/or abandoned. Traps are not placed randomly; rather they are fished in specific areas multiple times before fishing activity moves to other grounds. Therefore, trap damage may be concentrated in particular areas rather than be uniform over all habitats.

Alternative 1 (No Action) would not result in any additional effects from current fishing practices on the physical environment as no testing of traps to target lionfish would be allowed in the South Atlantic Region. **Alternative 2** and **NMFS Preferred Alternative 3** could potentially cause negative effects to the physical environment. Misplaced traps could come into physical contact with sensitive habitat and cause destruction and habitat loss. Lost traps and gear (e.g. buoy lines) have the potential to affect habitat for long periods. **NMFS Preferred Alternative 3** (up to 5,000 traps) is expected to have the greatest potential for negative effects to habitat from trap interactions compared to **Alternative 2** (up to 2,200 traps) simply because it allows more effort. Traps are susceptible to strong winds and large waves and can be moved miles from their original deployment sites during a storm event. This movement can damage EFH or ESA-listed and non-listed coral species. In addition, buoyed and sinking line from deployed and lost gear can also pose entanglement risks and destruction to sensitive habitat. One way to limit the potential for trap movement is to require minimum weighting of traps to reduce the risk of trap movement and loss (see Chapter 5). These requirements can also help ensure traps are deployed on the desired spot, and do not drift long distances as they sink to the bottom. Non-containment type traps are primarily in the experimental design phase. If these traps are not properly weighted they could be lost, or misplaced upon deployment. In this regard, non-containment type traps may pose a greater risk to physical habitats than containment traps. In fact, wire basket traps are shown to move around the least of all containment trap types (Matthews and Hunt 2010).

If traps are lost, one way to identify and associate any traps that are lost or misplaced with these trap testing experiments, is to require unique gear/line markings; providing valuable information about trap loss and movement (see Chapter 5). Additionally, traps can be lost out to sea even when not deployed in the water. It has been observed that containment traps stacked along docks and marinas can be carried out to sea during large storm events. It is unknown how non-containment traps would be stored when not in use and therefore unknown if they would be carried out to sea during a storm event. To help mitigate the potential effect of additional lost traps in the environment, is to require traps used in these experiments to have an existing stamp, certification and/or endorsement; in this way the universe of traps that could be lost is not expanded by allowing this additional testing, although the risk of loss could change depending on where the traps are set and how they are stored. If this mitigation method is used, then **Alternative 2** and **Preferred Alternative 3** would be expected to have a similar potential for long term effects to habitat and the physical environment from lost and misplaced containment traps, as **Alternative 1 (No Action)** because no new additional containment traps would be added to the environment. To be clear, however, even if this mitigation were required, and based on NMFS's and ONMS's preferred alternatives under Actions 1 and 2, **Alternative 2** and **Preferred Alternative 3** would allow the effectiveness of containment trap designs not currently fished in the South Atlantic Region to be tested, so additional traps could be added to this Region. Testing of traps could also occur during periods when certain traps would normally be prohibited. Because those traps could be used at times when they are prohibited, and could potentially be set in different areas within the Region than are typically utilized, increased effects may be seen. Furthermore, requiring traps used in these experiments to have an existing stamp, certification and/or endorsement may not be required. In addition, non-containment traps, which do not have the existing stamp, certification and/or endorsement requirement, could be used, increasing effort and potential for effects. In these cases, **NMFS Preferred Alternative 3** would be expected to have more negative effects than **Alternative 2.**

<u>Sub-Action 3.2: Florida Keys Region</u>

This sub-action looks the effects of different numbers of traps within the Florida Keys Region, which includes FKNMS and other marine waters outside the sanctuary. In Chapter 3, we discussed the affected environment, including the trap fisheries that operate within the Gulf and South Atlantic, including the Florida Keys. Here we note the number of traps in those fisheries within the Florida Keys Region as context for understanding the effects of setting additional traps within this region. Within the Florida Keys Region, there are approximately 1,495,000 commercial traps from the spiny lobster, stone crab, and golden crab fisheries (golden crab traps are prohibited in water of FKNMS); all that allow a percentage of incidental take of finfish. These numbers do not necessarily mean all are in use, but potentially could be. This number also does not take into account recreational trap use or traps that are only authorized for state waters (e.g. pinfish traps, recreational stone crab traps, recreational shrimp traps) that contribute to an extremely high number of traps potentially deployed in this Region. While state trap use is not managed by NMFS, FKNMS includes state and federal waters and the potential additional traps due to recreational trap use in state waters should be noted. Finfish trap use was prohibited in federal waters of the South Atlantic, including within the Florida Keys Region in1992 (SAFMC 1991) and has been prohibited in all Gulf federal waters, including within the Florida Keys Region, since 2007, which was the end of the ten-year phase out period implemented in 1997 (GMFMC 1996). Under regulations implementing the original Fishery Management Plan for the Reef Fish Resources of the Gulf (Reef Fish FMP), a fish trap in the Gulf EEZ is defined as a trap and its component parts (including the lines and buoys), regardless of the construction material, used for or capable of taking finfish, except a trap historically used in the directed fishery for crustaceans (that is, blue crab, stone crab, and spiny lobster) (50 CFR 622.2). Under the regulations implementing Amendment 14 to the Reef Fish FMP, starting in 1997, fish traps were prohibited in the area west of 85° 30′ W. long., which is west of the Florida Keys Region; this prohibition extended to include all federal waters in the Gulf including federal waters off the Florida Keys Region in the Gulf, after February 7, 2007. Golden crab traps are not listed as a crustacean fishery exception for the Gulf, and thus are considered fish traps. Therefore, golden crab traps have not been allowed in the Florida Keys Region in the Gulf since 2007. Golden crab traps are allowed in federal waters in the South Atlantic part of the Florida Keys Region, as long as they are deployed in waters 700 feet (213 m) or deeper (50 CFR 622.246(a)). This depth restriction effectively keeps this gear entirely out of FKNMS; the only area of FKNMS that contains waters deeper than 700 feet is the Tortugas South Ecological Reserve, a deep-water protected zone in the western part of the sanctuary where fishing is not allowed. Finfish traps were prohibited offshore of Key Largo, FL in 1975 and offshore of Big Pine Key, FL in 1981 under regulations promulgated for the Key Largo and Looe Key National Marine Sanctuaries[47], respectively. Finfish trap use has been prohibited in state waters off Florida, which encompasses the majority of FKNMS waters, since 1980 although pinfish traps for bait are allowed.

Sub-Action 3.2 for the Florida Keys examines three alternatives, a No Action (no traps) alternative (**Alternative 1**), testing up to 1600 traps/year (**Alternative 2**), and testing up to 3000 traps per year (**NMFS** and **ONMS Preferred Alternative 3**). To reiterate, the proposed traps in the original EFP applications being considered by NMFS for the Florida Keys Region include: 25 spiny lobster wood traps with modified funnels, 525 spiny lobster wood and wire traps with modified funnels, 500 spiny lobster all wire traps with modified funnels, 25 wire pinfish traps with modified funnels, 25 black sea bass pots with modified funnels, and 40 non-containment purse traps. Included in those numbers are a pending and withdrawn ONMS permit application that proposed to test 25 spiny lobster wood traps with modified funnels, 25 spiny lobster wood and wire traps with modified funnels, 25 wire pinfish traps with modified funnels, and 25 black sea bass pots with modified funnels within FKNMS (100 total traps), and a pending ONMS permit application that proposes to test 15 spiny lobster traps with one modified trap (16 total traps). Although applications involving some of this effort have been withdrawn, NMFS and ONMS expect to receive additional applications proposing to test similar amounts of traps, as explained elsewhere in the document.

Biological Effects

Expected Effects on the Biological Environment from Removal of Lionfish

Similar to effects under Sub-Action 3.1, **Alternative 1 (No Action)**, not issuing permits for trap testing to target lionfish would mean there would no traps set to target lionfish in Florida Keys Region, and therefore no pressure on the lionfish population in the Florida Keys Region

[47] 15 CFR Part 929 established regulations for the Key Largo National Marine Sanctuary. 15 CFR Part 937 established regulations for the Looe Key National Marine Sanctuary. These two sets of regulations were replaced by the final rule establishing FKNMS regulations, 15 CFR Part 922, published on January 30, 1997. The former Key Largo and Looe Key National Marine Sanctuaries have been incorporated into the FKNMS as Existing Management Areas (15 CFR 922.164(b)).

from the proposed traps. Thus, the lionfish population is expected to remain at current levels, if not increase as time progresses. This would prevent any beneficial effects to the biological environment from removing lionfish (e.g., reduced competition with lionfish for prey species, potential for increased abundance of prey species that lionfish may have removed, reduced predation of lionfish on commercially, recreationally, and ecologically important species, etc.). **Alternative 1 (No Action)** also would not allow NMFS, ONMS and any applicants to gain any knowledge about the effectiveness of various trap types and design modifications at capturing lionfish, while avoiding and minimizing impacts to non-target species, protected species, and habitats in the Florida Keys Region. However, without the additional removal of any lionfish from the Florida Keys Region, **Alternative 1 (No Action)** is expected to have the greatest positive effect on lionfish. **Alternative 2** and **NMFS Preferred Alternative 3,** both allow for the removal of lionfish from a specific area over time. This effort could have an indirect positive effect to the biological environment by removing invasive lionfish from these areas with **NMFS Preferred Alternative 3** expected to have more of an indirect positive effect then **Alternative 2**. Again, **NMFS Preferred Alternative 3** would be expected to result in the removal of more lionfish than **Alternative 2**, simply because it proposes a greater effort. **Alternative 2** and **NMFS** and **ONMS Preferred Alternative 3** both allow for the removal of lionfish from a specific area over time. This effort could have an indirect positive effect to the biological environment by removing invasive lionfish from these areas, with **Preferred Alternative 3** expected to have more of an indirect positive effect then **Alternative 2** because it involves more effort. **NMFS** and **ONMS Preferred Alternative 3** would allow up to 3,000 traps and **Alternative 2** would allow up to 1,600 traps. Thus, the greatest negative effects are expected to occur for lionfish under **NMFS** and **ONMS Preferred Alternative 3** as more traps mean more opportunity for capture and removal from the environment. However, the total number of experimental traps proposed for use under both **Alternative 2** and **NMFS** and **ONMS Preferred Alternative 3** is small compared to the total number of traps currently allowed for use in the Florida Keys Region. Therefore, the lionfish population reduction resulting from trap use could be negligible. Regardless, any reduction in the lionfish population is deemed positive. In addition, **NMFS** and **ONMS Preferred Alternative 3** could allow for more knowledge about a larger array of trap types and design modifications. This could improve knowledge and understanding of how to effectively capture lionfish and/or avoid and minimize potential effects to the biological environment.

Expected Effects to Co-Occurring Species

As with Sub-Action 3.1, effects of the alternatives considered under Sub-Action 3.2 in terms of effects to native fish populations are expected to be similar. **Alternative 1 (No Action)** is expected to have no negative effects on other fish species in terms of bycatch because no traps would be added to the Florida Keys Region. However, lionfish population levels would remain similar to what they are currently, placing continued stress on co-occurring species through competition.

Bycatch effects are anticipated under **Alternative 2** and **NMFS** and **ONMS Preferred Alternative 3,** with **NMFS** and **ONMS Preferred Alternative 3** (up to 3,000 traps) having more potential for negative effects than **Alternative 2** (up to 1,600 traps). Additional traps deployed in the Region effectively increase the amount of time trap gear is in the water and could capture non-target species. Bycatch rates in traps that are part of current, allowable fisheries in the Florida Keys Region (e.g., spiny lobster traps) would be minimal based on data collected under those fisheries (see Section 3.1.1). However, species affected and rates of bycatch in trap types that are not currently part of an approved fishery in the Florida Keys region (e.g., black sea bass pots) are unknown as these trap types have not been allowed in federal waters of this region for over 10 years. In spite of this, using bycatch data from the historical trap fishery and from other approved fisheries in other regions and the limited number of traps in the Florida Keys Region, it is expected bycatch to remain minimal. **NMFS** and **ONMS Preferred Alternative 3** could have the greatest negative effects to co-occurring species from bycatch because it would allow the greatest number of traps for use. As mentioned in Sub-Action 3.1, lost traps can ghost fish. Previous fish trap studies concluded Dade County, Florida fish trap fishermen lost 1-5 traps per trip, with an annual loss of, at times, up to 100%. Losses were due to theft or loss of buoys (Sutherland and Harper 1983). Monroe County, Florida trap fishermen estimated average annual trap losses of 63%. Their losses were mainly from currents and severance of buoys by large ships in deep water and from vandalism inshore (Sutherland and Harper, 1983). It is noted that trap loss from this study was prior to the requirement that traps be returned to shore after each trip starting in 1994 in the Gulf. Sutherland et al. (1987) found that 85% of traps used off Key Biscayne, Florida, were lost with most losses attributed to theft. Any increase in the amount of traps lost is expected to increase bycatch of co-occurring species. However, the effort proposed for the Florida Keys region is small, especially compared to what is currently being used in allowed trap fisheries. This increase would not be anticipated to be significant due to studies showing finfish and shellfish bycatch in the current commercial trap fisheries to be negligible (see Section 3.1.1) and bycatch for non-containment traps to be non-existent. Based on NMFS's and ONMS's preferred alternatives under Actions 1 and 2, **Alternative 2** and **NMFS** and **ONMS Preferred Alternative 3** would allow the effectiveness of trap designs not currently fish to be tested, and that testing would also occur during periods when traps would normally be prohibited. **NMFS** and **ONMS Preferred Alternative 3** would have the greatest potential for lost traps, simply because it proposes the greatest amount of effort. As mentioned in Sub-Action 3.1, there are ways to mitigate for the potential of lost traps and traps that can ghost fish (see Chapter 5). The effect from requiring that mitigation are expected to have the same results across regions.

Alternative 2 and **NMFS** and **ONMS Preferred Alternative 3** both have the potential to remove lionfish from a specific area over time, which has the potential to positively affect co-occurring species that lionfish may prey on or outcompete for food. **NMFS** and **ONMS Preferred Alternative 3** has the greatest potential to remove the most lionfish from the Florida Keys Region over time, simply because it proposes the greatest amount of effort. **Alternative 1 (No Action)** would not allow for the removal of any additional lionfish from this Region over time, and thus would not have any positive effect to endemic, co-occurring species in terms of removing this invasive, competing species.

Expected Effects to Protected Species

Alternative 1 (No Action) would not have any additional biological effects in terms of protected species interactions and bycatch as no trap testing to target lionfish would be allowed in the Florida Keys Region. The greatest negative effects to protected species are anticipated under **NMFS** and **ONMS Preferred Alternative 3** as it proposes the greatest trap effort, thereby, potentially increasing bycatch and entanglement issues both from fished traps and ghost traps. Non-containment type traps are expected to have similar potential effects related to entanglement of protected species from vertical buoy lines as containment traps. In addition, while there are ESA-listed corals in the Florida Keys Region, traps allowed in this Region will be set deeper than where ESA-listed corals are known to exist as a condition of the EFPs and ONMS permits (see Chapter 5), so it is believed any adverse effects are highly unlikely. If traps were allowed to be tested in waters shallower than 30 meters, impacts to ESA-listed corals could occur when traps move and damage or injure corals. See section 3.2.4.1 for more details. Even with increased trap effort under **Alternative 2** and **NMFS** and **ONMS Preferred Alternative 3**¸effects to Nassau grouper were determined to be highly unlikely (see Appendix B). There are no other protected species that are anticipated to be caught in the trap as bycatch. The probability for entanglement of marine mammals, sea turtles, and smalltooth sawfish increases with the number of traps given the increased potential for encounters with gear. The use of traps in a trawl configuration proposed under the types of traps analyzed under Action 1 also decreases the amount of trap line in the water, thus decreases the risk of entanglement of these species (Knowlton et al. 2012). However, trap pot trawls do increase risk for serious injury or mortality for protected species given the stronger line and heavier weight of additional traps. Lineless gear would eliminate risk of entanglement of protected species, specifically for whales, dolphins, sea turtles, and smalltooth sawfish and is being considered as mitigation (see Chapter 5). Data on other trap fisheries is provided in Chapter 3 (see Sections 3.3.4.1, 3.3.4.2, 3.3.4.3, and 3.3.4.4). The effects to protected species from **Alternative 2** would fall in between those resulting from **Alternatives 1 (No Action)** and **NMFS** and **ONMS Preferred Alternative 3**. However, none of the potential negative effects to protected species are expected to be significant. Please see the Section 7 ESA consultation conducted for this project in Appendix B, for more detailed information.

<u>Physical Effects</u>

As with Sub-Action 3.1, traps and pots may impact and degrade habitat including habitats identified and described as EFH. Although each individual trap has a relatively small footprint, the damage can be substantial due to the number of traps deployed, including lost and abandoned traps. The Florida Keys region is home to the third largest barrier reef and therefore trap concentration damage could have a greater effect on this habitat than in other Regions.

Like Sub-Action 3.1, Sub-Action 3.2 **Alternative 1 (No Action)** would have any additional effects on the physical environment in terms of habitat compared to **Alternative 2** and **NMFS** and **ONMS Preferred Alternative 3** as no traps to target lionfish would be allowed in the Florida Keys Region waters. More trap effort under **NMFS** and **ONMS Preferred Alternative 3** could lead to a higher chance of habitat degradation and potential impacts to ESA-listed and non-listed corals than **Alternative 2** because it would allow the highest number of traps for testing per year. Some trap types being proposed are known to move during storm or high wind events, damaging EFH, various coral species, and other important marine habitats such as seagrass. In addition, buoyed and sinking line from deployed and lost gear can also pose entanglement risks with sensitive habitat. One way to limit the potential for trap movement is to require minimum weighting of traps to reduce the risk of trap movement and loss (see Chapter

5). It can also help ensure traps are deployed on the desired spot, and do not drift long distances as they sink to the bottom. Non-containment type traps could have more of a negative effect than containment traps since they are primarily in the experimental design phase, and necessary weighting to minimize movement is unknown at this time. Potentially requiring unique gear/line markings could help identify and associate any traps that are lost or misplaced with these trap testing experiments; providing valuable information about trap loss and movement. Additionally traps can be lost in the marine environment even when not actively being fished. Traps stacked along docks and marinas can be carried out to sea during large storm events. However, as noted above, the total number of traps proposed for use under both **Alternative 2** (up to 1,600 traps) and **NMFS** and **ONMS Preferred Alternative 3** (up to 3,000 traps) is very small compared to the total number of traps currently allowed for use in the Florida Keys Region. Impacts to EFH and other habitats and species from this additional trap load may not be above detectable levels. **NMFS** and **ONMS Preferred Alternative 3** could potentially introduce 3,000 new traps to the South Florida/ FKNMS environment. To help mitigate this potential effect from lost traps used in these experiments, traps could be required to have an existing stamp, certification and/or endorsement; in this way, no new traps would be introduced that could be lost (the universe of traps that could be lost remains the same), although the risk of loss could change depending on where the traps are set and how they are stored. If this mitigation method is used, then **NMFS** and **ONMS Preferred Alternative 3** and **Alternative 2** would be expected to have a similar potential for long term effects to habitat and the physical environment from lost and misplaced traps, as **Alternative 1 (No Action)** because no new additional traps would be added to the environment. To be clear, however, even if this mitigation were required, based on NMFS's and ONMS's preferred alternatives under Actions 1 and 2, **Alternative 2** and **NMFS** and **ONMS Preferred Alternative 3** would allow the effectiveness of containment trap designs not currently fished in the Florida Keys Region to be tested, so additional traps could be added to this Region. Testing of endorsed traps could also occur during periods when traps would normally be prohibited.. Because those existing traps could be used at times when they are prohibited, could potentially be set in different areas within the Region than are typically utilized, increased effects may be seen. In addition, non-containment traps, which do not have the existing stamp, certification and/or endorsement requirement, could be used, increasing effort and potential for effects. In that case, **NMFS** and **ONMS Preferred Alternative 3** would be expected to have more negative effects than **Alternative 2.**

Sub-Action 3.3: Gulf of Mexico Region

This sub-action looks at the effects of different numbers of traps within the Gulf of Mexico Region. In Chapter 3, we discussed the affected environment, including the trap fisheries that operate within the Gulf. Here we note the number of traps in those fisheries within the Gulf of Mexico Region as context for understanding the effects of setting additional traps within this region. While there is some incidental finfish catch allowed in spiny lobster and stone crab traps within the Gulf of Mexico Region, finfish traps have been prohibited in all federal waters of the Gulf since 2007 (the end of a ten-year phase out program implemented in 1997) (GMFMC 1996). Fish trap use west of Cape San Blas, Florida (west of 85° 30′ W. long.) was prohibited in 1997, although no fish traps were being used in that area at that time. Finfish trap harvest has been prohibited in state waters off Florida in this region since 1980, although pinfish traps for bait are allowed. The estimated total number of traps currently used within this Region is considered small and an exact number cannot be identified at this time.

To reiterate, the original EFP applications for the Gulf of Mexico Region proposed the following traps: 25 spiny lobster wood traps with modified funnels, 1,025 spiny lobster wood and wire traps with modified funnels, 1,000 spiny lobster all wire traps with modified funnels, 25 wire pinfish traps with modified funnels, 25 black sea bass pots with modified funnels, and 4,080 non-containment purse traps. Although applications involving some of this effort have been withdrawn, NMFS expects to receive additional applications proposing to test similar amounts of traps, as explained elsewhere in the document.

Biological Effects

Expected Effects on the Biological Environment from Removal of Lionfish

Similar to effects under Sub-Action 3.1 and Sub-Action 3.2, **Alternative 1 (No Action)**, not issuing permits for trap testing to target lionfish in the Gulf of Mexico Region, would not allow any applicants to gain any knowledge about the effectiveness of various trap types and design modifications at capturing lionfish, while avoiding and minimizing impacts to non-target species, protected species and habitats in the Gulf of Mexico Region. Under **Alternative 1 (No Action)**, no traps to target lionfish would be set in the Gulf of Mexico Region and no additional lionfish would be removed from this Region. Thus, the lionfish population is expected to remain at current levels, if not increase as time progresses. This would prevent any benefit effects to the biological environment from removing lionfish (e.g., reduced competition with lionfish for prey species, potential for increased abundance of prey species that lionfish may have removed, reduced predation of lionfish on commercially, recreationally, and ecologically important species, etc.). **Alternative 2** and **NMFS Preferred Alternative 3** both allow for the removal of lionfish from a specific area over time. This effort could have an indirect positive effect to the biological environment by removing invasive lionfish from these areas, with **NMFS Preferred Alternative 3** expected to have more of an indirect positive effect then **Alternative 2** because it allows for more effort. **Preferred Alternative 3** would allow up to 10,000 traps while **Alternative 2** would allow up to 5,600 traps. The total number of traps proposed for use under both **Alternative 2** and **NMFS Preferred Alternative 3** would be an increase over the minimal crustacean trap use in southwest Florida. Therefore, lionfish population reduction would be anticipated to occur due to removal as studies have shown that condensed, regular, removal efforts have resulted in decreased localized lionfish populations (Green 2017). In addition, **Preferred Alternative 3** could allow for more knowledge about a larger array of trap types and design modifications. This could improve knowledge and understanding of how to effectively capture lionfish and/or avoid and minimize potential effects to the biological environment.

As with Sub-Action 3.1 and Sub-Action 3.2, effects to native fish populations would be expected to be similar. **Alternative 1 (No Action)** would have no negative effects on other fish species because no traps would be added to the Gulf of Mexico Region. However, lionfish population levels would remain similar to what they are currently, placing continued stress on co-occurring species through competition. Bycatch effects are anticipated to increase in **Alternative 2** and **NMFS Preferred Alternative 3,** with **NMFS Preferred Alternative 3** (up to

10,000 traps) having more potential for negative effects than **Alternative 2** (up to 5,600 traps). Additional traps deployed in the Region effectively increase the amount of time trap gear is in the water and could capture non-target species. Bycatch rates in traps that are similar to those used in current, allowable fisheries in the Gulf of Mexico Region (e.g., spiny lobster traps) would be minimal based on data collected under those fisheries (see Section 3.1.1). However, species affected and rates of bycatch in trap types that are not currently part of an approved fishery in the Gulf of Mexico Region (e.g., black sea bass pots, wire pinfish traps) are unknown as these trap types have not been allowed in federal waters of this region for over 10 years. In spite of this, using bycatch data from the historical trap fishery and from other approved fisheries in other regions, it is expected bycatch to be minimal. Incidentally, studies conducted during the start of the Gulf fish trap permit moratorium in 1994 found that mortality of undersized target and bycatch species taken in fish trap use at that time was minimal in comparison to mortality associated with otter trawls and likely in comparison to other gear used in the reef fish fishery. Furthermore, less than 5% of fish traps were lost annually, and therefore ghost fishing, due to fishermen tending to their traps at sea and returning them to shore after each trip. Traps were pulled on average every hour during the day and soaked overnight while the crew slept. However, many reef fish species have recovered and have increased population numbers since the 1990s, thus, it would be expected fish trap use in this Region could result in higher bycatch of co-occurring species. As mentioned in Sub-Actions 3.1 and 3.2, lost traps can ghost fish. Any lost traps are expected to increase bycatch of co-occurring species although the overall biological effects from trap testing are expected to be minimal based on bycatch studies from other areas. Based on NMFS's preferred alternatives under Actions 1 and 2, **Alternative 2** and **NMFS Preferred Alternative 3** would allow the effectiveness of trap designs not currently fished to be tested, and that testing would also occur during periods when traps would normally be prohibited. **NMFS Preferred Alternative 3** would have the greatest potential for lost traps, simply because it proposes the greatest amount of effort. As mentioned in Sub-Action 3.1 and 3.2, one way to mitigate the potential effect of ghost fishing and the bycatch of non-target species is to fish with degradable panels or wire on the containment trap or use non-containment type traps, which are highly unlikely to catch finfish species other than lionfish. See Chapter 5 for other mitigation measures.

Alternative 2 and **NMFS Preferred Alternative 3** both have the potential to remove lionfish from a specific area over time, which has the potential to positively affect co-occurring species that lionfish may prey on or outcompete for food. **NMFS Preferred Alternative 3** has the greatest potential to remove the most lionfish from the Gulf of Mexico Region over time, simply because it proposes the greatest amount of effort. **Alternative 1 (No Action)** would not allow for the removal of any additional lionfish from this Region over time, and thus would not have any positive effect to endemic, co-occurring species in terms of removing this invasive, competing species.

Expected Effects to Protected Species

Alternative 1 (No Action) would not have any biological effects in terms of protected species interactions and bycatch as no trap testing to target lionfish would be allowed in the Gulf of Mexico Region. Among the alternatives considered, the greatest negative effects to protected species are anticipated under **NMFS Preferred Alternative 3** as it proposes the greatest trap effort. This alternative would have the potential to increase bycatch and entanglement issues both from fished traps and lost traps. Non-containment type traps are expected to have similar potential effects related to entanglement of protected species from vertical buoy lines as containment traps. The probability for entanglement of marine mammals, sea turtles, and smalltooth sawfish increases with the number of traps given the increased potential for encounters with gear. The use of trap trawl configurations proposed under the types of traps analyzed under Action 1 would also decrease the amount of trap line in the water, thus decreases the risk of entanglement of these species (Knowlton et al. 2012). However, trap pot trawls increase the risk for serious injury or mortality for protected species given the stronger line and heavier weight of additional traps. Lineless gear would also eliminate risk of entanglement of protected species, specifically for whales, dolphins, sea turtles, and smalltooth sawfish and is being considered as mitigation (see Chapter 5). In the Gulf of Mexico Region, bycatch of Nassau grouper would be unlikely because the range of Nassau grouper does not overlap with this Region. Therefore, **Alternative 1 (No Action)** through **NMFS Preferred Alternative 3** would have the same effect on Nassau grouper. There are no other protected species that are anticipated to be caught in the trap as bycatch. Currently, traps are not allowed in the Flower Garden Banks National Marine Sanctuary (FGBNMS) where ESA-listed coral may be present in the Gulf of Mexico Region. Trap movement into FGNMS may occur but it is not anticipated that FGBNMS would approve a permit for testing. As explained in Action 2, existing protected, "no fishing" areas will not be authorized for trap testing under EFP permits (see Chapter 5), therefore, **Alternative 1 (No Action)** through **NMFS Preferred Alternative 3** would have the same effect on ESA-listed coral. Data on other trap fisheries and protected species interactions is provided in Chapter 3 (see Sections 3.3.4.2, 3.3.4.3, and 3.3.4.4). The effects to protected species from **Alternative 2** would fall between those resulting from **Alternatives 1 (No Action)** and **NMFS Preferred Alternative 3**. However, none of the potential negative effects to protected species are expected to be significant. Please see the Section 7 ESA consultation conducted for this proposed action in Appendix B, for more detailed information.

Physical Effects

As mentioned in Sub-Actions 3.1 and 3.2, traps and pots may impact and degrade habitat, including habitats identified and described as EFH. While trap fishing in the FGBNMS would most likely not be authorized by a permit from FGBNMS, it is unknown the effect traps could have on other hard bottom throughout the Gulf of Mexico Region. Fish traps have been prohibited in this Region for over 10 years and other crustacean trap fisheries do not occur in the majority of this Region, thus we do not have recent data from which we can evaluate potential effects. An analysis of potential mesophotic coral ecosystems (MCE) in the northern Gulf by Locker et al. (2010), indicated that the Region has an order of magnitude greater potential area for deep corals than the U.S. Caribbean or the main Hawaiian Islands. The gently sloping shelf located within the northern Gulf and west side of the Florida platform, not seen in these other areas, contributes to the high potential. Trap concentration damage could have a greater effect on potential MCE than in other Regions. While critical habitat and HAPCs have been identified for the Gulf of Mexico Region, there are areas that may be yet to be identified and thus more traps may increase effects to these areas.

Like Sub-Action 3.1 and Sub-Action 3.2, Sub-Action 3.3, **Alternative 1 (No Action)** would not have any effects on the physical environment in terms of habitat as no trap testing to target lionfish would be allowed in the Gulf of Mexico Region waters. More trap effort under **NMFS Preferred Alternative 3** could lead to a higher chance of habitat degradation and potential impacts to ESA-listed and non-listed corals due to trap movement and other potential issues, because it would allow for the highest number of traps per year for the Gulf of Mexico Region. If all 10,000 traps were to be concentrated in a single area this could potentially lead to significant habitat impacts. However, this amount of effort would be distributed across different applicants, and therefore different testing locations. Furthermore, Amendment 5 to the Reef Fish FMP (GMFMC 1993) found that 9,600 traps off Florida's west coast would not adversely impact the environment. Thus, impacts to EFH and other habitats and species under **Alternative 2** and **NMFS Preferred Alternative 3** from this additional trap load may not be above detectable levels, at least off Florida. Fish traps nor any other trap types were historically used west of Cape San Blas, Florida and therefore physical effects by trap use to areas west of this are unknown. Some trap types being proposed are known to move during storm or high wind events, damaging EFH, various coral species, and other important marine habitats such as seagrass. In addition, buoyed and sinking line from deployed and lost gear can also pose entanglement risks with sensitive habitat. One way to limit the potential for trap movement is to require minimum weighting of traps to reduce the risk of trap movement and loss (see Chapter 5). It can also help ensure traps are deployed on the desired spot, and do not drift long distances as they sink to the bottom. Non-containment type traps could have more of a negative effect than containment traps since they are primarily in the experimental design phase, and necessary weighting to minimize movement is unknown at this time. By requiring unique gear/line marking, any traps that are lost or misplaced could be later identified and associated with these trap testing experiments, providing valuable information about trap loss and movement. Additionally traps can be lost in the marine environment even when not actively being fished. Traps stacked along docks and marinas can be carried out to sea during large storm events. The prohibition on trap use for the collection of finfish has been in place in all of the Gulf since 2007 and the number of traps proposed under **Alternative 2** (5,600) traps, would be less than the amount of fish traps historically used off west Florida. Studies showed that effects from Gulf fish trap use at the start of the Gulf fish trap permit moratorium in 1994 (9,600 traps) had little impact on the physical environment and would not adversely impact this environment (GMFMC 1993). However, this could be due to fish traps being banned from the Gulf stressed area (10-fathom contour off areas of lower human population density and at the 20-fathom contour off areas of higher human population density) with the original Reef Fish FMP and, therefore, placed well outside of sensitive habitat (GMFMC 1981). Traps were generally placed on habitat that mostly consisted of sand and low relief rock with live bottom of sponges and gorgonians.

NMFS Preferred Alternative 3 could potentially introduce 10,000 new traps to the Gulf environment and could lead to a chance of habitat degradation as traps could now be utilized in the majority of the Gulf. To help mitigate this effect, traps used in these experiments could be required to have an existing stamp, certification and/or endorsement. If this mitigation method was used, then **NMFS Preferred Alternative 3** and **Alternative 2** might have a similar potential for long term effects to habitat and the physical environment from lost and misplaced traps as **Alternative 1 (No Action)** because no new additional traps would be constructed for testing; only existing certified gear would be used. However, even as existing gear, it could be placed in areas historically not used for trap fishing or at times when traps are usually prohibited. To be clear, however, even if this mitigation were required, and based on NMFS's preferred alternatives under Actions 1 and 2, **Alternative 2** and **NMFS Preferred Alternative 3** would allow the effectiveness of containment trap designs not currently fished in the Gulf of Mexico Region to be tested, so additional traps could be added to this Region. Testing of traps could also occur during periods when certain traps would normally be prohibited. Because those traps could be used at times when they are prohibited, and could potentially be set in different areas within the Region than are typically utilized, increased effects may be seen. Furthermore, requiring traps used in these experiments to have an existing stamp, certification and/or endorsement may not be required. In addition, non-containment traps, which do not have the existing stamp, certification and/or endorsement requirement, could be used, increasing effort and potential for effects. In these cases, **NMFS Preferred Alternative 3** would be expected to have more negative effects than **Alternative 2.**

4.3.2 Economic and Social Effects

Alternative 1 (No Action) under Sub-Action 3.1 would not allow traps to be tested for targeting lionfish in the South Atlantic region, and thus no traps would be added to the South Atlantic Region. The same is true for **Alternative 1 (No Action)** under Sub-Action 3.2 in the Keys region and FKNMS and in the Gulf region under Sub-Action 3.3. Thus, **Alternative 1 (No Action)** would eliminate the expected direct economic and social benefits to the current and expected future EFP and/or ONMS permit applicants and cooperators. It would also eliminate the expected indirect economic and social benefits to other participants in the harvesting and dealer sectors of the commercial lionfish fishery and the communities with which they are associated.

All of the original applicants have proposed to do some testing in South Atlantic waters. Although two of the pending applications have been withdrawn, NMFS expects to receive additional applications proposing to test similar in similar locations, as explained elsewhere in the document. Because the trap component of the current lionfish fishery (incidental harvest in allowable trap fishing) exists almost entirely in the Keys, excluding the South Atlantic from testing under **Alternative 1 (No Action)** would prevent a determination of whether traps could be effectively used to target lionfish in this region and potentially further develop the trap component of the lionfish fishery in those waters and associated communities, particularly on the east coast of Florida (e.g., Volusia and Brevard counties). Relative to **Alternative 1 (No Action)**, **Alternative 2** and particularly **NMFS Preferred Alternative 3** for Sub-Action 3.1 would result in greater net economic and social benefits for applicants seeking to test traps for targeting lionfish in the South Atlantic region, as well as other entities in the harvesting sector, the dealer sector, and associated communities. Again, the two primary sources of direct and indirect economic and social benefits are: (1) the landing and sales of lionfish that are harvested as a result of the authorized testing (direct effects) and potentially in the future if the fishery continues to expand as a result (indirect effects), and (2) the information that is gathered regarding the "best" way to harvest lionfish (direct effect for applicants and cooperators, indirect effect for other entities). There would also be indirect economic and social effects on the fisheries that interact with the lionfish fishery because it is still in its early stages of development and few entities rely primarily or solely on the harvest of lionfish. The vast majority of the entities currently in the lionfish fishery primarily participate in other fisheries.

In general, from an economic and social perspective, “more is better” in this case. The more traps that can be used to test their effectiveness in targeting lionfish, assuming they are at all effective, the greater the resulting landings and revenues would be and the more information that would be gathered regarding the “best” method to harvest lionfish using traps. Part of the latter determination is the number of traps to deploy under various fishing conditions, in different areas, and at different times of the year. Allowing more traps would allow more opportunities to alter the method used to harvest lionfish and determine which one is “best.” From the perspective of the harvesting sector, the “best” method would likely be considered the one that generates the greatest profits, while dealers and communities are more concerned with generating the greatest landings and revenues/sales as that leads to the greatest economic impacts (i.e., jobs, income, value-added, and output).

Based on lionfish landings data from 2012-2016, a trip that incidentally harvested lionfish using traps typically used between 200 and 300 traps per trip (haul). The maximum number of traps used on any trip during this time was 2,600, though deploying that many traps is rare and the typical maximum in a given year is between 1,000 and 1,500 traps per trip (haul). However, as those trips were meant to target other species, such as spiny lobster and stone crab, the number of traps needed to “optimally” harvest lionfish could be different. Still, to get a sense of the difference in the potential effects between **Alternative 2** and **NMFS Preferred Alternative 3**, assume each trip uses 250 traps. Up to as many as nine trips (hauls) could be made under **Alternative 2**, but that number would increase to 20 trips (hauls) under **NMFS Preferred Alternative 3**, or by more than double. In turn, this could lead to twice as many landings and revenues resulting from the trips/hauls and the “amount” of data to be collected would also be more than doubled. Thus, **NMFS Preferred Alternative 3** would be expected to generate greater direct and indirect economic and social benefits compared to **Alternative 2**.

The qualitative analysis for Sub-Action 3.1 can also be applied to the alternatives under Sub-Action 3.2 and Sub-Action 3.3. That is, **Alternative 1 (No Action)** for each of those sub-actions would eliminate the direct economic and social benefits to the current and future applicants and cooperators that have proposed to test traps for targeting lionfish, specifically in the Florida Keys region and the FKNMS under Sub-Action 3.2 and the Gulf region under Sub-Action 3.3. For each Sub-Action, **Alternative 1 (No Action)** would eliminate the testing that could be done.

Similar to the comparison of **Alternative 2** and **NMFS Preferred Alternative 3** under Sub-Action 3.1, although the number of traps allowed under **NMFS** and **ONMS Preferred Alternative 3** for Sub-Action 3.2 and **NMFS Preferred Alternative 3** under Sub-Action 3.3 is not quite double the number allowed under **Alternative 2** in both cases, the difference would still be meaningful. As such, for the reasons noted above, the net economic and social benefits would likely be greater under **NMFS** and **ONMS Preferred Alternative 3** relative to **Alternative 2** for Sub-Action 3.2 and **NMFS Preferred Alternative 3** relative to **Alternative 2** for Sub-Action 3.3. Further, although the information from the testing would eventually be expected to spread throughout the Southeast, relatively more of the benefits would be expected to accrue to Monroe county and the commercial fishing businesses, vessels, and dealers in that community under

Alternative 2 and particularly **NMFS** and **ONMS Preferred Alternative 3** for Sub-Action 3.2. Relatively more of the benefits would be expected to accrue to communities on the Gulf coast of Florida under **Alternative 2** and particularly **NMFS Preferred Alternative 3** for Sub-Action 3.3, most likely in the Florida panhandle and possibly the Tampa bay area given where traps are expected to be deployed and where markets for lionfish are already established.

Further, because the lionfish fishery and associated markets are already firmly established in Monroe County, Florida, it is probably not necessary to conduct as much testing in the Florida Keys to determine the "best" method for harvesting lionfish using traps relative to the other two regions, particularly the Gulf because the fishery has only just recently expanded into that region. Thus, from the perspective of net economic and social benefits, it will likely require more testing and thus more traps to generate comparable quantities of landings, revenues, and data/information under the EFPs in the Gulf. This provides additional rationale for selecting **NMFS Preferred Alternative 3** under Sub-Action 3.3, as well as under Sub-Action 3.1 to a lesser extent.

4.4 Action 4. Bait

> **Action 4 Alternatives**
>
> Alt. 1 (No Action). No permits issued for trap testing to target lionfish.
> Alt 2. No bait.
> **NMFS** and **ONMS Pref Alt. 3**. Any bait.
>
> * See Chapter 2 for detailed description of alternatives

4.4.1 Biological and Physical Effects

Biological Effects

Expected Effects to the Biological Environment from Removal of Lionfish

The majority of lionfish landings currently come from incidental catch in the spiny lobster trap fishery. Spiny lobster traps are most often baited with undersized spiny lobster. Commercial fishermen have observed that lionfish are most often found in traps that do not contain spiny lobster, and spiny lobster are usually not found in the same traps as lionfish (R. Stiglitz, pers. comm. 2017). It is reasonable to conclude that lionfish captured in traps are attracted to the structure created by the trap on the seafloor, rather than the bait, such as spiny lobsters. **Alternative 1 (No Action)** would not result in the issuance of permits for testing of traps to target lionfish. Since no permits would be issued, no additional traps, whether baited or not, would be introduced into the environment. **Alternative 2** would allow testing of traps to target lionfish without the use of bait. Because lionfish captured in traps are thought to be attracted by structure and not necessarily bait, Alternative 2 is not expected to have different effects as **NMFS and ONMS Preferred Alternative 3**. **NMFS and ONMS Preferred Alternative 3** would allow the testing of traps to target lionfish with any type of bait. NMFS EFPs and ONMS permits could be issued to test the effectiveness of utilizing various types of bait or no bait at all. It is currently unknown if baited traps attract lionfish. Any bait that attracts species other than lionfish could negatively affect the biological environment. If baited traps attract more lionfish, they have the potential to remove more lionfish, which could benefit the biological environment. Potential benefits of lionfish removal include reduced competition between native fish species and lionfish for prey and increased abundance of prey species that lionfish may have removed.

Expected Effects to Co-Occurring Species

Biological effects from testing of traps to target lionfish could result from bycatch of commercially important species, such as spiny lobster, snapper-grouper, and reef fish. **Alternative 1 (No Action)** would not allow testing of traps to target lionfish, which would result in the least amount of impacts to co-occurring species. In commercial trap fisheries, bait is used as an attractant for target species and could consist of fish (black sea bass portion of the snapper-grouper fishery) or cowhide (spiny lobster fishery). Under **Alternative 1 (No Action)**, there would be no additional trap use and no baited traps that could attract co-occurring species. **Alternative 2** is not expected to have negative effects to bycatch of co-occurring species due to most finfish being attracted to traps by bait. **Preferred Alternative 3** could result in bycatch of co-occurring species such as reef fish and snapper-grouper if bait attracts species other than lionfish (i.e. non-target) and would have the potential to negatively affect the biological environment.

Allowing the testing of experimental trap gear with bait in **NMFS and ONMS Preferred Alternative 3** is expected to result in the greatest negative biological effect from bycatch and no anticipated bycatch impacts from **Alternative 1 (No Action)**. However, how much or how little different baits attract lionfish and/or non-target species is directly related to testing the effectiveness of trap types and design modifications. Not allowing trap testing (including testing of baited traps) would prevent any knowledge and information about the effectiveness of different bait at attracting lionfish, while avoiding and minimizing effects to non-target species. For example, if one of the experiments finds high rates of capture of non-target species when baited with a certain bait type, that information would be very useful to NMFS and other fisheries management agencies when determining what baits might be allowed while fishing for lionfish in the future.

Expected Effects to Protected Species

Alternative 1 (No Action) would have the greatest positive effects on the biological environment in terms of protected species and bycatch compared to **Alternative 2** and **NMFS and ONMS Preferred Alternative 3** because no permits for testing of traps to target lionfish, whether baited or not, would be issued. **Alternative 2** is expected to have fewer biological effects because unbaited traps tend to attract fewer non-target, including protected, species. **NMFS and ONMS Preferred Alternative 3** would have the greatest negative biological effects on protected species because bottlenose dolphins and sea turtles are the most likely protected species to be attracted to certain baits that may be used, which increases their risk of becoming entangled. Depending on the location, bottlenose dolphins (*Tursiops truncatus*) may be attracted to bait and engage in pot-tipping behavior, increasing their risk of entanglement (Noke and Odell 2002). To help mitigate this potential effect, the Bottlenose Dolphin Take Reduction Team recommends the use of an inverted or modified bait well to discourage dolphins from attempting to feed on bait if bait is used (S. Horstman, National Marine Fisheries Service, pers. comm. 2017). Spiny lobster and stone crabs are both prey species of loggerhead sea turtles. Records of entanglements in spiny lobster and stone crab traps indicate that sea turtle entanglement is associated with fisheries that either target or bait with sea turtle prey items (e.g., finfish). Loggerhead sea turtles may be particularly vulnerable to entanglement in trap lines because of their attraction to, or attempts to feed on, species caught in the traps and epibionts growing on traps, trap lines, and floats (NMFS and USFWS 1991). Due to body configuration, leatherback sea turtles are also thought to be particularly prone to entanglement. Nassau grouper use the traps for shelter and the bait is unlikely to be a large effect on whether they enter a trap but they may be more likely to enter a trap depending on the type of bait used. We have no information suggesting smalltooth sawfish are attracted to the bait used in traps. However, it is noted that if lionfish itself is used as “bait,” this is not considered a natural prey species of any of the protected species in the South Atlantic or Gulf and would not be thought to attract protected species. Information gathered during this testing could help to better inform NMFS and other fisheries management agencies about the future use of allowable baits in commercial trap fisheries.

Physical Effects

The different alternatives on the use of bait in lionfish traps are not expected to have any effects to the physical environment.

4.4.2 Economic/Social Effects

Alternative 1 (No Action) would not allow traps to be tested for targeting lionfish in the South Atlantic region, whether baited or not. Thus, **Alternative 1 (No Action)** would eliminate the expected direct economic and social benefits to the current and future EFP and ONMS applicants and cooperators that have proposed to test traps for targeting lionfish. It would also eliminate the expected indirect economic and social benefits to other participants in the harvesting and dealer sectors of the commercial lionfish fishery and the communities with which they are associated.

NMFS and **ONMS Preferred Alternative 3** would allow any type of bait to be used when testing traps while **Alternative 2** would only allow traps to be tested without using bait. While these alternatives cannot be evaluated quantitatively, **NMFS** and **ONMS Preferred Alternative 3** would generate greater net economic and social benefits relative to **Alternative 2** because it significantly expands the choice set with respect to testing methods, thereby providing greater flexibility for applicants and their cooperators. There are numerous types of bait used in traps, including different types of small fish, different parts of the fish and other animals, as well as many kinds of artificial bait. **NMFS** and **ONMS Preferred Alternative 3** would allow considerably more experimentation and thus the collection of considerably more data to determine which type(s) of bait are most effective at harvesting lionfish (i.e., increasing CPUE) and thereby increasing landings and revenues. Because bait is not costless and some baits are more costly than others, applicants will need to determine whether the increase in costs associated with each bait type are outweighed by the increased revenues and thus whether profitability is enhanced by using bait. The ultimate goal from an economic perspective would be to determine which bait type, if any, leads to greater profitability when targeting lionfish than if no bait is used, at least for entities involved in or with connections to the commercial fishing businesses and vessels that use traps to harvest lionfish.

The expected direct economic and social benefits under **NMFS** and **ONMS Preferred Alternative 3** would accrue to the current applicants and their cooperators. However, as noted previously, these applicants and cooperators participate in or have direct connections to the harvesting sector of the existing lionfish fishery. Thus, it is also likely some of these direct benefits will accrue to some commercial fishing businesses. Once the data and results of this research regarding the effectiveness and profitability of alternative baits are shared in the future, indirect economic and social benefits would be expected to accrue to all participants in the harvesting sector. Higher landings and revenues (sales) are the primary source of economic and social benefits to seafood dealers and communities. If the type(s) of bait that lead to the greatest profits also increases landings and revenues (sales) now and in the future, they would also be expected to experience indirect economic and social benefits, particularly in the future. Under **Alternative 2** and **NMFS Preferred Alternative 3,** there would also be indirect economic and social effects on the fisheries that interact with the lionfish fishery because it is still in its early stages of development and few entities rely primarily or solely on the harvest of lionfish. The vast majority of the entities currently in the lionfish fishery primarily participate in other fisheries.

Based on the characteristics and locations of expected applicants, and what is known about the current lionfish fishery, it is expected that most of the direct and indirect economic and social benefits under **NMFS** and **ONMS Preferred Alternative 3** would accrue to commercial fishing businesses, vessels, and dealers in Monroe County as the trap component of the fishery exists almost entirely in the Florida Keys. In addition, although other communities now have a larger share of the current landings and revenue from the fishery, Monroe County, Florida still has the larger number of commercial fishing businesses, vessels, and dealers associated with the fishery by far. Depending on how successful testing is in other areas, some of these benefits could accrue to other areas as well, particularly in Volusia and Brevard counties on the east coast of Florida and the Panhandle counties in Florida where the commercial fishery has already become established.

4.5 Summary of Combined Actions

Table 4.5.1 provides various combinations of actions and alternatives that represent the most protective and greatest impact scenarios, when considered alongside NMFS's and ONMS's preferred alternatives. Table 4.5.2 provides the potential resource impacts of the scenarios defined in Table 4.5.1, examining the synergistic effects of these various combinations of actions, including examining the No Action and NMFS and ONMS preferred alternatives.

Table 4.5.1. Scenarios of Action combinations representing the full range of potential impacts. NMFS's and ONMS's preferred alternatives are also considered. NMFS preferred alternatives are shown in *italics*. ONMS preferred alternatives are shown in **bold**. Preferred alternatives shared by NMFS and ONMS are shown in ***bold italics***.

Alternatives	Action 1: Allowable trap types	Action 2: Allowable testing locations/times	Action 3: Number of traps	Action 4: Bait
Scenario 1: Most protective	*Alt. 2: Specified traps or trap modifications* Alt. 5a: Traps currently approved for use in waters of FKNMS	*Alt. 3: Gulf, South Atlantic, and FKNMS with specified exclusions* Alt. 4a: In waters deeper than 30m in FKNMS from Aug. 6 to May 15	Alt. 2: 2,200 traps/yr for South Atlantic Region; 1,600 for Florida Keys Region; 5,600 for Gulf of Mexico Region	Alt 2: No Bait
Scenario 2: Greatest Impact/Flexibility	Alt. 4: Any non-containment Traps **Alt. 5b: Approved and other described traps in waters of FKNMS**	Alt. 2: Anywhere in Gulf, South Atlantic, and FKNMS at any time **Alt. 4b: In waters deeper than 30m in FKNMS year round**	*Alt. 3: 5,000 traps for South Atlantic Region;* ***3,000 for Florida Keys Region;*** *10,000 for Gulf of Mexico Region*	***Alt. 3: Any bait***

Table 4.5.2. Resource impacts of Action combinations based on scenarios defined in Table 4.5.1 in addition to the No Action alternatives and NMFS's and ONMS's preferred alternatives.

	No action	Scenario 1: Most protective	Scenario 2: Greatest impact/flexibility	NMFS and ONMS preferred alternatives
Biological and Ecological Environment	Negligible	Negligible	Less than significant	Less than significant
Effects from removal of lionfish	Negligible	Negligible	Negligible	Negligible
Effects to co-occurring species	Negligible	Negligible	Less than significant	Less than significant
Effects to protected species	Less than significant	Negligible	Less than significant	Less than significant
Physical Environment	Negligible	Negligible	Less than significant	Less than significant
Essential Fish Habitat & other habitats	Negligible	Negligible	Less than significant	Less than significant
Economic and Social Environment	Less than significant	Negligible	Negligible	Negligible
Applicants and their cooperators	Less than significant	Negligible	Negligible	Negligible
Participants in commercial lionfish fishery	Less than significant	Negligible	Negligible	Negligible
Economic impact of the lionfish fishery	Negligible	Negligible	Negligible	Negligible
Other affected fisheries	Negligible	Negligible	Negligible	Negligible
OVERAL SIGNIFICANCE OF EFFECTS: Considering direct, indirect, and cumulative effects	Less than significant	Negligible	Less than significant	Less than significant

As summarized in Table 4.5.2, the No Action alternatives would be expected to result in less than significant effects. Under this No Action scenario, no EFPs or ONMS permits would be issued; therefore, no trap testing would occur, and there would be no effect on the physical environment from the traps themselves. Current threats to the biological environment would continue as would impacts of lionfish on other affected fisheries. By not issuing permits, fishermen would not be able to conduct trap testing, resulting in economic and social impacts greater than in all remaining scenarios where trap testing of some kind would be allowed.

Scenario 1 is expected to have negligible effects to the physical, biological, and socioeconomic environment compared to the No Action alternatives because lionfish trap testing could occur. However, trap designs, placement location, quantity of traps, and lack of bait would be those activities least likely to result in physical and biological effects. Negligible effects to protected species are anticipated because certain areas would be avoided during trap testing to reduce the potential for protected species interactions. Those potential effects would be reduced by applying certain mitigation to trap testing, such as requiring use of sinking lines and degradable panels, limiting the number of vertical lines, and ensuring that traps are sufficiently weighted to reduce potential movement.

Scenario 2 is expected to result in the greatest impacts to the physical and biological environment compared to all other scenarios but those impacts are still expected to be less than significant with mitigation. Because any trap type could be used in any location, there is the greatest potential for impacts to the physical and biological environments as compared to the other scenarios. The number of traps used would be the same as in NMFS and ONMS preferred alternatives, so the effects based on the amount of traps in water at any one time would be the same. Scenario 2 has the greatest potential to result in effects to protected species because sensitive areas would not be excluded from trap testing. However, those effects would be reduced by applying certain mitigation to trap testing, such as requiring use of sinking lines and degradable panels, limiting the number of vertical lines, and ensuring that traps are sufficiently weighted to reduce potential movement. The socioeconomic effects from Scenario 2 are expected to be negligible.

The NMFS and ONMS preferred alternatives are expected to have less than significant effects to the physical environment, like Scenario 2, because the broadest suite of trap types could be tested. However, the NMFS and ONMS preferred alternatives would result in fewer impacts on the biological and ecological environment than Scenario 2 because certain areas will be avoided during trap testing to reduce the potential for protected species interactions and contact with sensitive habitats. As with Scenarios 1 and 2, those effects would be reduced by applying certain mitigation to trap testing, such as requiring use of sinking lines and degradable panels, limiting the number of vertical lines, and ensuring that traps are sufficiently weighted to reduce potential movement.

4.6 Cumulative Effects

Federal agencies preparing an environmental assessment (EA) must also consider cumulative effects of a proposed action and other actions. Cumulative effects are those effects that result from incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (federal or non-federal) or person undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions that take place over a period of time (40 C.F.R. 1508.7). The proposed action analyzed below is based on the conglomeration of the preferred alternatives for all four actions identified in Chapter 2. Below is our five-step cumulative effects analysis that identifies criteria that must be considered in an EA.

1. *The area in which the effects of the proposed action will occur*

The affected area considered for trap testing to target lionfish encompasses federal waters of the Gulf of Mexico (Gulf) and South Atlantic, as well as waters within the Florida Keys National Marine Sanctuary (FKNMS). The Gulf, South Atlantic, and FKNMS contain important biological and physical resources. Most relevant to this trap testing are the valuable non-target species that could be captured as bycatch. Throughout these areas, there are protected species, such as threatened and endangered sea turtle species, dolphin species protected under the MMPA, and critically endangered large whales, that could become entangled in trap lines. There are valuable coral species and reef habitats that could be physically damaged by trap movement, and lost or misplaced traps. In addition, there are invasive, exotic lionfish that are taking over the reefs, and voraciously eating valuable commercial and recreational, as well as ecologically important species. For more information about the area in which the effects of this trap testing would occur, please see Chapter 3, Affected Environment, which goes into detail about these important resources as well as other relevant features of the human environment.

2. *The impacts that are expected in that area from the proposed action*

The trap testing to target lionfish could add up to 10,000 additional traps per year in the Gulf, 5,000 in the South Atlantic and 3,000 in South Florida/FKNMS. Adding these numbers of traps to test effectiveness of traps at capturing lionfish while also avoiding and minimizing effects to non-target species, protected species, and habitat could have potentially significant effects to natural resources, depending on where and when these traps are set. In depth discussion and analysis of how trap fishing can affect natural resources is provided in Barnette (2001). Specific alternatives as well as mitigation measures have been included in this programmatic EA (PEA) to avoid and minimize these potentially significant effects. Trap type and design modification testing is expected to expand knowledge regarding the effective capture of lionfish, while avoiding and minimizing impacts to non-target species, protected species, and habitats. The environmental consequences of the proposed trap testing are analyzed in detail in Chapter 4.

3. *Other Past, Present and Reasonably Foreseeable Future Actions that have or are expected to have impacts in the area and the impacts or expected impacts of these actions:*

Other Fishery-related actions:

The effects of fisheries activities in the Gulf and South Atlantic are analyzed in depth in Barnette (2001), and that analysis is incorporated here by reference. Cumulative effects related to managing the spiny lobster fishery have been analyzed in the environmental impact statement (EIS) for Amendment 11 to the Fishery Management Plan for Spiny Lobster in the Gulf and South Atlantic (GMFMC and SAFMC 2012), and are incorporated here by reference. Cumulative effects from, and relating to, the management of the black sea bass pot component of the snapper-grouper fishery have been fully analyzed in the EIS for Regulatory Amendment 16 to the Fishery Management Plan for the Snapper-Grouper Fishery of the South Atlantic Region (SAFMC 2016a), and are incorporated here by reference. Cumulative effects from and relating to the management of the stone crab trap fishery have been fully analyzed in the EA to repeal the fishery management plan for the stone crab fishery of the Gulf (NMFS 2011b). Cumulative effects from and relating to the management of the golden crab trap fishery have been fully analyzed in the EIS for the comprehensive ACL amendment to the fishery management plan for golden crab in the South Atlantic (SAFMC 2011c). The cumulative effects analysis in those documents summarize the effects of past, present and reasonably foreseeable future (at the time of publication) fisheries actions that could combine to have a cumulative effect on fisheries management and/or the human environment. They include detailed analysis of those trap fisheries, as well as other fisheries, cumulative effects on non-target species, including protected species, and habitats in the Gulf and South Atlantic. Those analyses are being incorporated into this PEA by reference. Additional pertinent actions, such as issuance of previous exempted fishing permits (EFP) and letters of acknowledgement, as well as discussion of possible future testing experiments are summarized in Chapter 1.

Ongoing management of the Gulf and South Atlantic spiny lobster fishery, black sea bass pot component of the South Atlantic snapper-grouper fishery, and the South Atlantic golden crab fishery all have impacts in the area, and the effects of these fisheries can contribute to cumulative effects with trap testing to target lionfish. Management of these fisheries determines who, where, and when these trap types are allowed to be fished. Currently, the Gulf of Mexico and South Atlantic Fishery Management Councils (Gulf and South Atlantic Councils) are considering an amendment to the Spiny Lobster FMP that considers regulations to make state management more consistent with federal management for this species. NMFS does not expect this amendment to combine with the limited trap testing to target lionfish to have cumulative effects as it only deals with the bully net and dive spiny lobster fishery not the spiny lobster trap fishery, and because any NMFS or ONMS permits to test gear would exempt participants from these fishing regulations and would only be for a limited time and with only the limited effects discussed in Chapter 4.

Lionfish caught as non-target species in other directed fisheries (e.g., spiny lobster, shrimp trawl, stone crab) are being sold commercially. Lionfish have recently been selling for more than $5.00 per pound wholesale (see section 3.4.3). If market trends continue, there will be increasing pressure on fishery managers to facilitate the harvest of lionfish, including removing gear prohibitions, such as trap restrictions and prohibitions, to enable the harvest of lionfish by trap. There are alternative gear types that can be used to harvest lionfish (e.g. spear, hook and line), but it is not clear how effective these other methods are, especially at harvesting lionfish from deeper waters. Additionally, fishery participants already harvesting lionfish as incidental catch (i.e., not targeting them) may want to harvest lionfish outside of their regular fishery seasons and/or fishing areas. This pressure could influence future management decisions to allow additional harvest of lionfish by trap year round if the trap testing to target lionfish proves successful in effectively capturing lionfish, while avoiding and minimizing impacts to non-target species, other protected species, and habitats.

Non-fishery related actions:

There have been many past and present and actions taken for the conservation and management of large whales in the Gulf and South Atlantic and we expect additional actions to be taken in the future. Recent research indicates the presence of North Atlantic right whales off North Carolina year round (Davis et al. 2017). It is worth noting that the proposed listing of the Bryde's whale and identification of habitat area for this species are recent. Foreseeable future actions will be necessary to protect this species and are relevant to trap testing to target lionfish.

There is a large and growing body of literature on past, present, and future impacts of global climate change induced 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. The Intergovernmental Panel on Climate Change has numerous reports addressing their assessments of climate change. More information can be found at their website[48]. We are not aware of other non-fishery related actions that contribute to climate change.

In response to requests by the public, shifting environmental conditions and threats in the Florida Keys, better scientific information, and legal requirements, FKNMS, guided by its advisory council, is undergoing a multi-year process to review management issues in the sanctuary. In this process, NOAA will be analyzing a broad range of alternatives about potential changes to regulations, zones, and boundaries within the sanctuary. The goals of this review are to improve biological diversity in the Florida Keys, protect and, where appropriate, restore and enhance natural habitats, populations and ecological processes, and facilitate to the extent compatible with the primary objective of resource protection, all public and private uses of the resources of these areas not prohibited pursuant to other authorities. The U.S. Fish and Wildlife Service's Florida Keys National Wildlife Refuges Complex, which co-manages 20 of the sanctuary's 27 Wildlife Management Areas, has played a key role in the review by simultaneously reviewing its own backcountry management plan. Outcomes of the FKNMS review process would be expected to benefit the FKNMS environment, and may affect where lionfish trap testing may occur in the future if sanctuary boundaries or specific zones are modified, reduced, or expanded to achieve the goals of the review.

In summary, there are various past, present and foreseeable future fishery and non-fishery related actions that are impacting the area. Some of these related actions have the potential to

[48] http://www.ipcc.ch/publications_and_data/publications_and_data.shtml

negatively affect habitats and resources in the area, such as fishery management actions that increase harvest limits. Some of the related activities have the potential to positively affect resources in the area, such as the FKNMS management plan review and area closures to protect important habitats.

4. *The overall impact that can be expected if the individual impacts are allowed to accumulate:*

Impacts to the Biological Environment from the Removal of Lionfish:

The trap testing to target lionfish would remove lionfish from areas over time. Removal of invasive lionfish from these areas is likely beneficial to other native co-occurring species and resources in the area that must compete with lionfish (Green 2017). The effects to lionfish from their removal will be cumulative with the effects to the species from other fisheries that also harvest lionfish as non-target species. However, given the rapid increase in lionfish numbers and observed occurrences, current harvesting efforts are not capturing lionfish in amounts that could reduce their population to a point where it decreases the abundance of the species or where lionfish will not be able to out-compete other species for prey. Thus, we do not expect the harvest under the testing combined with the current harvest to significantly reduce lionfish populations and benefit the environment. Information gained from trap testing could provide valuable knowledge and information about how to effectively capture lionfish, while avoiding and minimizing potential impacts to co-occurring species. However, it is reasonably foreseeable that, given the economic incentives to harvest lionfish, fisheries managers may seek to develop ways to allow additional harvest of lionfish, including via trap, even without information from this trap testing. Testing traps will only serve to better inform future management decisions. Thus, harvest of lionfish, and the benefits to the environment as a result of lionfish removal, could potentially result even without the testing here. In that sense, the testing of traps to target lionfish is not likely to add any measureable amount of harvest such that it could combine to have a significant cumulative effect on lionfish populations or on the environment from lionfish removal (including to co-occurring species), although any removal is deemed positive.

Impacts to co-occurring species:

The impacts to co-occurring species from the trap testing to harvest lionfish could result from capture in traps during testing, although bycatch of co-occurring species from the proposed testing is expected to be minimal, as discussed in detail in Chapters 3 and 4. As discussed in Action 1 and in Chapter 4, bycatch of co-occurring species in current commercial trap fisheries that utilize these trap types, which involve many more traps, is also minimal. The impacts to co-occurring species as a result of the testing is cumulative with the effects to these co-occurring species from existing commercial trap fisheries. For example, the harvest of spiny lobster in lobster traps fished in the Florida Keys could combine with the effect of any spiny lobster caught during trap testing projects. However, it is highly unlikely this cumulative effect to spiny lobster would be significant, because the traps tested would be modified to minimize or eliminate spiny lobster bycatch and any spiny lobster caught would be released back into the environment. Moreover, the trap testing is of such a limited scope and effort that any effect to spiny lobster would likely not be significant, even if they were not released. The amount of traps expected for testing are only a small fraction of the total number of traps fished in these areas at any given time (see Chapter 2 for traps fished in existing commercial fisheries). Additionally, several mitigation measures are being considered to further reduce potential effects to co-occurring species, such as requiring the use of degradable panels, which can prevent a lost or misplaced trap from ghost fishing by allowing any bycaught species to escape. If only existing traps were allowed for testing, it would prevent construction of additional traps that could be lost or misplaced and eventually end up in the marine environment leading to additional ghost fishing and capturing co-occurring species. Furthermore, some of the trap types that would be used under the testing described in this document are non-containment type traps. Non-containment type traps are not expected to capture any co-occurring species due to the way they fish. NMFS does not expect that the level of effort proposed could combine with the effort under the existing fisheries to have a cumulatively significant effect on co-occurring species.

Impacts to protected species:

Interactions with protected species could result from the trap testing to target lionfish if not effectively mitigated and could lead to cumulative effects from existing commercial trap fisheries. Non-containment traps are expected to have the same effect on protected species as containment traps as it is usually the vertical line that presents the issue for protected species (via entanglement). Specific alternatives and mitigation measures are being considered in this PEA to avoid and minimize the risk to protected species from the proposed trap testing, such as avoiding areas where protected species are known to occur. For example, by excluding from trap testing the area where the Bryde's whale is known to occur, the trap testing would prevent entanglement or other interactions from trap testing, thereby eliminating the potential for the trap testing to combine with other non-fishery actions in the area to produce a cumulative effect to these protected large whale species.

The proposed mitigation is designed to avoid interactions with protected species, and, therefore, potential effects from the proposed trap testing are expected to be insignificant and/or discountable. For more detailed discussion, please see the Endangered Species Act section 7 consultation for this trap testing in Appendix B. Because any NMFS and/or ONMS permits would include terms and conditions designed to specifically avoid and minimize the potential for effects to protected resources, such as whales and sea turtles, and because the trap testing is limited in scope and effort, we do not expect the trap testing to significantly affect protected resources, when combined with the other actions that might affect the species.

Impacts to habitat:

Trap testing could affect habitats (e.g., essential fish habitat and Acropora Critical Habitat). This trap testing excludes areas where fishing is restricted to prevent trap testing from affecting ecologically important and sensitive areas. Lost or misplaced traps and their associated gear, such as lines, are known to cause physical damage to the environment. Please see Barnette (2001), for in depth discussions of the potential effects to habitat from trap fisheries. Rates of trap loss in the commercial fisheries varies; with some estimates as high as 20%, and as low as 5% (DEP 2001; Lewis et al. 2009; Taylor and McMichael 1983), depending on the study and the trap fishery. Historic rates of fish trap loss have been documented at even higher percentages (up to 100%), although most of those losses were attributed to theft and due to the way this fishery was prosecuted (Sutherland and Harper 1983). The potential loss of 5-20% (~470-1900) of traps associated with this proposed trap testing could cause negative effects to habitat, and result in ghost fishing causing potential further impacts over time. However, permittees may not use the total number of traps approved for use via their EFP and/or ONMS permit. Although non-containment traps are not expected to ghost fish if lost or misplaced in the environment, they would likely still have the same potential as containment traps to affect habitats due to movement and/or abrasion, and due to the effect of setting the trap. Misplaced and lost traps from this study could combine with lost and misplaced traps from commercial fisheries to have a cumulative effect, although it is not expected this would result in a level of significance. Whether the cumulative effects are significant would depend on where and when traps were lost or misplaced, and with what habitats and resources there were trap interactions. Specific alternatives and mitigation measures have been considered in this PEA as a way to mitigate the potential negative effects of trap movement, loss and misplacement. For example, we consider an alternative that would not allow trap testing in areas restricted to fishing. In many of these areas, fishing is restricted to protect sensitive habitats. NMFS and ONMS also consider reporting requirements that would require applicants to immediately report any lost or misplaced traps, cease trap testing, and work with NMFS and ONMS until the problem is corrected. As discussed below, trap movement, loss and misplacement is expensive, therefore it is in everyone's best interest to avoid lost and misplaced traps. Another option, unique gear/line marking, could provide valuable information if a lost or misplaced trap is later found. For these reasons, we do not expect any cumulative effects arising from trap movement, loss or misplacement to become significant.

Impacts to the socio-economic environment:

The results of the proposed action could be used to inform future efforts by NMFS SERO and other fisheries management agencies in the development of ways to harvest lionfish. If a certain trap type is found to be more effective than another at capturing lionfish, while avoiding and minimizing impacts to non-target species, protected species, and habitats, then those trap types are more likely to be allowed for use in a future lionfish harvest management. Furthermore, if a certain trap type is not tested at all, not tested in a particular region or time of year, or not tested sufficiently to generate scientifically reliable results, managers will lack needed information about how effective it is at capturing lionfish, while reducing other effects. The proposed testing has the potential to direct future fishery development and management efforts on the part of NMFS, the Gulf and South Atlantic Councils, and marine sanctuary managers. In this regard, this proposed trap testing has the potential to affect the magnitude and distribution of costs and benefits, with respect to the potential development of a future directed trap fishery, should one be established and depending on what the characteristics of any future fishery might be.

5. *Summary:*

The trap testing to target lionfish, if conducted in a manner consistent with the mitigation measures proposed in this PEA, is not expected to have individually significant effects to the biological, physical, or socio-economic environment or to combine with the effects of other past, present, and reasonably foreseeable future actions in such a way that could have a potentially significant, cumulative effect. Because the trap testing would be limited in scope and effort and incorporates mitigation measures, it is not expected to contribute to climate change through the increase or decrease in the carbon footprint from fishing or to combine with the impacts of the FKNMS management review or other non-fishery related actions to produce a cumulative effect. Applicants, should they be issued a permit from NMFS or ONMS, would be required to abide by the mitigation, monitoring and reporting requirements that would be a condition of permits. Such applicants must still obtain all of the necessary permits and authorizations from other federal, state and local entities, and abide by any conditions that those might require. For the reasons outlined in this cumulative effects analysis and the rest of the PEA, we do not expect the proposed actions to have the potential to combine with other past, present and reasonably foreseeable future actions to have a significant cumulative effect on the human environment.

Chapter 5. Mitigation and Monitoring

5.1 Mitigation

Mitigation required for all regions:

To avoid adverse impacts to areas with sensitive habitats and other resources, trap testing would be prohibited in those areas that are identified in Appendix D. Trap testing also would be prohibited in any additional areas that are closed to trap fishing after the permit is issued, but prior to the testing being completed.

The following conditions would apply to trap testing in all permitted areas: Traps fished individually are limited to a single vertical line. Line length should not be longer than necessary for the depth fished. Lines must be outfitted with weights to prevent excess additional line from floating at the surface. Traps fished in a trawl configuration are limited to two vertical lines, one at the beginning and end of the trawl. Lines between traps fished in a trawl should be limited to the minimum length necessary. Traps must be weighted with the minimum amount of weight necessary to avoid trap movement after deployment. All containment traps are required to have a degradable panel to minimize adverse impacts from ghost fishing if trap is lost. Trap surface buoys are to be marked with “LF” to identify experimental lionfish traps. All non-lionfish bycatch must be returned to the water, whether alive or dead. No species, other than lionfish, may be retained.

Mitigation by specific regions[49]:

South Atlantic

Applicants permitted to test traps in the South Atlantic also would be required to follow these conditions:

- No trap testing off the coast of North Carolina; unless given a specific exemption for fishing without the use of vertical line (i.e. lineless gear approved by National Marine Fisheries Service [NMFS]) (see Fig. 2.2.2.1).
- No trap testing from the North Carolina/South Carolina border to Cape Canaveral, Florida from November 1 through April 30; unless given a specific exemption for fishing without the use of vertical line (i.e. lineless gear approved by NMFS) (see Fig 2.2.2.1 and Table 2.2.2.1).

[49] Regions defined in Action 3

Gulf of Mexico

Applicants permitted to test traps in the Gulf of Mexico (Gulf) also would be required to follow these conditions:

- No trap testing in the Important Habitat Area for Bryde's Whales (see Figure 2.2.2.2 and Table 2.2.2.2).

Florida Keys

Applicants permitted to test traps in the Florida Keys also would be required to follow these conditions:

- No trap testing in waters less than 30 meters deep, to avoid ESA-listed corals.
- No trap testing around known historical resources (e.g., Eagle, Duane, Bibb).
- Spiny lobster and stone crab traps used for testing within this region must have a current endorsement, stamp, or certification.

Conservation Recommendations:

Any new vertical line or groundline for use in trap testing activity authorized via EFPs or ONMS permits, should be sinking or negatively buoyant. It is also recommended that any sinking or negatively buoyant line for this activity is marked with 12 inch (30.48 cm), WHITE colored markings every 25 feet along the length of the line. Such marking should be permanently affixed on or along the line and the color code should be clearly visible when the gear is hauled or removed from the water. The 12-inch marking could be accomplished in a variety of ways. Two methods that have been tested and found to work satisfactorily under normal conditions are: 1) the colored twine is seized around the line and woven between the strands; and 2) the line is spray-painted when dry.

It is also recommended that lines attached to traps have a breaking strength less than 1,400 pounds (Knowlton et al. 2016) to reduce the risk of serious injury or mortality if a large whale becomes entangled in trap gear. NMFS also recommends use of stiff vertical lines to reduce entanglement risk. Furthermore, lines should remain knotless and free of objects with buoys attached via weak links so that line could potentially slide through baleen plates if a whale ever became entangled in the mouth (NMFS 2014).

If bait (other than lionfish) is utilized and then found to be ineffective, or it attracts protected species, it is recommended that use of such bait be discontinued to reduce the risk of attracting protected species; particularly dolphins. In some areas, dolphins will try to tip baited traps to get the bait, which can lead to entanglement.

5.2 Monitoring

Through the issuance of EFPs and ONMS permits to allow experimental testing of various trap designs to target lionfish, NMFS and ONMS would require that permit holders collect and report data comparing the catch, catch rates, and bycatch of various trap types. Data obtained from any experiments could inform future fishery management decisions related to reducing invasive lionfish populations in deep waters.

Participants authorized by EFPs and ONMS permits to test alternative trap designs to target lionfish would be restricted to testing only within the areas authorized by their specific permits. Additional conditions (specified above) would be placed on activities to mitigate the potential adverse effects of testing traps to target lionfish and provide relevant data to resource managers. Not all conditions would necessarily be applicable to each EFP or ONMS permit. Similarly, additional conditions not listed here may be deemed necessary to protect species and habitats during the course of trap testing to target lionfish.

NMFS would monitor the activity authorized by these EFPs, and ONMS would monitor the activities under its permits. NMFS and ONMS have the ability to modify the conditions of their permits or to end the research project, to address bycatch or other issues as warranted. NMFS and ONMS would specifically add terms and conditions to any permits to reduce interactions with, and mortality of, non-target species, protected species, and critical habitat. ONMS would similarly modify permit conditions to address bycatch and interactions with non-target species, protected species, and critical habitat within FKNMS.

In issuing an EFP or an ONMS permit to conduct this research, NMFS and ONMS would include strict requirements to immediately contact NMFS if any marine mammal, sea turtle, Nassau grouper, or any other Endangered Species Act-listed species interaction should occur. Vessel operators would be required to submit data to NMFS and/or ONMS upon request. Further, as with all EFPs, NMFS would require annual summary reports to be submitted. Similarly, ONMS will have annual permit reporting requirements that may include some or all of the information listed below, and any additional information deemed necessary to assess the success of permitted activities and protection of FKNMS resources. The proposed action is not likely to adversely affect ESA-listed species. However, NMFS and ONMS will ensure permit holders receive outreach materials describing how captured sea turtles and ESA-listed fish should be handled to minimize adverse effects from incidental take and reduce mortality if a protected species interaction were to occur. Most, if not all, sea turtles and ESA-listed fish released after entanglement and/or forced submergence events have experienced some degree of physiological injury. Experience with other gear types (i.e., hook-and-line) has shown that the ultimate severity of these events depends not only on the actual interaction (i.e., physical trauma from entanglement/forced submergence), but on the amount of gear remaining on the animal at the time of release. The manner of handling an animal also greatly affects its chance of recovery. Therefore, the experience, ability, and willingness of permit holders to remove gear are crucial to the survival of sea turtles and fish following release.

Reporting Requirements:

Gear

- Detailed description of trap type, construction material, and dimensions.
- Detailed descriptions of any modifications from standard specifications made to the trap (e.g. funnel size or shape).
- Provide the endorsement/certification/stamp number of each trap fished.
- Numbers of each trap type and configuration of how trap(s) will be set (e.g. trawl).
- Approximate weight of each trap.
- Detailed description of line type, length of line, line material, and line breaking strength.
- Detailed description of buoy type, buoy size, and buoy amounts per trawl. Trap surface buoys are to be marked with "LF" to identify experimental lionfish traps so it can be traced back to the applicant if it is lost.
- Lost or missing traps and/or trap gear (e.g. vertical lines).

Location and Environmental Conditions

- Latitude and longitude of each individually set trap or, if a trawl, the starting and endpoints of traps. Coordinates should be taken at the time of trap deployment and at the time of trap retrieval.
- Water depths of each individual trap, if a trawl, the starting and endpoints of traps.
- Information on sea state such as approximate wave height and any impending conditions (e.g. high winds).

Catch Information

- Bait type used, or specify if no bait is used.
- Numbers, lengths, and weights and species ID of all fish and crustaceans captured by trap type. Photos can be submitted for NMFS to assist with species ID.
- Numbers, lengths and weights of all lionfish captured and retained.
- Soak time for each single trap or trap trawl configuration.

Protected Species

- Any ESA-listed species interactions should be immediately reported to the NMFS Protected Resources Division at 727-824-5312.
- If a live dolphin is found entangled in a trap/pot line, immediately call the Marine Mammal Stranding Hotline at 1 877 WHALE HELP for further instruction.
- Any entangled marine mammal or incidental injury or mortality to a marine mammal must be reported to the Marine Mammal Authorization Program within 48 hours. Reporting forms can be found at http://www.nmfs.noaa.gov/pr/interactions/mmap/

5.3 Summary

For these reasons, and as discussed in Chapter 4 of this programmatic environmental assessment, NMFS and ONMS do not expect that the preferred alternatives, which would allow experimental testing of various trap designs to harvest lionfish, would have significant adverse ecological, economic, or social impacts. As described above, NMFS and ONMS would closely monitor the activities occurring under any EFP and/or ONMS permit and take appropriate action, if necessary, to mitigate interactions with protected species, other bycatch species, or sensitive habitats. NMFS and ONMS will have the ability to modify the conditions of any EFP and/or the ONMS permit, and to end the research project, to address any of these impacts as warranted.

Chapter 6. Other Applicable Laws

6.1 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 National Marine Fisheries Service [NMFS]) 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. Part of the responsibility that NMFS has under the MMPA involves monitoring populations of marine mammals to make sure that they stay at optimum levels. If a population falls below its optimum level, it is designated as "depleted." A conservation plan is then developed to guide research and management actions to restore the population to healthy levels.

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.

Under the MMPA, to legally fish in a Category I and/or II fishery, a fisherman must take certain steps. For example, owners of vessels or gear engaging in a Category I or II fishery, are automatically registered with the Marine Mammal Authorization Program and are required to obtain a marine mammal authorization certificate that must be present when fishing (50 CFR 229.4). They are also required to accommodate an observer if requested (50 CFR 229.7(c)) and they must comply with any applicable take reduction plans. Fishermen must, regardless of their category, report every incidental mortality and injury of marine mammals that occurs as a result of commercial fishing operations. If you do not report within 48 hours, you may be subject to suspension, revocation, or denial of a marine mammal authorization certificate. The black sea bass pot component of the South Atlantic snapper-grouper fishery is part of the Atlantic mixed species trap/pot fishery, a Category II fishery, in the final List of Fisheries (LOF) for 2017 (82 FR 3655, January 12, 2017). The Atlantic mixed species trap/pot fishery designation was created in 2003 (68 FR 41725, July 15, 2003), by combining several separately listed trap/pot fisheries into a single group. The Gulf and South Atlantic spiny lobster trap and golden crab trap/pot fisheries are classified as Category III. The Gulf stone crab trap fishery is classified as Category II. The harvest of lionfish under this EFP will be considered a lawful commercial fishery defined by the implementing regulations of the MMPA (50 CFR 216). It is, therefore, subject to section 118 (Taking of marine mammals incidental to commercial fishing operations) of the MMPA.

6.2 Coastal Zone Management Act

Under the Coastal Zone Management Act (16 U.S.C. § 1456) and federal consistency regulations (15 C.F.R. Part 930), states with federally-approved coastal management programs are required to develop a list of federal license or permit activities that have reasonably foreseeable effects on any coastal use or resource of the state, and which the state agency wishes to review for consistency with its management program. However, if a state wants to review federal licenses or permits for activities located outside the state's coastal zone for which there are reasonably foreseeable coastal effects, the state must generally describe in its federal consistency list the geographic location of such activities in accordance with 15 C.F.R. § 930.53. The Florida coastal management program's federal consistency list does not provide a geographic location description to review ONMS or NMFS permits for activities located outside the state's coastal zone. As such, the state would need to request permission from NOAA under 15 C.F.R. § 930.54 to review any permit applications submitted to ONMS and/or NMFS.

In correspondences between ONMS and the Florida Department of Environmental Protection (DEP) on October 24 and November 9, 2006, DEP opined that existing agreements between the FKNMS and various state agencies adequately address the state's interests in permitting activities in the FKNMS, including those in state waters. As part of FKNMS' effort to update its management plan and review its environmental compliance, FKNMS will be engaging the Florida DEP to revisit whether DEP wants to continue to include ONMS permits on its federal consistency list.

6.3 National Marine Sanctuaries Act (NMSA)

Under the NMSA (also known as Title III of the Marine Protection, Research and Sanctuaries Act of 1972), as amended, the U.S. 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. The NMSA provides authority for comprehensive and coordinated conservation and management of these marine areas. NOAA's Office of National Marine Sanctuaries serves as the trustee for this network of protected areas, which include 13 national marine sanctuaries and two marine national monuments encompassing more than 600,000 square miles of marine and Great Lakes waters. These sites include significant coral reef and kelp forest habitats, and breeding and feeding grounds of whales, sea lions, sharks, and sea turtles. The three sanctuaries in the South Atlantic exclusive economic zone are the USS Monitor, Gray's Reef, and Florida Keys National Marine Sanctuaries. The Flower Garden Banks National Marine Sanctuary is located in the Gulf of Mexico EEZ.

As a co-lead of this PEA, ONMS has carefully considered the effects of the alternatives proposed in this document on the resources managed by the National Marine Sanctuaries. ONMS will continue to review any activities proposed within FKNMS or other national marine sanctuaries under relevant authorities and will condition activities that are eligible for permits, as applicable, to ensure that activities do not result in adverse impacts to sanctuary resources or qualities. Activities that do not meet sanctuary permit review criteria and/or which cannot be conditioned sufficiently to not result in adverse or unknown impacts to sanctuary resources may not be eligible for an ONMS permit.

6.4 National Historic Preservation Act (NHPA)

The National Historic Preservation Act (NHPA) of 1966, (Public Law 89-665; 16 U.S.C. 470 *et seq.*) is intended to preserve historical and archaeological sites in the United States of America. Section 106 of the NHPA requires federal agencies to evaluate the impact of all federally funded or permitted projects for sites on listed on, or eligible for listing on, the National Register of Historic Places and aims to minimize damage to such places.

Historical research indicates that over 2,000 ships have sunk on the Federal Outer Continental Shelf between 1625 and 1951; thousands more have sunk closer to shore in state waters during the same period. Only a handful of these have been scientifically excavated by archaeologists for the benefit of generations to come. Further information can be found on the Bureau of Ocean Energy Management (BOEM) archaeology website[50]

The proposed action does not adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places nor is it expected to cause loss or destruction of significant scientific, cultural, or historical resources. Several notable shipwrecks can be found in federal and state waters including in the South Atlantic and Gulf of Mexico: Loftus (eastern Florida), SS Copenhagen (Southeast Florida), Half-Moon (Southeast Florida), Hebe (Myrtle Beach), Georgiana (Charleston, South Carolina), Monitor (Cape Hatteras, North Carolina), Huron (Nags Head, North Carolina), and Metropolis (Corolla, North Carolina); and the U.S.S. Hatteras (Texas).

ONMS believes that the proposed action would not adversely affect areas listed in or eligible for listing in the National Register of Historic Places, or cause loss or destruction of significant scientific, cultural or historic places. Based on a search of the Florida Master Site File (FMSF), it was determined that twelve FMSF registered resources are reported in the proposed action area. The identified historical resources consist of large shipwrecks and similar materials that are known by local fishermen and avoided so their gear does not get entangled in the wrecks. Any permits issued by ONMS will be conditioned to avoid areas of known historical resources. For these reasons, ONMS has determined that the proposed action is not likely to negatively affect historic properties. ONMS sent a letter to the State Historic Preservation Officer (SHPO) on March 5, 2018 requesting review and concurrence with ONMS's finding that the proposed action would have No Adverse Effect on historical resources per 36 CFR § 800.5(b). The SHPO responded by letter dated March 27, 2018 (DHR Project File No.: 2018-1029) noting that their office concurs with ONMS's determination of no adverse effect to historical properties.

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[50] http://www.boem.gov/Environmental-Stewardship/Archaeology/Shipwrecks.aspx

6.5 E.O. 12898: Environmental Justice

E.O. 12898 requires that "to the greatest extent practicable and permitted by law…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."

The alternatives being considered in this document are not expected to result in any disproportionate adverse human health or environmental effects to minority populations or low-income populations of Texas, Louisiana, Alabama, Mississippi, Florida, North Carolina, South Carolina, or Georgia, rather the impacts would be spread across all participants in multiple fisheries regardless of race or income. A detailed description of the communities impacted by the actions contained in this document and potential socioeconomic impacts of those actions are contained in Chapters 3 and 4 of this document.

6.6 E.O. 13089: Coral Reef Protection

E.O. 13089, signed by President William Clinton on June 11, 1998, recognizes the ecological, social, and economic values provided by the Nation's coral reefs and ensures that federal agencies are protecting these ecosystems. More specifically, the Order requires federal agencies to identify actions that may harm U.S. coral reef ecosystems, to utilize their program and authorities to protect and enhance the conditions of such ecosystems, and to ensure that their actions do not degrade the condition of the coral reef ecosystem.

Chapter 7. List of Preparers

Table 7.1.1. List of preparers.

Name	Agency/Division	Area of Expertise
Frank Helies	NMFS / SF	Fishery Biologist/IPT co-lead
Heather Blough	NMFS / DIR	Fishery Policy
Noah Silverman	NMFS / DIR	NEPA Coordinator
Kelli O’Donnell	NMFS / SF	Fishery Biologist/IPT co-lead
Nick Farmer	NMFS / SF	Fishery Biologist
Jessica Powell	NMFS / PR	Marine Mammal Subject Matter Expert
Mary Wunderlich	NMFS / PR	Endangered Species Subject Matter Expert
Mike Travis	NMFS / SF	Economist
Jocelyn D’Ambrosio	NOAA / GC	General Counsel
David Dale	NMFS / HC	EFH Coordinator
Scott Sandorf	NMFS / SF	Policy
Kyle Dettloff	NMFS / SEFSC	Statistician
Joanne Delaney	NOAA / FKNMS	Resource Protection and Permit Coordinator

NOAA = National Oceanic and Atmosphere Administration, NMFS = National Marine Fisheries Service, SF = Sustainable Fisheries Division, PR = Protected Resources Division, HC = Habitat Conservation Division, GC = General Counsel, SEFSC = NMFS Southeast Fisheries Science Center, FKNMS = Florida Keys National Marine Sanctuary

Chapter 8. Agencies and Persons Consulted

Responsible Agency

Environmental Assessment:
NMFS, Southeast Region
263 13th Avenue South
St. Petersburg, Florida 33701
(727) 824-5301 (TEL)
(727) 824-5320 (FAX)

National Oceanic & Atmospheric Administration
Office of National Marine Sanctuaries
Florida Keys National Marine Sanctuary
33 East Quay Road
Key West, FL 33040
305-809-4700
305-293-5011 (fax)

List of Agencies, Organizations, and Persons Consulted

Alabama Department of Conservation and Natural Resources/Marine Resources Division
Florida Department of Environmental Protection
Florida Department of State Division of Historical Places
Florida Fish and Wildlife Conservation Commission
Georgia Department of Natural Resources
Gulf of Mexico Fishery Management Council
Louisiana Department of Wildlife and Fisheries
Mississippi Department of Marine Resources
North Carolina Division of Marine Fisheries
National Marine Fisheries Service

- Washington Office
- Office of Ecology and Conservation
- Southeast Regional Office
  - Protected Resources
  - Habitat Conservation
  - Sustainable Fisheries
- Southeast Fisheries Science Center

NOAA General Counsel
South Atlantic Fishery Management Council
South Carolina Department of Natural Resources
Texas Parks and Wildlife Department
United States Coast Guard

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Appendix A. Considered But Rejected Alternatives

NMFS and ONMS considered restricting soak times (time traps are in the water between being retrieved), or days of deployment. However, these are not good indications of effort, and make it difficult to predict potential effects. Soak time is not a good indicator of how long a trap will be in the water at any given time because most trap fishers check their traps after a certain period (soak time); but tend to immediately redeploy those traps, after removing catch and/or rebaiting. Because of this, the action was eliminated from further detailed study. NMFS and ONMS did not consider a maximum soak time as a specific mitigation to reduce the potential for effects to non-target species. Only very limited soak times (i.e. 48 hours or less) have the potential to mitigate adverse effects to non-target species captured as part of this testing. Therefore, no specific maximum soak time was considered as mitigation.

Action. Allowable soak times

Sub-Action 1: Containment traps

Alternative 1 (No Action). None

Alternative 2. Up to 48 hours/trap

Alternative 3. Up to 7 days/trap

Alternative 4. Up to 15 days/trap

Alternative 5. Up to 30 days/trap

Sub-Action 2: Non-containment traps

Alternative 1 (No Action). None

Alternative 2. Up to 48 hours/trap

Alternative 3. Up to 7 days/trap

Alternative 4. Up to 15 days/trap

Alternative 5. Up to 30 days/trap

Appendix B. Endangered Species Act Consultation

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
(727) 824-5305; FAX (727) 824-5308
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APR 13 2018

F/SER/31: MW

MEMORANDUM FOR: John C. McGovern, Ph.D.
Assistant Regional Administrator
Sustainable Fisheries Division
National Marine Fisheries Service

Sarah Fangman
Superintendent
Florida Keys National Marine Sanctuary
National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries

FROM: For Roy E. Crabtree, Ph.D.
Regional Administrator

SUBJECT: Endangered Species Act (ESA) Section 7(a)(2) Consultation on Issuing Permits to Use Traps to Target Lionfish throughout the Gulf of Mexico and South Atlantic, including within the Florida Keys National Marine Sanctuary (SER-2018-19048)

This memorandum responds to National Marine Fisheries Service (NMFS) Sustainable Fisheries Division's (SFD) January 5, 2018, request for initiation of Section 7 consultation under the ESA on the proposed issuance of the exempted fishing permits (EFPs) to test traps to target lionfish and the follow up memorandum on the proposed action February 23, 2018. In addition, this memorandum responds to correspondence with the National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries (ONMS), Florida Keys National Marine Sanctuary (FKNMS), dated March 19, 2018, requesting joint consultation, as some of the trap testing also requires a permit from the Sanctuary. NMFS and ONMS have been evaluating the environmental impacts of authorizing limited testing of various trap designs and configurations to target lionfish through a programmatic environmental assessment (PEA), and recently selected the preferred alternatives described in the Description of Proposed Action section below (proposed action). NMFS-SFD described the effects of the proposed action on ESA-listed species and their designated critical habitats. NMFS-SFD determined that the proposed action is not likely to adversely affect any ESA-listed species that may occur in the action area and will not affect or is not likely to adversely affect designated critical habitats, and sought concurrence with the determination. ONMS agrees with those determinations, and likewise seeks concurrence.

Proposed Action and Action Area

The proposed action evaluated in this consultation is to authorize the use of traps to target lionfish based on the preferred alternatives selected in the PEA and the identified mitigation requirements. NMFS and ONMS anticipate allowing the use of various trap types to target lionfish throughout the Gulf and South Atlantic, including FKNMS. The authorized projects will involve fishing with similar gear and methodology; therefore, we expect similar potential effects to ESA-listed species and designated critical habitat. The effects section evaluates the testing to be authorized in the next six years to ensure the potential overall impacts of authorizing the testing are accurately assessed.

Description of Proposed Action

NMFS expects to approve EFPs seeking an exemption from the regulations prohibiting the use of fish traps, in federal waters of the Gulf of Mexico (Gulf) and South Atlantic, to allow the applicants to determine which traps and targeting strategies can effectively capture lionfish in the Gulf and South Atlantic while avoiding impacts to non-target species, protected species, and habitats. Harvest of lionfish by trap is not authorized by a fisheries management plan (FMP), or any other non-FMP regulation. Therefore, harvest of lionfish itself is not prohibited; however, applicants would need an exemption from the regulation generally prohibiting using or possessing a fish trap in federal waters of the Gulf or South Atlantic [50 CFR 622.9(c); see also 50 CFR 622.2 (defining fish trap)]. In addition, applicants seeking to set traps in the waters of the FKNMS would need a permit to set traps on the sea floor of the FKNMS [15 CFR 922.163(a)(3)]. NMFS and ONMS are coordinating on their environmental review of the activities underlying their respective permitting decisions—the expected trap testing, some of which may occur in waters of the FKNMS—and agreed to expand the scope of consultation to cover the ONMS permits to conduct the testing within the waters of the FKNMS. The scope of the consultation will be consistent with the preferred alternatives in the joint PEA.

NMFS and ONMS selected preferred alternatives in the PEA regarding the trap type, locations and time of year for deployment, number of traps per location, and the bait type to be authorized under expected exempted fishing permit (EFP) and ONMS permits . NMFS anticipates approving EFPs that would allow the testing of modified spiny lobster traps;[1] American lobster pots; pinfish traps; black sea bass pots; traps constructed of the same material as these traps (e.g. wood, wire, rigid plastic), with similar dimensions (e.g. mesh size, shape, height, length, width), and fished in the same manner as any of these other traps; and/or non-containment purse trap gear to determine their viability as lionfish traps. ONMS anticipates allowing the use of state- and federally-approved spiny lobster traps, state-approved stone crab traps, state-approved blue crab traps, state-approved pinfish traps, and state-approved shrimp traps, as well as traps that are approved for use in the southeast region under state or federal regulations (such as black sea bass pots, which are allowed in South Atlantic waters north of the Florida Keys and golden crab traps), and traps that traps that are approved for use in other managed fisheries (such as the

[1] The applicants have proposed to modify the funnels from what is allowable under NMFS and the Florida Fish and Wildlife Conservation Commission (FWC) requirements. In particular, the applicants are proposing to use funnels that are 6 in x 3 in and 7 in x 5 in. NMFS anticipates allowing these funnel sizes or other modifications that do not increase the potential for bycatch.

American lobster pot). Applicants may propose to modify trap size, trap materials, funnel size, number, size and placement of escape gaps, and/or add optical recognition devices. Modifications would be limited to those that do not increase the overall footprint of the trap, do not increase potential for movement, and do not increase the potential for bycatch (e.g., limited to smaller funnels than currently allowed and/or more or larger escape gaps).

NMFS anticipates authorizing up to 18,000 traps annually, to be deployed across the exclusive economic zone (EEZ) of the Gulf (up to 10,000 traps), South Atlantic (up to 5,000 traps), and Florida Keys, including within FKNMS (up to 3,000 traps). ONMS permits would be required for testing within the waters of the FKNMS. As described below, sampling locations and time of year are limited to protect protected species and habitat. Any type of bait would be allowed.

Sampling effort would occur throughout the EEZ of the Gulf and South Atlantic and within FKNMS, with certain restrictions for protected species and habitat. NMFS will not issue EFPs to test traps in the following areas: off North Carolina, year round; south of North Carolina border from November 1 through April 30, the area that is currently closed to black sea bass pot fishing from December 1 to March 31[2]; in the Gulf, Bryde's whale Habitat Area, year round; within the Florida Keys, including the FKNMS, in waters shallower than 30 meters; additional areas where fishing is restricted; and areas where there is potential for conflicts with shrimp and stone crab fisheries. ONMS will only issue permits for testing in waters with the FKNMS that are deeper than 30 meters. The locations and times of year are described in more detail in the Action Area section below.

NMFS expects to issue EFPs that would be effective for up to two years following issuance. The ONMS also expects to issue permits that would be effective for two years. The PEA contains detailed analyses on the environmental, economic, and social effects of the proposed action, including mitigation and monitoring measures NMFs and ONMS anticipate requiring as conditions of the permits.

Action Area

The proposed action involves authorizing up to the following number of traps to be used at any one time in three separate areas of the South Atlantic, Florida Keys, and Gulf to capture lionfish: 5,000 traps authorized in the South Atlantic Region; 3,000 traps authorized in the Florida Keys Region; 10,000 traps authorized in the Gulf of Mexico Region. The action area includes these regions.

For the purpose of the proposed action, the Regions are defined as:

- **South Atlantic Region** - U.S. EEZ waters from North Carolina to the Broward/Miami-Dade county line in Florida, Florida Fish and Wildlife Conservation Commission (FWC) Marine Fisheries trip ticket area codes 631-741 (Figure 1).

[2] Federal regulations prohibit black sea bass pot fishing in a given area from December 1 through March 31. 50 CFR 622.183(b)(6)(ii). The EFPs would not allow lionfish trap testing in this area for two additional months, from November 1 through April 30.

- **Florida Keys Region** - U.S. EEZ waters from the Broward/Miami-Dade county line to a line extending west from the top of Florida Bay, approximately 25.1º N. latitude, FWC Marine trip ticket area codes 744-2 (Figure 2).
- **Gulf of Mexico Region** - U.S. EEZ waters from a line extending west from the top of Florida Bay, approximately 25.1º N. latitude, to the Texas/Mexico border, FWC Marine trip ticket area codes 3-21 (Figure 3).

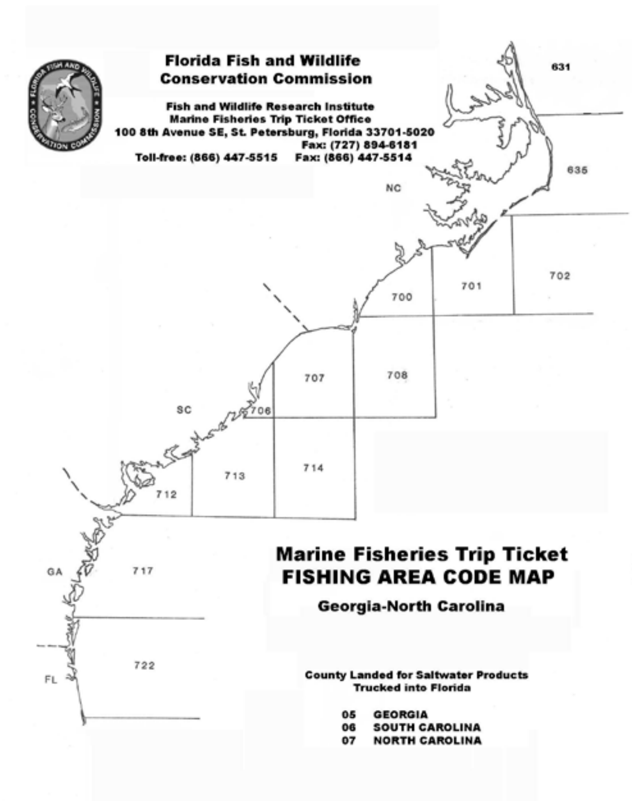

Figure 1. Northern portion of the South Atlantic Region (FWC Marine Fisheries trip ticket area codes 631-722).

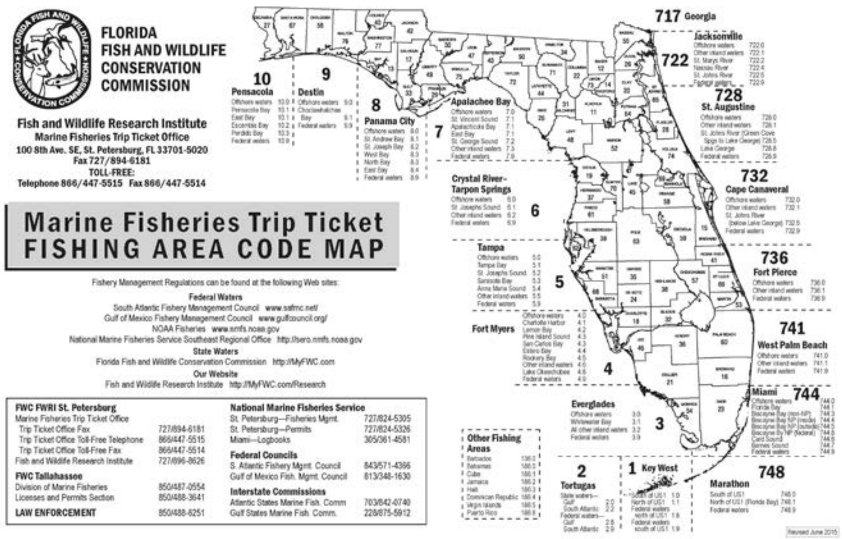

Figure 2. Southern portion of the South Atlantic Region (FWC Marine Fisheries trip ticket area codes 717-741), Florida Keys Region (FWC Marine Fisheries trip ticket area codes 744-2), and eastern portion of the Gulf of Mexico Region (FWC Marine Fisheries trip ticket area codes 3-10).

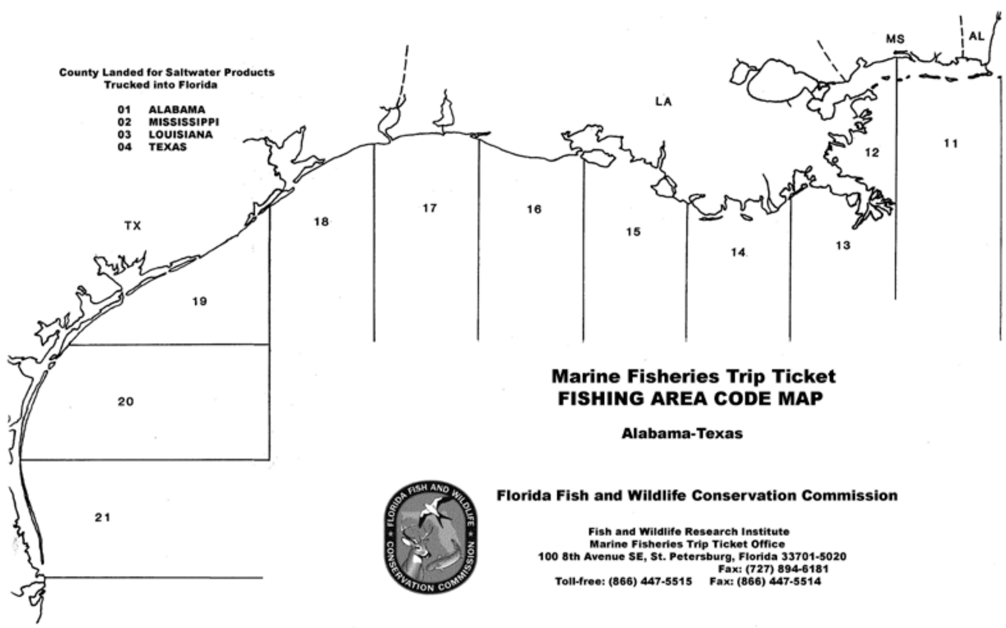

Figure 3. Western portion of the Gulf of Mexico Region (FWC Marine Fisheries trip ticket area codes 11-21).

Consultation History

NMFS Sustainable Fisheries Division (SFD) and Protected Resources Division (PRD) staff met to discuss the proposed action and review draft documents in preparation for the consultation. As a result of that discussion, on February 23, 2018, SFD requested concurrence on their opinion that the proposed action is not likely to adversely affect six species of whales (blue, sei, sperm, fin, Bryde's [proposed to be listed], and North Atlantic right whales); six species of sea turtles (Northwest Atlantic Distinct Population Segment [DPS] of loggerhead, North Atlantic and South

Atlantic DPSs of green, hawksbill, kemp's ridley, and leatherback sea turtles); seven species of coral (elkhorn, staghorn, rough cactus, pillar, lobed star, mountainous star, and boulder star coral); and two species of fish (the U.S. DPS of smalltooth sawfish and Nassau grouper). SFD also determined the proposed action is not likely to adversely affect elkhorn and staghorn coral critical habitat and Northwest Atlantic loggerhead DPS critical habitat. Upon receipt of the request for concurrence, PRD staff reviewed the request for completeness and requested additional information as needed to complete the review and analysis for concurrence. Thereafter, ONMS and SFD agreed to expand the consultation to include the ONMS action to issue permits for testing within the FKNMS as the underlying action, testing traps within the FKNMS, falls within the scope of the action on which SFD sought consultation. ONMS wrote to PRD requesting to expand the scope of consultation, and stating that ONMS agrees with the conclusions in SFD's request for consultation and likewise seeks concurrence.

Listed Species and Critical Habitat in the Action Area

Listed species most abundant in the action areas are more likely to have individuals interact with the proposed gear. NMFS's memorandum identified six species of ESA-listed marine mammals and six species or DPSs of sea turtles, seven species of coral, and two species of fish that have the highest probability of interacting with the gear used for this fishing activity. Table 1 depicts the list of endangered and threatened species, DPSs, and critical habitat that may be affected by the proposed action.

Table 1. Species and Critical Habitat that may be Affected by the Proposed Action

Species	**Scientific Name**	**Status**
Marine mammals		
Blue whale	*Balaenoptera musculus*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
North Atlantic right whale	*Eubalaena glacialis*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Bryde's whale	*Balaenoptera edeni*	Endangered[a]
Sea Turtles	Scientific Name	Status
Green sea turtle	*Chelonia mydas*	Threatened[b]
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened[c]
Kemp's ridley sea turtle	*Lepidochelys kempii*	Threatened
Invertebrates		
Elkhorn coral	*Acropora palmata*	Threatened
Staghorn coral	*Acropora cervicornis*	Threatened
Rough cactus coral	*Mycetophyllia ferox*	Threatened
Pillar coral	*Dendrogyra cylindrus*	Threatened
Lobed star coral	*Orbicella annularis*	Threatened
Mountainous star coral	*Orbicella faveolata*	Threatened
Boulder star coral	*Orbicella franksi*	Threatened
Fish	Scientific Name	Status
Smalltooth sawfish	*Pristis pectinata*	Endangered[d]
Nassau grouper	*Epinephelus striatus*	Threatened

Species	Scientific Name	Status
Critical Habitat		
Elkhorn and staghorn coral critical habitat		
Northwest Atlantic DPS of loggerhead sea turtle critical habitat		

[a] Gulf subspecies, proposed for listing
[b] The North Atlantic DPS and South Atlantic DPS
[c] The Northwest Atlantic DPS.
[d] The U.S. DPS.

Effects of the Action

As noted above, NMFS anticipates authorizing up to 18,000 traps annually, to be deployed across the EEZ of the Gulf (up to 10,000 traps), South Atlantic (up to 5,000 traps), and Florida Keys, including in the FKNMS (up to 3,000 traps). ONMS permits are required for testing within the FKNMS. The total expected effort is being considered to ensure the potential overall impacts are accurately assessed. The PEA for the proposed action describes and summarizes the potential mechanisms of interaction with trap/pot fishing gear via entanglement or bycatch of protected species (NMFS 2018). I have reviewed the full project description in your memorandum and in the PEA.

In order to assess the potential effects of the various trap types, I assumed that the potential effects to protected species and critical habitat analyzed in this consultation would be similar for all types. Even though the size, shape and construction materials vary across trap type, all are anticipated to have the same potential routes of effects to protected species, unless lineless trap gear is used. For example, we assume that the entanglement risk to a protected species from a black sea bass pot would be the same as a spiny lobster trap, because the risk of entanglement comes from the vertical line attached to the trap, and not from the design of the trap itself. Non-containment type traps are expected to have similar potential effects related to entanglement from vertical buoy lines as containment traps. The only difference with the non-containment trap compared to containment traps in terms of protected species interactions would be an even further reduction of the chance of bycatch of protected species, such as Nassau grouper, which we have already determined to be extremely low, as discussed below. We also assumed the potential effects to critical habitat would be similar for the various trap types because the main route of effect to habitat from a trap is physical damage if the trap or trap lines come into contact with critical habitat. The traps are not drastically different in size, shape or dimensions. We assumed they are likely to be weighted similarly and deployed in a similar fashion across the various trap types.

Based on my evaluation, and as explained below, I concur with your determination that the proposed action is not likely to adversely affect these ESA-listed species in Table 1 above. I also concur with your determination that the proposed action is not likely to adversely affect designated Northwest Atlantic loggerhead DPS critical habitat or elkhorn and staghorn coral critical habitat.

Marine Mammals

Blue, sei, sperm, fin, Bryde's, and North Atlantic right whales could be affected by the proposed action by becoming entangled in vertical line gear and vessel interactions. However, the gear set in the proposed action is highly unlikely to entangle these whales or result in vessel strikes for the reasons discussed below.

Blue, Sei, and Sperm Whales

In the southeast U.S. Atlantic region, blue, sei, and sperm whales are predominantly found seaward of the continental shelf in deeper waters (CETAP 1982; NMFS 2011; Waring et al. 2013; Wenzel et al. 1988). Blue and sei whales occur in the Atlantic EEZ; however, blue whales are likely rare in the southeast as they are only occasional visitors in Atlantic EEZ waters, which may represent the current southern limit of their feeding range. There are no identified stocks of blue and sei whales in the Gulf. Sperm whales are the most abundant large cetacean in the Gulf, found year-round in waters greater than 200 m deep (Waring et al. 2016).

The depth seaward of the continental shelf at which blue, sei, and sperm whales are found greatly reduces the likelihood of any overlap between these whales and the proposed action, which is primarily expected to occur between approximately 30 m and 90 m deep based on depth range of the current applications and where surveys have shown highest densities of lionfish. The proposed action would allow an annual maximum authorization of 5,000 traps in the South Atlantic Region, 3,000 traps in the Florida Keys Region, including within FKNMS, and 10,000 traps in the Gulf Region, described in the Action Area section above, for up to six years. This limited number of traps and lines in the water, and the depth at which they will be placed, make the likelihood of gear interactions with blue, sei, and sperm whales extremely low. Therefore, I believe any adverse effect from the proposed action is discountable.

Fin Whales

Fin whales are baleen whales common in waters of the U.S. Atlantic EEZ, principally from Cape Hatteras northward (Waring et al. 2012). The allowable locations of the proposed action would be south of this range (waters off South Carolina to southern Florida, the Florida Keys, and the Gulf). An annual maximum of 5,000 traps would be allowed in the South Atlantic Region described in the Action Area section above. The distribution of fin whales and the limited number of traps in the water make the likelihood of gear interactions with fin whales from the proposed action so extremely low, I believe any adverse effect from the proposed action is discountable.

Bryde's Whale

The Bryde's whale's range is a small area in the northeastern Gulf near the De Soto Canyon (Rosel et al. 2016), referred to here as the Bryde's whale Habitat Area. The Bryde's whale Habitat Area was identified in published literature as waters between 100 and 300 m depth along the continental shelf break (LaBrecque et al. 2015). However, there have been sightings at 302 and 309 m depth in this region and west of Pensacola, Florida, and thus NMFS believes the Habitat Area is better defined out to the 400 m depth contour and to Mobile Bay, Alabama, to provide some buffer around the deeper water sightings and to include all sighting locations in the northeastern Gulf, respectively (Rosel et al. 2016). This larger area is what we mean when we refer to the Bryde's whale Habitat Area. The proposed action would exclude trap testing in the Bryde's whale Habitat Area, which approximates the 150 m isobaths on the eastern edge and the surrounding buffer area to 410 m on the western edge (Patty Rosel, NMFS SEFSC, pers. comm. 2018), making the likelihood of gear interactions so low, I believe any adverse effect from the proposed action is discountable.

North Atlantic Right Whales (NARWs)
The coastal waters of the southeastern U.S. are a wintering and sole known calving area for NARWs. NARWs concentrations are highest in the core calving area (Georgia and Florida) from November through April (71 FR 36299, June 26, 2006); on rare occasions, NARWs have been spotted as early as September and as late as July (Taylor et al. 2010). During spring, these females migrate back north with their new calves to high latitude foraging grounds where they feed on large concentrations of copepods (NMFS 2017). New data from passive acoustic monitoring suggests that NARWs may be present off the coasts of New Jersey, Virginia, and North Carolina year round (Davis et al. 2017). Because the proposed action would prohibit trap testing off North Carolina year round and from South Carolina to Florida from November-April, unless the applicant is given a specific exemption for fishing with the use of vertical line (i.e., lineless gear approved by NMFS), the likelihood of interactions with the vertical lines used in trap testing is extremely low, and I believe any adverse effect from the proposed action is discountable.

Large whales surface to breath air and are more vulnerable to vessel interactions. Given that the traps will be placed shallower than the blue, sei, and sperm whales generally occur and that the traps will avoid the habitats commonly used by fin, Bryde's whales, and NARW, it is extremely unlikely, and therefore, discountable that a vessel used in the trap testing would strike an ESA-listed whale, even during transiting. Based on all of the reasons described above, I therefore concur with your determination that the proposed action may affect, but is not likely to adversely affect ESA-listed whales.

Sea Turtles

Northwestern Atlantic DPS of Loggerhead, North Atlantic and South Atlantic DPSs of Green, Hawksbill, Kemp's Ridley, and Leatherback Sea Turtles
ESA-listed sea turtles could be affected by the proposed action through entanglement (for example, if they are attracted to the traps given how they are baited it could increase their entanglement risk), and vessel interactions. However, I anticipate the risk of these interactions to be extremely low given the low effort associated with the proposed action, namely authorizing an annual maximum of 5,000 traps in the South Atlantic Region, 3,000 traps in the Florida Keys Region, including within FKNMS, and 10,000 traps in the Gulf Region, described in the Action Area section above, for up to six years, and because of the sea turtle life history information described below.

Sea turtles may interact with other trap gear such as crab and spiny lobster traps. We have consulted on the effects of the spiny lobster fishery of the Gulf and South Atlantic and noted the potential for effects, including the potential for entanglement. These fisheries have high effort in shallow waters where there is a higher degree of overlap with sea turtles than the trap testing associated with the proposed action, and thus we do not expect the same effects from the proposed action as we have found for these other fisheries. Different life stages of sea turtles are associated with different habitat types and water depths. For example, pelagic stage loggerheads are found offshore closely associated with *Sargassum* rafts. As loggerheads mature they begin to live in coastal inshore and nearshore waters foraging over hard- and soft-bottom habitats of the continental shelf (Carr 1986; Witzell 2002). Gear set closer to these areas is more likely to encounter benthic juvenile and adult sea turtles where they are more densely concentrated in this narrower nearshore environment. The spiny lobster trap fishery occurs primarily in state waters around the Florida Keys less than 30 m deep and is issued approximately 500,000 trap tags annually. The traps under the proposed action will be placed in benthic areas in offshore waters generally deeper than 30 m. Sea turtles are less densely concentrated in these waters than nearshore areas and would have a low risk of entanglement. Differences in the bait and target species associated with the spiny lobster and crab fisheries and the proposed trap testing also make effects from the proposed testing less likely than under those fisheries. Spiny lobster and stone crabs are prey species of loggerhead sea turtles, and records of entanglements in spiny lobster and stone crab traps indicate that sea turtle entanglement is associated with fisheries that either target or bait with sea turtle prey items. I anticipate depredation on bait is unlikely to occur under the proposed action as the lionfish are not a sea turtle prey species nor are the traps anticipated to be baited with sea turtle prey species. Sub-adult and adult loggerheads are primarily coastal dwelling and typically prey on benthic invertebrates such as mollusks and decapod crustaceans in hard bottom habitats. Kemp's ridley sea turtles also feed on these species. Thus, loggerhead and Kemp's ridley sea turtles may be the species attracted to gear baited with these prey items. Green, hawksbill, and leatherback turtles may also be attracted to fishing bait and have been caught on fishing hooks, but their feeding habits make it less likely that they would be attracted to the bait in the traps associated with the proposed action. Green sea turtles become herbivorous as they mature, feeding on algae and sea grasses, but also occasionally consume jellyfish and sponges. The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan 1988). Leatherbacks feed primarily on cnidarians (medusae, siphonophores) and tunicates, so they are less likely to pursue baited gear. Therefore, because of the number of traps authorized over a six year timeframe, the depth of the traps in areas away from higher sea turtle concentrations, and the bait used, the risk of sea turtle entanglement would be extremely unlikely under the proposed action.

Sea turtles surface to breath air and may be vulnerable to vessel interactions. Given the limited effort of a maximum of 18,000 traps that may be authorized annually across the three regions described in the Action Area section above, associated trips to deploy and tend the traps, and the mitigation and monitoring measures in place, it seems extremely unlikely, and therefore, discountable that a vessel used in the trap testing would strike a sea turtle, even during transiting. I concur with your determination that the proposed action may affect, but is not likely to adversely affect, ESA-listed sea turtles.

Fish

Smalltooth Sawfish

There are no historic or recent reports of smalltooth sawfish entangled in pot/trap lines. The rope is generally thicker than the space between individual teeth on a smalltooth sawfish's rostrum, so the rope is unlikely to become tangled in its teeth. In the U.S., smalltooth sawfish are most often found off the southwest coast of Florida, from about Charlotte Harbor through the Everglades region at the southern tip of the state. Only a limited portion of the traps authorized under the proposed action are expected to be within the range of the smalltooth sawfish. Within this range, the majority of smalltooth sawfish are located in shallow waters (less than 10 m) and the traps will be placed deeper than 30 m. Adult smalltooth sawfish occasionally may move into deeper waters; however, because of the limited effort authorized under the proposed action in the range of the smalltooth sawfish described above, the use of trap trawl configurations, which minimize line in the water, and the morphology of sawfish described above, I believe the interactions with smalltooth sawfish as a result of the proposed action is extremely unlikely to occur, and therefore, discountable. In addition, smalltooth sawfish spend the vast majority of their time at or near the seafloor, where they are not vulnerable and subject to vessel interactions. Their benthic habits make it extremely unlikely, and therefore, discountable that these species would be struck by a vessel. I concur with your determination that the proposed action may affect, but is not likely to adversely affect, smalltooth sawfish.

Nassau Grouper

Nassau grouper could be caught as bycatch as a result of the proposed action. The only area that the range of the Nassau grouper overlaps with the proposed action is in the Florida Keys Region. The proposed action would authorize an annual maximum of 3,000 traps in the Florida Keys Region, including within FKNMS, for up to six years. These traps would be distributed deeper than 30 m throughout the Region, described in the Action Area section above. Some of the projects may use non-containment traps or use modified funnels that may restrict larger Nassau grouper from entering the traps. There are limited records of Nassau grouper bycatch in the spiny lobster fishery of the Gulf and South Atlantic from the lobster trap observer program in the 1990s; however, we do not think it is appropriate to extrapolate from that data to estimate the bycatch from the traps that will be set under the proposed action. These records were of small juveniles caught primarily from shallower, state waters, as the spiny lobster fishery occurs mainly in waters less than 30 m deep. The traps proposed will be set in waters deeper than 30 m in the Florida Keys Region. There is limited information on the current Nassau grouper abundance in the Florida Keys Region; however, abundance is thought to have declined over the past few decades, and encounter rates are likely lower than those recorded in the lobster trap observer program in the 1990s, when the species was more abundant. There are also no known spawning areas for adults in the proposed action area within the Florida Keys Region. Based on the limited effort anticipated under the proposed action in the Florida Keys Region (maximum of 3,000 traps at any given time on an annual basis for up to six years) and because most of these traps would have a modified funnel that would likely exclude the large Nassau grouper found in waters deeper than 30 m, I believe the capture of Nassau grouper is extremely unlikely to occur and therefore discountable. In addition, Nassau grouper spend the vast majority of their time at or near the seafloor, where they are not vulnerable and subject to vessel interactions. Their benthic habits make it extremely unlikely, and therefore, discountable that this species would be struck by a vessel. I concur with your determination that the proposed action may affect, but is not likely to adversely affect, Nassau grouper.

Coral

Elkhorn, Staghorn, Rough Cactus, Pillar, Lobed Star, Mountainous Star, and Boulder Star Corals

We evaluated the potential threat that the proposed action might pose to ESA-listed corals based on the information provided in the species status reviews and the Final Listing Rules (71 FR 26852, May 09, 2006; 79 FR 53852, Sept. 10, 2014). The known routes of effect from fishing on ESA-listed corals are a result of man-made abrasion and breakage resulting from damaging fishing practices (and associated diver/snorkeler interactions and anchoring), vessel groundings, and fishing/marine debris (ABRT et al. 2005). The proposed action does not target herbivorous fish, and there is expected to be limited bycatch of other fish species, so there are likely no potential trophic effects to the listed corals.

The proposed action does not overlap with where these species occur in the Florida Keys Region or the Flower Garden Banks National Marine Sanctuary. The proposed action would exclude trap testing in waters shallower than 30 meters off the Florida Keys Region and exclude completely in the Flower Garden Banks National Marine Sanctuary. These seven ESA-listed corals are considered absent below 30 m in the Florida Reef Tract based on literature searches and communication with researchers that revealed a lack of documented occurrence at these depths (Jennifer Moore, NMFS SERO, pers. comm. 2017). In addition, the limited effort of an annual maximum of 3,000 traps authorized in the Florida Reef Tract contained within the Florida Keys Region, described in the Action Area section above, for up to six years further limits the potential for effects. Derelict fishing gear/marine debris can destroy benthic organisms especially elkhorn and staghorn coral, due to their branching morphology. Fishery-related marine debris is often created by accidental gear loss due to weather or accidental entanglement with submerged benthic features. Since the gear will be tended frequently and are being monitored as a condition of each permit, I believe the likelihood of gear being lost and becoming detrimental marine debris is extremely unlikely, and therefore discountable.

In addition, traps placed in deeper waters showed less movement during storm events (Lewis et al. 2009). Moreover, FKNMS regulations prohibit damaging, breaking, cutting, or otherwise disturbing coral inside the sanctuary’s boundaries (15 CFR 922.163(a)(2)). Likewise, taking or possessing wildlife protected under the ESA is also prohibited under FKNMS regulations (15 CFR 922.163(a)(10)). Thus, within the FKNMS, the regulations may provide additional protections. Given the lack of overlap in where these listed corals occur and where the proposed action’s gear could occur, the limited effort, the depth and frequent checking on the gear, and the protective regulations, I expect the probability of interaction between the proposed action and ESA-listed corals to be extremely low, and therefore, discountable.

Vessel groundings that may harm ESA-listed corals are possible as a result of the proposed action, but I believe these events are extremely unlikely to occur. Over the past 20 years, technological advancements and accessibility to depth gauges and GPS units has also increased vessel operators’ ability to detect bottom features and calculate vessel position in relation to mapped coral structures. Experience and the use of technology greatly reduce the likelihood of vessels groundings. Additionally, some of these corals occur within the FKNMS (where regulations prohibit injury or damage to corals or within 3 nmi of shore (i.e., and thus are not within the action area). FKNMS regulations govern the operations of vessels within its borders and prohibit vessels from striking or otherwise injuring corals (15 CFR 922.163(a)(5)(i)). The presence of navigational aids warning mariners of dangerous coral reefs and shoals and marking areas where particular regulations apply throughout the FKNMS is likely to further reduce the potential for vessel groundings and impacts to corals. In addition, mooring buoys have also been deployed throughout the Sanctuary, reducing boaters' need to anchor. Given the experience of the vast majority of vessel operators, technology available, and the existence of navigational aids and mooring buoys and regulations prohibiting vessel groundings, I believe adverse effects to ESA-listed coral from such events are extremely unlikely to occur, and therefore, discountable.

To summarize, the proposed action's unlikely interaction with listed coral species, in combination with the measures in place to protect listed coral species where they do occur and avoid such interaction, makes any adverse effect on these species from the proposed action extremely unlikely to occur. Based on this information and the discussion provided in this section, effects on the listed coral species from the proposed action are discountable. I concur with your determination that the proposed action may affect, but is not likely to adversely affect, elkhorn, staghorn, rough cactus, pillar, lobed star, mountainous star, and boulder star coral.

Critical Habitat

Elkhorn and Staghorn Coral Critical Habitat

Critical habitat for elkhorn and staghorn coral in Florida extends from Palm Beach County to Key West, which also includes the Dry Tortugas. The physical or biological feature of elkhorn and staghorn coral critical habitat essential to their conservation is substrate of suitable quality and availability to support larval settlement and recruitment, and reattachment and recruitment of asexual fragments. Substrate of suitable quality and availability is defined as consolidated hard bottom or dead coral skeleton that is free from fleshy macroalgae cover and sediment cover, occurring in water depths from the mean high water line to 98 ft. Because the traps authorized under the proposed action will be set deeper than elkhorn and staghorn critical habitat, I believe any adverse effects to the essential features is highly unlikely to occur, and therefore, discountable. I concur with your determination that the proposed action may affect, but is not likely to adversely affect, elkhorn and staghorn critical habitat.

Northwest Atlantic Loggerhead DPS Critical Habitat

Critical habitat for the Northwest Atlantic DPS of loggerhead sea turtles in the South Atlantic is defined by five specific habitat types, also referred to as physical and biological features or PBFs: nearshore reproductive, winter concentration, concentrated breeding, constricted migratory, and *Sargassum*.

The proposed action uses fishing methods and gear types that either will have no effect or are highly unlikely to adversely affect any of the primary constituent elements (PCEs) of the five specific habitat types; thus, any adverse effects from this fishery will not occur or are insignificant. Our rationale for each unit is summarized below.

The proposed action will have no effect on nearshore reproductive habitat (Units LOGG-N-3 through N-36) and winter concentration habitat (Units LOGG-N-1and N-2). Nearshore reproductive habitat are a portion of portion of the nearshore waters adjacent to nesting beaches that are used by hatchlings to egress to the open-water environment as well as by nesting females to transit between beach and open water during the nesting season. The following PCEs support this habitat: (i) Nearshore waters directly off the highest density nesting beaches and their adjacent beaches, as identified in 50 CFR 17.95(c), to 1.6 kilometer (km) offshore; (ii) Waters sufficiently free of obstructions or artificial lighting to allow transit through the surf zone and outward toward open water; and (iii) Waters with minimal man-made structures that could promote predators (i.e., nearshore predator concentration caused by submerged and emergent offshore structures), disrupt wave patterns necessary for orientation, and/or create excessive longshore currents. The proposed action will operate a minimum of 2 miles offshore of the 1-mile boundary, so there will be no possibility of impacting the PCEs of this critical habitat. Winter concentration habitat only occurs off the coast of North Carolina between Cape Hatteras and Cape Lookout and testing is not allowed off North Carolina under the proposed action, unless the applicant is given a specific exemption for fishing with the use of vertical line (i.e., lineless gear approved by NMFS). Even if lineless gear is used we do not expect effects. Regardless, the proposed action is not capable of affecting the PCEs of water temperature, the proximity of shelf waters in relation to the Gulf Stream, and water depth.

NMFS designated two concentrated breeding habitat units (Units LOGG-N-17 and N-19) along the east coast of Florida as essential for the conservation of the species. The PCEs that support this habitat are (1) high densities of reproductive male and female loggerheads, (2) proximity to primary Florida migratory corridor, and (3) proximity to Florida nesting grounds.

As stated above, I believe it is extremely unlikely that the proposed action will entangle loggerhead sea turtles; therefore, will not affect the density of reproductive males and females in the area. Therefore, any effects on the first PCE are considered discountable. Further, I believe the proposed action has no means by which to affect the other PCEs of concentrated breeding habitat. The gears and activities in these fisheries do not have the capacity to affect the distance of the concentrated breeding habitat in relation to the Florida migratory corridor or the Florida nesting grounds.

NMFS designated four constricted migratory habitat units along the east coast of Florida Habitat (Units LOGG-N-1 and LOGG-N-17 through N-19). Two of these habitat units directly overlap with the two concentrated breeding habitat units described above. The PCEs that support this critical habitat are (1) constricted continental shelf area relative to nearby continental shelf waters that concentrate migratory pathways, and (2) passage conditions to allow for migration to and from nesting, breeding, and/or foraging areas.

The proposed action may operate within the constricted migratory corridor units. Given its activities and gear types it does not have the capacity to modify the first PCE. The proposed action deploys gear in Atlantic waters that could possibly affect passage conditions (the second PCE). Yet, because any gear deployments in these areas are temporary, I do not expect them to meaningfully alter the passage conditions that allow migration to and from nesting, breeding, or feeding habitats. Any effects to the second PCE will be insignificant.

Two units of *Sargassum* critical habitat (LOGG-S-01 and LOGG-S-02) were designated to conserve loggerhead sea turtles by protecting essential forage, cover, and transport habitat for post-hatchlings and early juveniles. The PCEs that support this habitat are: (1) convergence zones, surface-water downwelling areas, the margins of major boundary currents, and other locations where there are concentrated components of the *Sargassum* community in water temperatures suitable for the optimal growth of *Sargassum* and inhabitance of loggerheads, (2) *Sargassum* in concentrations that support adequate prey abundance and cover, (3) available prey and other material associated with *Sargassum* habitat including, but not limited to, plants and cyanobacteria and animals native to the *Sargassum* community such as hydroids and copepods, and (4) sufficient water depth and proximity to available currents to ensure offshore transport, foraging, and cover requirements by *Sargassum* for post-hatchling loggerheads, i.e., > 10-m depth.

The proposed action could operate in the widespread areas of the *Sargassum* critical habitat units, but I believe any effects to the PCEs will be insignificant. The proposed action does not have the capability to affect the location of convergence zones, surface-water downwelling (the movement of denser water downward in the water column) areas, or other locations where there are concentrated components of the *Sargassum* community in water temperatures suitable for optimal growth of *Sargassum* and inhabitance of loggerheads. The proposed action would have no effect on availability of prey for hatchling loggerhead sea turtles or other material associated with *Sargassum* habitat because the proposed action does not target or incidentally harvest smaller prey species or *Sargassum*. The proposed action does not have the capability to affect the water depth or proximity to currents necessary for offshore transport, foraging, and cover. While some vessels associated with the proposed action may transit through *Sargassum* habitats, those vessel tracks are not anticipated to scatter *Sargassum* mats to the point of affecting the *Sargassum* concentrations or the functionality of the PCEs. Further, the wakes and surface water disruption associated with these vessels are not of sufficient magnitude to result in significant effects to the distribution of *Sargassum* mats. Temporary and incidental removal of *Sargassum* via fishing gear could occur, though any incidental harvest is not anticipated to be at such a level that *Sargassum* concentrations or functionality of the PCEs will be affected. Therefore, any adverse effects to the *Sargassum* habitat will be insignificant.

In conclusion, I concur with your determination that activities associated with the proposed action will not adversely affect any of the Northwest Atlantic loggerhead DPS critical habitat units. The proposed action will either have no effect on the habitat type due to location or methods, or will have insignificant effects that will not adversely affect the habitat.

Conclusion

Based on this analysis, I concur with that the proposed actions are not likely to adversely affect the ESA-listed species or critical habitat.

Reinitiation of Consultation

The proposed action (i.e., issuing EFPs and/or ONMS permits to target lionfish by traps) includes the condition that if an ESA-listed species is taken during the proposed action, then fishing under the applicable permit must cease and formal section 7 consultation initiated. In addition, reinitiation of consultation is required and shall be requested by NMFS-SFD or ONMS or by PRD, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (1) take occurs; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered; or if (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16). This concludes your consultation responsibilities under the ESA for species under NMFS's purview.

If you have any questions regarding this memorandum, please contact Mary Wunderlich, Protected Resources Division, at (727) 209-5985.

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Appendix C. Essential Fish Habitat Consultation

In the Southeast Region, the Sustainable Fisheries Division (SFD) consults with the Habitat Conservation Division (HCD) during their evaluation of scientific research, exempted fishing, and exempted educational activities for the Regional Administrator. Scientific research and exempted educational activities often propose the use of sampling gear or collection methods, which have been identified by fishery management councils to have the potential to adversely impact essential fish habitat (EFH) and therefore require an EFH consultation. Due to the limited scope and design of most scientific research, exempted fishing, and exempted educational activities, the only option to protect and conserve EFH would be to not conduct the activity at all which would be contrary to 50 CFR 600.745(a). However, for certain types of actions resulting in no more than minimal adverse effects to EFH individually and cumulatively, National Marine Fisheries Service (NMFS) may issue a statement of General Concurrence in accordance with the requirements of 50 CFR 600.920(g). Research and monitoring activities are specifically identified as candidates for General Concurrence in the preamble to the EFH Final Rule in Comment 23 and Response B. The General Concurrence (below) for scientific research activities, exempted fishing, and exempted education activities in the exclusive economic zone of the Southeast United States became effective November 24, 2014, and revised on March 5, 2018.

As discussed in Chapter 4 of this programmatic environmental assessment (PEA), NMFS does not expect that the preferred alternatives, which would allow experimental testing of various trap designs to target lionfish, would have significant adverse ecological, economic, or social impacts. As described in Chapter 5, NMFS would closely monitor the activities occurring under each exempted fishing permit (EFP) and take appropriate action, if necessary, to mitigate interactions with protected species, other bycatch species, or sensitive habitats including EFH. NMFS and ONMS will have the ability to modify permit conditions, and to end the research projects, to address any of these impacts as warranted. The proposed actions, if conducted in a manner consistent with specific alternatives and mitigation measures, are not expected to have individually significant effects to the biological, physical, or socio-economic environment. Applicants, should they be issued a permit, would be required to abide by the mitigation, monitoring, and reporting requirements that would be a condition of permits issued by NMFS and Office of National Marine Sanctuaries. Specific alternatives and mitigation measures have been considered in this PEA as a way to mitigate the potential negative effects of trap movement, loss, and misplacement. For example, NMFS may not allow trap testing in areas restricted to fishing and in many of these areas, fishing is restricted to protect sensitive habitats.

Therefore, NMFS and ONMS anticipate the General Concurrence for scientific research activities, exempted fishing, and exempted education activities will apply to applications for EFPs to test whether various trap types would be effective at capturing lionfish while minimizing bycatch of other species and effects to the environment. When applying this General Concurrence to a proposed scientific research, exempted fishing, or exempted educational activity, the Sustainable Fisheries Division shall send an e-mail to the Habitat Conservation Division in accordance with the required notification procedure. If the SFD or HCD determines an application falls outside the scope of the General Concurrence, a project-specific, individual EFF consultation would be required.

Appendix D. Examples of Areas Restricted to Fishing

Gulf of Mexico

Madison and Swanson
50 CFR 622.34(a)(1)(i)

Steamboat Lumps
50 CFR 622.34(a)(1)(ii)

The Edges
50 CFR 622.34(a)(1)(iii)

Alabama Special Management Zone (SMZ)
50 CFR 622.35(d)

West Flower Garden Bank
50 CFR 622.74(a)(1)

East Flower Garden Bank
50 CFR 622.74(a)(2)

Florida Middle Ground Habitat Area of Particular Concern (HAPC)
50 CFR 622.74(b)

Tortugas Marine Reserves HAPC
50 CFR 622.74(c)

Pulley Ridge HAPC
50 CFR 622.74(d)

Stetson Bank HAPC
50 CFR 622.74(e)

McGrail Bank HAPC
50 CFR 622.74(f)

South Atlantic

Special Management Zones (SMZs)

50 CFR 622.182(a)(1)(i)-(li)

Spawning SMZs

South Cape Lookout Spawning SMZ
50 CFR 622.183(a)(2)(ii)

Devil's Hole/Georgetown Hole Spawning SMZ
50 CFR 622.183(a)(2)(iii)

Area 51 SMZ
50 CFR 622.183(a)(2)(iv)

Area 53 SMZ
50 CFR 622.183(a)(2)(v)

Warsaw Hole/50 Fathom Hole SMZ
50 CFR 622.183(a)(2)(vi)

Deepwater Coral HAPCs

Cape Lookout Lophelia Banks
50 CFR 622.224(c)(1)(i)

Cape Fear Lophelia Banks
50 CFR 622.224(c)(1)(ii)

Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson Miami Terrace)
50 CFR 622.224(c)(1)(iii)

Pourtales Terrace
50 CFR 622.224(c)(1)(iv)

Blake Ridge Diapir
50 CFR 622.224(c)(1)(v)

Coral HAPCs

Oculina Bank HAPC
50 CFR 622.224(b)(1)
50 CFR 622.224(b)(2)

Marine Protected Areas (MPAs)

Snowy Grouper Wreck MPA
50 CFR 622.183(a)(1)(A)

Northern South Carolina MPA
50 CFR 622.183(a)(1)(B)

Edisto MPA
50 CFR 622.183(a)(1)(C)

Charleston Deep Artificial Reef MPA
50 CFR 622.183(a)(1)(D)

Georgia MPA
50 CFR 622.183(a)(1)(E)

North Florida MPA
50 CFR 622.183(a)(1)(F)

St. Lucie Hump MPA
50 CFR 622.183(a)(1)(G)

East Hump MPA
50 CFR 622.183(a)(1)(H)

Florida Keys National Marine Sanctuary

15 CFR 922.164 and Appendices II, IV – VI

<u>Sanctuary Preservation Areas (SPAs)</u>
Alligator Reef Sanctuary Preservation Area
Carysfort/South Carysfort Sanctuary Preservation Area
Cheeca Rocks Sanctuary Preservation Area
Coffins Patch Sanctuary Preservation Area
Conch Reef Sanctuary Preservation Area
Davis Reef Sanctuary Preservation Area
Eastern Dry Rocks Sanctuary Preservation Area
The Elbow Sanctuary Preservation Area
French Reef Sanctuary Preservation Area
Grecian Rocks Sanctuary Preservation Area
Hen and Chickens Sanctuary Preservation Area
Dry Rocks Sanctuary Preservation Area
Looe Key Sanctuary Preservation Area
Molasses Reef Sanctuary Preservation Area
Newfound Harbor Key Sanctuary Preservation Area
Sand Key Sanctuary Preservation Area
Rock Key Sanctuary Preservation Area
Sombrero Key Sanctuary Preservation Area

<u>Special Use (Research Only) Areas</u>
Conch Reef Research Only Area
Eastern Sambo Research Only Area
Looe Key Research Only Area
Tennessee Reef Research Only Area

<u>Ecological Reserves</u>
Tortugas (North and South) Ecological Reserve
Western Sambo Ecological Reserve

<u>Existing Management Areas</u>
Key Largo Management Area
Looe Key Management Area