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F/SER31:KL

SEP 19 2012

Mr. Mark Lewis
Superintendent, Biscayne National Park
National Park Service
9700 SW 328th Street
Homestead, FL 33133

Re: Biscayne National Park General Management Plan

Dear Mr. Lewis:

Enclosed is the National Marine Fisheries Service's (NMFS) biological opinion (opinion) based on our review of impacts associated with the Biscayne National Park General Management Plan (GMP). This opinion is based on project-specific information provided in the draft environmental impact statement as well as NMFS' review of published literature. This opinion analyzed the project effects on sea turtles, smalltooth sawfish, elkhorn and staghorn corals, and designated critical habitat for elkhorn and staghorn corals. We believe that the implementation of the GMP is likely to adversely affect green, loggerhead, and hawksbill sea turtles but is not likely to jeopardize their continued existence.

We look forward to further cooperation with you on other National Park Service projects to ensure the conservation and recovery of our threatened and endangered marine species. If you have any questions regarding this consultation, please contact Kelly Logan, consultation biologist, by e-mail at Kel.Logan@noaa.gov or (954) 356-6790.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure

File: 1514-22.P
Ref: P/SER/2011/03871

Endangered Species Act - Section 7 Consultation
Programmatic Biological Opinion

Agency: National Park Service (NPS)

Applicant: Biscayne National Park, Florida

Activity: General Management Plan for Biscayne National Park

Consulting Agency: National Marine Fisheries Service (NMFS)
Southeast Regional Office
Protected Resources Division
(P/SER/2011/03871)

Date Issued: Sept 19, 2012

Approved By:

Roy E. Crabtree, Ph.D.
Regional Administrator

Glossary of Commonly Used Acronyms

BNP	Biscayne National Park
COE	Army Corps of Engineers
DPS	Distinct Population Segment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FMP	Fisheries Management Plan
FWCC	Florida Fish and Wildlife Conservation Commission
FWRI	Florida Wildlife Research Institute
GMP	General Management Plan
ICW	Intracoastal Waterway
ITS	Incidental Take Statement
HMS	Highly Migratory Species
NAD83	North American Datum 1983
NMFS	National Marine Fisheries Service
NPS	National Park Service
NOAA	National Oceanic and Atmospheric Association
NOS	National Ocean Service
PSRPA	BNP System Resource Protection Act
RPM	Reasonable and Prudent Measures
SEFSC	Southeast Fisheries Science Center
USFWS	U.S. Fish and Wildlife Service

Background

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. §1531 *et seq.*), requires that each federal agency ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of those species. When the action of a federal agency may affect a protected species or its critical habitat, that agency is required to consult with either NMFS or the U.S. Fish and Wildlife Service (USFWS), depending upon the protected species that may be affected.

Consultations on most listed marine species and their designated critical habitat are conducted between the action agency and NMFS. Consultations are concluded after NMFS determines the action is not likely to adversely affect listed species or critical habitat or issues a biological opinion ("opinion") that determines whether a proposed action is likely to jeopardize the continued existence of a federally-listed species, or destroy or adversely modify federally-designated critical habitat. The opinion also states the amount or extent of listed species incidental take that may occur and develops non-discretionary measures that the action agency must take to reduce the effects of said anticipated/authorized take. The opinion may also recommend discretionary conservation measures. No incidental destruction or adverse modification of critical habitat may be authorized. The issuance of an opinion detailing NMFS' findings concludes ESA Section 7 consultation.

This document represents NMFS' programmatic opinion based on our review of impacts associated with the implementation of the National Park Service's (NPS) General Management Plan for Biscayne National Park (BNP), which includes multiple components and will be used to manage BNP over the next 15-25 years. This opinion analyzes project effects on sea turtles, smalltooth sawfish, elkhorn and staghorn corals, and designated critical habitat for elkhorn and staghorn corals in accordance with Section 7 of the ESA. NMFS has analyzed the preferred alternative described in the draft environmental impact statement (DEIS) and its effects on listed species and designated critical habitat under our purview in accordance with Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 *et seq.*). This opinion is based on project information provided by the NPS as well as published literature and the best available scientific and commercial information. It is NMFS' biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of loggerhead, green and hawksbill sea turtles, smalltooth sawfish, or elkhorn and staghorn corals, and is not likely to destroy or adversely modify the designated critical habitat for elkhorn and staghorn corals.

Programmatic Consultations

NMFS and the USFWS have developed a range of techniques to streamline the procedures and time involved in consultations for broad agency programs or numerous similar activities with well-understood predictable effects on listed species and critical habitat. Some of the more common of these techniques and the requirements for ensuring that streamlined consultation procedures comply with Section 7 of the ESA and its implementing regulations are discussed in the October 2002 joint Services memorandum, *Alternative Approaches for Streamlining Section 7 Consultation on Hazardous Fuels Treatment Projects* (http://www.fws.gov/endangered/esa-library/pdf/streamlining.pdf; see also, 68 FR 1628 (January 13, 2003)).

Programmatic consultations can be used to evaluate the expected effects of groups of related agency actions expected to be implemented in the future, where specifics of individual projects such as project location are not definitively known. A programmatic consultation must identify project design criteria (PDCs) or standards that will be applicable to all future projects implemented under the consultation document. PDCs serve to prevent adverse effects to listed species, or to limit adverse effects to predictable levels that will not jeopardize the continued existence of listed species or destroy or adversely modify critical habitat, at the individual project level or in the aggregate from all projects implemented under the programmatic opinion. Programmatic consultations allow for streamlined project-specific consultations because much of the effects analysis is completed up front in the programmatic consultation document. At the project-specific consultation stage, a proposed project is reviewed to determine if it can be implemented according to the PDCs, and to evaluate or tally the aggregate effects that will have resulted by implementing projects under the programmatic consultation to date, including the proposed project. The following elements should be included in a programmatic consultation to ensure its consistency with ESA Section 7 and its implementing regulations.

1. Project design criteria to prevent or limit future adverse effects on listed species and critical habitat;

2. Description of the manner in which projects to be implemented under the programmatic consultation may affect listed species and critical habitat and evaluation of expected level of effects from covered projects;

3. Process for evaluating expected, and tracking actual aggregate or net additive effects of all projects expected to be implemented under the programmatic consultation. The programmatic consultation document must demonstrate that when the PDCs are applied to each project, the aggregate effect of all projects will not adversely affect listed species or their critical habitat, or will not jeopardize species or destroy or adversely modify their critical habitat, as applicable;

4. Procedures for streamlined project-specific consultation. As discussed above, if an approved programmatic consultation document is sufficiently detailed, project-specific consultations ideally will consist of certifications and concurrences between action agency biologists and consulting agency biologists, respectively. An action agency biologist or team will provide a description of a proposed project, or batched projects, and a certification that the project(s) will be implemented in accordance with the PDCs. The action agency also provides a description of anticipated project-specific effects and a tallying of net effects to date resulting from projects implemented under the program, and certification that these effects are consistent with those anticipated in the programmatic consultation document. If a project is likely to result in prohibited take of a listed species, a project-specific incidental take statement must be developed. The consulting agency biologist reviews the submission and provides concurrence, or adjustments to the project(s) necessary to bring it (them) into compliance with the programmatic consultation document. The project-specific consultation process must also identify any effects that were not considered in the programmatic consultation. Finally, the project-specific consultation procedures must provide contingencies for proposed projects that cannot be implemented in accordance with the PDCs. Full stand-alone consultations may

be performed on these projects if they are too dissimilar in nature or in expected effects from those projected in the programmatic consultation document.

5. Procedures for monitoring projects and validating effects predictions; and

6. Comprehensive review of the program, generally conducted annually.

BIOLOGICAL OPINION

1 Consultation History

On May 11, 2010, we received a request for consultation pursuant to Section 7 of the Endangered Species Act (ESA) from the National Park Service (NPS) regarding determinations from the draft coral restoration plan (RP)/programmatic environmental impact statement (PEIS) for Biscayne National Park (BNP). NPS determined that some restoration activities following vessel groundings may affect, but are not likely to adversely affect, *Acropora* spp., smalltooth sawfish (*Pristis pectinata*), and five species of sea turtles (*Chelonia mydas*, *Caretta caretta*, *Lepidochelys kempi*, *Eretmochelys imbricata*, *Dermochelys coriacea*). We requested additional information on July 9, 2010, as a supplement to the comments on the PEIS provided by NMFS in a June 25, 2010, letter. We received final information from NPS on August 30, 2010, at which point we initiated programmatic formal consultation. On April 5, 2011, we received a request from NPS for the draft proposed Fisheries Management Plan (FMP) for BNP. On August 25, 2011, via letter dated August 19, 2011, we received a separate request for Section 7 consultation for the General Management Plan (GMP) for the operation of BNP for the next 15-25 years. Under the ESA, we must comprehensively assess the entire scope of a Federal agency's proposed action in order to ensure that the action is not likely to violate Section 7(a)(2). Therefore, we determined it was necessary to combine the Section 7 consultation requests for the FMP and the GMP, as well any other actions that may be implemented under the GMP, and informed the NPS of this decision during a conference call on February 23, 2012. The NPS determined that the activities conducted under the GMP may affect, but are not likely to adversely affect, elkhorn and staghorn corals, smalltooth sawfish, and swimming sea turtles, and these activities are not likely to result in adverse modification to designated critical habitat for elkhorn and staghorn coral. Because NMFS did not concur with the NPS's not likely to adversely affect determinations, we initiated formal consultation on May 17, 2011.

2 Description of the Proposed Action

2.1 Project Components

The proposed action is adoption and implementation of a revised General Management Plan for the operation of BNP for the next 15-25 years. The GMP is composed of a number of separate actions and includes the following components, some of which are described in more detail below:

1. The seven stilt-supported structures within Bay waters in the northernmost portion of BNP will be maintained and may be used by the public.
2. Recreational and commercial fishing will continue within BNP except within the Marine Reserve Zone (to be established). Fishing will be implemented in accordance with the FMP.
3. A second Visitor's Center will be established, either via new construction or through leasing of an existing facility nearby.
4. NPS will continue to pursue acquisition of the five small keys located north of Boca Chita Key, known as the Ragged Keys.
5. BNP will continue to maintain and operate the Black Point Jetty, located adjacent to the Black Point Marina County Park. BNP will explore the possibility of developing interpretive activities at this location.

6. The use and management of mooring buoys would continue under the Mooring Buoy and Marker Plan.
7. All of BNP's dredged channels (Intracoastal Waterway, Black Point Marina Channel, Homestead Bayfront Marina Channel, and Turkey Point Channel) will continue to be maintenance dredged to keep them open to boating and shipping traffic. No new dredging would be permitted anywhere within BNP. Depth limits for dredging would be enforced, not to exceed 7-12 feet within the Intracoastal Waterway, 4.5 feet within the Black Point Marina and Homestead Bayfront Marina Channels, and 7.5 feet within the Turkey Point Channel.
8. The naturally occurring Biscayne Channel, Boca Chita Harbor Channel, Caesar Creek Channel, Hawk Channel, and Pacific Reef Channel will continue to be marked for navigation. Markers will be maintained by the U.S. Coast Guard and NPS. These channels will not be dredged.
9. Vessel groundings will continue to be managed under BNP's Vessel Groundings Policy and Procedures. Any corals damaged by vessel groundings will be restored under BNP's Coral Reef Restoration Plan.
10. A boardwalk/loop trail is proposed through mangroves near the Convoy Point entrance. The boardwalk will not result in removal of mangroves.
11. Most of the waters within BNP will be zoned as multi-use, allowing for sightseeing, boating, fishing, scuba diving, snorkeling, swimming, canoeing, and kayaking. Three slow-speed zones will be designated along with several non-combustion engine zones within shallow water areas.
12. A marine reserve zone will be established between Hawk Channel and BNP's eastern boundary, extending from Pacific Reef north to Long Reef. The marine reserve zone will encompass 10,522 acres of marine habitat (2,663 acres of coral reefs) and will be a no-take zone where recreational and commercial fishing will be prohibited. Swimming, snorkeling, diving, and glass bottom boat tours will be permitted in this area.
13. The Legare Anchorage (a protective area for cultural resources, including the H.M.S. Fowey shipwreck) will be reduced from 3 square miles to 1 square mile and will be marked by buoys. Vessels will be allowed to travel through the area, but drifting, mooring, anchoring, and entering the water will not. Recreational hook-and-line fishing will be permitted while trolling, but commercial fishing and trapping will not be permitted. Research activities will be allowed with proper permits.
14. Several of the keys within BNP will include canoe docks and staging areas for canoes and kayaks for visitor use. Elliot Key Harbor will continue to be used for visitor boat docking, both for day use and for overnight docking.
15. NPS may issue 1-year research permits via the NPS Research Permit and Reporting System.

Coral Reef Restoration

Vessel groundings occur annually within Biscayne National Park (BNP), injuring submerged Park resources. NPS is tasked with restoring the injured and damaged resources caused by these groundings. Currently, BNP resource managers evaluate the impacts of coral reef restoration actions and methods when planning and implementing restoration at each vessel grounding site. This process can be time consuming, thus increasing the potential for additional impacts to coral reefs due to storm events or high current episodes. NPS has proposed a programmatic approach to address injuries to coral reefs caused by vessel groundings within BNP. The proposed programmatic approach would allow resource managers to choose the most appropriate restoration or enhancement methods from a "toolbox" of methods that are evaluated under their programmatic RP/EIS. This would reduce the time required for National Environmental Policy Act (NEPA) impact analysis compliance for specific projects, as it could be tiered off the programmatic NEPA document. This alternative would permit a faster response, getting corals on the road to recovery sooner and reducing the risk of additional injury. Based on our own experience responding to vessel groundings that injure coral reef resources, NMFS believes that reef restorations typically occur at two response levels or time scales: (1) first response – emergency restoration to immediately recover and reattach injured corals, and (2) long-term restoration of the reef – restoration and enhancement activities used to not only restore corals but also to re-establish the topography and substrates necessary for coral growth and recruitment in the future.

A number of restoration methods have been used in BNP to address impacts from vessel groundings over the past several years. The RP/PEIS evaluated several such methods, most of which have recently been analyzed under the NEPA process during the development of other restoration plans (Allie B and Igloo Moon Restoration Plans). The following list represents methods that were evaluated by an interdisciplinary team of scientists and included in the restoration "toolbox" for this RP/PEIS:

1. No active restoration/no monitoring – leave injured site as is to naturally recover with no monitoring.

2. Monitoring only – collect quantitative data about the natural biological recovery at grounding sites. Methods include photo documentation and direct quantitative measurements.

3. Reattachment of biota – includes reattachment of fragments or whole colonies that were dislodged or broken following the grounding, as well as transplantation of loose fragments from other nearby sites. This involves the use of epoxy, cement, or mechanical devices (e.g., plastic cable ties). Fragments or colonies may be reattached either to the sea floor directly or to artificial bases (e.g., a concrete disk), which are then affixed to the sea floor.

4. Biological seeding – deploy larvae over the site, that were previously collected and maintained within a laboratory (previous collections would need to have been permitted).

5. Remove bottom paint/fouling substance from reef – remove and dispose of any toxic materials from the surface of corals or the substrate.

6. Seal fractures – use cement or epoxy to seal fractures and fissures that were generated by the grounding.

7. Stabilize displaced substrate – reestablish reef stability and topography by placing displaced substrate or non-native materials in natural reef depressions caused by the grounding.

8. Stabilize displaced substrate with artificial structures – use artificial structures (Reef Balls, articulated mats, concrete, etc.) to create the structural complexity of the reef prior to the grounding event.

9. Stabilize rubble – stabilize or relocate loose rubble. This may involve the use of barges and cranes with diver assistance. Can also involve the use of articulated mats and other artificial structures to stabilize the substrate.

10. Rubble removal from injury site – remove loose rubble from the site using a small barge or pontoon boat along with diver assistance.

The method or methods to be used is/are dependent on the specific damage caused by the grounding, and the objectives of the restoration. It is expected that several methods will be used in conjunction with one another to maximize restoration success. Each method within the toolbox has been assessed by NMFS through this biological opinion (see Section 6.0, Effects of the Action) to determine the potential for adverse effects to protected corals or their critical habitat, and the likelihood of each technique being used in either first response - emergency restoration, long-term response, or both. It is expected that although some of the proposed methods may adversely affect corals in the short term (due to handling, reattachment, etc.), that these methods will ultimately benefit the species by preventing the mortality of some injured corals.

The collection of *Acropora* fragments or gametes is considered a *directed* take (collection) of a protected species, not incidental take, and cannot be authorized in this programmatic biological opinion. However, this type of collection may be implemented if it were to qualify as an exception under the 4(d) rule, or if an ESA Section 10 permit was secured prior to any action. Under the 4(d) rule, certain restoration or research and enhancement activities may be excepted from the take prohibitions when these activities are implemented under an existing legal authority such as those discussed in Section 2.2 of this document.

Many if not all emergency restoration actions that are excepted from the 4(d) take prohibition also meet the requirements for use of emergency consultation procedures. Some methods that involve rebuilding the structural topography and integrity of the reef are only suitable for use in long-term restoration responses after a site-specific restoration plan has been developed and submitted for project specific consultation with NMFS. Some restoration projects will involve both emergency consultation and advance consultation on long-term activities for the site. Some restoration techniques suitable for long-term restoration could adversely affect elkhorn and staghorn corals, as there are higher risks or unknown results associated with them. Any proposed methods not included in the RP/PEIS or not listed above and approved in Section 6 of this programmatic biological opinion will have to be consulted on independently.

Based on historical numbers of groundings in BNP, NPS estimates that 10 vessel groundings will occur each year over reef habitat. NPS believes, on average, one of these sites will require restoration involving *Acropora* corals and/or *Acropora* critical habitat each year.

Fishery Management Plan
The following text describing actions to be implemented under the Fishery Management Plan component of the GMP is excerpted from the NPS' November 2008 FMP/Draft EIS:

<u>Alternative 4 (Preferred Alternative)</u> - Rebuild and conserve park fisheries resources

Under Alternative 4, a considerable change from current management strategies would occur to focus on rebuilding and conserving park fisheries resources. Substantial improvement in the status of park fisheries resources and a further decline in fishing-related habitat impacts would be sought. Numbers of commercial fishers would decrease over time via establishment of a non-transferable permit system. This alternative would require considerable changes to current fishing regulations within the park.

Populations of fishery-targeted fish and invertebrates- Management actions would be enacted (in conjunction with the FWCC) to increase the abundance and average size of targeted fish and invertebrate species within the park by at least 20% over current conditions and over conditions in similar habitat outside the park. These efforts initially would be focused on frequently harvested species such as grouper, snapper, and hogfish, which studies have indicated have already been negatively affected by fishing impacts. Future efforts, as deemed appropriate given the best available data, could include less-impacted species such as grunts and barracuda, and catch-and release species such as bonefish and permit. Analyses to determine whether the 20percent increase is reached in the future would utilize the best available data, likely including, but not limited to, data generated from visual census and creel surveys.

To achieve the desired increases in fish abundance and size under this alternative, a range of management actions would be considered by the park and FWCC, and new regulations proposed to the FWCC for consideration and public comment. Possible actions could include, but would not be limited to: considerable increases in minimum harvest sizes (meaning that very few fish will be legally harvestable for several years until resources improve), designation of slot limits, substantial decreases in bag limits, limiting the number of commercial fishermen, and seasonal or spatial closures (including species-specific spawning closures or marine reserve areas which would be closed to all fishing activities).

Recreational Fishing Activity - BNP would continue monitoring recreational catch and effort, as well as the percent of recreational fishers who are satisfied with their fishing experience, via creel surveys. BNP would also strive to assess the effect of catch and release fishing on growth and survival of recreationally caught species, particularly those not targeted but often caught by recreational fishers ("recreational bycatch"; e.g., grunts) (staff- and funding-dependent).

- Visitor experience (of which recreational fishing experience is a part) is a fundamental component of the National Park Service mission. Thus, BNP would continue to monitor (via creel surveys) levels of satisfaction with recreational fishing experience. Currently, > 90% of recreational fishers report being satisfied with their experience following fishing outings in BNP (BNP unpublished data). If the level of satisfaction decreased below 90% for any six-month period (indicative of a sustained trend), BNP would make further efforts to identify characteristics of a fishing outing most important to providing a satisfying experience (i.e., through interviews and surveys), and make subsequent efforts to provide those characteristics (staff- and funding-dependent). For example, if a growing percentage of flats fishers reported they were not satisfied with their fishing experience because the flats they were fishing were commonly disturbed by passing motorboats, then BNP would consider methods to decrease such disturbances, including establishment of non-combustion engine use zones (as currently under consideration in BNP's General Management Plan).

- Spearfishing would be limited to gear lacking a trigger mechanism (e.g., the Hawaiian sling model). The use of air-providing equipment (e.g., scuba and hookah) while spearfishing would be prohibited. These actions would be taken for several reasons. First, spearfishing typically results in the selective removal of the largest fish present, while the park is attempting to increase the average size of targeted fish under this alternative. Second, the park's current regulations are less restrictive than in surrounding waters. Spearfishing is prohibited in neighboring John Pennekamp Coral Reef State Park, in the upper Keys of neighboring Monroe County, in additional sections of the neighboring Florida Keys National Marine Sanctuary, and in nearby Everglades National Park, yet permitted in BNP, which is a national park. These less restrictive regulations result in increased spearfishing pressure in the park, which the regulatory changes under this alternative would seek to ameliorate. Other, more minor, concerns are associated with (1) the harvest of fish smaller than minimum regulatory size due to "underwater magnification", (2) spearfisher-associated reef and cultural resource damage, and (3) potential behavioral effects on fishes that are targeted by spearfishers. Each of these negative impacts would be decreased in intensity with the actions listed above. The two-day recreational lobster sport season would be eliminated in the park, as described in the section on Habitat Conditions, below.

- As part of the "recreational boat use" permit system , all park visitors fishing from boats will be required to purchase an annual "recreational use" boat permit.

Commercial fishing – BNP would continue to monitor commercial landings and effort through acquisition of data from the FWCC's trip ticket program.

Additionally, BNP would strive to:

- Monitor and assess impacts of bycatch associated with commercial fisheries, particularly roller-frame shrimp trawlers (staff- and funding-dependent)
- Investigate methods to reduce bycatch and gear impacts/damage in roller-frame trawl and other commercial fisheries. Work with commercial fishers to develop and implement recommended changes (staff- and funding-dependent)
- Perform increased outreach and public education to ensure commercial fishers are aware of regulations and potential gear and bycatch impacts (staff- and funding-dependent)
- New fisheries would not be allowed to develop within the park. The park would continue to allow existing commercial fishing within its borders (based upon data from the FWCC, the National Marine Fisheries Service, and other available data). The commercial fisheries that are, and would continue to be, permitted within the park are: bait shrimp roller-frame trawl fisheries, blue crab and stone crab pot fisheries, spiny lobster pot and dive fisheries, the ballyhoo purse seine fishery, and pelagic and benthic hook-and-line fisheries (with the exception of multiple-hook "long lines"). All other commercial fisheries, including the "wingnet" shrimp fishery and fisheries that may develop in the future, would be prohibited within the park upon implementation of the FMP. Additional restrictions could be placed upon permitted commercial fishing activities if data indicated that fisheries resources are declining.
- Future growth in the number of commercial fishermen would be prevented. All commercial fishers would be required to purchase a limited-entry, Special Use Permit from the park Superintendent. The permit would be nontransferable and would require annual renewal for

each year in which landings are reported. A deadline for permit purchase would be set and communicated to the public via mailings and mass media. To be eligible for the permit, commercial fishers must have reported landings within the last 3 years prior to the year of permit establishment in zones 744.4, 744.5 or 744.8 (or, for years prior to the establishment of 744.4, 744.5 or 744.8, zone 744.0). Eligibility would also require commercial fishers to have met a minimum landings qualifier for one or more of those years. An appeals process would be established for those not meeting the permit criteria, but for whom circumstances may dictate inclusion in the permitted group. Non-permitted commercial fishers would be prohibited.

- BNP would require that all fishing guides operating at any time in BNP waters purchase an annual permit.
- The limited-entry, Special Use Permit would be permanently nontransferable. Permits would require annual renewal, and would be "use or lose", such that a permit could not be renewed if (1) it was not renewed the previous year, or (2) no catch was reported in the previous year. Thus, the numbers of commercial fishers would likely decrease over time, but the opportunity for commercial fishing remains intact as long as there is interest. As a condition of the permit, shrimp trawlers would be subject to inspection by park staff to ensure that trawl gear is in compliance with FWCC regulations (i.e., in regard to horizontal beam length and finger bar spacing). Up to two failed inspections would result in warnings to the permit-holder; a third failed inspection would result in termination of the permit-holder's permit.
- BNP would also work to establish a trap-free zone north and east of park headquarters at Convoy Point in which deployment of commercial or recreational crab traps would not occur. The purpose of the zone would be to provide a natural viewscape for visitors viewing the park from the park Visitor Center, as well as to avoid conflicts with other recreational activities (e.g., windsurfing, canoeing and kayaking) occurring in this high visitor-use area. Beginning at park headquarters, the zone would range north to the mouth of Mowry Canal (C-103), east to the spoil islands located near the mouth of Mowry Canal, southeast to the mouth of the marked channel leading to Homestead Bayfront marina, and west along the marked channel back to park headquarters. BNP would work with the industry to seek voluntary compliance with the trap-free zone; if unsuccessful, BNP would explore the possibility of establishing an official closure.

Habitat Conditions – BNP would continue to monitor and assess densities of debris associated with recreational and commercial fisheries (i.e., discarded fishing tackle, lost line, derelict lobster and crab traps, and trap debris) through visual surveys, and to partner with other regulatory and private organizations to organize cleanups of park waters. BNP would also:

- Monitor and assess habitat impacts of all commercial and recreational fisheries (staff- and funding-dependent)
- Work with commercial shrimp trawlers to identify areas being trawled to help identify future management actions and areas of user conflicts (staff- and funding-dependent)
- Improve knowledge of benthic habitats via increased mapping efforts; make habitat maps easily available to the public in a format that can be downloaded to GPS units; consider marking fragile areas with buoys / beacons / lights (staff- and funding-dependent)

Management actions to reduce the level and impact of debris associated with recreational and commercial fisheries would be considered if an increase above current levels was observed. Such actions could include increased removal efforts by Park staff and partner groups, increased education efforts, or spatial closures. Additionally:

- BNP would explore the feasibility and effectiveness of establishing a regulation to restrict traps from hardbottom habitat (staff- and funding-dependent).
- The two-day recreational lobster sport season would be eliminated to protect coral reef habitat from diver-related damage.
- Roller-frame trawl gear inspections would be initiated by BNP staff (under the commercial permit – see *Commercial Fishing Activity*) to ensure working gear to minimize trawl-related habitat damage.
- Coral reef protection areas (CRPAs) would be established to delineate coral reef habitat on which lobster and crab traps could not be deployed. Traps within the CRPAs could be moved outside CRPA boundaries by authorized FWCC or Park staff, or other authorized personnel.
- With respect to Coral Reef Protection Area (CRPA's) no-trap areas, under Alternative 4 the trap identification number from traps observed within CRPAs would be recorded; traps with three or more recorded violations could be confiscated from Park waters.

Law Enforcement, Education and Coordination – BNP would continue to work with the FWCC to maximize efficiency of ongoing law enforcement efforts. Additionally, based on ongoing discussions between NPS / BNP and the FWCC, BNP would pursue the following steps:

- Develop novel, cooperative approaches to increase the number of fishers checked by law enforcement officers, and increase the public perception of the likelihood of being stopped by law enforcement officers. For example, BNP would pursue establishing interagency fishery-enforcement "blitzes" that would occur on a quarterly, reoccurring basis. These blitzes would be implemented over a 2-day weekend period consisting of coordinated teams of all available law enforcement commissioned officers from the FWCC, NPS and, potentially, Miami-Dade County. During these fishery-enforcement blitzes, officers would congregate in several "bottleneck" locations (e.g., near marinas, or on the bay side of reef-to-bay channels) and stop all vessels for fishery enforcement checks. The primary focus of these blitzes would be dedicated fisheries regulations enforcement.
- Explore opportunities to make NPS-written violations trackable through the state law enforcement tracking system, and vice versa. Currently, federal violations may not show up in the state tracking database, and vice versa. NPS and FWCC would consider a system under which, where feasible according to concurrent jurisdiction and applicable reciprocity agreements, BNP LE Rangers write citations tiered to State law and State regulatory authority. This approach would improve information sharing between agencies, and result in citations written by both Federal officers (BNP LE Rangers) and FWCC officers for fisheries infractions and boating violations appearing when individual criminal records are requested and accessed.
- Improve communication abilities between NPS BNP and FWCC officers. The two groups currently use non-compatible radio communication systems. NPS and FWCC would pursue the potential establishment of a system under which BNP LE Rangers are permitted access to the state law enforcement radio communication system.
- Take steps to encourage magistrate courts / judges to treat fisheries and boating enforcement violations / citations as serious cases, and to establish and enforce strict penalties for all

violations, particularly for repeat offenders. Steps would include correspondence and meetings with federal prosecutors, in coordination with the FWCC.

As fishers become more aware of increased law enforcement efforts, they may be less likely to violate fishing regulations, since losses resulted from detections and successful prosecution will likely exceed the gains expected from violating the regulations (Beddington et al. 2007)

From an educational perspective, BNP would strive to increase educational and outreach efforts, bolstered by increased cooperation with partner groups, including other governmental and non-governmental organizations. Such efforts would include:

- Developing "in-school" programs to educate local youth on park resources, responsible use and management challenges (staff- and funding-dependent)
- Offering a recently developed "Fisheries Education Course", which reviews and explains fishing regulations, species identification, and responsible fishing practices to the public. This course may also serve as an alternative to paying a fine for first-time fishing violations.
- Adding "Special Regulations Apply" to park signage; create signage that educates regarding marine debris (staff- and funding-dependent).
- Increasing dissemination of information to the public via radio, television, and to hotels / motels (staff- and funding-dependent).
- Encouraging the use of biodegradable fishing materials.
- Sponsoring additional marine debris cleanups (staff- and funding-dependent).
- BNP would investigate the feasibility of establishment of a stamp associated with the FWCC recreational fishing license that would enable the license holder to fish in BNP, and that would fund additional enforcement efforts by the FWCC in BNP.
- BNP would establish a "recreational use" permit, in the form of a sticker required for any boat engaged in recreational activities in BNP. The permit would *not* be required for boaters navigating through but not utilizing the park for recreation. The purpose of the permit would be to generate funds used for fisheries-related park needs, such as law enforcement and education efforts in the park. The conditions of the permit would be as follows:
    a. The permit fee would be set by the park.
    b. Permits will be offered on both an annual basis (by calendar year, with cost pro-rated depending on date of purchase) and on a shorter-term basis. (*e.g.* for out-of state boaters that will only be boating in the park for a limited time and would not need to purchase a year's permit).
    c. The permit would be required for all vessels involved in recreational activities (e.g., fishing, diving, swimming, birding, etc.) in BNP or not underway (with exceptions for boat engine or vessel malfunction).
    d. Permit-holders owning multiple boats could obtain more than one sticker per permit if supporting documentation is provided verifying the ownership of multiple boats.
    e. Educational materials (re: fishing and boating impacts and how to avoid or minimize them) would be distributed to permit purchasers.
- Aside from funding additional law enforcement staff and fishery regulation efforts, funding generated from the permit would be used to support the following educational efforts:

a. Place signage and materials in English/Spanish/Creole at public access ramps and fuel docks leading to BNP explaining fishing and general regulations pertaining to vessels using Park waters
b. Coordinate with appropriate media outlets to disseminate rules and regulations
c. Provide education to schools, clubs, vendors, etc.
d. Establish community outreach programs focused on area youth

- Attempts would be made to coordinate efforts with Everglades National Park and Florida Keys National Marine Sanctuary.
- BNP would seek funding or use permit-generated funds to develop an educational video on rules and regulations pertaining to fishing, boating and habitat within Park. The video would eventually become required viewing for first-time purchasers of the permit.

2.2 Authorities Under Which the Action will be Conducted

The National Park Service Organic Act of 1916 promotes and regulates the use of national parks, monuments, and reservations. Biscayne National Monument was authorized by an Act of Congress in 1968 (Public Law 90-606), expanded in 1974 (PL 93-477), and re-designated as a national park and expanded again in 1980 (PL 96-287). BNP is regulated by the rules set forth in Title 36 of the Code of Federal Regulations (CFR), and is operated under a general management plan established for BNP in 1983. The purpose of BNP is "to preserve and protect for the education, inspiration, recreation, and enjoyment of present and future generations a rare combination of terrestrial, marine, and amphibious life in a tropical setting of great natural beauty."

When a disturbance occurs that negatively impacts BNP's resources, the BNP System Resource Protection Act (PSRPA) allows the NPS to seek compensation for injuries and damages. The recovered funds are then used to restore, replace, or acquire equivalent resources, and to monitor and study any such resources. Through the promulgation of the ESA Section 4(d) regulations for threatened elkhorn and staghorn corals (73 FR 64264; October 28, 2008), restoration activities implemented by NPS under the authority of the PSRPA are excepted from the ESA Section 9 prohibitions when the restoration activity described in this prohibition is implemented for either of the two acroporid corals. Under this rule and for the purpose of this exception, a restoration activity is specifically defined as "the methods and processes used to provide aid to injured individual elkhorn or staghorn corals." Therefore, not all methods subsequently described in Section 6.1.4 qualify for this restoration exception, as many of these techniques are aimed at rebuilding the topography of the reef habitat as opposed to aiding injured corals. However, in most cases methods not covered under the ESA Section 4(d) rule will have insignificant, discountable, or beneficial effects on listed corals.

In accordance with U.S. Code Title 16, Congress directed that "...the waters within the park shall continue to be open to fishing in conformity with the laws of the State of Florida" (16 U.S.C. Sect. 410gg-2). As such, fishery regulations in BNP waters are regulated by the State of Florida, and recreational and commercial fisheries have occurred in BNP waters since its founding. While BNP's enabling legislation establishes that fishing will continue to occur in BNP waters in accordance with State regulations, BNP must also manage its fishery resources according to Park and NPS mandates and legislation. For example, Congress directed that "the Secretary of the Interior, after consultation with appropriate officials of the State, may designate species for which, areas and times within which, and methods by which fishing is prohibited, limited, or otherwise regulated in the interest of sound conservation to achieve the purposes for which the park was established" (16 USC Sect. 410gg-2). Thus, even though fishing regulations in BNP waters should conform to State regulations, the Secretary of the Interior has the ability to establish additional fishing regulations pertaining strictly to BNP. In terms of management, Biscayne National Park can therefore be divided into two zones: a) the original monument zone, in which fishing regulations follow State regulations, with the opportunity for the Secretary of the Interior to enforce additional regulations as deemed necessary, and b) the expansion zone, in which State regulations are enforced, and in which the Secretary of the Interior cannot institute additional regulations (see 16 U.S.C. Sect. 410gg-2). Due to the complex nature of the legislations, policies, and other management directives, however, it is in the best interest of the public and BNP staff to manage fisheries uniformly within the park. Uniform regulations across all of BNP, regardless of the applicable regulatory authority, will allow for the most effective resource management and can ensure that visitors have a high-quality fishing experience. Pursuant to the sound conservation of fishery resources, BNP must also adhere to the following NPS Management Policies (NPS 2006):

• Where harvesting is allowed and subject to NPS control, harvesting will not unacceptably impact park resources or natural processes, including the natural distributions, densities, age-class distributions, and behavior of:

(1) harvested species;
(2) native species that harvested species use for any purpose; or,
(3) native species that use harvested species for any purpose.

While Congress has given NPS the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement (enforceable by the federal courts) that NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. Impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources and values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. For example, a loss of fisheries resources within BNP, due to overfishing at unsustainable levels, could be considered impairment since it would result in lost opportunities for enjoyment of fisheries resources (for both extractive and non-extractive activities), while drastically altering natural resource community composition. Additionally, a 1995 Executive Order on Recreational Fishing (Executive Order12962) was amended on September 26, 2008 requiring federal agencies to ensure that "recreational fishing shall be managed as a sustainable activity in national wildlife refuges, national parks, national monuments, national marine sanctuaries, marine protected areas, or any other relevant conservation or management areas or activities under any Federal authority, consistent with applicable law". Thus, BNP must ensure that fishing activities occurring within its boundaries are managed in a sustainable manner.

In the fall of 2000, BNP began FMP development with the formation of an internal FMP developmental team. Representatives from the BNP / NPS team approached the FWCC in 2001 to determine the feasibility of, and interest in, working cooperatively to develop the FMP. It was determined that such a partnership would be in the best interest of BNP, FWCC, and the fishery resources in BNP. Discussions continued on how to best work cooperatively on the FMP, and a cooperative relationship was formally established in October 2002 in the form of a Memorandum of Understanding which outlined both agencies' goal of working together to produce a FMP that would guide the management and conservation of fisheries and fishing experience in BNP over the next five years. The MOU was established in 2002. FWCC commissioners agreed that resources in BNP should be managed to a more conservative standard than resources in surrounding waters, given BNP's status as a National Park (FWCC 2001). Nevertheless, at the request of the FWCC the following text was included in the MOU between the FWCC and BNP: "FWCC and the park agree to seek the least restrictive management actions necessary to fully achieve mutual management goals for the fishery resources of the park and adjoining areas. Furthermore, both parties recognize the FWCC's belief that marine reserves (no-take areas) are overly restrictive and that less-restrictive management measures should be implemented during the duration of this MOU. Consequently, the FWCC does not intend to implement a marine reserve (no-take area) in the waters of the park during the duration of this MOU, unless both parties agree it is absolutely necessary."

Under the MOU, NPS and FWCC agree: to seek concurrence in meeting their management goals and strive to identify means, measures and other interagency actions for the mutual benefit of the aquatic resources within Biscayne Bay and the park; to consult with each other on any actions that they may propose to be taken to conserve or protect fish populations and other aquatic resources within Park boundaries or to further regulate the fisheries; manage fisheries within the park and Biscayne Bay according to applicable Federal and State laws, and in a manner that promotes healthy, self-sustaining fish populations and recognizes the biological characteristics and reproductive potential of individual; develop a comprehensive fisheries management plan for the long-term management of fish and aquatic resources within the park. FWCC's intent is to co-sign and endorse the Fishery Management Plan.

Based on the structure of the MOU and the cooperative relationship between FWCC and NPS/BNP, and the activities NPS will undertake to implement the GMP endorsed by FWCC, including issuing fishing and boating permits, we believe that the effects of the activities conducted in BNP and discussed in this opinion are direct and indirect results of NPS' action in adopting and implementing this plan.

2.3 Project Design Criteria (PDCs)

Based on past ESA Section 7 consultations on similar in-water activities, PDCs have been identified that typically have been applied to in-water activities that limit environmental effects to those that are intended to be temporary and/or do not result in take of listed species or adverse effects to the essential features of designated critical habitat. The nature of the in-water activities involved in a proposed project will dictate which of the PDCs will be applicable to future projects covered by this consultation. The PDCs are either directly applicable to NPS' or their contractors' actions in implementing activities covered by the GMP, or must be incorporated by NPS into permits or other materials that regulate private parties' conduct within the Park.

Several of the components of the GMP (listed in Section 2.1 above) will have no effect on any ESA-listed species or critical habitat under NMFS purview. These include components numbered 1, 3, and 4. These components do not have any in-water activities associated with them and therefore have no mechanism to cause effects to ESA-listed species or critical habitat. These components will not have corresponding PDCs and will not be discussed further in this opinon. Component 15 may result in what is considered *directed* take (collection) of protected species. However, other than a single recent permit authorizing The Nature Conservancy to fund and implement outplanting of coral recruits from nurseries to restore *Acropora* to depleted reef sites, NPS is not aware of any other research permits to take listed species under NMFS' jurisdiction from inside of BNP. Thus, such permitted takes are not covered by this opinion and if such permits are proposed, NPS would have to consult on those actions separately.

Table 1. Activities and Mandatory Project Design Criteria for Projects Authorized under the GMP.

Construction and Maintenance of Boat Ramps and Boat Launch Areas (Components 5 and 14)	Projects involving boat ramps and boat launch areas are limited to the following: ☐ Installation and maintenance of boat ramps or associated structure requiring 50 cubic yards of fill or less. ☐ Installation of canoe and kayak launches. ☐ Replacement or repair of mooring pilings and dolphins associated with existing structures ☐ Project is not located in designated critical habitat for acroporid corals. ☐ Projects will not adversely impact submerged aquatic vegetation tidal wetlands, hard bottom, or any other essential fish habitat. ☐ Projects must adhere to NMFS' *Sea Turtle and Smalltooth Sawfish Construction Conditions*. ☐ Mangroves are not authorized for removal. ☐ Projects involving pile driving will require coordination with NMFS during 2d tier consultation to determine whether pile driving noise from the project requires implementation of harm avoidance measures to ensure no adverse effects to listed species from noise ☐ Project is determined to be a "no effect" for any species proposed to be listed as threatened or endangered, or in habitat proposed to be designated as critical habitat for any federally listed species. **[Note: NMFS will confirm this criterion in the project specific review]**
Construction of Boardwalk loop trail (Component 10)	In-water construction activities of this type are limited to the following: ☐ Piling supported walkways and viewing platforms 1000 square feet or less of surface area over wetlands or other surface waters. ☐ Projects involving pile driving will require coordination with NMFS during 2d tier consultation to determine whether pile driving noise from the project requires implementation of harm avoidance measures to ensure no adverse effects to listed species from noise ☐ For projects where aquatic vegetation and/or mangroves are present, the project will, at a minimum, fully comply with the August 2001, NMFS *Construction Guidelines in Florida for Minor Piling-Supported Structures Constructed in or over Submerged Aquatic Vegetation, Marsh, or Mangrove Habitat* "dock construction guidelines". ☐ Projects must adhere to NMFS' *Sea Turtle and Smalltooth Sawfish Construction Conditions*. ☐ Mangroves are not authorized for removal. ☐ No dredging associated with pier construction is authorized. ☐ Water depths may not be altered in association with pier construction. ☐ Project is determined to be a "no effect" for any species proposed to be federally listed as threatened or endangered, or in habitat proposed to be designated as critical habitat for any federally listed species. **[Note: NMFS will confirm this criterion during the project specific review]**

Maintenance Dredging of Canals and Channels (Component 7)	In-water construction activities of this type are limited to the following: ☐ Maintenance dredging of the following existing channels: Intracoastal Waterway, Black Point Marina Channel, Homestead Bayfront Marina Channel, and Turkey Point Channel. ☐ No other channels are approved for dredging. ☐ Dredging will be limited to the previously authorized design depths. For the Intracoastal Waterway the maximum dredge depth is -7 to -12 ft., the maximum dredge depth for the Turkey Point Channel is -7.5 ft., and the maximum dredge depth for the Black Point Marina and Homestead Bayfront Marina Channels is -4.5 ft. ☐ Excavated spoil material shall be deposited in a suitable upland disposal site. ☐ Project is not located in designated critical habitat for *acroporid* corals. ☐ Projects will have no effect on submerged aquatic vegetation, including seagrass, tidal wetlands, hard bottom, or any other essential fish habitat. ☐ Projects must adhere to NMFS' *Sea Turtle and Smalltooth Sawfish Construction Conditions*. ☐ Mangroves are not authorized for removal. ☐ No dredging will be performed by hopper dredge. ☐ Project is determined to be a "no effect" for any species <u>proposed to be federally listed</u> as threatened or endangered, or in habitat proposed to be <u>designated as critical habitat</u> for any federally listed species. **[Note: NMFS will confirm this criterion during the <u>project specific review</u>]**
Vessel Groundings and Coral Restoration (Component 9)	Coral Restoration and Vessel Groundings will be handled pursuant to BNP's Vessel Groundings Policy and Procedures. ☐ Reattachment of *Acropora* spp. will target fragments that have been produced naturally or by the disturbance of the vessel grounding, whenever possible, prior to harvesting fragments from intact colonies. ☐ Bonding agents (cement, epoxy, etc.) necessary for reattachment, sealing fractures, and stabilizing substrates will consist of the least caustic, most environmentally friendly versions available, at the time of restoration. ☐ Identification markers, passive collection devices such as gamete nets, and other restoration equipment will be anchored to substrate adjacent to *Acropora* spp. and not anchored to corals themselves. Removal of equipment prior to storm events, except for securely anchored markers, will be required. ☐ Contractors selected to perform reef restoration work should be able to provide restoration plans, monitoring reports, and references for similar projects to demonstrate their experience. ☐ An anchoring plan will be prepared and approved by BNP resource managers to minimize any potential damage to any nearby submerged resources (seagrasses, corals, etc.). Any anchoring or spudding shall take place in areas devoid of resources. ☐ Materials brought to the site will be from a local quarry or direct from the manufacturer to ensure the placement of only clean materials. ☐ Divers will take care to minimize contact with the biota, the reef structure, and any other surrounding habitats. ☐ Disturbance to the sediments will be minimized during the selected restoration actions. ☐ Turbidity screens will be used as necessary. ☐ NMFS' "*Sea Turtle and Smalltooth Sawfish Construction Conditions*" will be followed.
Commercial and Recreational Fishing, Recreational Boating (Components 2, 11 and 14)	Commercial fishing shall be conducted in accordance with the following conditions: ☐ All commercial fishers are required to obtain a limited-entry special use permit from the superintendent of BNP. ☐ Permits are non-transferable. ☐ Permits require annual renewal and are not renewable if it was not renewed the previous year and/or if there was no catch reported for the previous year. ☐ BNP will work with FWCC to seek to eliminate the 2 day mini lobster season within BNP. ☐ BNP will install educational signs warning boaters of the presence of ESA-listed species. ☐ BNP will install monofilament recycling bins in accordance with the Terms and

	Conditions below. Construction and labels must adhere to the specifications provided at: http://mrrp.myfwc.com/media/1517/MRRPProtocol.pdf. □ BNP will limit spearfishing to gear lacking a trigger mechanism (e.g., the Hawaiian sling model). □ The use of air-providing equipment (e.g., scuba and hookah) while spearfishing will be prohibited. □ BNP will require all park visitors fishing from boats to purchase an annual "recreational use" boat permit. □ BNP will not allow any new fisheries to develop within the park. Bait shrimp roller-frame trawl fisheries, blue crab and stone crab pot fisheries, spiny lobster pot and dive fisheries, the ballyhoo purse seine fishery, and pelagic and benthic hook-and-line fisheries (with the exception of multiple-hook "long lines") will continue to be permitted within BNP. All other commercial fisheries, including the "wingnet" shrimp fishery and fisheries that may develop in the future, will be prohibited within BNP upon implementation of the FMP. □ BNP will place additional restrictions on permitted commercial fishing activities if data indicates that fisheries resources are declining. □ BNP will incorporate the reasonable and prudent measures and terms and conditions (Section 11.3 and 11.4) relating to fishing and vessel usage into the special use permits.
Channel Markers and Mooring Buoys (Components 6, 8, and 13)	In-water construction activities of this type are limited to the following: □ Mooring buoys and channel markers will not be installed in areas where *Acropora* spp. are located (confirmed by pre-construction survey). □ Mooring buoys and channels markers will be installed in sandy substrate devoid of hardbottom wherever possible. □ Any mooring buoys or markers installed in hardbottom will use anchor pins and will not be installed within 15 feet of a known *Acropora* colony. □ Each mooring will have a 200-foot clearance in order to provide a safe margin to ensure moored vessels cannot swing on the mooring and collide with one another. □ The NPS will install boater education signage in accordance with the Terms and Conditions below to inform boaters that they are required to use the mooring buoys and to educate them about coral habitats and proper boating, fishing, and diving techniques to avoid damaging the resources. [Note: NPS will work with NMFS to develop the appropriate signs]BNP will conduct a tier 2 consultation (as described in Section 2.4) prior to installation of any mooring buoy or channel marker. □ As part of the tier 2 consultaion, a detailed plan will be sent to NMFS prior to any installation of buoys or markers. □ The plan will include a pre-construction survey for *Acropora* spp. □ Projects must adhere to NMFS' *Sea Turtle and Smalltooth Sawfish Construction Conditions.*

2.4 Tier 2: Project-Specific Review and Consultation Process for the Proposed Action

General Process

The components listed in Section 2.1 above are expected to be carried out over the next 15-25 years, therefore many of the details and specifics are not yet known. All individual components of this GMP must incorporate all applicable PDCs (see Table 1, Section 2.3), meet the other conditions of this opinion, and must be consistent with the effects conclusions and predictions in this opinion.

Process for Construction and Maintenance Dredging Projects
The NPS will forward the project specific details, along with its determination of whether the action follows the requirements of this opinion, to NMFS for second tier consultation[1]. Individual project details and their compliance with PDCs will be sent to NMFS via e-mail at nmfs.ser.biscaynecorals@noaa.gov. NMFS will respond to NPS if there is a need for additional information and/or NMFS disagrees with NPS in terms of project compliance with PDCs and determines that a proposed action may adversely affect species or critical habitat discussed in this opinion beyond the adverse effects specifically authorized in this opinion. Any projects proposed to include pile driving require NMFS' concurrence that the project as proposed, or with implementation of harm avoidance measures, is not likely to adversely affect listed species as a result of noise from the project. As part of NMFS's tier 2 verification of project compliance, NMFS will verify "no effect" determinations for any species that is <u>proposed to be federally listed</u> as threatened or endangered, or in habitat that is proposed to be <u>designated as critical habitat</u> for any federally listed species, subsequent to issuance of this biological opinion, because applicants may not be aware of such proposed rulemakings.

Process for Commercial and Recreational Fishing, Recreational Boating Activities
The NPS will forward annual reports detailing the number and types of special use permits issued as well as any fishing related data the park has collected. NPS will also alert NMFS to any progress or steps taken towards implementing the no-take marine reserve, the trap-free zones, and the elimination of the 2-day sport season for spiny lobster trapping. As part of NMFS's tier 2 verification process, NMFS will review these submittals and respond if we believe that additional restrictions need to be implemented on fishing and vessel usage within BNP.

Process for Channel Markers and Mooring Buoy Projects
The NPS will forward project specific detailed plans including pre-construction surveys for Acropora spp. to NMFS prior to any installation of buoys or markers, along with its determination of whether the action follows the requirements of this opinion, to NMFS for second tier consultation[2]. Individual project details and their compliance with PDCs will be sent to NMFS via e-mail at nmfs.ser.biscaynecorals@noaa.gov. NMFS will respond to NPS if there is a need for additional information and/or NMFS disagrees with NPS in terms of project compliance with PDCs and determines that a proposed action may adversely affect species or critical habitat discussed in this opinion beyond the adverse effects specifically authorized in this opinion. As part of NMFS's tier 2 verification of project compliance, NMFS will verify "no effect" determinations for any species that is <u>proposed to be federally listed</u> as threatened or endangered, or in habitat that is proposed to be <u>designated as critical habitat</u> for any federally listed species, subsequent to issuance of this biological opinion, because applicants may not be aware of such proposed rulemakings.

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[1] Second tier consultation is a project-specific consultation where a proposed project is reviewed to determine if it can be implemented according to the PDCs, and to evaluate or tally the aggregate effects that will have resulted by implementing projects under the programmatic consultation to date, including the proposed project.

[2] Second tier consultation is a project-specific consultation where a proposed project is reviewed to determine if it can be implemented according to the PDCs, and to evaluate or tally the aggregate effects that will have resulted by implementing projects under the programmatic consultation to date, including the proposed project.

Process for Coral Reef Restoration in Response to Vessel Groundings
Under this programmatic consultation, restoration activities directed at elkhorn or staghorn corals or their critical habitat within BNP and proposed for implementation by NPS may occur at two response levels. The first response is for emergency restoration and the second is a long-term response intended for the complete restoration of the grounding site. First response is intended to save injured corals, through collection and reattachment, that otherwise may perish as a result of any delays. Under Section 402.05 of the ESA, informal consultation may be conducted through alternative procedures that the Director determines to be consistent with Sections 7(a)-(d) of the Act when emergency circumstances (acts of God, disasters, national defense emergencies, etc.) mandate the need to consult in an expedited manner. Vessel groundings can be considered disasters that adversely impact a protected resource; therefore, NPS may conduct emergency restoration actions to provide aid to injured corals following these events. Per the rules of emergency Section 7 consultation (50 CFR §402.05), NPS will be required to initiate consultation with NMFS Protected Resources Division as soon as practicable after the emergency is under control. Provided only those techniques assessed in this programmatic opinion are utilized in the emergency restoration, consultation will be tiered off this opinion. If however, other techniques are used during this emergency restoration, independent Section 7 consultation may be necessary.

Following the first response, NPS will undertake an evaluation process to identify the extent of resource injuries and to determine any further appropriate restoration needs. This evaluation will be used as the framework for NPS to create a site-specific restoration plan that will select methods from the "toolbox" of techniques authorized under this programmatic opinion to restore individual *Acropora* corals and *Acropora* critical habitat. This is considered a long-term response which may involve providing aid to injured corals as well as rebuilding the topography and structural integrity of the reef. This site specific, long-term restoration plan must incorporate all applicable PDCs and meet the conditions of this opinion. The NPS will forward the site-specific restoration plan, along with its determination of whether the action follows the requirements of this opinion, to NMFS for second tier consultation. The NPS' site-specific restoration plan will be transmitted via e-mail to nmfs.ser.biscaynecorals@noaa.gov. Any required NMFS response will also be sent via e-mail by the assigned PRD biologist, to facilitate timely implementation of restoration work. Early communications between NMFS and NPS are encouraged, but not required, to facilitate restoration plan development and completion of second tier consultations.

2.5 Annual Comprehensive Review of Operation of Programmatic Consultation
PRD and NPS will conduct a review of the operation of the programmatic consultation annually. This review will evaluate, among other things, whether the nature and scale of programmatic effects predicted continues to be valid, whether the PDCs (see Table 1, Section 2.3) continue to be appropriate, and whether the project-specific consultation procedures are being complied with and are effective.

3 Action Area

The action area is defined by regulation as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (50 CFR 402.02). The proposed action area is BNP whose boundaries are described in the United States Code Title 16, Chapter 1, Subchapter LIX-E, § 410gg (Figure 1). Individual project components will occur at specific sites located within BNP.

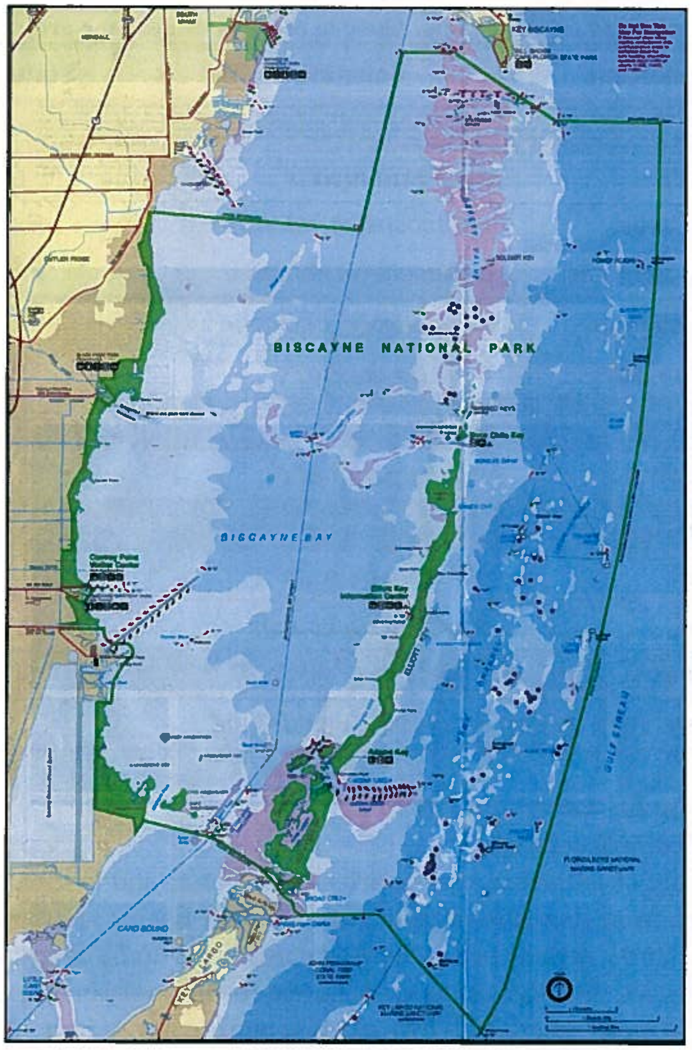

Figure 1. Image showing the boundaries of Biscayne National Park (from Mappery.com)

4 Status of Listed Species and Critical Habitat

The following endangered (E), threatened (T), and proposed species (P), and designated critical habitat under the jurisdiction of NMFS may occur in or near the action area.

Table 2. Listed species and critical habitat likely to occur in or near the project area.

Common Name	Scientific Name	Status
Turtles		
green sea turtle	*Chelonia mydas*[3]	E/T
hawksbill sea turtle	*Eretmochelys imbricata*	E
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
leatherback sea turtle	*Dermochelys coriacea*	E
loggerhead sea turtle	*Caretta caretta*[4]	T
Fish		
smalltooth sawfish	*Pristis pectinata*[5]	E
Invertebrates		
elkhorn coral	*Acropora palmata*	T
staghorn coral	*Acropora cervicornis*	T
Critical Habitat		
elkhorn and staghorn corals (*Acropora*) – Florida Unit		

4.1 Species Not Likely to be Adversely Affected

Leatherback and Kemp's Ridley Sea Turtles

Leatherback and Kemp's ridley sea turtles may be affected by hook-and-line capture, and entanglement in fishing gear from recreational and commmercial fishing; however, due to their diets and preferred habitats, these species of sea turtle are not likely to be found in the action area. Leatherback sea turtles are the most pelagic of the sea turtles, only entering coastal waters on a seasonal basis to feed in areas where jellyfish are concentrated or to nest. This species of sea turtle does not commonly bite baited hooks and no incidental captures of leatherback sea turtles from fishing activities have been documented along the Atlantic coast of Florida in the past 10 years (Tables 3 and 4). Sea turtle observations by park staff and visitors from 1979-2011 indicates no observances of Kemp's ridley sea turtles within BNP. This species has a very restricted range relative to other sea turtle species with most adults occurring in the Gulf of Mexico in shallow near shore waters, although adult-sized individuals sometimes are found on the eastern seaboard of the United States as well. Nesting is essentially limited to the beaches of the western Gulf of Mexico, primarily in the Mexican state of Tamaulipas, although few nests have also been recorded in Florida and the Carolinas (Meylan et al. 1995). Kemp's ridleys nest in daytime aggregations known as "arribadas", primarily at Rancho Nuevo, a stretch of beach in Mexico. Most of the population of adult females nests in this single locality (Pritchard 1969).

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[3] Green turtles are listed as threatened except for the Florida and Pacific coast of Mexico breeding populations, which are listed as endangered.

[4] Northwest Atlantic Ocean (NWA) distinct population segment (DPS). On September 16, 2011, NMFS and USFWS issued a final rule changing the listing of loggerhead sea turtles from a single, threatened species to nine DPSs listed as either threatened or endangered (76 FR 58868). The NWA DPS was listed as threatened.

[5] U.S. DPS.

Adults of this species are usually confined to the Gulf of Mexico, although adult-sized individuals sometimes are found on the east coast of the United States. Studies suggest that benthic immature Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud 1995). Given the known life history and distribution of this species it is unlikely that a Kemp's ridley sea turtle would be found within the action area. Therefore, NMFS considers the effects of the proposed action on these two species to be discountable and they will not be discussed further in this opinion.

Table 3. Capture of Sea Turtles from Piers along the Atlantic Coast of Florida.

DATE OF CAPTURE	SPECIES	LOCATION	FINAL DISPOSITION
April 5, 2001	Loggerhead	Juno Beach Fishing Pier (Palm Beach)	Taken to a turtle rehabilitation facility and released
August 19, 2001	Green	Deerfield Beach Fishing Pier (Broward)	Hook removed/line cut and then released
August 25, 2001	Green	Commercial Blvd. Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
August 27, 2001	Green	Deerfield Beach Fishing Pier (Broward)	Taken to a turtle rehabilltation facility and released
April 4, 2002	Green	Dania Beach Fishing Pier (Broward)	Hook removed/line cut and then released
November 9, 2002	Loggerhead	Juno Beach Fishing Pier (Palm Beach)	Taken to a turtle rehabilitation facility and released
April 19, 2003	Loggerhead	Juno Beach Fishing Pier (Palm Beach)	Hook removed/line cut and then released
February 23, 2004	Green	Deerfield Beach Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
July 30, 2004	Green	Lake Worth Fishing Pier (Palm Beach)	Hook removed/line cut and then released
August 18, 2004	Green	Deerfield Beach Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
February 16, 2005	Loggerhead	Juno Beach Fishing Pier (Palm Beach)	Taken to a turtle rehabilitation facility and released
July 19, 2005	Green	Dania Beach Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
July 8, 2006	Loggerhead	Jetty Park Fishing Pier (Brevard)	Taken to a turtle rehabilitation facility and released
May 1, 2007	Green	Deerfield Beach Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
May 14, 2007	Loggerhead	Deerfield Beach Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
May 21, 2007	Green	Jetty Park Fishing Pier (Brevard)	Taken to a turtle rehabilitation facility and released
June 20, 2007	Green	Juno Beach Fishing Pier (Palm Beach)	Taken to a turtle rehabilitation facility and released
June 30, 2007	Green	Juno Beach Fishing Pier (Palm Beach)	Taken to a turtle rehabilitation facility and released
July 29, 2007	Green	Dania Beach Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
January 28, 2008	Green	Dania Beach Fishing Pier (Broward)	Hook removed/line cut and then released
February 20, 2008	Green	Flagler Pier (Flagler)	Taken to a turtle rehabilitation facility and released
July 12, 2008	Hawksbill	Pompano Beach Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
August 11, 2008	Green	Dania Beach Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
March 6, 2010	Green	Deerfield Beach Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
June 6, 2010	Green	Commercial Blvd. Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
June 13, 2010	Green	Deerfield Beach Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released

July 6, 2010	Green	Commercial Blvd. Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
July 25, 2010	Green	Commercial Blvd. Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
August 7, 2010	Green	Deerfield Beach Fishing Pier (Broward)	Taken to a turtle rehabilitation facility and released
June 22, 2011	Green	Dania Beach Fishing Pier (Broward)	Unknown

Table 4. Capture of Sea Turtles from Platforms Other Than Piers along the Atlantic Coast of Florida.

DATE OF CAPTURE	SPECIES	LOCATION	FINAL DISPOSITION
February 11, 2001	Loggerhead	2 miles offshore of Miami Beach (Miami-Dade)	Taken to a turtle rehabilitation facility and released
March 31, 2001	Loggerhead	Channels between Stiltsville and Soldier Key (Miami-Dade)	Taken to a turtle rehabilitation facility and released
June 1, 2001	Green	Hermans Bay beach access, Hutchinson Island (St. Lucie)	Hook removed/line cut and then released
June 15, 2001	Kemp's ridley	Anastasia State Park (St. Johns)	Taken to a turtle rehabilitation facility and released
November 12, 2001	Green	Indian River Lagoon, west of Big Mud Creek (St. Lucie)	Taken to a turtle rehabilitation facility and released
January 31, 2002	Green	Just outside the inlet at St. Augustine (St. Johns)	Hook removed/line cut and then released
April 11, 2002	Loggerhead	1 mile south of Jensen Public Beach (Martin)	Hook removed/line cut and then released
March 16, 2003	Green	1 mile south of Sebastian Inlet (Indian River)	Hook removed/line cut and then released
May 15, 2003	Loggerhead	Patrick AFB Officers Club (Brevard)	Taken to a turtle rehabilitation facility and released
August 1, 2003	Green	Pineda Causeway and US 1, IRL (Brevard)	Taken to a turtle rehabilitation facility and released
August 17, 2003	Green	Southern end of Coral Cove Park (Palm Beach)	Taken to a turtle rehabilitation facility and released
October 12, 2003	Green	Jetty Park, Cape Canaveral (Brevard)	Hook removed/line cut and then released
February 7, 2005	Loggerhead	Draw bridge at E. Ocean Ave., Boynton Beach (Palm Beach)	Taken to a turtle rehabilitation facility and released
February 21, 2005	Green	Beach 2.5 miles north of Jupiter Inlet (Martin)	Hook removed/line cut and then released
July 4, 2005	Green	Satellite Beach Seamark Condo (Brevard)	Taken to a turtle rehabilitation facility and released
July 7, 2005	Green	4050 S. Peninsula Ave., Wilber by the Sea (Volusia)	Taken to a turtle rehabilitation facility and released
August 6, 2005	Loggerhead	George Crady Bridge, Lil Talbot Park (Nassau)	Taken to a turtle rehabilitation facility and released
February 10, 2007	Green	Walton Rocks Beach (St. Lucie)	Taken to a turtle rehabilitation facility and released
April 20, 2007	Green	1404 N. Lake Way, Palm Beach (Palm Beach)	Taken to a turtle rehabilitation facility and released
August 14, 2007	Loggerhead	Adjacent to George Crady State Fishing Pier (Nassau)	Taken to a turtle rehabilitation facility and released
December 2, 2007	Green	Walton Rocks Beach, Hutchinson Island (St. Lucie)	Hook removed/line cut and then released
January 9, 2008	Green	Salt Run boat ramp (St. Johns)	Hook removed/line cut and then released
June 15, 2008	Green	Public crossover Sailfish Ln., Boynton Beach (Palm Beach)	Hook removed/line cut and then released
January 2, 2009	Loggerhead	Jetty Park, Cape Canaveral (Brevard)	Hook removed/line cut and then released

January 10, 2009	Green	4800 block, Ponce Inlet, South Atlantic Ave. (Volusia)	Taken to a turtle rehabilitation facility and released
April 9, 2009	Green	South end of Vilano Beach (St. Johns)	Taken to a turtle rehabilitation facility and released
April 24, 2009	Kemp's ridley	Nassau Sound (Nassau)	Taken to a turtle rehabilitation facility and released
October 18, 2009	Green	Southern Blvd. Bridge, South Flagler Dr. (Palm Beach)	Taken to a turtle rehabilitation facility and released
August 24, 2010	Green	Offshore of Juno Beach (Palm Beach)	Taken to a turtle rehabilitation facility and released
July 3, 2011	Green	Offshore (Brevard)	Unknown
July 22, 2011	Green	Inshore (Brevard)	Unknown
October 16, 2011	Green	Offshore (Volusia)	Unknown

4.2 Species Likely to be Adversely Affected

We believe that the implementation of the proposed GMP is likely to adversely affect green, hawksbill, and loggerhead sea turtles, smalltooth sawfish, elkhorn and staghorn corals, and designated critical habitat for elkhorn and staghorn corals.

4.2.1 Elkhorn and Staghorn Corals

Elkhorn and staghorn corals were listed as threatened under the ESA on May 9, 2006 (71 FR 266852), based on a status review initiated in 2004. Elkhorn and staghorn corals are the only two corals listed under the ESA. The Atlantic *Acropora* Status Review (Atlantic *Acropora* Biological Review Team (BRT) 2005) presents a summary of published literature and other currently available scientific information regarding the biology and status of both elkhorn and staghorn corals. The following discussion summarizes those findings relevant to our evaluation of the proposed action.

Elkhorn and staghorn corals are two of the major reef-building corals in the wider Caribbean. Elkhorn colonies are flattened to near-round, with frond-like branches that typically radiate outward from a central trunk that is firmly attached to the sea floor. Staghorn colonies are staghorn-antler-like, with cylindrical, straight or slightly curved branches. The branching morphology of these species provides important habitat for other reef organisms. Historically, both acroporid species formed dense thickets at shallow (<5 m) and intermediate (10 to 15 m) depths in many reef systems, including some locations in the Florida Keys, western Caribbean (e.g., Jamaica, Cayman Islands, Caribbean Mexico, Belize), and eastern Caribbean. Early descriptions of Florida Keys reefs referred to reef zones, of which the elkhorn and staghorn zones were described for many shallow-water reefs, based on the high coverage and colony density, and in some cases, near exclusiveness of these species (Figure 2) (Jaap 1984, Dustan 1985, Dustan and Halas 1987). In terms of accretion rates and the formation of structurally complex reefs, the structural and ecological roles of Atlantic *Acropora* spp. in the wider Caribbean are unique and cannot be filled by other reef-building corals (Bruckner et al. 2002).

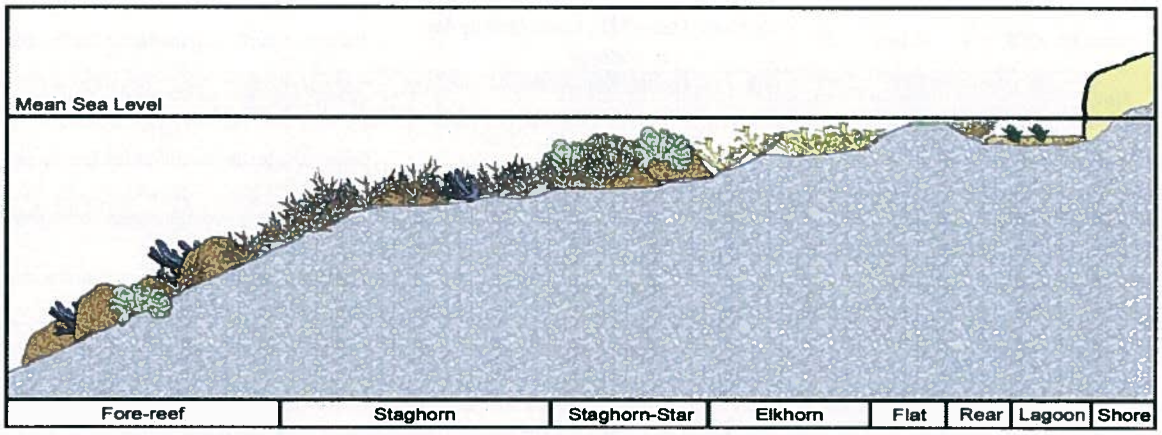


Figure 2: Reef zonation schematic example modified from several reef zonation-descriptive studies (Goreau 1959, Kinzie 1973, Bak 1977).

Life History

The maximum range in depth reported for elkhorn coral is <1 m to 30 m, but the optimal depth range for this coral is considered to be 1 to 5 m depth (Goreau and Wells 1967). Currently, the deepest known colonies of elkhorn coral occur at 21 m in the Flower Garden Banks National Marine Sanctuary (Hickerson pers. comm.) and at Navassa National Wildlife Refuge (Miller pers. comm.). The preferred habitat of elkhorn coral is the seaward face of a reef (turbulent shallow water), including the reef crest, and shallow spur-and-groove zones (Shinn 1963, Cairns 1982, Rogers et al. 1982). At low tide, colonies are sometimes exposed. Colonies of elkhorn coral often grow in nearly mono-specific, dense stands and form an interlocking framework known as thickets in fringing and barrier reefs (Jaap 1984, Tomascik and Sander 1987, Wheaton and Jaap 1988). Storm-generated fragments are often found occupying back reef areas immediately landward of the reef flat/reef crest, while colonies are rare on lagoonal patch reefs (Dunne 1979). Elkhorn coral has formed extensive barrier-reef structures in Belize (Cairns 1982); the greater and lesser Corn Islands, Nicaragua (Gladfelter 1982, Lighty et al. 1982); and Roatan, Honduras, and built extensive fringing reef structures throughout much of the Caribbean (Adey 1978). Colonies generally do not form a thicket below 5 m depth, with maximum water depths of framework construction ranging from 3 m to 12 m (see Table 1 in Lighty et al. 1982).

Historically, staghorn coral was reported from depths ranging from <1 to 60 m (Goreau and Goreau 1973). It is suspected that 60 m is an extreme situation and that the coral is relatively rare below 20 m depth. The common depth range is currently observed at 5 to 15 m. In southeastern Florida, this species historically occurred on the outer reef platform (16 to 20 m) (Goldberg 1973), on spur-and-groove bank reefs and transitional reefs (Jaap 1984, Wheaton and Jaap 1988), and on octocoral-dominated hard-bottom (Davis 1982). Colonies have been common in back- and patch-reef habitats (Gilmore and Hall 1976, Cairns 1982). Although staghorn coral colonies are sometimes found interspersed among colonies of elkhorn coral, they are generally in deeper water or seaward of the elkhorn zone and, hence, more protected from waves. Historically, staghorn coral was also the primary constructor of mid-depth (10 to 15 m) reef terraces in the western Caribbean, including Jamaica, the Cayman Islands, Belize, and some reefs along the eastern Yucatan peninsula (Adey 1978).

All Atlantic *Acropora* spp. are considered to be environmentally sensitive, requiring relatively clear, well-circulated water (Jaap et al. 1989). Atlantic *Acropora* spp. are almost entirely dependent upon sunlight for nourishment compared to massive, boulder-shaped species in the region (Porter 1976, Lewis 1977), with these latter types of corals more dependent on zooplankton. Therefore, *Acropora* spp. may not be able to compensate with an alternate food source, such as zooplankton and suspended particulate matter, like other corals. Subsequently, Atlantic *Acropora* species are much more susceptible to increases in water turbidity than some other coral species. Reductions in long-term water clarity can also reduce the coral photosynthetic to respiration ratio (P/R ratio).

Optimal water temperatures for elkhorn and staghorn corals range from 25° to 29°C, although colonies in the U.S.Virgin Islands (USVI) have been known to tolerate short-term temperatures around 30°C without obvious bleaching (loss of zooxanthellae). All *Acropora* spp. require near oceanic salinities (34 to 37 ppt). All Atlantic acroporids are susceptible to bleaching due to adverse environmental conditions (Ghiold and Smith 1990, Williams and Bunkley-Williams 1990). Jaap (1979) and Roberts et al. (1982) note an upper temperature tolerance of 35.8°C for both species. Additionally, major mortality of elkhorn and staghorn corals occurred in the Dry Tortugas, Florida, in 1977 due to a winter cold front that depressed surface water temperatures to 14° to 16°C. Some reduction in growth rates of staghorn coral was reported in Florida when temperatures dropped to less than 26°C (Shinn 1966).

Atlantic *Acropora* spp., like many stony coral species, employ both sexual and asexual reproductive propagation. Atlantic *Acropora* spp. reproduce sexually by broadcast spawning, meaning that coral larvae develop externally to the parental colonies (Szmant 1986), and both species are simultaneous hermaphrodites, meaning that a given colony will contain both female and male reproductive parts during the spawning season. Gametes (eggs and sperm) are located in different layers of the same polyp (Soong 1991). The spawning season for elkhorn and staghorn corals is relatively short, with gametes released only a few nights during July, August, and/or September. In some populations, spawning is synchronous after the full moon during any of these three months. Annual egg production in elkhorn and staghorn populations studied in Puerto Rico was estimated to be 600 to 800 eggs per cm^2 of living coral tissue (Szmant 1986).

In *Acropora* spp., fertilization and development are exclusively external. Embryonic development culminates with the development of planktonic larvae called planulae. Little is known concerning the settlement patterns (Bak et al. 1977, Sammarco 1980, Rylaarsdam 1983). In general, upon proper stimulation, coral larvae, whether released from parental colonies or developed in the water column external to the parental colonies, settle and metamorphose on appropriate substrates, in this case preferably coralline algae. Initial calcification ensues with the forming of the basal plate. Buds that form on the initial corallite develop into daughter corallites.

Studies of elkhorn and staghorn corals on the Caribbean coast of Panama indicated that larger colonies of both species (as measured by surface area of the live colony) have higher fertility rates (Soong and Lang 1992). For elkhorn coral, the larger the colony, the higher the fecundity rate; over 80 percent of the colonies larger than 4000 cm^2 were fertile. The estimated size at puberty for elkhorn coral was 1600 cm^2 and the smallest reproductive colony observed was 16 x 8 cm^2. Only colonies of staghorn coral with a branch length larger than 9 cm were fertile and over 80 percent of colonies with branches longer than 17 cm (n=18) were fertile. The estimated size at puberty for staghorn coral was 17 cm in branch length and the smallest reproductive colony observed was 9 cm in branch length (Soong and Lang 1992).

Spatial and temporal patterns of coral recruitment have been intensively studied on wider Caribbean reefs (Birkeland 1977, Bak and Engel 1979, Rogers et al. 1984, Baggett and Bright 1985, Chiappone and Sullivan 1996). Biological and physical factors that have been shown to affect spatial and temporal patterns of coral recruitment include substrate availability and community structure (Birkeland 1977), grazing pressure (Rogers et al. 1984, Sammarco 1985), fecundity, mode and timing of reproduction (Harriot 1985, Richmond and Hunter 1990), behavior of larvae (Lewis 1974, Goreau et al. 1981), hurricane disturbance (Hughes and Jackson 1985), physical oceanography (Baggett and Bright 1985, Fisk and Harriot 1990), the structure of established coral assemblages (Lewis 1974, Harriot 1985), and chemical cues (Morse et al. 1988). Studies of *Acropora* spp. from across the wider Caribbean confirm two overall patterns of sexual recruitment: (1) low juvenile densities relative to other coral species and (2) low juvenile densities relative to the commonness of adults (Porter 1987). This pattern suggests that the composition of the adult population is dependent upon variable recruitment.

The growth rate of elkhorn coral, expressed as the linear extension of branches, is reported to range from 4 to 11 cm annually (Vaughan 1915, Jaap 1974). The growth rate for staghorn coral has been reported to range from 3 to 11.5 cm/yr. These growth rates are relatively fast compared to other corals and historically enabled the species to construct significant reefs in several locations throughout the wider Caribbean (Adey 1978). Growth of elkhorn and staghorn corals is also expressed in expansion, occurring as a result of fragmenting and forming new centers of growth (Bak and Criens 1982, Tunnicliffe 1981). A broken-off branch may be carried by waves and currents to a distant location or may land in close proximity to the original colony. If the location is favorable, branches grow into a new colony, expanding and occupying additional area. Fragmenting and expansion, coupled with a relatively fast growth rate, facilitates potential spatial competitive superiority for elkhorn and staghorn corals relative to other corals and other benthic organisms (Shinn 1976, Neigel and Advise 1983, Jaap et al. 1989).

Status and Distribution

Throughout much of the wider Caribbean, *A. palmata* coral historically comprised the elkhorn zone (Figure 2) at 1 to 8 m depth (reef flat, wave zone, reef crest) in diverse areas including Jamaica (Goreau 1959), Alacran Reef, Yucatan peninsula (Kornicker and Boyd 1962), Abaco Island, Bahamas (Storr 1964), the southwestern Gulf of Mexico, Bonaire (Scatterday 1974), and the Florida Keys (Jaap 1984, Dustan and Halas 1987). The predominance of elkhorn coral in shallow reef zones is related to the degree of wave energy; in areas with strong wave energy conditions only isolated colonies may occur, while thickets may develop at intermediate wave energy conditions (Geister 1977). Although considered a turbulent water species, elkhorn coral is sensitive to breakage by wave action, and is thus replaced by coralline algae in heavy surf zones throughout the province (Adey 1977).

Historically, throughout much of the wider Caribbean, staghorn coral so dominated the reef within the 7 to 15 m depth that the area became known as the staghorn zone (Figure 2). It was documented in several reef systems such as the north coast of Jamaica (Goreau 1959) and the leeward coast of Bonaire (Scatteryday 1974). In many other reef systems in the wider Caribbean, most notably the western Caribbean areas of Jamaica, Cayman Islands, Belize, and eastern Yucatan (Adey 1977), staghorn coral was a major mid-depth (10 to 25 m) reef-builder.

Principally due to wind conditions and rough seas, staghorn coral has not been known to build extensive reef structures in the Lesser Antilles and southwestern Caribbean.

Available information on the historical distribution and abundance patterns focus on percent coverage, density, and relative size of the corals during three periods: pre-1980, the 1980 – 1990 decades, and recent (since 2000). Few data are present before the 1980 baseline, likely due in part to researchers' tendencies to neglect careful measurement of abundance of species that are ubiquitous.

Both acroporid species underwent precipitous declines in the early 1980s throughout their ranges and this decline has continued. Although quantitative data on former distribution and abundance are scarce, in the few locations where quantitative data are available (e.g., Florida Keys, Dry Tortugas, Belize, Jamaica, and the USVI), declines in abundance (coverage and colony numbers) are estimated at >97 percent. Although this downward (decline) trend has been documented as continuing in the late 1990s, and even in the past five years in some locations, local extirpations (i.e., at the island or country scale) have not been definitively documented.

Figure 3 summarizes the abundance trends of specific locations throughout the wider Caribbean where quantitative data exist illustrating the overall trends of decline of elkhorn and staghorn corals since the 1980s. It is important to note that the data are from the same geographic area, not repeated measures at an exact reef/site that would indicate more general trends. The overall regional trend depicted is a >97 percent loss of coverage (area of substrate the species occupy).

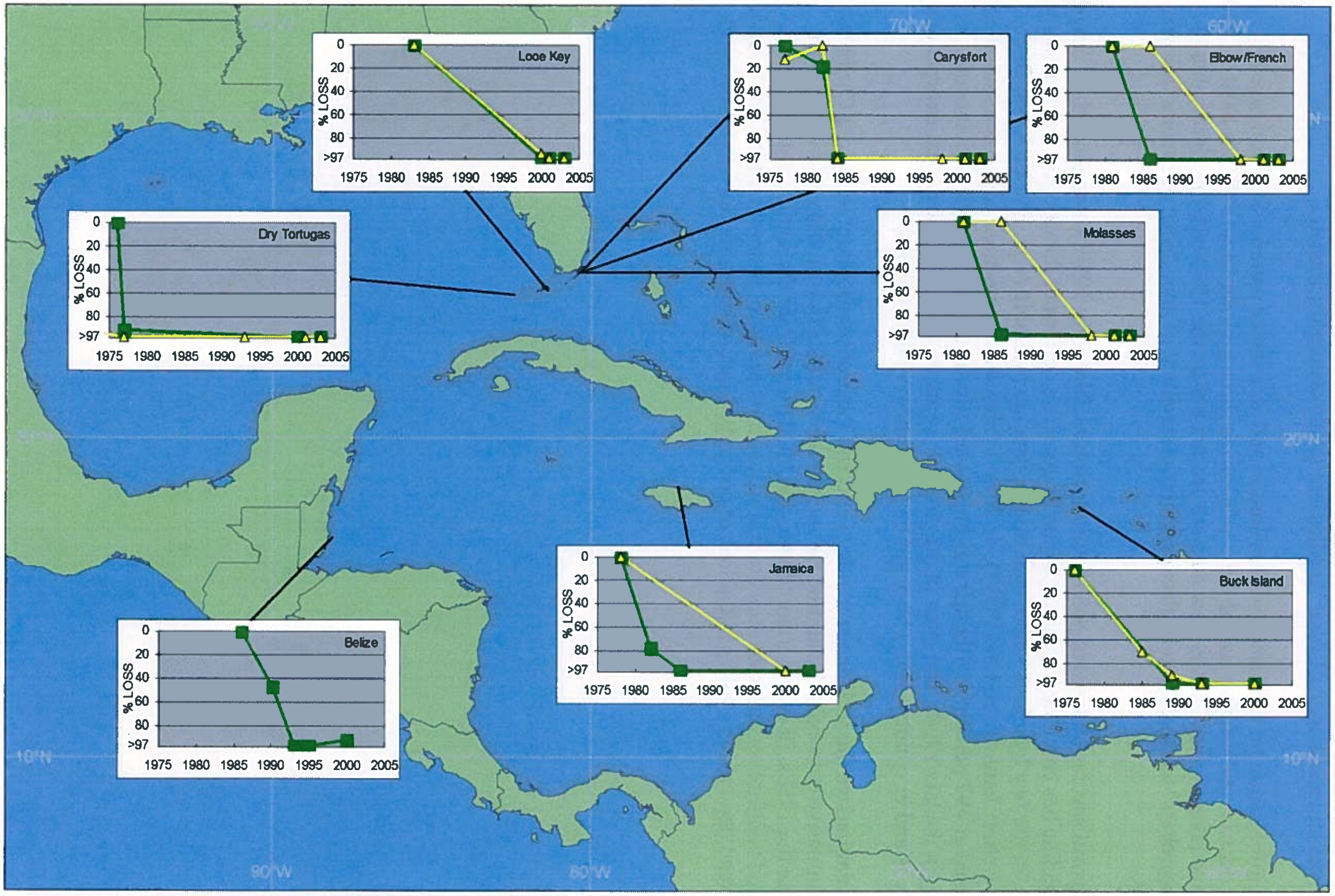


Figure 3. Percent loss of staghorn coral (green squares) and elkhorn coral (yellow triangles) throughout the Caribbean for all locations (n=8) where quantitative trend data exist. Shaded areas on map illustrate the general range of elkhorn and staghorn corals (*Acropora* BRT 2005).

Threats and Outlook

Elkhorn and staghorn corals face myriad stressors that in some cases act synergistically. Diseases, temperature-induced bleaching, and physical damage from hurricanes are deemed to be the greatest threats to elkhorn and staghorn corals' survival and recovery. The impact of disease, though clearly severe, is poorly understood in terms of etiology and possible links to anthropogenic stressors. Impacts from anthropogenic physical damage (e.g., vessel groundings, anchors, and divers/snorkelers), coastal development, competition, and predation are deemed to be moderate. Table 5 summarizes the factors affecting the status of elkhorn and staghorn corals and the identified sources of those stressors.

Many factors, including both intrinsic life history characteristics, as well as external threats, are important to consider in assessing the status and vulnerability of elkhorn and staghorn corals. Recovery of the two corals from their current level of decreased abundance depends upon rates of recruitment and growth outpacing rates of mortality. These species have rapid growth rates and high potential for propagation via fragmentation. However, while fragmentation is an excellent life history strategy for recovery from physical disturbance, it is not as effective when fragment sources (i.e., large extant colonies) are scarce.

Table 5. Factors Affecting Elkhorn and Staghorn Corals.

Natural abrasion and breakage Source: storm events	**Disease** Source: undetermined/understudied
Sedimentation Source: land development/run-off dredging/disposal sea level rise major storm events	**Anthropogenic abrasion and breakage** Source: divers vessel groundings anchor impact fishing debris
Temperature Source: hypothermal events global climate change power plant effluents El Niño-Southern Oscillation events	**Predation** Source: overfishing natural trophic reef interactions **Loss of genetic diversity** Source: population decline/bottleneck
Nutrients Source: point-source non-point-source	**Contaminants** Source: point-source non-point-source
Competition Source: overfishing	**CO_2** Source: fossil fuel consumption
Sea level rise Source: global climate change	**Sponge boring** Source: undetermined/understudied

Thus, it is anticipated that successful sexual reproduction will need to play a major role in Atlantic *Acropora* spp. recovery (Bruckner 2002). Meanwhile, there is substantial evidence to suggest that sexual recruitment of both elkhorn and staghorn corals is currently compromised. Reduced colony density in these broadcast-spawning, self-incompatible species, compounded in some geographic areas by low genotypic diversity, suggests that fertilization success and consequently, larval availability, has been reduced. In addition, appropriate substrate available for fragments to attach to is likely reduced due to changes in benthic community structure on many Caribbean reefs. Coupled with impacts from coastal development (i.e., dominance by macroalgal, turf, and/or sediment-coated substrates), these factors are expected to further reduce successful larval recruitment below an appropriate scale that can compensate for observed rates of ongoing mortality.

Species at reduced abundance are at a greater risk of extinction due to stochastic environmental and demographic factors (e.g., episodic recruitment factors). Both acroporids have persisted at extremely reduced abundance levels (in most areas with quantitative data available, less than 3 percent of prior abundance) for at least two decades.

The major threats (e.g., disease, elevated sea surface temperature, and hurricanes) to elkhorn and staghorn corals' persistence are severe, unpredictable, likely to increase in the foreseeable future, and, at current levels of knowledge, unmanageable. However, managing some of the stressors identified as less severe (e.g., nutrients, sedimentation) may assist in decreasing the rate of elkhorn and staghorn corals' decline by enhancing coral condition and decreasing synergistic stress effects.

The impacts on elkhorn and staghorn corals from all of the above mentioned stressors could be exacerbated by reduced genetic diversity, which often results when species undergo rapid decline like *Acropora* spp. have in recent decades. This expectation is heightened when the decline is due to a potentially selective factor such as disease, in contrast to a less selective factor such as hurricane damage, which will likely cause disturbance independent of genotype. If the species remain at low densities for prolonged periods of time, genetic diversity may be significantly reduced. Thus, given the current dominance of asexual reproduction, the rapid decline (largely from a selective factor), and the lack of rapid recovery of elkhorn and staghorn corals, it is plausible that these species have suffered a loss of genetic diversity that could compromise their ability to adapt to future changes in environmental conditions. No quantitative information is available regarding genetic diversity for either species.

4.2.2 Loggerhead, Hawksbill, and Green Sea Turtles

Stranding data indicate that 2,089 green, 132 hawksbill, 249 Kemp's ridley, 1,906 loggerhead, 33 leatherback, and 103 unidentified sea turtles were documented as having stranded (due to boat strikes, natural mortality, interactions with fishing gear, undetermined causes, etc.) in all of Florida from 2008-2010 (NOAA Sea Turtle Stranding and Salvage Network - STSSN). More specifically, 116 green, 8 hawksbill, 31 Kemp's ridley, 56 loggerhead, 4 unidentified, and no leatherback turtles were stranded as a result of fishing related activities. This is likely an underestimate of fishing related strandings, as often fatally stranded turtles are too decomposed to establish cause of death. Stranding data provided by Alan Foley from the Florida Fish and Wildlife Conservation Division (FWCC) indicates that 219 sea turtles stranded in Miami-Dade County between 2008 and 2011 (70 loggerhead, 131 green, 1 leatherback, and 1 hawksbill), and data provided by NPS indicates that 48 sea turtles have stranded within BNP between 2004 and 2011 (20 loggerhead, 17 green, 7 unidentified, and 4 hawksbill). Of these, only 1 loggerhead, 1 green, and 1 hawksbill were due to fishing related activities. Kemp's ridley turtles have never been reported observed within BNP. Based on this information as well as their known dietary and habitat preferences, we believe that only green, loggerhead, and hawksbill sea turtles are likely to be adversely affected by the proposed action.

Species discussions in this section will provide background information on each species. Discussions of sea turtles will focus primarily on the Atlantic Ocean populations of these species since these are the populations that may be affected by the proposed action. However, because sea turtles are migratory, we will also discuss their range-wide status. Further, some turtle species are listed as a single population throughout their global distributions and jeopardy determinations are applicable to a species as it is listed. The following subsections are synopses of the best available information on the life history, distribution, population trends, and current status of the three species of sea turtles that are likely to be adversely affected by one or more components of the proposed action. Additional background information on the status of each species can be found in a number of published documents, including: recovery plans for the Atlantic green sea turtle (NMFS and USFWS 1991), hawksbill sea turtle (NMFS and USFWS 1993), and loggerhead sea turtle (NMFS and USFWS 2008; sea turtle status reviews and biological reports (Conant et al. 2009, NMFS and USFWS 1995, Marine Turtle Expert Working Group [TEWG] 1998, 2000, 2007, and 2009, NMFS 2001a).

Impact of Deep Water Horizon Oil Spill on Status of Sea Turtles
On April 20, 2010, while working on an exploratory well approximately 50 miles offshore Louisiana, the semi-submersible drilling rig Deepwater Horizon (DWH) experienced an explosion and fire. The rig subsequently sank and oil and natural gas began leaking into the Gulf of Mexico. Oil flowed for 86 days, until finally being capped on July 15, 2010. Millions of barrels of oil were released into the Gulf. Additionally, approximately 1.84 million gallons of chemical dispersant was applied both subsurface and on the surface to attempt to break down the oil. There is no question that the unprecedented Deepwater Horizon event and associated response activities (e.g., skimming, burning, and application of dispersants) have resulted in adverse effects on listed sea turtles.

At this time, the total effects of the oil spill on species found throughout the Gulf of Mexico, including ESA-listed sea turtles, are not known. Potential DWH-related impacts to all sea turtle species include direct oiling or contact with dispersants from surface and subsurface oil and dispersants, inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, loss of foraging resources which could lead to compromised growth and/or reproductive potential, harm to foraging, resting and/or nesting habitats, and disruption of nesting turtles and nests. There is currently an ongoing investigation and analyses being conducted under the Oil Pollution Act (33 U.S.C. 2701 et seq.) to assess natural resource damages and to develop and implement a plan for the restoration, rehabilitation, replacement or acquisition of the equivalent of the injured natural resources. The final outcome of that investigation may not be known for many months to years from the time of this biological opinion. Consequently, other than some emergency restoration efforts, most restoration efforts that occur pursuant to the Oil Pollution Act have yet to be determined and implemented, and so the ultimate restoration impacts on the species are unknowable at this time.

4.2.2.1 Green Sea Turtle
The green sea turtle was listed as threatened under the ESA on July 28, 1978, except for the Florida and Pacific coast of Mexico breeding populations, which were listed as endangered. Critical habitat for the green sea turtle has been designated on September 2, 1998, for the waters

surrounding Isla Culebra (Puerto Rico) and its associated keys. No green sea turtle critical habitat exists in the action area for this consultation.

Species Description, Distribution, and Population Structure
Green sea turtles have a smooth carapace with four pairs of lateral (or costal) scutes and a single pair of elongated prefrontal scales between the eyes. They typically have a black dorsal surface and a white ventral surface although the carapace of green sea turtles in the Atlantic Ocean has been known to change in color from solid black to a variety of shades of grey, green, brown and black in starburst or irregular patterns (Lagueux 2001).

Green sea turtles are distributed circumglobally, mainly in waters between the northern and southern 20°C isotherms (Hirth 1971) and nesting occurs in more than 80 countries worldwide (Hirth and USFWS 1997). The two largest nesting populations are found at Tortuguero, on the Caribbean coast of Costa Rica, and Raine Island, on the Great Barrier Reef in Australia. The complete nesting range of green sea turtles within the southeastern United States includes sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands between Texas and North Carolina as well as the USVI and Puerto Rico (NMFS and USFWS 1991; Dow et al. 2007). However, the vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Johnson and Ehrhart 1994; Meylan et al. 1995). Principal U.S. nesting areas for green sea turtles are in eastern Florida, predominantly Brevard through Broward counties. For more information on green sea turtle nesting in other ocean basins, refer to the 1991 Recovery Plan for the Atlantic Green Turtle (NMFS and USFWS 1991) or the 2007 Green Sea Turtle 5-Year Status Review (NMFS and USFWS 2007a).

In United States Atlantic and Gulf of Mexico waters, green turtles are found in inshore and nearshore waters from Texas to Massachusetts. Principal benthic foraging areas in the southeastern United States include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Hildebrand 1982; Doughty 1984; Shaver 1994), the Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Caldwell and Carr 1957; Carr 1984), Florida Bay and the Florida Keys (Schroeder and Foley 1995), the Indian River Lagoon system in Florida (Ehrhart 1983), and the Atlantic Ocean off Florida from Brevard through Broward Counties (Guseman and Ehrhart 1992; Wershoven and Wershoven 1992). The summer developmental habitat for green turtles also encompasses estuarine and coastal waters from North Carolina to as far north as Long Island Sound (Musick and Limpus 1997). Additional important foraging areas in the western Atlantic include the Culebra Archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito Coast of Nicaragua, the Caribbean coast of Panama, scattered areas along Colombia and Brazil (Hirth 1971), and the northwestern coast of the Yucatan Peninsula.

Adults of both sexes are presumed to migrate between nesting and foraging habitats along corridors adjacent to coastlines and reefs (Hays et al. 2001) and, like loggerheads, are known to migrate from northern areas in the summer back to warmer southern waters to the south in the fall and winter to avoid seasonally cold seawater temperatures. In terms of genetic structure, regional subpopulations show distinctive mitochondrial DNA properties for each nesting rookery (Bowen et al. 1992; Fitzsimmons et al. 2006). Despite the genetic differences, turtles from separate nesting origins are commonly found mixed together on foraging grounds throughout the species' range. However, such mixing occurs at extremely low levels in Hawaiian foraging areas, perhaps making this central Pacific population the most isolated of all green turtle populations occurring worldwide (Dutton et al. 2008).

Life History Information

Green sea turtles exhibit particularly slow growth rates [about 1-5 centimeters per year (Green 1993; McDonald-Dutton and Dutton 1998)] and also have one of the longest ages to maturity of any sea turtle species [i.e. 20-50 years (Chaloupka and Musick 1997; Hirth and USFWS 1997)]. The slow growth rates are believed to be a consequence of their largely herbivorous, low-net energy diet (Bjorndal 1982). Upon reaching sexual maturity, females begin returning to their natal beaches (i.e., the same beaches where they were born) to lay eggs (Balazs 1982; Frazer and Ehrhart 1985) and are capable of migrating significant distances (hundreds to thousands of kilometers) between foraging and nesting areas. While females lay eggs every 2-4 years, males are known to reproduce every year (Balazs 1983).

Green sea turtle mating occurs in the waters off nesting beaches. In the southeastern United States, females generally nest between June and September, and peak nesting occurs in June and July (Witherington and Ehrhart 1989). During the nesting season, females nest at approximately two-week intervals, laying an average of 3-4 clutches (Johnson and Ehrhart 1996). Clutch size often varies among subpopulations, but mean clutch size is around 110-115 eggs. In Florida, green sea turtle nests contain an average of 136 eggs (Witherington and Ehrhart 1989), which will incubate for approximately two months before hatching. Survivorship at any particular nesting site is greatly influenced by the level of anthropogenic stressors, with the more pristine and less disturbed nesting sites (e.g., Great Barrier Reef in Australia) showing higher survivorship values than nesting sites known to be highly disturbed (e.g., Nicaragua) (Campbell and Lagueux 2005; Chaloupka and Limpus 2005). After emerging from the nest, hatchlings swim to offshore areas and go through a posthatchling pelagic stage where they are believed to live for several years, feeding close to the surface on a variety of marine algae and other life associated with drift lines and other debris. This early oceanic phase remains one of the most poorly understood aspects of green turtle life history (NMFS and USFWS 2007b). However, at approximately 20- to 25-cm caprapace length, juveniles leave pelagic habitats and enter benthic foraging habitats. Growth studies using skeletochronology indicate that for green sea turtles in the Western Atlantic shift from the oceanic phase to nearshore development habitats (protected lagoons and open coastal areas rich in sea grass and marine algae) after approximately 5-6 years (Zug and Glor 1998; Bresette et al. 2006). As adults, they feed almost exclusively on sea grasses and algae in shallow bays, lagoons, and reefs (Rebel and Ingle 1974) although some populations are known to also feed heavily on invertebrates (Caraballo et al. 2002). While in coastal habitats, green sea turtles exhibit site fidelity to specific foraging and nesting grounds and it is clear they are capable of "homing in" on these sites if displaced (McMichael et al. 2003). Reproductive migrations of Florida green turtles have been identified through flipper tagging and/or satellite telemetry. Based on these studies, the majority of adult female Florida green turtles are believed to reside in nearshore foraging areas throughout the Florida Keys from Key Largo to the Dry Tortugas and in the waters southwest of Cape Sable, Florida, with some post-nesting turtles also residing in Bahamian waters as well (NMFS and USFWS 2007b).

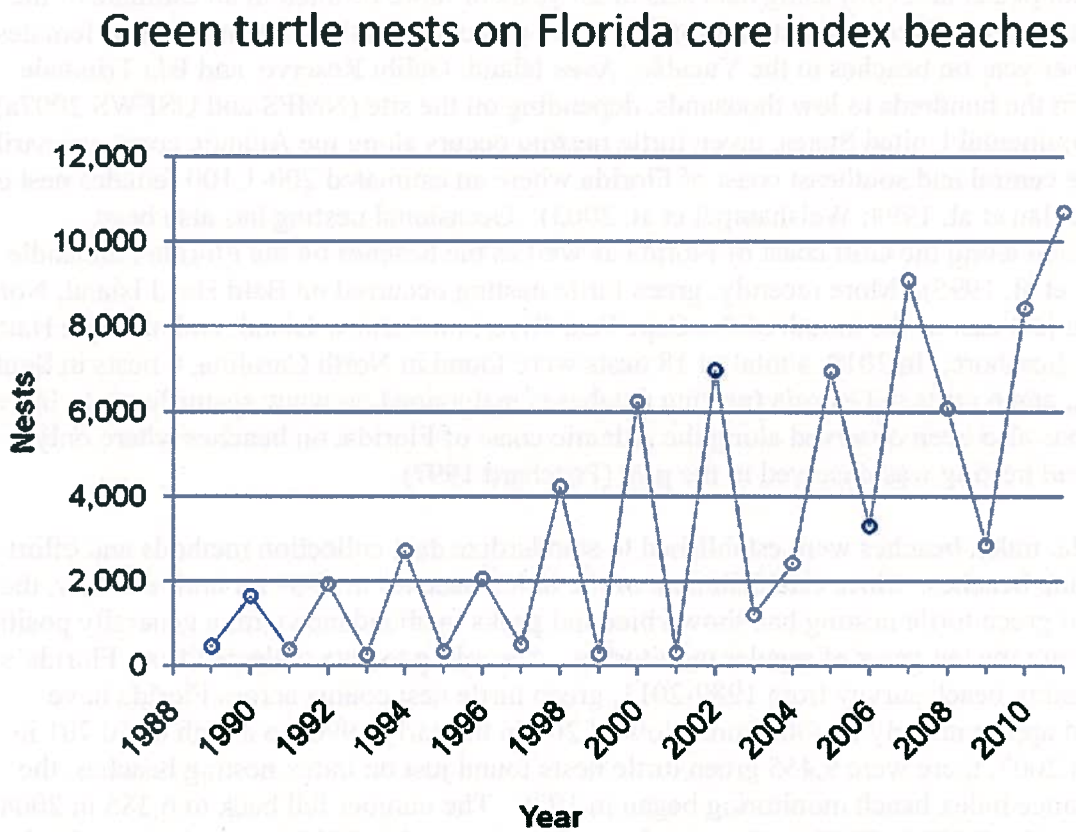
Abundance and Trends
A summary of nesting trends is provided in the most recent 5-year status review for the species (NMFS and USFWS 2007b) in which the authors collected and organized abundance data from 46 individual nesting concentrations organized by ocean region (i.e., Western Atlantic Ocean, Central Atlantic Ocean, Eastern Atlantic Ocean, Mediterranean Sea, Western Indian Ocean, Northern Indian Ocean, Eastern Indian Ocean, Southeast Asia, Western Pacific Ocean, Central Pacific Ocean, and Eastern Pacific Ocean). The authors were able to determine trends at 23 of the 46 nesting sites and found that 10 appeared to be increasing, nine appeared to be stable, and 4 appeared to be decreasing. With respect to regional trends, the Pacific, the Western Atlantic, and the Central Atlantic regions appeared to show more positive trends (i.e., more nesting sites increasing than decreasing) while the Southeast Asia, Eastern Indian Ocean, and possibly the Mediterranean Sea regions appeared to show more negative trends (i.e., more nesting sites decreasing than increasing). These regional determinations should be viewed with caution since trend data was only available for about half of the total nesting concentration sites examined in the review and that site specific data availability appeared to vary across all regions.

The western Atlantic region (focus of this opinion) was one of the best performing in terms of abundance in the entire review as there were no sites that appeared to be decreasing. The 5-year status review for the species identified eight geographic areas considered to be primary sites for green sea turtle nesting in the Atlantic/Caribbean and reviewed the trend in nest count data for each (NMFS and USFWS 2007a). These sites include: (1) Yucatán Peninsula, Mexico; (2) Tortuguero, Costa Rica; (3) Aves Island, Venezuela; (4) Galibi Reserve, Suriname; (5) Isla Trindade, Brazil; (6) Ascension Island, United Kingdom; (7) Bioko Island, Equatorial Guinea; and (8) Bijagos Achipelago, Guinea-Bissau. Nesting at all of these sites was considered to be stable or increasing with the exception of Bioko Island and the Bijagos Archipelago where the lack of sufficient data precluded a meaningful trend assessment for either site (NMFS and USFWS 2007a). Seminoff (2004) likewise reviewed green sea turtle nesting data for eight sites in the western, eastern, and central Atlantic, including all of the above with the exception that nesting in Florida was reviewed in place of Isla Trindade, Brazil. Seminoff (2004) concluded that all sites in the central and western Atlantic showed increased nesting, with the exception of nesting at Aves Island, Venezuela, while both sites in the eastern Atlantic demonstrated decreased nesting. These sites are not inclusive of all green sea turtle nesting in the Atlantic. However, other sites are not believed to support nesting levels high enough that would change the overall status of the species in the Atlantic (NMFS and USFWS 2007a). More information about site specific trends for the other major ocean regions can be found in the most recent 5-year status review for the species (see NMFS and USFWS (2007a)).

By far, the largest known nesting assemblage in the western Atlantic region occurs at Tortuguero, Costa Rica. According to monitoring data on nest counts as well as documented emergences (both nesting and non-nesting events), there appears to be an increasing trend in this nesting assemblage since monitoring began in the early 1970s. For instance, from 1971-1975 there were approximately 41,250 average emergences documented per year and this number increased to an average of 72,200 emergences documented per year from 1992-1996 (Bjorndal et al. 1999). Troëng and Rankin (Troëng and Rankin 2005) collected nest counts from 1999-2003 and also reported increasing trends in the population consistent with the earlier studies, with nest count data suggesting 17,402-37,290 females per year (NMFS and USFWS 2007a). Modeling by (Chaloupka et al. 2008) using data sets of 25 years or more resulted in an estimate of the Tortuguero, Costa Rica, population growing at 4.9 percent annually. The number of females nesting per year on beaches in the Yucatán, Aves Island, Galibi Reserve, and Isla Trindade number in the hundreds to low thousands, depending on the site (NMFS and USFWS 2007a). In the continental United States, green turtle nesting occurs along the Atlantic coast, primarily along the central and southeast coast of Florida where an estimated 200-1,100 females nest each year (Meylan et al. 1994; Weishampel et al. 2003). Occasional nesting has also been documented along the Gulf coast of Florida as well as the beaches on the Florida Panhandle (Meylan et al. 1995). More recently, green turtle nesting occurred on Bald Head Island, North Carolina; just east of the mouth of the Cape Fear River; on Onslow Island; and on Cape Hatteras National Seashore. In 2010, a total of 18 nests were found in North Carolina, 6 nests in South Carolina, and 6 nests in Georgia (nesting databases maintained on www.seaturtle.org). Increased nesting has also been observed along the Atlantic coast of Florida, on beaches where only loggerhead nesting was observed in the past (Pritchard 1997).

In Florida, index beaches were established to standardize data collection methods and effort on key nesting beaches. Since establishment of the index beaches in 1989 up until recently, the pattern of green turtle nesting has shown biennial peaks in abundance with a generally positive trend during the ten years of regular monitoring. According to data collected from Florida's index nesting beach survey from 1989-2011, green turtle nest counts across Florida have increased approximately tenfold from a low of 267 in the early 1990s to a high of 10,701 in 2011. In 2007, there were 9,455 green turtle nests found just on index nesting beaches, the highest since index beach monitoring began in 1989. The number fell back to 6,385 in 2008 and dropped under 3,000 in 2009, at first causing some concern, but 2010 saw an increase back to 8,426 nests on the index nesting beaches and then the high of 10,701was measured in 2011 (FWC Index Nesting Beach Survey Database). Modeling by (Chaloupka and Balazs 2007) using data sets of 25 years or more has resulted in an estimate of the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9 percent.

There are no reliable estimates of the number of immature green sea turtles that inhabit coastal areas of the southeastern United States, where they come to forage. Ehrhart et al. (2007) have documented a significant increase in in-water abundance of green turtles in the Indian River Lagoon area. It is likely that immature green sea turtles foraging in the southeastern United States come from multiple genetic stocks; therefore, the status of immature green sea turtles in the southeastern United States might also be assessed from trends at all of the main regional nesting beaches, principally Florida, Yucatán, and Tortuguero.



Threats
The principal cause of past declines and extirpations of green sea turtle assemblages has been the overexploitation of green sea turtles for food and other products. Although intentional take of green sea turtles and their eggs is not extensive within the southeastern United States, green sea turtles that nest and forage in the region may spend large portions of their life history outside the region and outside United States jurisdiction, where exploitation is still a threat. There are also significant and ongoing threats to green sea turtles from human-related causes in the United States. Similar to that described in more detail above for loggerhead sea turtles, these threats include beach armoring, erosion control, artificial lighting, beach disturbance (e.g., driving on the beach), pollution, foraging habitat loss as a result of direct destruction by dredging, siltation, boat damage, interactions with fishing gear, and oils spills. In 2010, there was a massive oil spill in the Gulf of Mexico at British Petroleum's DWH well Millions of barrels of oil were released into the Gulf. At this time the assessment of total direct impact to sea turtles has not been determined. Additionally, the long-term impacts to sea turtles as a result of habitat impacts, prey loss, and subsurface oil particles and oil components broken down through physical, chemical, and biological processes are not known. More detailed information on the effects of oil spills affecting populations in the action area, including the potential impacts of the 2010 DWH oil spill are described in the Environmental Baseline section of this document.

Fibropapillomatosis disease is an increasing threat to green sea turtles. Presently, this disease is cosmopolitan and has been found to affect large numbers of animals in some areas, including Hawaii and Florida (Jacobson 1990; Jacobson et al. 1991; Herbst 1994). Other sources of natural mortality include cold-stunning and biotoxin exposure. Cold-stunning is not considered a major source of mortality in most cases. As temperatures fall below 8°-10°C, turtles may lose their ability to swim and dive, often floating to the surface. The rate of cooling that precipitates cold-stunning appears to be the primary threat, rather than the water temperature itself (Milton and Lutz 2003). Sea turtles that overwinter in inshore waters are most susceptible to cold-stunning because temperature changes are most rapid in shallow water (Witherington and Ehrhart 1989). During January 2010, an unusually large cold-stunning event in the southeastern United States resulted in around 4,600 sea turtles, mostly greens, found cold-stunned, with hundreds found dead or dying. A large cold-stunning event occurred in the western Gulf of Mexico in February 2011, resulting in approximately 1650 green turtles being found cold-stunned in Texas. Of these, approximately 620 were found dead or died after stranding and approximately 1030 were rehabilitated and released. Additionally, during this same time frame, approximately 340 green turtles were found cold-stunned in Mexico, with approximately 300 of those reported as being subsequently released.

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

Climate change impacts on sea turtles currently cannot, for the most part, be predicted with any degree of certainty; however significant impacts to the hatchling sex ratios of loggerhead turtles may result (NMFS and USFWS 2007c). In marine turtles, sex is determined by temperature in the middle third of incubation with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25°-35°C (Ackerman 1997). Increases in global temperature could potentially skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007c). Modeling suggests an increase of 2°C in air temperature would result in a sex ratio of over 80 percent female offspring for loggerheads nesting near Southport, North Carolina. The same increase in air temperatures at nesting beaches in Cape Canaveral, Florida, would result in close to 100 percent female offspring. More ominously, an air temperature increase of 3°C is likely to exceed the thermal threshold of most clutches, leading to death (Hawkes et al. 2007). Warmer sea surface temperatures have been correlated with an earlier onset of loggerhead nesting in the spring (Weishampel et al. 2004; Hawkes et al. 2007), as well as short inter-nesting intervals (Hays et al. 2002) and shorter nesting season (Pike et al. 2006). Additionally, green sea turtle hatchling size also appears to be influenced by incubation temperatures, with smaller hatchlings produced at higher temperatures (Glen et al. 2003).

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

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

4.2.2.2 Northwest Atlantic Ocean DPS of Loggerhead Sea Turtle
The loggerhead sea turtle was listed as a threatened species throughout its global range on July 28, 1978. NMFS and USFWS published a final rule designating nine DPSs for loggerhead sea turtles (76 FR 58868, September 22, 2011; effective October 24, 2011). The DPSs established by this rule include: (1) Northwest Atlantic Ocean (threatened); (2) Northeast Atlantic Ocean (endangered); (3) South Atlantic Ocean (threatened); (4) Mediterranean Sea (endangered); (5) North Pacific Ocean (endangered); (6) South Pacific Ocean (endangered); (7) North Indian Ocean (endangered); (8) Southeast Indo-Pacific Ocean (endangered); and (9) Southwest Indian Ocean (threatened). The Northwest Atlantic DPS (NWA DPS) is the only one that occurs within the action area and therefore is the only one to be considered in this opinion. No critical habitat has been designated as of the date of this opinion.

Species Description, Distribution, and Population Structure
Loggerheads are large sea turtles with the mean straight carapace length (SCL) of adults in the southeast United States being approximately 92 cm. The corresponding mass is approximately 116 kg (Ehrhart and Yoder 1978). Adult and subadult loggerhead sea turtles typically have a light yellow plastron and a reddish brown carapace covered by non-overlapping scutes that meet along seam lines. They typically have 11 or 12 pairs of marginal scutes, five pairs of costals, five vertebrals, and a nuchal (precentral) scute that is in contact with the first pair of costal scutes (Dodd 1988).

The loggerhead sea turtle inhabits continental shelf and estuarine environments and occurs throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans (Dodd 1988). The majority of loggerhead nesting occurs at the western rims of the Atlantic and Indian Oceans concentrated in the north and south temperate zones and subtropics (NRC 1990).

In the western North Atlantic, the majority of loggerhead nesting is concentrated along the coasts of the United States from southern Virginia to Alabama. Additional nesting beaches are found along the northern and western Gulf of Mexico, eastern Yucatán Peninsula, at Cay Sal Bank in the eastern Bahamas (Addison and Morford 1996; Addison 1997), off the southwestern coast of Cuba (Gavilan 2001), and along the coasts of Central America, Colombia, Venezuela, and the eastern Caribbean Islands.

Non-nesting, adult female loggerheads are reported throughout the United States and Caribbean Sea. Little is known about the distribution of adult males who are seasonally abundant near nesting beaches although aerial surveys suggest that loggerheads in U.S. waters are distributed as a whole in the following proportions: 54 percent in the southeast U.S. Atlantic, 29 percent in the northeast U.S. Atlantic, 12 percent in the eastern Gulf of Mexico, and 5 percent in the western Gulf of Mexico (TEWG 1998). Shallow water habitats with large expanses of open ocean access, such as Florida Bay, provide year-round resident foraging areas for significant numbers of male and female adult loggerheads while juveniles are also found in enclosed, shallow water estuarine environments not frequented by adults (Epperly et al. 1995c). Further offshore, adults primarily inhabit continental shelf waters, from New England south to Florida, the Caribbean, and Gulf of Mexico (Schroeder et al. 2003). Benthic, immature loggerheads foraging in northeastern U.S. waters are known to migrate southward in the fall as water temperatures cool and then migrate back northward in spring (Shoop and Kenney 1992; Keinath 1993; Epperly et al. 1995c; Morreale and Standora 1998).

Within the NWA DPS, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf coast of Florida. Previous Section 7 analyses have recognized at least five Western Atlantic subpopulations, divided geographically as follows: (1) a Northern nesting subpopulation, occurring from North Carolina to Northeast Florida at about 29°N; (2) a South Florida nesting subpopulation, occurring from 29°N on the east coast to Sarasota on the west coast; (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting subpopulation, occurring on the Eastern Yucatán Peninsula, Mexico (Márquez M 1990; TEWG 2000); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (NMFS-SEFSC 2001). The recovery plan for the Northwest Atlantic population of loggerhead sea turtles concluded, based on recent advances in genetic analyses, that there is no genetic distinction between loggerheads nesting on adjacent beaches along the Florida Peninsula and that specific boundaries for subpopulations could not be designated based on genetic differences alone. Thus, the plan uses a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries, in addition to genetic differences, to identify recovery units. The recovery units are: (1) the Northern Recovery Unit (Florida/Georgia border north through southern Virginia); (2) the Peninsular Florida Recovery Unit (Florida/Georgia border through Pinellas County, Florida); (3) the Dry Tortugas Recovery Unit (islands located west of Key West, Florida); (4) the Northern Gulf of Mexico Recovery Unit (Franklin County, Florida, through Texas); and (5) the Greater Caribbean Recovery Unit (Mexico through French Guiana, the Bahamas, Lesser Antilles, and Greater Antilles) (NMFS and USFWS 2008). The recovery plan concluded that all recovery units are essential to the recovery of the species. Although the recovery plan was written prior to the listing of the NWA DPS, the recovery units for what was then termed the Northwest Atlantic population apply to the NWA DPS.

Life History Information
Loggerhead sea turtles reach sexual maturity between 20 and 38 years of age, although this varies widely among populations (Frazer and Ehrhart 1985; NMFS and SEFSC 2001). The annual mating season for loggerhead sea turtles occurs from late March to early June, and eggs are laid throughout the summer months. Female loggerheads deposit an average of 4.1 nests within a nesting season (Murphy and Hopkins 1984) and have an average remigration interval of

3.7 years (Tucker 2010). Mean clutch size varies from 100 to 126 eggs for nests occurring along the southeastern U.S. coast (Dodd 1988).

Loggerheads originating from the western Atlantic nesting aggregations are believed to lead a pelagic existence in the North Atlantic Gyre for a period as long as 7-12 years (Bolten et al. 1998). Stranding records indicate that when immature loggerheads reach 40-60 centimeters straight carapace length, they begin to occur in coastal inshore waters of the continental shelf throughout the U.S. Atlantic and Gulf of Mexico (Witzell 2002). Recent studies have suggested that not all loggerhead sea turtles follow the model of circumnavigating the North Atlantic Gyre as pelagic juveniles, followed by permanent settlement into benthic environments (Laurent et al. 1998; Bolten and Witherington 2003). These studies suggest some turtles may either remain in the pelagic habitat in the North Atlantic longer than hypothesized or move back and forth between pelagic and coastal habitats interchangeably (Witzell 2002).

As post-hatchlings, loggerheads hatched on U.S. beaches migrate offshore and become associated with Sargassum habitats, driftlines, and other convergence zones (Carr 1986) (Witherington 2002). Juveniles are omnivorous and forage on crabs, mollusks, jellyfish, and vegetation at or near the surface (Dodd 1988). Sub-adult and adult loggerheads are primarily found in coastal waters and prey on benthic invertebrates such as mollusks and decapod crustaceans in hard bottom habitats.

Abundance and Trends

A number of stock assessments and similar reviews (TEWG 1998; TEWG 2000; NMFS and SEFSC 2001; Heppell et al. 2003; NMFS and USFWS 2008; Conant et al. 2009; TEWG 2009; NMFS-SEFSC 2009d) have examined the stock status of loggerheads in the Atlantic Ocean, but none have been able to develop a reliable estimate of absolute population size.

Numbers of nests and nesting females can vary widely from year to year. However, nesting beach surveys can provide a reliable assessment of trends in the adult female population, due to the strong nest site fidelity of females turtles, as long as such studies are sufficiently long and effort and methods are standardized [see e.g., NMFS and USFWS (2008)]. NMFS and USFWS (2008) concluded that the lack of change in two important demographic parameters of loggerheads, remigration interval and clutch frequency, indicate that time series on numbers of nests can provide reliable information on trends in the female population. Analysis of available data for the Peninsular Florida Recovery Unit up through 2008 led to the conclusion that the observed decline in nesting for that unit could best be explained by an actual decline in the number of adult female loggerheads in the population (Witherington et al. 2009).

Annual nest totals from beaches within the Northern Recovery Unit (NRU) averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (Georgia Department of Natural Resources (GDNR) unpublished data, North Carolina Wildlife Resources Commission (NCWRC) unpublished data, South Carolina Department of Natural Resources (SCDNR) unpublished data), and represent approximately 1,272 nesting females per year [4.1 nests per female (Murphy and Hopkins 1984)]. The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3 percent annually. Nest totals from aerial surveys conducted by SCDNR showed a 1.9 percent annual decline in nesting in South Carolina from

1980 through 2008. Overall, there is strong statistical data to suggest the NRU has experienced a long-term decline. Data in 2008 showed improved nesting numbers. In 2008, 841 loggerhead nests were observed compared to the 10-year average of 715 nests in North Carolina. The number dropped to 276 in 2009, but rose again in 2010 (846 nests) and 2011 (948 nests). In South Carolina, 2008 was the seventh highest nesting year on record since 1980, with 4,500 nests, but this did not change the long-term trend line indicating a decline on South Carolina beaches. Nesting dropped in 2009 to 2,183, with an increase to 3,141 in 2010. Georgia beach surveys located a total of 1,648 nests in 2008. This number surpassed the previous statewide record of 1,504 nests in 2003. In 2009, the number of nests declined to 998, and in 2010, a new statewide record was established with 1,760 loggerhead nests. (GDNR, NCWRC, and SCDNR nesting data located at www.seaturtle.org).

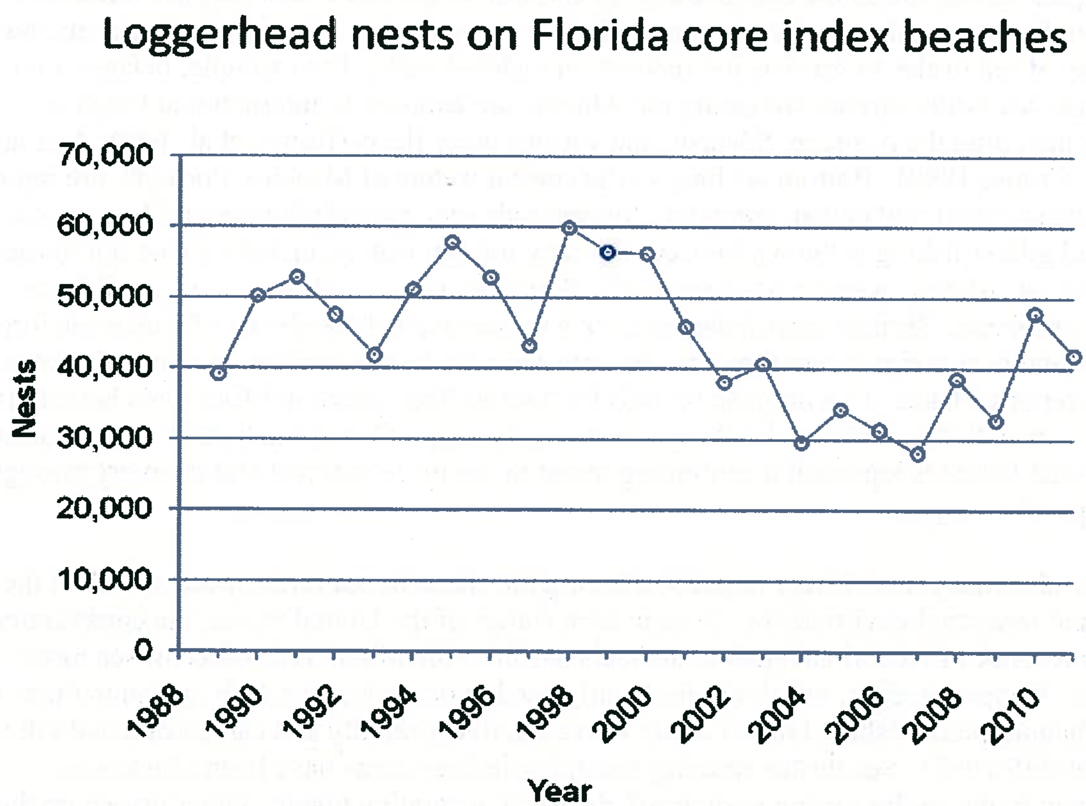
Another consideration that may add to the importance and vulnerability of the NRU is the sex ratio of this subpopulation and its potential importance for genetic diversity. Research conducted over a limited timeframe but across multiple years found that while the small Northern subpopulation can produce a larger proportion of male hatchlings than the large Peninsular Florida subpopulation, the sex ratio is female biased. In most years, the extent of the female bias is likely to be less extreme based upon current information. However, because their absolute numbers are small, their contribution to overall hatchling sex ratios is small (Wyneken et al. 2004; Wyneken et al. 2012). Since nesting female loggerhead sea turtles exhibit nest fidelity, the continued existence of the Northern subpopulation is related to the number of female hatchlings that are produced. Fewer females will limit the number of subsequent offspring produced by the subpopulation.

The Peninsular Florida Recovery Unit (PFRU) is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census (all beaches including index nesting beaches) undertaken from 1989 to 2007 showed a mean of 64,513 loggerhead nests per year, representing approximately 15,735 nesting females per year (NMFS and USFWS 2008). The statewide estimated total for 2010 was 73,702 (FWRI nesting database). An analysis of index nesting beach data shows a 26 percent decline in nesting by the PFRU between 1989 and 2008, and a mean annual rate of decline of 1.6 percent despite a large increase in nesting for 2008, to 38,643 nests (NMFS and USFWS 2008; Witherington et al. 2009), FWRI nesting database). In 2009, nesting levels, while still higher than the lows of 2004, 2006, and 2007, dropped below 2008 levels to approximately 32,717 nests, but in 2010 a large increase was seen, with 47,880 nests on the index nesting beaches (FWRI nesting database). The 2010 Florida index nesting number is the largest since 2000. With the addition of data through 2010, the nesting trend for the proposed NWA DPS of loggerheads became only slightly negative and not statistically different from zero (no trend) (NMFS and USFWS 2010). Nesting at the index nesting beaches in 2011 declined from 2010, but was still the second highest since 2001, at 43,595 nests (FWRI nesting database).

The remaining three recovery units—Dry Tortugas (DTRU), Northern Gulf of Mexico (NGMRU), and Greater Caribbean (GCRU)—are much smaller nesting assemblages but still considered essential to the continued existence of the species. Nesting surveys for the DTRU are conducted as part of Florida's statewide survey program. Survey effort was relatively stable during the 9-year period from 1995-2004 (although there was no data for 2002). Nest counts ranged from 168-270, with a mean of 246, but with no detectable trend during this period (NMFS and USFWS 2008). Nest counts for the NGMRU are focused on index beaches rather than all beaches where nesting occurs. Analysis of the 12-year dataset (1997-2008) of index nesting beaches in the area shows a significant declining trend of 4.7 percent annually (NMFS and USFWS 2008). Nesting on the Florida Panhandle index beaches, which represents the majority of NGMRU nesting, had shown a large increase in 2008, but then declined again in 2009 and 2010 before rising back to a level similar to the 2003-2007 average in 2011. Similarly, nesting survey effort has been inconsistent among the GCRU nesting beaches and no trend can be determined for this subpopulation. Zurita et al. (2003) found a statistically significant increase in the number of nests on seven of the beaches on Quintana Roo, Mexico, from 1987-2001, where survey effort was consistent during the period. However, nesting has declined since 2001, and the previously reported increasing trend appears to not have been sustained (NMFS and USFWS 2008).

Determining the meaning of the long-term nesting decline data is confounded by various in-water research that suggests the abundance of neritic juvenile loggerheads is steady or increasing. Ehrhart et al. (2007) found no significant regression-line trend in the long-term dataset. However, notable increases in recent years and a statistically significant increase in CPUE of 102.4 percent from the 4-year period of 1982-1985 to the 2002-2005 periods were found. Epperly et al. (2007) determined the trends of increasing loggerhead catch rates from all the aforementioned studies in combination provide evidence there has been an increase in neritic juvenile loggerhead abundance in the southeastern United States in the recent past. A study led by the South Carolina Department of Natural Resources found that standardized trawl survey CPUEs for loggerheads from South Carolina to North Florida was 1.5 times higher in summer 2008 than summer 2000. However, even though there were persistent inter-annual increases from 2000-2008, the difference was not statistically significant, likely due to the relatively short time series. Comparison to other datasets from the 1950s through 1990s showed much higher CPUEs in recent years regionally and in the South Atlantic Bight, leading SCDNR to conclude that it is highly improbable that CPUE increases of such magnitude could occur without a real and substantial increase in actual abundance (Arendt et al. 2009). Whether this increase in abundance represents a true population increase among juveniles or merely a shift in spatial occurrence is not clear. NMFS and USFWS (2008), citing (Bjorndal et al. 2005), caution about extrapolating localized in-water trends to the broader population and relating localized trends in neritic sites to population trends at nesting beaches. The apparent overall increase in the abundance of neritic loggerheads in the southeastern United States may be due to increased abundance of the largest Stage III individuals (oceanic/neritic juveniles, historically referred to as small benthic juveniles), which could indicate a relatively large cohort that will recruit to maturity in the near future (TEWG 2009). However, in-water studies throughout the eastern United States also indicate a substantial decrease in the abundance of the smallest Stage III loggerheads, a pattern also corroborated by stranding data (TEWG 2009).

The SEFSC has developed a preliminary stage/age demographic model to help determine the estimated impacts of mortality reductions on loggerhead sea turtle population dynamics (NMFS-SEFSC 2009d). This model does not incorporate existing trends in the data (such as nesting trends) but instead relies on utilizing the available information on the relevant life-history parameters for sea turtles and then predicts future population trajectories based upon model runs using those parameters. Therefore, the model results do not build upon, but instead are complementary to, the trend data obtained through nest counts and other observations. The model uses the range of published information for the various parameters including mortality by stage, stage duration (years in a stage), and fecundity parameters such as eggs per nest, nests per nesting female, hatchling emergence success, sex ratio, and remigration interval. Model runs were done for each individual recovery unit as well as the western North Atlantic population as a whole, and the resulting trajectories were found to be very similar. One of the most robust results from the model was an estimate of the adult female population size for the western North Atlantic in the 2004-2008 time frame. The distribution resulting from the model runs suggest the adult female population size to be likely between approximately 20,000 to 40,000 individuals, with a low likelihood of being up to 70,000 (NMFS-SEFSC 2009d). A much less robust estimate for total benthic females in the western North Atlantic was also obtained, with a likely range of approximately 30,000-300,000 individuals, up to less than 1 million (NMFS-SEFSC 2009d).



Threats

Loggerhead sea turtles face numerous natural and anthropogenic threats that help shape its status and affect the ability of the species to recover. As many of the threats affecting loggerheads are either the same or similar in nature to threats affecting other listed sea turtle species, many of the threats identified in this section below are discussed in a general sense for all listed sea turtles rather than solely for loggerheads. Threats specific to a particular species are then discussed in the corresponding status sections where appropriate.

The Loggerhead Biological Review Team determined that the greatest threats to the Northwest Atlantic DPS of loggerheads result from cumulative fishery bycatch in neritic and oceanic habitats (Conant et al. 2009). Domestic fishery operations often capture, injure, and kill sea turtles at various life stages. Loggerheads in the pelagic environment are exposed to U.S. Atlantic pelagic longline fisheries. Although loggerhead sea turtles are most vulnerable to pelagic longlines during their immature life history stage, there is some evidence that benthic juveniles may also be captured, injured, or killed by pelagic fisheries as well (Lewison et al. 2004). Southeast U.S. shrimp fisheries have historically been the largest fishery threat to benthic sea turtles in the southeastern United States, and continue to interact with and kill large numbers of turtles each year. Loggerheads in the benthic environment in waters off the coastal United States are exposed to a suite of other fisheries in federal and state waters including trawl, gillnet, purse seine, hook-and-line, including bottom longline and vertical line (e.g., bandit gear, handline, and rod-reel), pound net, and trap fisheries (refer to the Environmental Baseline section of this opinion for more specific information regarding federal and state managed fisheries affecting sea turtles within the action area). In addition to domestic fisheries, sea turtles are subject to direct as well as incidental capture in numerous foreign fisheries, further exacerbating the ability of sea turtles to survive and recover on a global scale. For example, pelagic, immature loggerhead sea turtles circumnavigating the Atlantic are exposed to international longline fisheries including the Azorean, Spanish, and various other fleets (Bolten et al. 1994; Aguilar et al. 1995; Crouse 1999). Bottom set lines in the coastal waters of Madeira, Portugal, are reported to take an estimated 500 pelagic immature loggerheads each year (Dellinger and Encarnaçâo 2000) and gillnet fishing is known to occur in many foreign waters, including (but not limited to) the northwest Atlantic, western Mediterranean, South America, West Africa, Central America, and the Caribbean. Shrimp trawl fisheries are also occurring off the shores of numerous foreign countries and pose a significant threat to sea turtles similar to the impacts seen in U.S. waters. Many unreported takes or incomplete records by foreign fleets make it difficult to characterize the total impact that international fishing pressure is having on listed sea turtles. Nevertheless, international fisheries represent a continuing threat to sea turtle survival and recovery throughout their respective ranges.

There are also many non-fishery impacts affecting the status of sea turtle species, both in the marine and terrestrial environment. In nearshore waters of the United States, the construction and maintenance of federal navigation channels has been identified as a source of sea turtle mortality. Hopper dredges, which are frequently used in ocean bar channels and sometimes in harbor channels and offshore borrow areas, move relatively rapidly and can entrain and kill sea turtles (NMFS 1997). Sea turtles entering coastal or inshore areas have been affected by entrainment in the cooling-water systems of electrical generating plants. Other nearshore threats include harassment and/or injury resulting from private and commercial vessel operations, military detonations and training exercises, and scientific research activities.

Coastal development can deter or interfere with nesting, affect nesting success, and degrade nesting habitats for sea turtles. Structural impacts to nesting habitat include the construction of buildings and pilings, beach armoring and renourishment, and sand extraction (Lutcavage et al. 1997; Bouchard et al. 1998). These factors may directly, through loss of beach habitat, or indirectly, through changing thermal profiles and increasing erosion, serve to decrease the amount of nesting area available to females and may change the natural behaviors of both adults and hatchlings (Ackerman 1997; Witherington et al. 2003; Witherington et al. 2007). In addition, coastal development is usually accompanied by artificial lighting which has been known to alter the behavior of nesting adults (Witherington 1992) and is often fatal to emerging hatchlings that are drawn away from the water (Witherington and Bjorndal 1991).

Predation by various land predators is a threat to developing nests and emerging hatchlings. Additionally, direct harvest of eggs and adults from beaches in foreign countries continues to be a problem for various sea turtle species throughout their ranges (NMFS and USFWS 2008).

Multiple municipal, industrial, and household sources, as well as atmospheric transport, introduce various pollutants such as pesticides, hydrocarbons, organochlorides (e.g. DDT and PCBs), and others that may cause adverse health effects to sea turtles (Iwata et al. 1993; Grant and Ross 2002; Garrett 2004; Hartwell 2004). Loggerheads may be particularly affected by organochlorine contaminants as they were observed to have the highest organochlorine contaminant concentrations in sampled tissues (Storelli et al. 2008). It is thought that dietary preferences were likely to be the main differentiating factor among species. Storelli et al. (2008) analyzed tissues from stranded loggerhead sea turtles and found that mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals and porpoises (Law et al. 1991). Recent efforts have led to improvements in regional water quality in the action area, although the more persistent chemicals are still detected and are expected to endure for years (Mearns 2001; Grant and Ross 2002). Acute exposure to hydrocarbons from petroleum products released into the environment via oil spills and other discharges may directly injure individuals through skin contact with oils (Geraci 1990), inhalation at the water's surface and ingesting compounds while feeding (Matkin and Saulitis 1997). Hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability in the action area.

The likely effects of global climate change discussed previously for green sea turtles also apply to loggerheads. For all sea turtles, more detailed information on potential impacts of the 2010 DWH oil spill are described in the Environmental Baseline section of this document.

Actions have been taken to reduce anthropogenic impacts to loggerhead sea turtles from various sources, particularly since the early 1990s. These include lighting ordinances, predation control, and nest relocations to help increase hatchling survival, as well as measures to reduce the mortality of pelagic immatures, benthic immatures, and sexually mature age classes from various fisheries and other marine activities. Recent actions have taken significant steps towards reducing the recurring sources of mortality of sea turtles in the environmental baseline and improving the status of all loggerhead subpopulations. For example, the Turtle Excluder Device (TED) regulation published on February 21, 2003 (68 FR 8456), represents a significant improvement in the baseline effects of trawl fisheries on loggerhead sea turtles, though shrimp trawling is still considered to be one of the largest sources of anthropogenic mortality on loggerheads (NMFS-SEFSC 2009d). For all sea turtles, more detailed information on potential impacts of the 2010 DWH oil spill are described in the Environmental Baseline section of this document.

4.2.2.3 Hawksbill Sea Turtle

The hawksbill sea turtle 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. Critical habitat was designated on June 2, 1998 in coastal waters surrounding Mona and Monito Islands in Puerto Rico (63 FR 46693). No critical habitat exists within the action area for this consultation.

Species Description, Distribution, and Population Structure

Hawksbill sea turtles are small to medium-sized (45 to 68 kilograms on average) although nesting females are known to weigh up to 80 kilograms in the Caribbean (Pritchard et al. 1983). The carapace is usually serrated and has a "tortoise-shell" coloring, ranging from dark to golden brown, with streaks of orange, red, and/or black. The plastron of a hawksbill turtle is typically yellow. The head is elongated and tapers to a point, with a beak-like mouth that gives the species its name. The shape of the mouth allows the hawksbill turtle to reach into holes and crevices of coral reefs to find sponges, their primary food source as adults, and other invertebrates. The shells of hatchlings are 42 mm long and are mostly brown and somewhat heart-shaped (Hillis and Mackay 1989; Van Dam and Sarti 1989; Eckert 1995).

Hawksbill 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 throughout the Caribbean Sea, off the coasts of Florida and Texas in the continental United States, in the Greater and Lesser Antilles, and along the mainland of Central America south to Brazil (Lund 1985; Plotkin and Amos 1988; Amos 1989; Groombridge and Luxmoore 1989; Plotkin and Amos 1990; NMFS and USFWS 1998b; Meylan and Donnelly 1999). They are highly migratory and use a wide range of habitats during their lifetimes (Musick and Limpus 1997; Plotkin 2003). Adult hawksbill turtles are capable of migrating long distances between nesting beaches and foraging areas. For instance, a female hawksbill sea turtle tagged in BIRNM was later identified 1,160 miles (1,866 kilometers) away in the Miskito Cays in Nicaragua (Spotila 2004).

Hawksbill sea turtles nest on insular and sandy beaches throughout the tropics and subtropics. Nesting occurs in at least 70 countries, although much of it now only occurs at low densities compared to other sea turtle species (NMFS and USFWS 2007b). It is believed that the widely dispersed nesting areas as well as the often low densities seen on nesting beaches is likely a result of overexploitation of previously large colonies that have since been depleted over time (Meylan and Donnelly 1999). The most significant nesting within the United States occurs in Puerto Rico and the USVI, specifically on Mona Island and Buck Island Reef National Monument, respectively. Although nesting within the continental U.S. is typically rare, it can also occur along the southeast coast of Florida and the Florida Keys. The largest hawksbill nesting population in the Western Atlantic occurs in the Yucatán Península of Mexico, where several thousand nests are recorded annually in the states of Campeche, Yucatán, and Quintana Roo (Garduno-Andrade et al. 1999; Spotila 2004). In the United States Pacific, hawksbills nest on main island beaches in Hawaii, primarily along the east coast of the island. Hawksbill nesting has also been documented in American Samoa and Guam. More information on nesting in other ocean basins may be found in the 5-year status review for the species (NMFS and USFWS 2007b).

Mitochondrial DNA studies show that reproductive populations are effectively isolated over ecological time scales (Bass et al. 1996). Substantial efforts have been made to determine the nesting population origins of hawksbill sea turtles assembled in foraging grounds, and genetic research has shown that hawksbills of multiple nesting origins commonly mix in foraging areas (Bowen et al. 1996). The fact that hawksbills exhibit site fidelity to their natal beaches suggests that if subpopulations become extirpated they may not be replenished by recruitment from other nesting rookeries (Bass et al. 1996).

Life History Information

Hawksbill sea turtles exhibit slow growth rates although they are known to vary within and among populations from a low of 1-3 cm per year measured in the Indo-Pacific (Chaloupka and Limpus 1997; Whiting 2000; Mortimer et al. 2002; Mortimer et al. 2003) to a high of 5 cm or more per year measured at some sites in the Caribbean (León and Díez 1999; Díez and Van Dam 2002). Differences in growth rates are likely due to differences in diet and/or density of turtles at foraging sites and overall time spent foraging (Bjorndal et al. 2000; Chaloupka et al. 2004). Consistent with slow growth, age to maturity for the species is also long, taking between 20 and 40 years depending on the region (Chaloupka and Musick 1997; Limpus and Miller 2000). Hawksbills in the western Atlantic are known to mature faster (i.e. 20 or more years) than turtles found in the Indo-Pacific (i.e., 30-40 years) based on studies performed in these areas (Boulan 1983; Boulon 1994; Limpus and Miller 2000; Diez and Dam 2002). Males are typically mature when their length reaches 69 cm while females are typically mature at 75 cm (Eckert et al. 1992; Limpus 1992). Female hawksbills return to their natal beaches every 2-3 years to nest (Witzell 1983; Van Dam et al. 1991) and generally lay 3-5 nests per season (Richardson et al. 1999). Compared with other sea turtles, clutch size for hawksbills can be quite high (e.g., up to 250 eggs per clutch) (Hirth and Abdel Latif 1980). Hawksbills may undertake developmental migrations (migrations as immatures) and reproductive migrations that involve travel over hundreds or thousands of kilometers (Meylan 1999). Post-hatchlings (oceanic stage juveniles) are believed to occupy the pelagic environment, taking shelter in floating algal mats and drift lines of flotsam and jetsam in the Atlantic and Pacific oceans (Musick and Limpus 1997) before recruiting to more coastal foraging grounds. In the Caribbean, hawksbills are known to almost exclusively feed on sponges (Meylan 1988; Van Dam and Díez 1997) although at times they have been seen foraging on other food items, notably corallimorphs and zooanthids (Van Dam and Díez 1997; Mayor et al. 1998; Leon and Díez 2000).

Reproductive females undertake periodic (usually non-annual) migrations to their natal beach to nest and exhibit a high degree of fidelity to their nest sites. Movements of reproductive males are less certain, but are presumed to involve migrations to the nesting each or to courtship stations along the migratory corridor. Hawksbills show a high fidelity to their foraging areas as well (Van Dam and Diez 1998). Foraging sites are typically areas associated with coral reefs although hawksbills are also found around rocky outcrops and high energy shoals which are optimum sites for sponge growth. They can also inhabit seagrass pastures in mangrove-fringed bays and estuaries, particularly along the eastern shore of continents where coral reefs are absent (Bjorndal 1997; Van Dam and Diez 1998).

Abundance and Trends

There are currently no reliable estimates of population abundance and trends for nonnesting hawksbills at the time of this consultation; therefore, nesting beach data is currently the primary information source for evaluating trends in global abundance. Most hawksbill populations around the globe are either declining, depleted, and/or remnants of larger aggregations (NMFS and USFWS 2007b). The largest nesting population of hawksbills appears to occur in Australia where approximately 2,000 hawksbills nest off the northwest coast and about 6,000 to 8,000 nest off the Great Barrier Reef each year (Spotila 2004). Additionally, about 2,000 hawksbills nest each year in Indonesia and 1,000 nest in the Republic of Seychelles (Spotila 2004). In the United States, about 500-1,000 hawksbill nests are laid on Mona Island, Puerto Rico (Díez and Van Dam 2007) and another 56-150 nests are laid on Buck Island off St. Croix (Meylan 1999; Mortimer and Donnelly 2008). Nesting also occurs to a lesser extent on other additional beaches on St. Croix, St. John, St. Thomas, Culebra Island, Vieques Island, and mainland Puerto Rico. Mortimer and Donnelly (2008) reviewed nesting data for 83 nesting concentrations organized among 10 different ocean regions (i.e., Insular Caribbean, Western Caribbean Mainland, Southwestern Atlantic Ocean, Eastern Atlantic Ocean, Southwestern Indian Ocean, Northwestern Indian Ocean, Central Indian Ocean, Eastern Indian Ocean, Western Pacific Ocean, Central Pacific Ocean, and Eastern Pacific Ocean). Historic trends (i.e., 20-100 year time period) were determined for 58 of the 83 sites while recent abundance trends (i.e., within the past 20 years) were also determined for 42 of the 83 sites. Among the 58 sites where historic trends could be determined, all showed a declining trend during the long term period. Among the 42 sites where recent trend data were available, 10 appeared to be increasing, 3 appeared to be stable, and 29 appeared to be decreasing. With respect to regional trends, nesting populations in the Atlantic (especially in the Insular Caribbean and Western Caribbean Mainland) are generally doing better than those in the Indo-Pacific regions. For instance, 9 of the 10 sites showing recent increases were all located in the Caribbean. Nesting concentrations in the Pacific Ocean appear to be performing the worst of all regions despite the fact that the region currently supports more nesting hawksbills than either the Atlantic or Indian Oceans (Mortimer and Donnelly 2008). Buck Island and St. Croix's East End beaches support two remnant populations of between 17-30 nesting females per season (Hillis and Mackay 1989; Mackay 2006). While the proportion of hawksbills nesting on Buck Island represents a small proportion of the total hawksbill nesting occurring in the greater Caribbean region, Mortimer and Donnelly (2008) report an increasing trend in nesting at that site based on data collected from 2001-2006. This increase is likely due to the conservation measures implemented when Buck Island Reef National Monument was expanded in 2001. More information about site specific trends for can be found in the most recent five year status review for the species [see (NMFS and USFWS 2007b)].

Threats

The historical decline of the species is primarily attributed to centuries of exploitation for the beautifully patterned shell which made it a highly attractive species to target (Parsons 1972). The fact that reproductive females exhibit a high fidelity for nest sites and the tendency of hawksbills to nest at regular intervals within a season made them an easy target for capture on nesting beaches. The tortoiseshell from hundreds of thousands of turtles in the western Caribbean region was imported into the United Kingdom and France during the 19th and early 20th centuries (Parsons 1972) and additional hundreds of thousands of turtles contributed to the region's trade with Japan prior to 1993 when a zero quota was imposed (Milliken and Tokunaga 1987) as cited in (Brautigram and Eckert 2006).

The continuing demand for the hawksbill's shell as well as other products (leather, oil, perfume, and cosmetics) represents an ongoing threat to recovery of the species. The British Virgin Islands, Cayman Islands, Cuba, Haiti, and the Turks and Caicos Islands (U.K.) all permit some form of legal take of hawksbill turtles. In the northern Caribbean, hawksbills continue to be harvested for their shells, which are often carved into hair clips, combs, jewelry, and other trinkets (Márquez M 1990; Stapleton and Stapleton 2006). Additionally, hawksbills are harvested for their eggs and meat while whole stuffed turtles are sold as curios in the tourist trade. Also, hawksbill sea turtle products are openly available in the Dominican Republic and Jamaica despite a prohibition on harvesting hawksbills and their eggs (Fleming 2001). In Cuba, 500 turtles are legally captured each year and while current nesting trends are unknown, the number of nesting females is suspected to be declining in some areas (Carillo et al. 1999; Moncada et al. 1999). International trade in the shell of this species is prohibited between countries that have signed the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), but illegal trade is still occurring and remains an ongoing threat to hawksbill survival and recovery throughout its range.

Due to their preference to feed on sponges associated with coral reefs, hawksbill sea turtles are particularly sensitive to losses of coral reef communities. Coral reefs are vulnerable to destruction and degradation caused by human activities (e.g., nutrient pollution, sedimentation, contaminant spills, vessel groundings and anchoring, recreational uses, etc.) and are also highly sensitive to the effects of climate change (e.g., higher incidences of disease and coral bleaching) (Wilkinson 2004; Crabbe 2008). Continued loss of coral reef communities (especially in the greater Caribbean region) is expected to impact foraging and represents a major threat to recovery of the species.

Hawksbills are also currently subject to the same suite of threats on both nesting beaches and in the marine environment that affect other sea turtles (e.g., interaction with federal and state fisheries, coastal construction, oil spills, climate change affecting sex ratios, etc.) as discussed in the green and loggerhead sea turtle status sections. Hawksbill sea turtles are also susceptible to capture in nearshore artisanal fishing gear such as drift-netting, long-lining, set-netting, and trawl fisheries with gill nets and artisanal hook and line representing the greatest impact to the species in the greater Caribbean region [(NRC 1990; Lutcavage et al. 1997; Epperly 2003)]. For all sea turtles, more detailed information on potential impacts of the 2010 DWH oil spill are described in the Environmental Baseline section of this document.

4.2.3 Smalltooth Sawfish

The smalltooth sawfish U.S. DPS was listed as endangered under the ESA on April 1, 2003 (68 FR 15674). Critical habitat for the species was designated on September 2, 2009 (74 FR 45353). The two designated critical habitat units are located along the southwestern coast of Florida between Charlotte Harbor and Florida Bay. These areas contain red mangroves and shallow euryhaline, habitats characterized by water depths between the Mean High Water Line and three feet (0.9 meter) measured at Mean Lower Low Water, the physical and biological features that are essential to the conservation of this species.

Species Description, Distribution, and Population Structure

The smalltooth sawfish is a tropical marine and estuarine elasmobranch fish species characterized by an extended snout with a long, narrow, flattened, rostral blade with a series of transverse teeth along either edge. The rostrum has a saw-like appearance, hence the name sawfish. Although they are rays, sawfish appear in some respects to be more shark-like than ray-like, with only the trunk and the head ventrally flattened. The smalltooth sawfish is distinguished from a similar listed species, the largetooth sawfish, by lacking a defined lower caudal lobe, by having the first dorsal fin origin located over the origin of the pelvic fins (versus considerably in front of the origin of pelvics in the largetooth sawfish), and by having 20 to 34 rostral teeth on each side of the rostrum (versus 14-23 in largetooth sawfish) (Bigelow and Schroeder 1953; Thorson 1973; McEachran and Fechhelm 1998; Compagno and Last 1999). The rostrum of the smalltooth sawfish is also about a quarter of the total length of an adult specimen, somewhat longer than the rostrum of largetooth sawfish, which is about a fifth of its total length (Bigelow and Schroeder 1953).

Sawfish in general inhabit shallow waters very close to shore in muddy and sandy bottoms, seldom descending to depths greater than 32 feet (10 meters). They are often found in sheltered bays, on shallow banks, and in estuaries or river mouths (NMFS 2000). Smalltooth sawfish are euryhaline, occurring in waters with a broad range of salinities from freshwater to full seawater (Simpfendorfer 2001) and many encounters are reported at the mouths of rivers or other sources of freshwater inflows (Simpfendorfer and Wiley 2004). Whether this observation represents a preference for river mouths because of physical characteristics (e.g., salinity) or habitat factors (e.g., mangroves or prey) or both is unclear (75 FR 61904).

Historic capture records of smalltooth sawfish within the United States range from Texas to New York, although peninsular Florida has historically been the U.S. region with the largest number of recorded captures and likely represents the core of the historic range (NMFS 2000). Recent records indicate there is a resident reproducing population of smalltooth sawfish in south and southwest Florida from Charlotte Harbor through the Dry Tortugas which also serves as the last U.S. stronghold for the species (Seitz and Poulakis 2002; Poulakis and Seitz 2004; Simpfendorfer and Wiley 2005). Water temperatures no lower than 16°-18°C and the availability of appropriate coastal habitat serve as the major environmental constraints limiting the northern movements of smalltooth sawfish in the western North Atlantic. As a result, most records of this species from areas north of Florida occur during spring and summer periods (May to August) when inshore waters reach higher temperatures. Most specimens captured along the Atlantic coast north of Florida are large adults (over 10 feet) and likely represent seasonal migrants, wanderers, or colonizers from an historic Florida core population(s) to the south rather than being members of a continuous, even-density population (Bigelow and Schroeder 1953). The coastal habitat of sawfish suggests that their biology may favor the isolation of populations that may be unable to traverse large expanses of deep water or otherwise unsuitable habitat (Faria 2007).

Life History Information

Smalltooth sawfish are approximately 31 inches (80 centimeters) at birth (Simpfendorfer 2002) and may grow to a length of 18 feet (540 centimeters) or greater during their lifetime (Bigelow and Schroeder 1953). A recent study by Simpfendorfer et al. (2008) suggests rapid juvenile growth for smalltooth sawfish for the first two years after birth with stretched total length increasing by an average of 650–850 millimeters in the first year and an average of 480–680 millimeters in the second year. Using a demographic approach and life history data for smalltooth sawfish and similar species from the literature, Simpfendorfer (2000) estimated intrinsic rates of natural population increase for the species at 0.08 to 0.13 per year and estimated population doubling times from 5.4 years to 8.5 years. These low intrinsic rates of population increase suggests that the species is particularly vulnerable to excessive mortality and rapid population declines due to stochastic events, after which recovery may take decades. Overall, much uncertainty still remains in estimating life history parameters for smalltooth sawfish since very little information exists on size classes other than juveniles. Simpfendorfer (2000) estimated that smalltooth sawfish reach sexual maturity at 10-20 years of age, while Clark et al. (2004) estimated that males reach maturity at younger ages (around 19 years old) compared to females (around 33 years old). Fertilization is internal as with all elasmobranch species and development is believed to be ovoviviparous[6]. Bigelow and Schroeder (1953) reported gravid females carry 15–20 embryos, although the source of their data is unclear and may represent an over-estimate of the true litter size. Studies of largetooth sawfish in Lake Nicaragua (Thorson 1976) report brood sizes of 1–13 individuals, with a mean of 7.3 individuals. The gestation period for largetooth sawfish is approximately five months and females likely produce litters every second year. Although there are no studies on smalltooth sawfish reproductive traits, its similarity to the largetooth sawfish implies that their reproductive biology may be similar, but reproductive periodicity has yet to be verified for either sawfish species.

Acoustic tracking results for very small juveniles (39-79 inches or 100-200 centimeters long) indicate that they spend the vast majority of their time in very shallow water (less than one foot deep) associated with shallow mud or sand banks and within red mangrove root systems. It is hypothesized that by staying in these very shallow areas they are inaccessible to their predators (mostly sharks) and as a result increase their overall chances of survival (Simpfendorfer 2003). Acoustic monitoring studies have shown that juveniles have high levels of site fidelity for specific nursery areas for periods lasting up to almost three months (Wiley and Simpfendorfer 2007). Encounter and research data indicate there is a tendency for smalltooth sawfish to move offshore and into deeper water as they grow. An examination of the relationship between the depth at which sawfish occur and their estimated size indicates that large animals roam over a much larger depth range than juveniles with larger sawfish regularly occurring at depths greater than 32 feet (10 meter) (Simpfendorfer 2001; Poulakis and Seitz 2004; Simpfendorfer and Wiley 2004). Limited data are available on the site fidelity of adult sawfish although Seitz and Poulakis (2002) suggested that they may have some level of site fidelity for relatively short periods of time. Historic records of smalltooth sawfish indicate that some large mature individuals migrated north along the U.S. Atlantic coast as temperatures warmed in the summer and then south as temperatures cooled (Bigelow and Schroeder 1953). However, given the very limited number of encounter reports from the east coast of Florida, Simpfendorfer and Wiley (2004) hypothesize the population previously undertaking the summer migration has declined to a point where the migration is currently undetectable or does not occur at all. Smalltooth sawfish feed primarily on small fish with mullet, jacks, and ladyfish believed to be their primary food resources (Simpfendorfer 2001). By moving its saw rapidly from side to side through the water,

[6] A mode of reproduction in animals in which embryos develop inside eggs that are retained within the mother's body until they are ready to hatch.

the relatively slow-moving sawfish is able to strike at individual fish (Breder 1952). The teeth on the saw stun, impale, injure, or kill the fish. Smalltooth sawfish then rub their saw against bottom substrate to remove the fish before ingesting it. In addition to fish, smalltooth sawfish are also known to prey on crustaceans (mostly shrimp and crabs) found along the sea bottom (Norman and Fraser 1937; Bigelow and Schroeder 1953).

Abundance, Trends, and Current Threats
Few long-term abundance data sets exist for the smalltooth sawfish, making it very difficult to estimate the current population size. However, Simpfendorfer (2001) estimated that the U.S. population size may number less than five percent of historic levels based on anecdotal data and the fact that the species range has contracted by nearly 90 percent, with south and southwest Florida the only areas known to currently support a reproducing population. Seitz and Poulakis (2002) and Poulakis and Seitz (2004) documented smalltooth sawfish occurrences during the period 1990-2002 along the southwest coast of Florida, and in Florida Bay and the Florida Keys, respectively. The studies reported a total of a total of 2,969 sawfish encounters during this period. In 2000, Mote Marine Laboratory also established a smalltooth sawfish public encounter database (now currently maintained by the Florida Museum of Natural History at the University of Florida) to compile information on the distribution and abundance of sawfish. The National Sawtooth Encounter Database (NSED) contains over 3,000 sawfish encounters reported from 2000-2012 (NSED 2012). Although encounter databases may provide a useful future means of measuring changes in the population and its distribution over time, accurate estimates concerning smalltooth sawfish abundance cannot be made at the current time because efforts are not expended evenly across each study period.

Despite the lack of data on abundance, recent encounters with neonates (young-of-the-year), juveniles, and sexually mature sawfish indicate that the Florida population is currently reproducing (Seitz and Poulakis 2002; Simpfendorfer 2003). The abundance of juveniles encountered, including very small individuals, suggests that the population remains viable (Simpfendorfer and Wiley 2004), and data analyzed from Everglades National Park as part of an established fisheries monitoring program indicate a slightly increasing trend in abundance within BNP over the past decade (Carlson et al. 2007; Carlson and Osborne 2012).

While this data suggests that the species may be showing some signs of recovery in the region, encounters are still rare along much of their historical range beyond south and southwest Florida (Snelson and Williams 1981; Simpfendorfer and Wiley 2004). The primary reason for the decline in smalltooth sawfish abundance has been bycatch in various commercial and recreational fisheries, including gillnets, otter trawls, trammel nets, seines, and hook-and-line (NMFS 2009). While there never has been a large-scale directed fishery, smalltooth sawfish can easily become easily entangled in netting gear directed at other commercial species, often resulting in serious injury or death. Snelson and Williams (1981) attributed the extirpation of smalltooth sawfish from the Indian River Lagoon off the east coast of Florida to heavy mortality associated with incidental captures by commercial fishermen. For instance, one fisherman interviewed by Evermann and Bean (1898) reported taking an estimated 300 smalltooth sawfish in just one netting season. Simpfendorfer (2002) extracted a data set from 1945–1978 of smalltooth sawfish landings by Louisiana shrimp trawlers containing both landings data and crude information on effort (number of vessels, vessel tonnage, number of gear units). The data from Louisiana show that smalltooth sawfish landings declined during that period from a high of 34,900 pounds in 1949 to less than 1,500 pounds in most years after 1967. In more recent years, the highest interaction with the species is reported for the Highly Migratory Species Atlantic Shark, Gulf of Mexico Reef Fish, and the Gulf of Mexico and South Atlantic shrimp trawl fisheries.

In addition to commercial fisheries, encounter data (NSED 2012) also documents that saws are sometimes removed from sawfish caught by recreational fishermen, often to avoid injury to the fishermen themselves or to keep the saw as a type of trophy. While the current threat of mortality associated with recreational fisheries is expected to be low given that possession of the species in Florida has been prohibited since 1992, bycatch in fisheries is still the primary threat to the species.

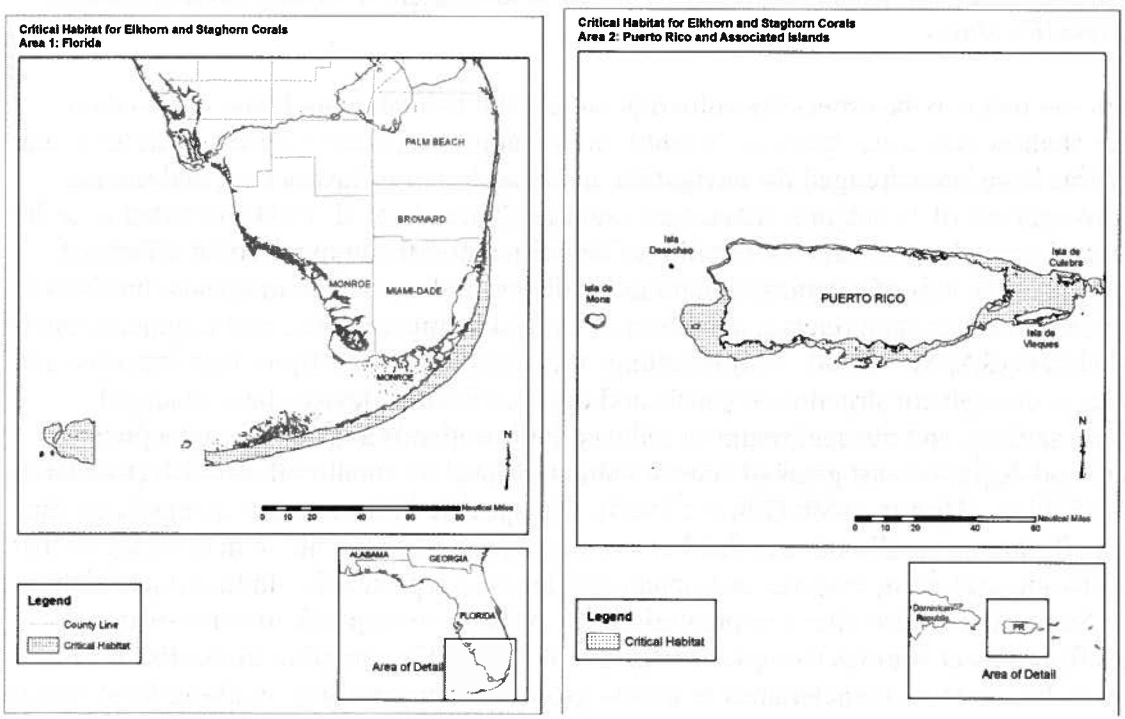
Another major factor in the historical decline of smalltooth sawfish is due to habitat modification, especially nursery habitat for juveniles. Activities such as agricultural and urban development, commercial activities, dredge and fill operations, boating, erosion, and diversions of freshwater runoff contribute to these losses (SAFMC 1998). From 1943-1970, approximately 10,000 hectares of coastal wetlands were lost due to dredge fill and other activities including substantial losses of mangroves at specific locations throughout Florida (Odum et al. 1982). While modification of mangrove habitat is currently regulated, some permitted direct and/or indirect damage to mangrove habitat from increased urbanization still occurs and is expected to continue to threaten survival and recovery of the species in the future. For instance, many of the areas known to have been used historically by juvenile sawfish have already been drastically modified (NMFS 2009).

Smalltooth sawfish may be especially vulnerable to coastal habitat degradation due to their affinity for shallow estuarine systems. In addition to mangroves, other riverine, nearshore, and offshore areas have been dredged for navigation, construction of infrastructure, and marine mining. An analysis of 18 major southeastern estuaries (Orlando et al. 1994) recorded over 703 miles of navigation channels and 9,844 miles of shoreline modifications. Habitat effects of dredging include the loss of submerged habitats by disposal of excavated materials, turbidity and siltation effects, contaminant release, alteration of hydrodynamic regimes, and fragmentation of physical habitats (SAFMC 1998). Modifications of natural freshwater flows into estuarine and marine waters through construction of canals and other controlled devices have changed temperature, salinity, and nutrient regimes; reduced both wetlands and submerged aquatic vegetation; and degraded vast areas of coastal habitat utilized by smalltooth sawfish (Reddering 1988; Whitfield and Bruton 1989; Gilmore 1995). No specific information is available on the effects of pollution on smalltooth sawfish but evidence from other elasmobranchs suggests that pollution disrupts endocrine systems and potentially leads to reproductive failure (Gelsleichter et al. 2006). Sawfish may also alter seasonal migration patterns in response to warm-water discharges from power stations (Simpfendorfer and Wiley 2005). Smalltooth sawfish is also limited by its life history characteristics as a slow growing, late maturing, and long-lived species making it particularly vulnerable to stochastic changes in its environment (NMFS 2000). These combined characteristics result in a very low intrinsic rate of population increase (Musick 1999) that also makes it slow to recover from any significant population decline (Simpfendorfer 2000).

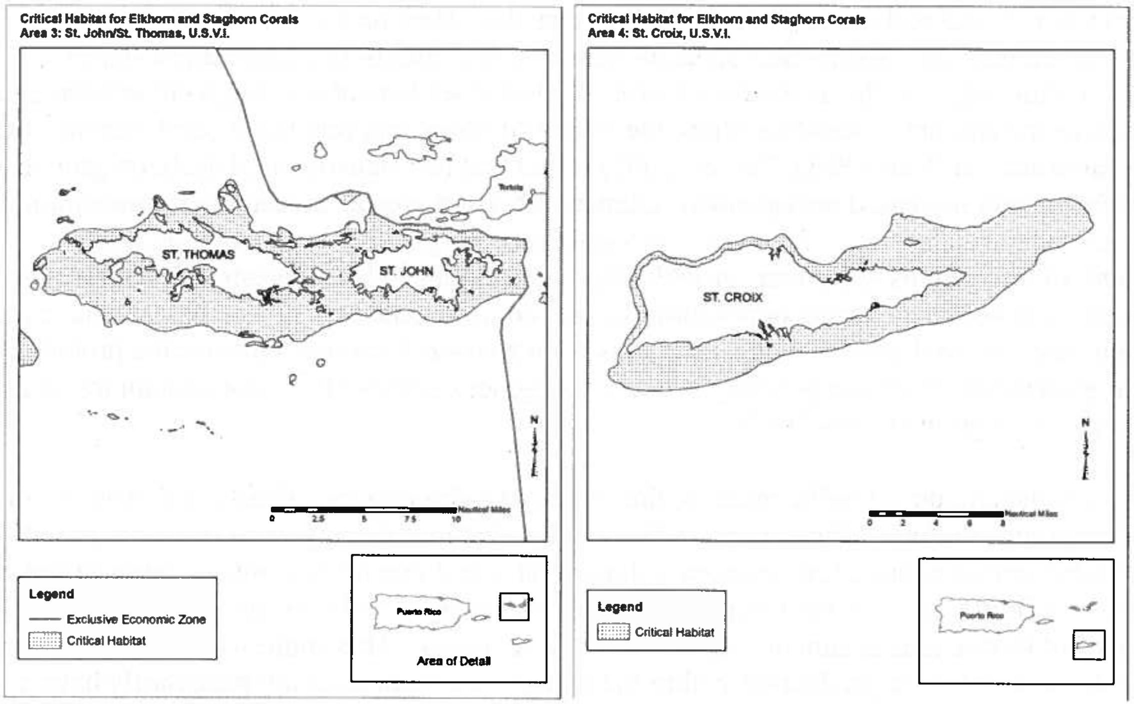
4.3 Critical Habitat Likely to be Adversely Affected: *Acropora* spp. Critical Habitat

Critical habitat is defined in Section 3(5)(A) of the ESA as (1) the specific areas within the geographic area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (a) essential to the conservation of the species and (b) that may require special management considerations or protection; and (2) specific areas outside the geographic area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. The term "conservation" is defined in Section 3(3) of the ESA as the use of all methods and procedures that are necessary to bring any endangered or threatened species to the point at which listing under the ESA is no longer necessary.

On November 26, 2008, a final rule designating *Acropora* critical habitat was published in the Federal Register. Within the geographical area occupied by a listed species, critical habitat consists of specific areas on which are found those physical or biological features essential to the conservation of the species. The feature essential to the conservation of *Acropora* species (also known as essential feature) is substrate of suitable quality and availability, in water depths from the mean high water line to 30 m (98 ft), to support successful larval settlement, recruitment, and reattachment of fragments. Substrate of suitable quality and availability means consolidated hardbottom or dead coral skeletons free from fleshy macroalgae or turf algae and sediment cover. Areas containing these features have been identified in four locations within the jurisdiction of the United States: Florida, Puerto Rico, St. Thomas/St. John, and St. Croix, depicted below.



Designated Critical Habitat Area 1 and 2 for Elkhorn and Staghorn Corals, Florida and Puerto Rico Areas



Designated Critical Habitat Area 3 and 4 for Elkhorn and Staghorn Corals, St.Thomas/St. John and St. Croix Areas

Elkhorn corals require hard, consolidated substrate, including attached, dead coral skeleton, devoid of turf or fleshy macroalgae for their larvae to settle. Atlantic and Gulf of Mexico Rapid Reef Assessment Program data from 1997-2004 indicate that although the historic range of both species remains intact, the number and size of colonies and percent cover by both species has declined dramatically in comparison to historic levels (Lang 2003).

While algae, including crustose coralline algae and fleshy macroalgae, are natural components of healthy reef ecosystems, increases in the dominance of algae since the 1980s impedes coral recruitment. The overexploitation of grazers through fishing has also enabled fleshy macroalgae to persist in reef and hardbottom areas formerly dominated by corals. Impacts to water quality, in particular nutrient inputs, associated with coastal development are also thought to enhance the growth of fleshy macroalgae by providing them with nutrient sources. Fleshy macroalgae are able to colonize dead coral skeleton and other hard substrate and some are able to overgrow living corals and crustose coralline algae. Because crustose coralline algae is thought to provide chemical cues to coral larvae indicating an area is appropriate for settlement, overgrowth by macroalgae may affect coral recruitment (Steneck 1986). Several studies show that coral recruitment tends to be greater when algal biomass is low (Rogers et al. 1984; Hughes 1985; Connell et al. 1997, Edmunds et al. 2004, Birrell et al. 2005, Vermeij 2006). In addition to preempting space for coral larval settlement, many fleshy macroalgae produce secondary metabolites with generalized toxicity, which also may inhibit settlement of coral larvae (Kuffner and Paul 2004).

Sediment from natural and anthropogenic sources can also affect reef distribution, structure, growth, and recruitment. Sediments can accumulate on dead and living corals and exposed hardbottom, thus reducing the available substrate for larval settlement and fragment attachment. In addition to the amount of sedimentation, the source of sediments can affect coral growth. In a study of three sites in Puerto Rico, Torres (2001) found that low-density coral skeleton growth was correlated with increased resuspended sediment rates and greater percentage composition of terrigenous sediment. In sites with higher carbonate percentages and corresponding low percentages of terrigenous sediments, growth rates were higher. This suggests that resuspension of sediments and sediment production within the reef environment does not necessarily have a negative impact on coral growth while sediments from terrestrial sources increase the probability that coral growth will decrease, possibly because terrigenous sediments do not contain minerals that corals need to grow (Torres 2001).

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5 Environmental Baseline

This section identifies the effects of past and ongoing human and natural factors leading to the current status of the species, their habitat, and ecosystem, within the action area. The environmental baseline is a snapshot of the action area at a specified point in time and includes state, tribal, local, and private actions already affecting the species, or that will occur contemporaneously with the consultation in progress. In this case, the action area is the entire BNP, whose boundaries are described in the United States Code Title 16, Chapter 1, Subchapter LIX-E, § 410gg (Figure 1). Individual project components will occur at specific sites located within BNP.

Unrelated federal actions affecting the same species or critical habitat that have completed formal or informal consultation are also part of the environmental baseline, as are federal and other actions within the action area that may benefit listed species or critical habitat.

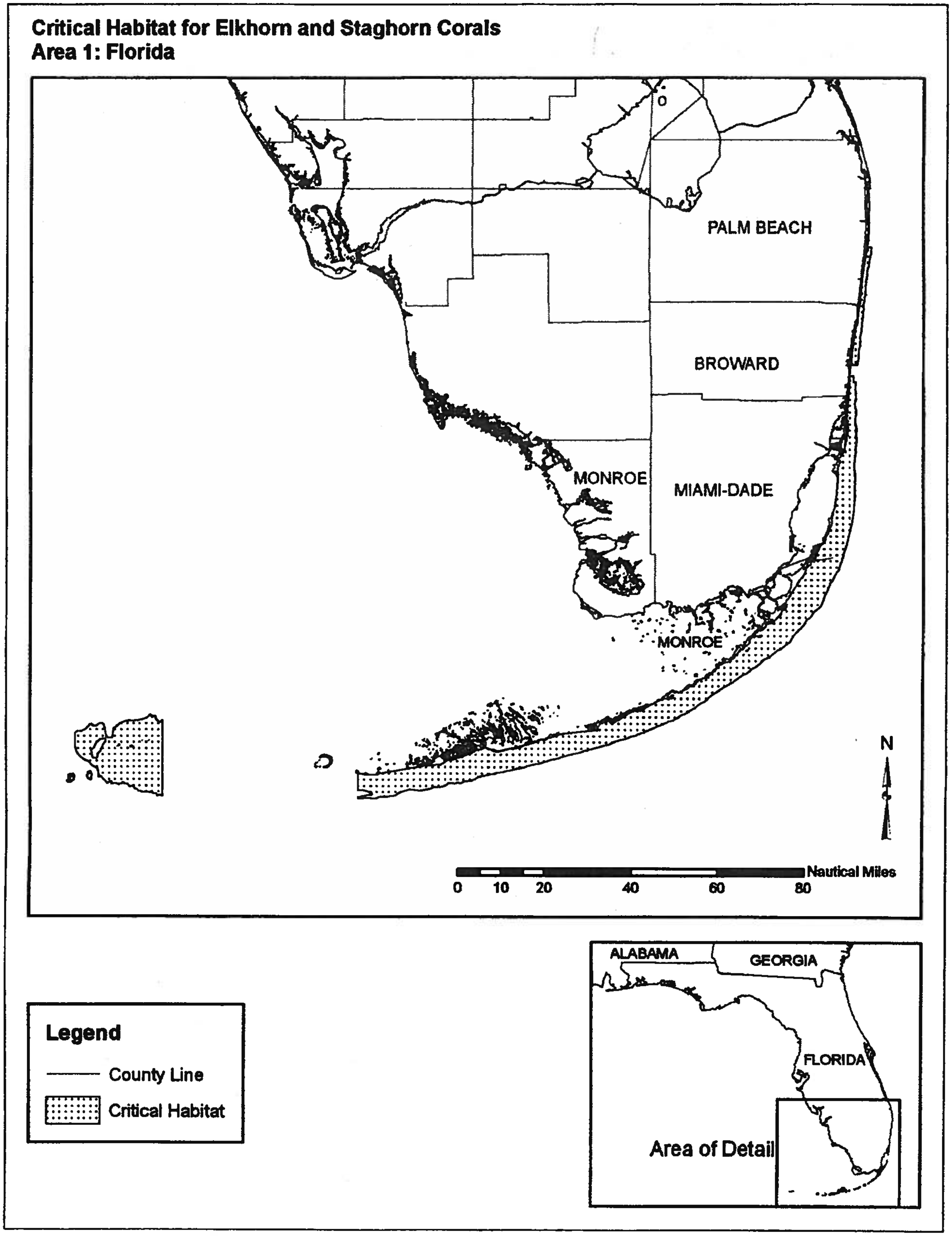
The environmental baseline for this opinion includes the effects of several activities that affect the survival and recovery of green, loggerhead, and hawksbill sea turtles, smalltooth sawfish, and elkhorn and staghorn corals in the action area. This opinion describes these activities' effects in the sections below.

5.1 Status of Elkhorn and Staghorn Coral, and their Critical Habitat Within the Action Area

Elkhorn and staghorn coral have been in decline since the 1980s, and can be found in low densities throughout BNP. A 2007 synoptic survey conducted by the University of North

Carolina – Wilmington along the Florida Reef Tract reports that elkhorn and staghorn coral were observed in approximately 10 percent and 23 percent, respectively, of the 235 reef sites surveyed. More specifically, elkhorn and staghorn corals were observed at 7 percent and 25 percent, respectively, of the 28 survey stations located within the boundary of BNP (Miller et al. 2007).

The Florida area of *Acropora spp.* critical habitat, comprises approximately 1,329 square miles (3,442 sq km) of marine habitat offshore of Palm Beach, Broward, Miami-Dade, and Monroe counties, Florida, and encompasses the entire Florida Reef Tract beginning east of Palm Beach County and extending south along the Florida Keys. A portion of this critical habitat, referred to as Florida sub-area B, is located within the eastern boundary of BNP and is depicted below (see 50 CFR 226.216(b)(1)(ii) for specific boundaries).



Sub-Areas A, B and C (north to south) of the Florida Area of *Acropora* Critical Habitat

5.1.1 Factors Affecting the Species' Environment and Critical Habitat Within the Action Area

Numerous activities funded, authorized, or carried out by federal agencies have been identified as threats and may affect elkhorn and staghorn corals or their critical habitat in the action area. Few other biological opinions have been conducted that can be referenced and the following identified activities are based on agency knowledge of ongoing actions that may require re-initiation of ESA consultation or new consultations based on the listing.

- The U.S. Environmental Protection Agency (EPA) regulates the discharge of pollutants, such as oil, toxic chemicals, radioactivity, carcinogens, mutagens, teratogens, or organic nutrient-laden water, including sewage water, into the waters of the United States. Elevated discharge levels may cause direct mortality, reduced fitness, or habitat destruction/modification.
- Aside from the RP, incorporated into this opinion, NMFS is unaware of any previous or ongoing Section 7 consultation which may include effects on *Acropora* spp. or it's designated critical habitat in the action area.

Numerous management mechanisms exist to protect corals and the habitats on which they grow; however, none specifically protect *Acropora* spp. Existing federal regulatory mechanisms and conservation initiatives most beneficial to branching corals have focused on addressing physical impacts, including damage from fishing gear, anchoring, and vessel groundings. The Coral Reef Conservation Act and the two Coral and Coral Reef Fishery Management Plans under the Magnuson-Stevens Act require the protection of corals and prohibit the collection of hard corals. Depending on the specifics of zoning plans and regulations, marine protected areas (MPAs) can help prevent damage from collection, fishing gear, groundings, and anchoring.

The State of Florida regulates activities that involve and occur in coral reefs in Florida. Statutes and rules protect all corals from collection, commercial exploitation, and injury/destruction on the sea floor (FS 253.001, 253.04, Chapter 68B-42.008 and 68B-42.009), except as authorized by a Special Activity License for the purposed of research. Additionally, Florida has a comprehensive state regulatory program that regulates most land, including upland, wetland, and surface water alterations throughout the state.

Although many regulations exist to protect corals, including elkhorn and staghorn corals, many of the activities identified as threats still occur. Poor boating and anchoring practices, poor snorkeling and diving techniques, and destructive fishing practices cause abrasion and breakage to elkhorn and staghorn corals. Nutrients, contaminants, and sediment from point and non-point sources cause direct mortality and the breakdown of normal physiological processes. Additionally, these stressors create an unfavorable environment for reproduction and growth.

Diseases have been identified as the major cause of elkhorn coral and staghorn coral decline. Although the most severe mortality resulted from an outbreak in the early 1980s, diseases are still present in elkhorn and staghorn coral populations and continue to cause mortality.

Hurricanes and large coastal storms could also significantly harm elkhorn and staghorn corals as well as their critical habitat. Due to their branching morphologies, *Acropora* corals are especially susceptible to breakage from extreme wave action and storm surges. Critical habitat can also be altered by storms as large pieces of hardbottom habitat can be repositioned due to these storm events. Historically, large storms potentially resulted in asexual reproductive events, if the fragments encountered suitable substrate, attached, and grew into new colonies. However, in the recent past, the amount of suitable substrate has been significantly reduced; therefore, many fragments created by storms die.

5.1.2 Conservation and Recovery Actions Benefiting Listed Corals and Coral Critical Habitat in the Action Area

NMFS has implemented ESA Section 4(d) regulations to establish "take" prohibitions for listed corals. The Caribbean Fishery Management Council (CFMC) has established regulations prohibiting the use of bottom-tending fishing gear in seasonally and permanently closed fishing areas containing coral reefs in federal waters of the Exclusive Economic Zone (EEZ). USVI is moving toward similar regulations for both commercial and recreational fishers, and has already established a ban on the use of gill and trammel nets, with the exception of surface nets for catching bait fish. In addition to regulations, education and outreach activities, as part of the NOAA Coral Reef Conservation Program (CRCP), as well as through NMFS' ESA program, are on-going through the Southeast Regional Office.

A draft recovery plan for elkhorn and staghorn corals is in preparation. A recovery team comprised of fishers, scientists, managers, and agency personnel from Florida, Puerto Rico, and USVI, and federal representatives has been convened and is working towards creating a draft recovery plan for public review based upon the latest and best available information. A recovery outline has been developed and is available on NMFS' website:
http://sero.nmfs.noaa.gov/pr/endangered%20species/Updated%20Recovery%20Outline.pdf
The document presents a broad outline for the recovery of elkhorn and staghorn corals and will serve to guide recovery-planning efforts and provide information for consultations and permitting activities until the recovery plan has been finalized and approved.

Numerous management mechanisms exist to protect corals or coral reefs in general. Existing federal regulatory mechanisms and conservation initiatives most beneficial to branching corals have focused on addressing physical impacts, including damage from fishing gear, anchoring, and vessel groundings. The Coral Reef Conservation Act and the Magnuson-Stevens Act Coral and Reef Fish Fishery Management Plans (South Atlantic, Caribbean) require the protection of corals and prohibit the collection of hard corals. Depending on the specifics of zoning plans and regulations, marine protected areas (MPAs) can help prevent damage from collection, fishing gear, groundings, and anchoring.

On October 29, 2008, NMFS published a final Section 4(d) rule extending the ESA Section 9 "take" prohibitions to listed elkhorn and staghorn corals. These prohibitions include the import, export, or take of elkhorn or staghorn corals for any purpose, including commercial activities. The rule has exceptions for some activities, including scientific research and species enhancement, and restoration carried out by authorized personnel. On November 26, 2008, NMFS published a final rule designated critical habitat for listed elkhorn and staghorn corals.

The critical habitat designation requires that all actions with a federal nexus ensure that the adverse modification of critical habitat will not occur as part of a Section 7 consultation with NMFS for the action.

The NOAA Coral Reef Conservation Program provides funding for several activities with an education and outreach component for informing the public about the importance of the coral reef ecosystem and the status of listed corals. The Southeast Regional Office of NMFS has also developed outreach materials regarding the listing of elkhorn and staghorn corals, the Section 4(d) regulations, and the designation of critical habitat. These materials have been circulated to constituents during education and outreach activities and public meetings, and as part of other Section 7 consultations, and are readily available on the website: http://sero.nmfs.noaa.gov/pr/esa/acropora.htm.

5.2 Status of Sea Turtles within the Action Area

Sea turtles located in the nearshore Atlantic Ocean that may be affected by the proposed action are the green, hawksbill, and loggerhead sea turtles. All of these species are migratory, traveling widely to forage or mate. The nearshore and inshore waters of the Atlantic Ocean may be used by these sea turtles as post-hatchling developmental habitat or foraging habitat. Loggerhead, green, and (to a much lesser degree) hawksbill sea turtles use the beaches of southeast Florida for nesting. NMFS believes that no individual sea turtles are likely to be permanent residents of the action area, although some individuals may be present at any given time. These same individuals will migrate into offshore waters, as well as other areas of the Gulf of Mexico, Caribbean Sea, and North Atlantic Ocean at certain times of the year, and thus may be impacted by activities occurring there; therefore, these species' statuses in the action area are considered to be the same as their range-wide statuses and supported by the species accounts in Section 4.0. Because they travel widely throughout the Atlantic, Gulf of Mexico, and Caribbean Sea, individuals in the action area are impacted by activities that occur in other areas within their geographic range. Appendix A includes a summary of anticipated sources of incidental interactions with sea turtles for federal actions within the southeast United States region that have undergone formal Section 7 consultation. BNP contains approximately 72,000 acres of coral reef habitat which many juvenile and adult sea turtles may use for foraging habitat. The east side of Elliot key is also used as a nesting beach for loggerhead sea turtles with an average of approximately 12 nests per year over the last 20 years.

5.2.1 Factors Affecting Sea Turtles within the Action Area

As stated in Section 3 ("Action Area"), the proposed project is located within the boundaries of the BNP and the action area for the proposed project includes the area in which Park management and use will take place. The following analysis examines actions that may affect these species' environment within the action area.

5.2.1.1 Federal Actions

In recent years, NMFS has undertaken several ESA Section 7 consultations to address the effects of federally-permitted fisheries and other federal actions on threatened and endangered species. Each of those consultations sought to develop ways of reducing the probability of adverse effects of the action on sea turtles and/or smalltooth sawfish. Similarly, recovery actions NMFS has undertaken under the ESA are addressing the problem of interactions with sea turtles by the fishing and oil and gas industries, vessel operations, and other activities such as COE dredging operations.

5.2.1.2 Fisheries
Adverse effects on threatened and endangered species from several types of fishing gear occur in or near the action area. Hook-and-line gear, trawl, and pot fisheries have all been documented as interacting with sea turtles.

For all fisheries for which there is an FMP, impacts have been evaluated under Section 7. Formal Section 7 consultations have been conducted on the following fisheries, occurring at least in part within the action area, found likely to adversely affect threatened and endangered sea turtles:

South Atlantic snapper-grouper fishery
The South Atlantic snapper-grouper fishery uses spear and powerheads, black sea bass pots, and hook-and-line gear. Hook-and-line gear used in the fishery includes commercial bottom longline gear and commercial and recreational vertical line gear (i.e., handline, bandit gear, and rod-and-reel). The most recent consultation was completed in 2006 (NMFS 2006) and found only hook-and-line gear likely to adversely affect, green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles. The consultation concluded the proposed action was not likely to jeopardize the continued existence of any of these species, and an ITS was provided.

Spiny lobster fishery
NMFS completed a Section 7 consultation on the Gulf and South Atlantic Spiny Lobster FMP on August 27, 2009 [i.e., (NMFS 2009)]. The commercial component of the fishery consists of diving, bully net and trapping sectors; recreational fishers are authorized to use bully net and hand-harvest gears. Of the gears used, only traps are expected to result in adverse effects on sea turtles. The consultation determined the continued authorization of the fishery would not jeopardize any listed species. An ITS was issued for takes in the commercial trap sector of the fishery. Fishing activity is limited to waters off south Florida and, although the FMP does authorize the use of traps in federal waters, historic and current effort is very limited. Thus, potential adverse effects on sea turtles are believed to also be very limited (e.g., no more than a couple of sea turtle entanglements annually).

5.2.2.2 ESA Section 10 Permits
The ESA allows the issuance of permits to capture/interact with ESA-listed species for the purposes of scientific research, under ESA Section 10(a)(1)(A). Authorized activities range from photographing, weighing, and tagging protected species incidentally taken in fisheries, to blood sampling, tissue sampling (biopsy), and performing laparoscopy on intentionally-captured organisms. The number of authorized takes varies widely depending on the research and species involved, but may involve the taking of hundreds of individuals annually. Most captures/interactions authorized under these permits are expected to be (and are) non-lethal. Before any research permit is issued, the proposal must be reviewed under the permit regulations (i.e., must show a benefit to the species). In addition, since issuance of the permit is a federal

activity, issuance of the permit by NMFS must also be reviewed for compliance with Section 7(a)(2) of the ESA to ensure that issuance of the permit does not result in jeopardy to the species or adverse modification of its critical habitat.

5.2.3 State or Private Actions

5.2.3.1 State Fisheries

Recreational fishing from private vessels, private and public piers, and from shore does occur in the area. Observations of state recreational fisheries have shown that smalltooth sawfish, green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles are known to bite baited hooks, and loggerheads frequently ingest the hooks. Hooked turtles and smalltooth sawfish have been reported by the public fishing from boats, piers, beaches, banks, and jetties and from commercial fishermen fishing for reef fish and for sharks with both single rigs and bottom longlines (NMFS 2001b). Additionally, lost fishing gear such as line cut after snagging on rocks, or discarded hooks and line, can also pose an entanglement threat to sea turtles and smalltooth sawfish in the area. A detailed summary of the known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the TEWG reports (1998; 2000).

Although few of these state regulated fisheries are currently authorized to incidentally capture or kill listed species, several state agencies have approached NMFS to discuss applications for a Section 10(a)(1)(B) incidental take permit. Since NMFS' issuance of a Section 10(a)(1)(B) permit requires formal consultation under Section 7 of the ESA, the effects of these activities are considered in Section 7 consultation. Any fisheries that come under a Section 10(a)(1)(B) permit in the future will likewise be subject to Section 7 consultation. Although the past and current effects of these fisheries on listed species are currently not determinable, NMFS believes that ongoing state fishing activities may be responsible for seasonally high levels of observed strandings of sea turtles on both the Atlantic and Gulf of Mexico coasts.

5.2.3.2 In-Water Research Projects

In Florida, in-water sea turtle research has increased in recent years, but no coordinated trend monitoring program exists for in-water populations. The first step in developing such a program involves determining what research is actually taking place. Researchers in Florida Wildlife Research Institute's (FWRI)'s marine turtle program inventoried all in-water marine turtle research that has been conducted in Florida. Through the use of interviews, questionnaires, and literature reviews, researchers compiled a comprehensive database containing detailed information on 36 research projects (21 active, 15 inactive) focusing on in-water aggregations of sea turtles. Geographic Information Systems (GIS) maps were also developed for each project that will serve as examples to in-water researchers of how GIS can be used to enhance their studies (FWRI online article 2008 http://research.myfwc.com/publications/publication info. asp?id=5 9157).

The vast majority of in-water projects (24) are, or were, located on the southeast coast of Florida. Based on the information compiled, candidate projects were identified for inclusion in a statewide in-water index monitoring program that would provide trend information on sea turtles in Florida's waters. Recommendations were presented on how to develop such a program, which would include the measurement of capture effort, promotion of cooperation among in-water research groups, and standardization of data collection methods resulting in a consistent set of measurements.

In-water projects involving smalltooth sawfish are also present in Florida. Scientists from organizations such as FWRI and Mote Marine Laboratory actively conduct research on the biology and ecology of this species. Particular interest has focused on the southwest coast of Florida where a large number of juveniles utilize shallow, euryhaline, mangrove-lined shores for forage and refuge.

In addition to dedicated in-water studies, other projects and activities were identified that involve the collection of sea turtle and sawfish data, often secondary to the primary purpose. These projects provide important data on general species distributions and can identify target areas for future in-depth studies. Many of these projects are conducted by other sections of FWRI, including capture efforts and aerial surveys for manatees or fish. Other data come from incidental capture in fisheries research projects, or by the fisheries themselves. Pre-dredge trawling, aerial surveys, stranding networks, and satellite tracking also provide important distributional data. The end result of this project is a narrative document that will function as a guide to in-water research in Florida.

5.2.3.2 Recreational Vessel Use

Recreational vessel use is expected to continue within the action area. Data indicates that sea turtles may be injured or killed by vessel strikes. Slow speed zones are proposed to be implemented at several locations within the action area. Although these slow speed zones may decrease the amount of vessel strike impacts to sea turtles, it is not expected that these impacts will be eliminated. The effects from vessel strikes is further evaluated in Section 6, below.

5.2.4 Other Potential Sources of Impacts in the Environmental Baseline

5.2.4.1 Marine Debris and Acoustic Impacts

A number of activities that may indirectly affect listed species in the action area of this consultation include anthropogenic marine debris and acoustic impacts. The impacts from these activities are difficult to measure. Where possible, conservation actions are being implemented to monitor or study impacts from these sources.

5.2.4.2 Marine Pollution

Sources of pollutants along the Gulf of Mexico and the Atlantic Ocean include atmospheric loading of pollutants such as polychorlinated biphenyls (commonly known as PCBs), stormwater runoff from coastal towns into rivers and canals emptying into bays and the ocean, and groundwater and other discharges. Nutrient loading from land-based sources such as coastal community discharges is known to stimulate plankton blooms in closed or semi-closed estuarine systems. The effects on larger embayments are unknown. Although pathological effects of oil spills have been documented in laboratory studies of marine mammals and sea turtles (Vargo et al. 1986), the impacts of many other anthropogenic toxins have not been investigated.

5.2.4.3 Environmental Contamination

Coastal runoff, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased under water noise and boat traffic can degrade marine habitats used by sea turtles (Colbum et al. 1996) and smalltooth sawfish. The development of marinas and docks in inshore waters can negatively impact nearshore habitats. An increase in the number of docks built increases boat and vessel traffic. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. Although these contaminant concentrations do not likely affect the more pelagic waters, sea turtles and smalltooth sawfish analyzed in this biological opinion travel between nearshore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

The Gulf of Mexico is an area of high-density offshore oil extraction with chronic, low-level spills and occasional massive spills (such as the 2010 Deepwater Horizon oil spill in the Gulf of Mexico, Ixtoc I oil well blowout and fire in the Bay of Campeche in 1979, and the explosion and destruction of a loaded supertanker, the Mega Borg, near Galveston in 1990). Oil spills can impact wildlife directly through three primary pathways: ingestion when animals swallow oil particles directly or consume prey items that have been exposed to oil, absorption when animals come into direct contact with oil, and inhalation when animals breath volatile organics released from oil or from "dispersants" applied by response teams in an effort to increase the rate of degradation of the oil in seawater. Several aspects of sea turtle biology and behavior place them at particular risk, including the lack of avoidance behavior, indiscriminate feeding in convergence zones, and large pre-dive inhalations (Milton et al. 2003). When large quantities of oil enter a body of water, chronic effects such as cancer, and direct mortality of wildlife becomes more likely (Lutcavage et al. 1997). Oil spills in the vicinity of nesting beaches just prior to or during the nesting season could place nesting females, incubating egg clutches, and hatchlings at significant risk (Fritts and McGehee 1982; Lutcavage et al. 1997; Witherington 1999). Continuous low-level exposure to oil in the form of tarballs, slicks, or elevated background concentrations also challenge animals facing other natural and anthropogenic stresses. Types of trauma can include skin irritation, altering of the immune system, reproductive or developmental damage, and liver disease (Keller et al. 2004, 2006). Chronic exposure may not be lethal by itself, but it may impair a turtle's overall fitness so that it is less able to withstand other stressors (Milton et al. 2003).

The earlier life stages of living marine resources are usually at greater risk from an oil spill than adults. This is especially true for turtle hatchlings, since they spend a greater portion of their time at the sea surface than adults; thus, their risk of exposure to floating oil slicks is increased (Lutcavage et al. 1995). One of the reasons might be the simple effects of scale: for example, a given amount of oil may overwhelm a smaller immature organism relative to the larger adult. The metabolic machinery an animal uses to detoxify or cleanse itself of a contaminant may not be fully developed in younger life stages. Also, in early life stages, animals may contain proportionally higher concentrations of lipids, to which many contaminants such as petroleum hydrocarbons bind. Most reports of oiled hatchlings originate from convergence zones, ocean areas where currents meet to form collection points for material at or near the surface of the water. Sixty-five of 103 post-hatchling loggerheads in convergence zones off Florida's east coast were found with tar in the mouth, esophagus or stomach (Loehefener et al. 1989). Thirty-four percent of post-hatchlings captured in Sargassum off the Florida coast had tar in the mouth or esophagus and more than 50 percent had tar caked in their jaws (Witherington 1994). These zones aggregate oil slicks, such as a Langmuir cell, where surface currents collide before pushing down and around, and represents a virtually closed system where a smaller weaker sea turtle can easily become trapped (Witherington 2002; Carr 1987). Lutz (1989) reported that hatchlings have been found apparently starved to death, their beaks and esophagi blocked with tarballs. Hatchlings sticky with oil residue may have a more difficult time crawling and swimming, rendering them more vulnerable to predation.

Fraizer (1980) suggested that olfactory impairment from chemical contamination could represent a substantial indirect effect in sea turtles, since a keen sense of smell apparently plays an important role in navigation and orientation. A related problem is the possibility that an oil spill impacting nesting beaches may affect the locational imprinting of hatchlings, and thus impair their ability to return to their natal beaches to breed and nest (Milton et al. 2003). Whether hatchlings, juveniles, or adults, tarballs in a turtle's gut are likely to have a variety of effects starvation from gut blockage, decreased absorption efficiency, absorption of toxins, effects of general intestinal blockage (such as local necrosis or ulceration), interference with fat metabolism, and buoyancy problems caused by the buildup of fermentation gases (floating prevents turtles from feeding and increases their vulnerability to predators and boats), among others. Also, trapped oil can kill the seagrass beds that turtles feed upon.

Unfortunately, little is known about the effects of dispersants on sea turtles, and such impacts are difficult to predict in the absence of direct testing. While inhaling petroleum vapors can irritate turtles' lungs, dispersants can interfere with lung function through their surfactant (detergent) effect. Dispersant components absorbed through the lungs or gut may affect multiple organ systems, interfering with digestion, respiration, excretion, and/or salt-gland function—similar to the empirically demonstrated effects of oil alone (Shigenaka, G., S. Milton, et al. 2003). Oil cleanup activities can also be harmful. Earth-moving equipment can dissuade females from nesting and destroy nests, containment booms can entrap hatchlings, and lighting from nighttime activities can misdirect turtles (Witherington 1999).

There are studies on organic contaminants and trace metal accumulation in green and leatherback sea turtles (Aguirre et al. 1994; Caurant et al. 1999; Corsolini et al. 2000). Mckenzie et al. (1999) measured concentrations of chlorobiphenyls and organochlorine pesticides in sea turtles tissues collected from the Mediterranean (Cyprus, Greece) and European Atlantic waters (Scotland) between 1994 and 1996. Omnivorous loggerhead turtles had the highest organochlorine contaminant concentrations in all the tissues sampled, including those from green and leatherback turtles (Storelli et al. 2008). It is thought that dietary preferences were likely to be the main differentiating factor among species. Decreasing lipid contaminant burdens with turtle size were observed in green turtles, most likely attributable to a change in diet with age. Sakai et al. (1995) found the presence of metal residues occurring in loggerhead turtle organs and eggs. Storelli et al. (1998) analyzed tissues from twelve loggerhead sea turtles stranded along the Adriatic Sea (Italy) and found that, characteristically, mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals and porpoises (Law et al. 1991). No information on detrimental threshold concentrations is available, and little is known about the consequences of exposure of organochlorine compounds to sea turtles. Research is needed on the short- and long-term health and fecundity effects of chlorobiphenyl, organochlorine, and heavy metal accumulation in sea turtles.

Nutrient loading from land-based sources, such as coastal communities and agricultural operations, are known to stimulate plankton blooms in closed or semi-closed estuarine systems. The effects on larger embayments are unknown. An example is the large area of the Louisiana continental shelf with seasonally-depleted oxygen levels (<2 mg/Liter) is caused by eutrophication from both point and non-point sources. Most aquatic species cannot survive at such low oxygen levels and these areas are known as "dead zones." The oxygen depletion, referred to as hypoxia, begins in late spring, reaches a maximum in mid-summer, and disappears in the fall. Since 1993, the average extent of mid-summer, bottom-water hypoxia in the northern Gulf of Mexico has been approximately 16,000 km^2, approximately twice the average size measured between 1985 and 1992. The hypoxic zone attained a maximum measured extent in 2002, when it was about 22,000 km^2, which is larger than the state of Massachusetts (U.S. Geological Service 2005). The hypoxic zone has impacts on the animals found there, including sea turtles, and the ecosystem-level impacts continue to be investigated.

5.2.5 Conservation and Recovery Actions Benefitting Sea Turtles

NMFS has implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles from commercial fisheries in the action area. These include sea turtle release gear requirements for Atlantic HMS and Gulf of Mexico reef fish and TED requirements for the southeastern shrimp trawl fisheries. These regulations have relieved some of the pressure on sea turtle populations.

Under Section 6 of the ESA, NMFS may enter into cooperative research and conservation agreements with states to assist in recovery actions of listed species. NMFS has agreements with Florida in the Southeast. Prior to issuance of these agreements, the proposal must be reviewed for compliance with Section 7 of the ESA.

Outreach and Education, Sea Turtle Entanglements, and Rehabilitation

NMFS and cooperating states have established an extensive network of Sea Turtle Stranding and Salvage Network (STSSN) participants along the Atlantic and Gulf of Mexico coasts that not only collect data on dead sea turtles, but also rescue and rehabilitate any live stranded sea turtles.

Sea Turtle Handling and Resuscitation Techniques

NMFS published a final rule (66 FR 67495, December 31, 2001) detailing handling and resuscitation techniques for sea turtles that are incidentally caught during scientific research or fishing activities. Persons participating in fishing activities or scientific research are required to handle and resuscitate (as necessary) sea turtles as prescribed in the final rule. These measures help to prevent mortality of hard-shelled turtles caught in fishing or scientific research gear.

A final rule (70 FR 42508) published on July 25, 2005, allows any agent or employee of NMFS, the USFWS, the U.S. Coast Guard, or any other federal land or water management agency, or any agent or employee of a state agency responsible for fish and wildlife, when acting in the course of his or her official duties, to take endangered sea turtles encountered in the marine environment if such taking is necessary to aid a sick, injured, or entangled endangered sea turtle, or dispose of a dead endangered sea turtle, or salvage a dead endangered sea turtle that may be useful for scientific or educational purposes. NMFS already affords the same protection to sea turtles listed as threatened under the ESA [50 CFR 223.206(b)].

On August 3, 2007, NMFS published a final rule requiring selected fishing vessels to carry observers on board to collect data on sea turtle interactions with fishing operations, to evaluate existing measures to reduce sea turtle takes, and to determine whether additional measures to address prohibited sea turtle takes may be necessary (72 FR 43176). This rule also extended the number of days NMFS observers placed in response to a determination by the Assistant Administrator that the unauthorized take of sea turtles may be likely to jeopardize their continued existence under existing regulations, from 30 to 180 days.

Other Actions
A revised recovery plan for the loggerhead sea turtle was completed December 8, 2008 (NMFS and USFWS 2008). The recovery plan for the Kemp's ridley sea turtle is in the process of being updated. Recovery teams comprised of sea turtle experts have been convened and are currently working towards revising these plans based upon the latest and best available information. Five-year status reviews have recently been completed for green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles. These reviews were conducted to comply with the ESA mandate for periodic status evaluation of listed species to ensure that their threatened or endangered listing status remains accurate. Each review determined that no delisting or reclassification of a species status (i.e., threatened or endangered) was warranted at this time. However, further review of species data for the green, hawksbill, leatherback, and loggerhead sea turtles was recommended, to evaluate whether distinct population segments (DPS) should be established for these species (NMFS and USFWS 2007a; NMFS and USFWS 2007b; NMFS and USFWS 2007c; NMFS and USFWS 2007d; NMFS and USFWS 2007e). The Services published a final rule on September 22, 2011, listing loggerhead sea turtles as separate DPSs.

5.3 Factors Affecting Smalltooth Sawfish within the Action Area

Smalltooth sawfish in the action area may be affected by the proposed action. Since the 1990s, the distribution of this species has been limited to peninsular Florida. As with sea turtles, it is unlikely that any sawfish are permanent residents of the action area, but some individuals may be in the area at any given time. BNP contains approximatley 4,825 acres of mangrove shorelines, predominantly red mangroves, which may provide forage and shelter habitat for smalltooth sawfish.

Smalltooth sawfish may travel widely throughout the Atlantic, Gulf of Mexico, and Caribbean Sea. Therefore, individuals found in the action area can potentially be affected by activities anywhere else within their range. Numerous activities have been identified as threats and may affect smalltooth sawfish in their range, and thus the action area. The following analysis examines actions that may affect this species' environment within the action area.

5.3.1 Federal Actions

As stated in Section 3.0 ("Action Area"), the proposed project is located within the boundaries of BNP. The action area for the proposed project includes the area in which construction will take place, as well as the water areas immediately surrounding the construction area.

5.3.1.1 Dredging

Maintenance dredging of canals will continue to occur within the action area. Habitat effects of dredging include the loss of submerged habitats by disposal of excavated materials, turbidity and siltation effects, contaminant release, alteration of hydrodynamic regimes, and fragmentation of physical habitats (SAFMC 1998); (GMFMC 1998); (GMFMC 2005). Cumulatively, these effects have degraded habitat areas used by juvenile and adult smalltooth sawfish.

5.3.1.2 Marine Debris

Smalltooth sawfish are susceptible to entanglements in polyvinyl chloride (PVC) pipe, discarded tires, and other debris items (Seitz and Poulakis 2006). Marine debris may impact smalltooth sawfish by creating entanglement obstacles.

5.3.2 State or Private Actions

State fisheries within the actiona area may effect smalltooth sawfish. Because of their life history (spending early part of their lives in shallow estuarine environments near human populations) and morphology (rostrum), smalltooth sawfish are susceptible to entanglements in marine debris, including lost/discarded fishing gear. Although entanglements in fishing nets are no longer a threat to smalltooth sawfish since their use is prohibited, smalltooth sawfish are still susceptible to entanglements in fishing line, crab and lobster traps.

5.3.3 Other Potential Sources of Impacts to the Environmental Baseline

Stochastic events, such as hurricanes, are common throughout the range of the smalltooth sawfish, especially in the current core of its range (i.e., south and southwest Florida). These events are by nature unpredictable and their effect on the recovery of the species is unknown; however, they have the potential to impede recovery directly if animals die as a result of them or indirectly if important habitats are damaged as a result of these disturbances. Simpfendorfer, C.A., P.R. Wiley et al. (2005) reported on the effects of Hurricane Charley on smalltooth sawfish habitat in Charlotte Harbor. It was unclear if the damage to the mangrove shoreline habitats in Charlotte Harbor had, or would have in the future, negative impacts on its ability to act as a smalltooth sawfish nursery area. Survey and telemetry studies completed and currently underway are assessing the habitat use patterns of juvenile smalltooth sawfish in this region. The impact of the damage to the shoreline mangrove habitats on smalltooth sawfish is likely to depend on which components of the habitat are most important. Simpfendorfer (2003) has also hypothesized that juvenile smalltooth sawfish use the prop roots of red mangroves to help in predator avoidance. In this case, immediate impact may be limited as most of the prop root habitat appeared to remain after the storm, but with high mangrove mortality the decay over time may reduce its availability.

5.3.4 Conservations and Recovery Actions Benefitting Smalltooth Sawfish

Regulations restricting the use of fishing gears known to incidentally catch smalltooth sawfish may benefit the species by reducing their incidental capture and/or mortality in these gear types

In 1994, entangling nets (including gillnets, trammel nets, and purse seines) were banned in Florida state waters. Although intended to restore the populations of inshore gamefish, this action removed possibly the greatest source of fishing mortality on smalltooth sawfish (Simpfendorfer 2002).

Research, monitoring, and outreach efforts on smalltooth sawfish are providing valuable information on which to base effective conservation management measures. Monitoring and research programs for the smalltooth sawfish are ongoing in southwest Florida. Surveys are conducted using longlines, setlines, gillnets, rod and reel, and seine nets. Cooperating fishermen, guides, and researchers are also reporting smalltooth sawfish they encounter. Data collected are providing new insight on the species' current distribution, abundance, and habitat use patterns.

Public outreach efforts are also helping to educate the public on smalltooth sawfish status and proper handling techniques and helping to minimize interaction, injury, and mortality of encountered smalltooth sawfish. Information regarding the status of smalltooth sawfish and what the public can do to help the species is available on the Florida Museum of Natural History and NMFS websites.[7] These organizations and individuals also educate the public about sawfish status and conservation through regular presentations at various public meetings and during interviews with the media.

On January 21, 2009, NMFS published the final recovery plan for the U.S. DPS of smalltooth sawfish. NMFS is implementing recovery actions identified in the plan based on the recovery action's priority and available funding. Additionally, a 5-year review of the species status was published in October of 2010. The 5-year review concluded that the U.S. DPS of smalltooth sawfish remains vulnerable to extinction, and the species still meets the definition of endangered under the ESA, in that the species is in danger of extinction throughout its range. The recovery plan and the 5-year review are available at http://sero.nmfs.noaa.gov/pr/SmalltoothSawfish.htm.

The FWRI is responsible for collecting a wide variety of estuarine and marine fisheries data for the State of Florida (e.g., stock assessments, life history, fisheries-dependent monitoring, and fisheries-independent monitoring). Headquartered in St. Petersburg, the FWRI has seven field laboratories located in East Point, Cedar Key, Port Charlotte, Marathon, Tequesta, Melbourne, and Jacksonville, which conduct estuarine and marine research and monitoring activities in their regions. The fisheries sampling conducted statewide by the State of Florida has the potential to provide a significant amount of data on smalltooth sawfish, especially as recovery of the species progresses and sawfish move beyond their current south Florida range.

The FWCC's Fisheries-Dependent Monitoring Program, in cooperation with NMFS, collects and compiles data on recreational landings, commercial landings, and processed fishery products in Florida. The recreational landings are collected as part of the Marine Recreational Fishing Statistical Survey (also now known as the Marine Recreational Information Program). Data collected from this program can be used to monitor the recovery of the smalltooth sawfish throughout Florida.

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[7] http://www.flmnh.ufl.edu/fish/Sharks/Sawfish/SRT/srt.htm and http://www.sero.nmfs.noaa.gov/pr/SmalltoothSawfish.htm

5.3.5 In-Water Research Projects

In-water projects involving smalltooth sawfish are present in Florida. Scientists from organizations such as FWRI and Mote Marine Laboratory actively conduct research on the biology and ecology of this species. Particular interest has focused on the southwest coast of Florida where a large number of juveniles utilize shallow, euryhaline, mangrove-lined shores for forage and refuge.

5.4 Summary and Synthesis of Environmental Baseline

In summary, several factors are presently adversely affecting elkhorn and staghorn corals, smalltooth sawfish, green, hawksbill, and loggerhead sea turtles in the action area. These factors are ongoing and are expected to occur contemporaneously with the proposed action:

- Interaction with commercial and recreational fishing gear
- Dredge-and-fill activities, including channel dredging and beach renourishment/restoration activities
- Commercial vessel traffic and recreational boating pursuits will continue to result in vessel strike damage to sea turtles and abrasion and breakage due to accidental groundings and poor anchoring techniques
- Runoff containing toxins and pollutants from land-based sources
- Entrainment in the cooling-water systems of electrical generating plants
- Disease outbreaks
- Major storm events
- Upland and coastal activities will continue to degrade water quality and decrease water clarity necessary for coral growth
- Interaction with fishing gear
- Poor diving and snorkeling techniques will continue to abrade and break corals.

These activities are expected to combine to adversely affect the recovery of elkhorn and staghorn corals, sea turtles, and smalltooth sawfish throughout their ranges, and in the action area.

6 Effects of the Action

As described below, NMFS believes that the proposed action may adversely affect elkhorn and staghorn corals, smalltooth sawfish, and green, loggerhead, and hawksbill sea turtles. NMFS also believes the action may adversely affect the ESA-designated critical habitat for *Acropora* corals. Because the action will result in adverse effects to corals, smalltooth sawfish, and sea turtles, we must evaluate whether the action is likely to jeopardize the continued existence of any of these species and/or adversely modify ESA-designated critical habitat.

We have organized the effects determination by species and then by specific components of the GMP. We have also grouped the components to avoid repetition. The components are grouped based on their effects to each species as well as having similar PDCs (see Table 1, Section 2.3). For example, components 6, 8, and 13 all have similar PDCs and effects, therefore they will be evaluated together under a single heading (Effects of installation of channel markers and mooring buoys).

In subsections 6.1 and 6.2 below we analyze proposed activities to identify routes of potential adverse effects to listed species and critical habitat; in subsection 6.3 we then estimate the extent of the adverse effects.

6.1 Effects of the Action on Elkhorn or Staghorn Coral Colonies and their Critical Habitat

We believe that elkhorn and staghorn corals and their designated critical habitat may be adversely affected through recreational and commercial fishing (Component 2), installation of channel markers and mooring buoys (Components 6, 8, and 13), maintenance dredging (Component 7), and vessel groundings and restoration (Component 9). The use of existing marinas and canoe launch areas (Components 5 and 14) and the potential installation of a boardwalk/loop trail (Component 10) would have no effect on *Acropora* spp and critical habitat. The marinas and canoe launch areas are already constructed and the boardwalk/loop trail would be constructed in an area devoid of coral resources as per the PDCs listed in section 2.3, above.

6.1.1 Effects from Commercial and Recreational Fishing (Component 2)

There are several methods used within BNP for commercial and recreational fishing. These include hook-and-line, SCUBA diving, use of roller frame trawls, purse seining (using lampara nets), and use of crab and lobster traps. As part of the FMP, the NPS will seek to establish a marine reserve zone which will extend from Hawk Channel to BNP's eastern boundary and from Pacific Reef north to Long Reef. This will be a no-take zone ecompassing approximately 10,522 acres where commercial and recreational fishing will be prohibited. NPS will need to go through rulemaking in order to establish the marine reserve zone. This could take a considerable amount of time and the specific details regarding size and location may change during this process.

We believe that commercial and recreational diving for spiny lobster and hook-and-line fishing for reef fish and snapper-grouper are not likely to adversely affect *Acropora* spp. and/or their designated critical habitat. The propensity of the commercial/recreational spiny lobster dive fishery to produce fishing-related marine debris is extremely unlikely. Fishery-related marine debris is often created by accidental gear loss due to weather or accidental entanglement with submerged benthic features. Commercial/recreational divers targeting spiny lobster primarily use their hands and/or nets to collect lobster and return to surface with those gears when fishing is completed. Since these gears are constantly used by fishers and never intentionally left behind at the cessation of fishing, we believe the likelihood of gear being lost and becoming detrimental marine debris is extremely unlikely, and therefore discountable.

Novice snorkelers/divers may stand on or kick *Acropora* spp. causing breakage, although there are no studies that document the frequency of this damage. A study conducted by Talge (1992) indicated that weekly touching had no detectable level of impact to the corals. The Cayman Islands Department of the Environment has studied diver impact at mooring buoy sites off of Grand Cayman Island. They determined that those sites with visitation greater than 5,000 divers per year resulted in coral injuries (Cayman Islands Department of the Environment 1994). Data provided by BNP indicates that less than 10 percent of BNP patrons engaged in fishing practices within BNP are diving/spearfishing (approximately 9 people per day on average). Based on this information, we believe that the effects to *Acropora* spp. from divers engaged in commercial and recreational fishing will be insignificant.

A 2001 study of 63 offshore coral reef and hard-bottom sites in the Florida Keys quantified the impacts of lost fishing gear to coral reef sessile invertebrates. Lost hook-and-line fishing gear accounted for 87 percent of all debris (N=298 incidents) encountered and was responsible for 84 percent of the 321 documented impacts to sponges and benthic cnidarians, predominantly consisting of tissue abrasion causing partial individual or colony mortality (Chiappone et al. 2005). Branching gorgonians (Octocorallia) were the most frequently affected (56 percent), followed by milleporid hydrocorals (19 percent) and sponges (13 percent). Because *Acropora* spp. were relatively rare, few impacts from lost fishing gear were noted for these species. In general, the factors affecting the impacts of lost fishing gear include sessile invertebrate density, the density of lost fishing gear, and gear length. It was estimated that <0.2 percent of the available milleporid hydrocorals, stony corals, and gorgonians in the habitats studied were adversely affected in terms of colony abrasions and partial mortality. *Acropora* spp. are equally rare (if not more so) within the BNP, therefore, we believe that effects from hook-and-line fishing will be discountable.

Trawling and other types of fishing gear can be harmful to coral reefs. Trawls can dislodge and abrade corals, and stationary gear such as traps can damage branching corals by breaking branches off as they move across the sea floor or by directly landing on them. This is particularly true in the case of storms that can mobilize traps and often snare buoy lines in branching corals such as *Acropora* (*Acropora* BRT 2005).

Roller frame trawls and lampara nets may be used within BNP. Lampara net fishing gear is selective for surface-oriented fish because the net is less than 8 ft (2.4 m) deep and designed to fish above the substrate. The method of fishing with the shallow lampara nets largely avoids contact with the reef, so corals experience little to no damage. Roller frame trawls can damage coral resources because they roll, across the bottom. However, roller frame trawls are only used on the soft-bottom and seagrass habitats within the Bay because they are ineffective if used over hardbottom habitat. The NPS will also work to establish a trawl-free zone within the Bay as part of their FMP. Therefore, we believe that effects to *Acropora* spp. and designated critical habitat from purse seine nets and roller frame trawls will be discountable.

Traps and/or trap lines can adversely affect *Acropora* via fragmentation or abrasion. Traps may affect *Acropora* via fragmentation and abrasion if they become mobilized during storm events and collide with colonies.[8] Crab traps are only used within the Bay waters over seagrass habitat where the stony crabs live. Crab traps are not used in hardbottom areas. Therefore, we believe that impacts from crab traps will be discountable.

Unlike crabs, spiny lobster tend to use hardbottom areas for foraging/sheltering habitat. Although spiny lobster traps will be deployed on sandy bottom, they are likely to be much closer to hardbottom areas than traps used for crabs. The deployment of spiny lobster traps may adversely affect *Acropora* as traps drop toward the sea floor or when traps are retrieved and pulled to the surface. Abrasion and fragmentation may occur when traps or trap lines contact

[8] Storm events are weather events with sustained winds of 15 knots for 2 days or more (C. Lewis and T. Matthews, FFWCC, pers. comm. to Andrew Herndon, NMFS, 2007)

Acropora during storm events or normal fishing activities. The following discussion summarizes the best available information on how *Acropora* may be impacted by these interactions with lobster trap fishing gear.

Fragmentation and Abrasion

Severe fragmentation can adversely affect sexual reproduction by reducing colonial biomass and/or causing a reallocation of energy away from reproduction toward stabilization, lesion repair, and growth (Van Veghel and Bak 1994, Van Veghel and Hoetjes 1995, Hall and Hughes 1996, Lirman 2000). Colony size in cnidarians[9] is directly correlated to survivorship, growth, and reproduction (i.e., the larger the colony, the greater the survivorship, growth, and reproductive potential) (Connell 1973, Loya 1976, Highsmith 1982, Jackson 1985, Karlson 1986, 1988; Hughes and Connell 1987, Lasker 1990, Babcock 1991, Hughes et al. 1992). Thus, fragmentation caused by spiny lobster trap gear could result in smaller colonies, potentially reducing their overall survivorship, and growth and reproduction potential. Mortality of coral fragments may also occur, eliminating entirely the possibility of asexual regeneration or future sexual reproduction by those fragments.

Fragmented coral colonies also frequently stop producing gametes for a period of time, due to the reallocation of energy mentioned above. Gamete production is likely to resume only once a certain level of growth and/or tissue repair/regeneration has occurred (Lirman 2000). Lirman (2000) found that *A. palmata* coral colonies that suffered fragmentation during Hurricane Andrew did not produce gametes fully three years after the event. Similar shifts in energy allocation from reproduction toward regeneration have been noted in *Montastraea annularis* (Van Veghel and Bak 1994) and other hard coral species (Kojis and Quinn 1985, Szmant 1986, Hughes et al. 1992). Thus, even surviving *Acropora* fragments may be removed from the spawning population for at least some period of time.

Lirman (2000) observed that the survivorship of *A. palmata* fragments was influenced by the type of substrate upon which the fragment settled. Fragments landing atop consolidated harbottom free from sediment cover, such as other *A. palmata* colonies, showed no signs of mortality, while fragments landing on sand showed a 71 percent loss in tissue after four months. As a result, fragments in isolated colonies separated from other hardbottom substrate may have a lower likelihood of survival (T. Matthews, FWCC, pers. comm. 2008). Other studies suggest a similar correlation between substrate type and survivorship in other coral species (e.g., Yap and Gomez 1984, 1985; Heyward and Collins 1985, Wallace 1985, Bruno 1998). The benthic habitat of the Florida Keys consists primarily of seagrass (71 percent) and bare substrate (20 percent) (e.g., sand or mud) (FWCC 2000). Since *Acropora* are highly reliant upon sunlight for nourishment (Porter 1976, Lewis 1977), if fragments are transported into these seagrass areas, their survivorship may be reduced due to shading. Seagrass beds also accrete sediment; any *Acropora* fragments transported into seagrass beds may also be susceptible to burial in sediment.

Abrasion

Abrasion by marine debris or fishing gear such as spiny lobster traps and trap lines can result in the loss of tissue, or tissue and skeleton. The loss of tissue can be partial or complete and the loss of tissue and skeleton can by superficial or extensive (Woodley et al. 1981, Glynn 1990,

[9] *Acropora* are members of the Phylum Cnidaria.

Craik et al. 1990, Hall 1997). The extent and severity of abrasion injuries is dependent upon the duration and frequency of the abrasion events.

The adverse effects to *Acropora* resulting from abrasion injuries are similar to those mentioned above for fragmentation. One of the primary impacts is the reallocation of energy away from reproduction and growth, towards regeneration or repair of the injured tissue and skeleton (Kobayashi 1984, Rinkevich and Loya 1989, Meester et al. 1994, Van Veghel and Bak 1994, Van Veghel and Hoetjes 1995, Hall and Hughes 1996, Hall 1997).

Areas injured by abrasion also provide sites for pathogens to enter and create habitable space for settlement of other organisms (e.g., algae, sponges, or other corals) (Bak et al. 1977, Hall 1997). In many coral species, polyps defend the colony by secreting mucus, discharging nematocysts, or through the production of allelochemicals (Hall 1997). The removal of polyps reduces a colony's ability to protect itself, potentially affecting its survivorship. Abrasion injuries also reduce the surface area available to photosynthesize, feed, and reproduce (Jackson and Palumbi 1979, Wahle 1983, Hughes and Jackson 1985, Babcock 1991, Hall and Hughes 1996, Hall 1997).

The type and severity of an abrasion injury (i.e., tissue or skeleton) affects the amount of time required for healing and the amount of energy that must be allocated for regeneration. Hall (1997) states that the time needed to fully recover from tissue injuries was much faster than the time required to completely regenerate fragmented skeleton. This suggests that the loss of tissue from a branch has less impact to the colony as a whole, than the loss of a branch. Hall (1997) hypothesizes that the replacement/regeneration of soft tissue requires the commitment of fewer resources than the regeneration of skeletal material, thus soft tissue can be replaced more quickly. However, Hall (1997) also observed that the area exposed when a branch is fragmented from the colony often healed more quickly than other soft tissue injuries. This suggests that while the regeneration of a fragmented branch may take considerably longer than healing a soft tissue injury, the colony may be exposed to disease and competitors for less time after branch fragmentation than when the colony is repairing a tissue injury.

Evaluating the Likelihood of Adverse Effects from Lobster Traps and Gear

We looked at the abundance and distribution of *Acropora* colonies within BNP, and the nature, extent and distribution of commercial lobster trap fishing, to determine whether the potential effects discussed above are likely to be more than insignificant or discountable to listed coral species.

Acropora Population Abundance and Location within BNP

The FWCC has conducted research to identify the presence and location of *Acropora cervicornis* and *Acropora palmata* colonies within BNP (Figure 4) (Katherine Wirt, pers. comm. May 30, 2012). According to this data, there are 3 known colonies of *A. palmata* and 69 known colonies of *A. cervicornis* within BNP. Throughout BNP there are approximately 72,000 acres of coral reef habitat. Based on the data provided in Figure 4 (below) we can estimate that there are 0.009 colonies of *A.cervicornis* and $4.16x10^{-5}$ colonies of *A. palmata* per acre of reef tract.

Estimated Fishing Effort

Data provided from creel surveys completed within BNP between 2000 and 2012 show an average of 91 boat trailers per day at the Homestead Bayfront Marina. While this survey is heavily biased towards the weekends, with fewer trailers per day during the average weekday, it only represents one of the five marinas within BNP. The other marinas likely have equal or higher numbers of trailers (pers. comm. Vanessa McDonough, NPS). Therefore, we believe that an estimate of approximately 91 trailers per day is reasonable. Ault et al. (2008) estimated that, on average, 31 percent of the vessels within BNP are engaged in some type of fishing. Further data provided from the creel surveys indicates that approximately 90 percent of those engaged in recreational fishing are doing so via hook-and-line and the remaining 10 percent through SCUBA diving. SCUBA divers usually dive in groups or at least in pairs, since the buddy system is a standard safety measure for any type of diving; therefore we estimate 2-4 divers per vessel. Based on these data, our best estimate of the number of people recreationally diving for lobster is 6-12 divers per day (0.31 X 91 trailers = 28.21 vessels involved in fishing X 0.10 = 3 vessels involved in SCUBA diving X 2-4 divers per vessel = 6-12 divers per day) during lobster season (August 6-March 31). The creel surveys did not include any data on commercial spiny lobster trapping.

Commercial fishers within BNP must have a special permit. The number of permitted commercial fishers within BNP has decreased steadily from 111 in 2003 to 49 in 2009 and is expected to drop even further under the new FMP because permits will be nontransferable. We believe that commercial fishing trends will be similar to recreational fishing trends within BNP (most will be hook-and-line fishing for snapper while a small percentage will be SCUBA diving for lobster).

Commercial spiny lobster trapping within Florida is regulated using trap certificate permits, which means that each trap corresponds to a single certificate. This allows regulators to control the amount of effort by controlling the total number of traps being used. According to the FWCC, there are currently 282 active permits for spiny lobster trapping within Miami-Dade County (Carolyn Champion, FWCC, pers. comm., May 29, 2012). Each permit can correspond to multiple trap certificates. The number of active certificates currently ranges from 2 to 4,693 per permit. Those permit holders with a large number of certificates are most likely big commercial trapping operations. These types of operations are not likely to be operating within BNP given the proximity to the lobster sanctuary and additional restrictions placed on trapping, as well as the shallow water depths within BNP (spiny lobster are generally more common in deeper waters). We believe that most of the lobster trapping occurring within BNP is conducted by smaller commercial and recreational trapping operations, therefore we will use the median of 301 certificates per permit holder to estimate the number of traps used within BNP. Much of the waters within BNP are a part of Biscayne Bay, which is a lobster sanctuary where spiny lobster fishing is prohibited. This further limits the number of lobster traps within BNP. Given that there are only 49 commercial fishing permits valid for use within BNP and that the majority of fishing (approximately 90 percent) is hook-and-line, we believe that there are approximately 5 active spiny lobster permits (10 percent of 49 permits) being used within BNP. If we use the median of 301 trap certificates per permit, we can estimate that there are approximately 1,505 spiny lobster traps within BNP.

We believe it is extremely unlikely that there will be impacts from deployment and retrieval of buoyed spiny lobster traps on any of the known colonies of *Acropora* within BNP. The NPS will be working with FWCC to establish trap-free zones near coral reef habitat of particular concern. These will be zones will be maintained through a voluntary compliance by trappers; however, BNP believes that there are so few people using traps within the park that it will not be difficult to maintain their voluntary compliance with these zones. Given that the location of the *Acropora* colonies within BNP have been mapped, it should be easy to include them into the trap-free zones to reduce the chance that they will be impacted by lobster traps. If we divide the 1,505 traps across the 72,000 acres of reef habitat we can estimate that there are approximately 0.02 traps per acre. The extremely low trap density makes it even more unlikely that a trap would come into contact with an *Acropora* colony.

Given the low number of known *Acropora* colonies within BNP as well as their location along the outer reef at the eastern boundary of BNP, the low density of traps within BNP, and BNP's intention to include trap-free zones, we believe that impacts from deployment and retrieval of buoyed spiny lobster traps will be discountable.

A number of traps (up to 20 percent) are lost annually due to storm events, accidental cut-offs, etc., where the buoy is lost and fishers can no longer locate the trap. We refer to these unbuoyed, lost traps as 'derelict traps'. Lewis et al. (2010) evaluated the impacts of trap mobilization on coral reef habitat during storm events. They observed that the mean area of impact from an individual unbuoyed spiny lobster trap was 0.75 square meter at both 4 and 8 m depths (the depth where most of the *Acropora* corals are found within BNP). The study also noted an annual average of 18 non-tropical storm events. It is worth noting that these estimates of annual storm events do not include the impacts of tropical storms or hurricanes. We believe that derelict traps may adversely affect *Acropora* when they mobilize during storm events.

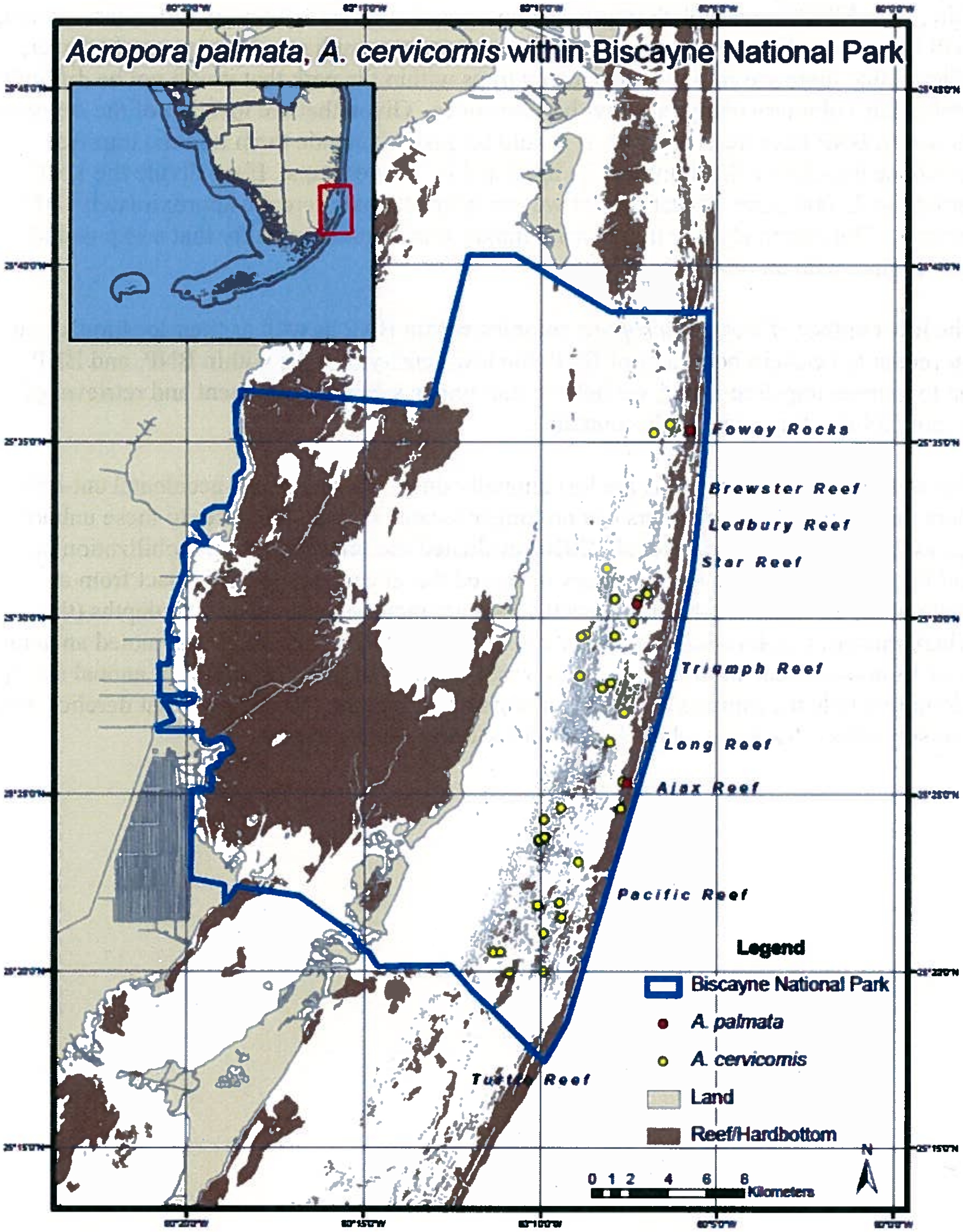

Figure 4. *Acropora cervicornis* and *Acropora palmata* colonies within BNP.

Acropora Critical Habitat

The physical or biological feature of *Acropora* critical habitat essential to its 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 hardbottom or dead coral skeleton that is free from fleshy macroalgae cover and sediment cover, occurring in water depths from the mean high water (MHW) line to 30 meters (98 feet). In our rule designating critical habitat for elkhorn and staghorn corals, we identified a range of activities that have the potential to adversely affect the essential feature, including include, but are not limited to, dredging and disposal, beach renourishment, large vessel anchorages, submarine cable/pipeline installation and repair, oil and gas exploration, pollutant discharge, and oil spill prevention and response.

Commercial/recreational hook-and-line fishing for yellowtail snapper and commercial/recreational diving for spiny lobster does not affect the essential features identified for *Acropora* critical habitat, or occurs so rarely that any effect on the essential features is discountable. Commercial trapping may affect *Acropora* critical habitat, but any effects will be temporary and insignificant. While commercial trapping does occur in areas where the essential features are present, the proposed action will not adversely affect the physical or biological features essential for conservation (i.e., suitable substrate). Traps do not cause consolidated hardbottom to become unconsolidated, nor do they cause growth of macroalgae or cause sedimentation. For these reasons, we believe the annual deployment of traps will have no effect on consolidated hardbottom, macroalgal growth, or sedimentation, and we do not expect any cumulative effects from trap deployment year after year. A trap could temporarily cover an area with the desired physical or biological characteristics. However, once a trap is retrieved the area it covered immediately becomes available. Therefore, we believe that trap impacts to *Acropora* critical habitat will be temporary and of such limited scope, that any adverse effects will be insignificant.

We believe that adverse effects to dead coral skeletons from spiny lobster trap fishing are discountable. No estimates are available regarding the area of dead coral skeletons in the action area. Therefore, to evaluate the impact of trap fishing on dead coral skeletons, we assumed dead coral skeletons suitable for *Acropora* larvae settlement covered each square meter of critical habitat. While we believe this circumstance is extremely unlikely to exist, this allowed us to make the most conservative estimate of impacts. Even under this highly unlikely set of conditions, less than 0.001 percent of dead coral skeletons would be adversely impacted annually by trap mobilization and fishing. This suggests that the rates of interaction between traps and dead coral skeletons are incredibly low even in this unlikely, but conservative, scenario. Under conditions more representative of the natural environment, we believe trap impacts to dead coral skeletons would be orders of magnitude lower. Thus, we believe any adverse effects to dead coral skeletons from spiny lobster trap fishing are discountable.

6.1.2 Effects from Channel Marking and Mooring Buoy Installation (Components 6, 8, and 13)

Installation of mooring buoys and channel markers could result in impacts to portions of *Acropora* spp. and their designated critical habitat. These impacts would be equal to the diameter of the anchor being installed. Channel markers will be used to delineate the proposed marine reserve area in the event that it is approved and implemented following rule making. NPS will install signs on existing channel markers wherever possible and all new markers will be installed in sandy bottom. No new channel markers will be installed in hardbottom. NPS will also install mooring buoys using anchor pins which have a much smaller impact diameter than other anchors (the only impact being from the size of the drillbit, approximately 1.5 inches in diameter). Due to the small size of the anchor pins their installation would affect an extremely small percentage of the existing habitat. Even if NPS installed 100 mooring buoys it would only result in the loss of approximately 1 square foot of critical habitat (the number of buoys installed is expected to be much lower than 100). Installation of mooring buoys would be beneficial to *Acropora* spp. because it would prevent boaters from anchoring directly on the coral and/or its critical habitat. The channel markers and mooring buoys would be installed according to the PDCs (see Table 1, Section 2.3) and a formal, detailed plan will be submitted to NMFS for a second tier review prior to any installation. Therefore, we believe that effects to *Acropora* spp. would be discountable and that the loss of the extremely small area of habitat containing the essential feature, though a permanent loss and thus an adverse effect, is infinitesimal..

6.1.3 Effects from Maintenance Dredging (Component 7)

We believe that maintenance dredging will not adversely affect *Acropora* spp. or their designated critical habitat. Maintenance dredging will only be permitted within the existing channels within BNP (Intracoastal Waterway, Black Point Marina Channel, Homestead Bayfront Marina Channel, and Turkey Point Channel). These channels have been previously dredged and do not contain the PCE for *Acropora* critical habitat. No new dredging would be permitted anywhere within BNP. Depth limits for dredging would be enforced, not to exceed the previously authorized design depths (7-12 feet within the Intracoastal Waterway, 4.5 feet within the Black Point Marina and Homestead Bayfront Marina Channels, and 7.5 feet within the Turkey Point Channel). All dredging will conform to the PDCs (see Table 1, Section 2.3), including use of turbidity curtains. Therefore, we believe that effects from maintenance dredging will be discountable.

6.1.4 Effects from Vessel Groundings and Subsequent Restoration Procedures (Component 9)

The purpose of restoration is to avoid unnecessary mortality of corals injured by vessel groundings and to return conditions, as much as possible, to a pre-disturbance baseline which would benefit these species and the critical habitat upon which they rely.

The restoration plan includes a first response component (emergency restoration) that allows NPS staff to rescue and restore corals soon after the incident, and a longer-term response that may result in the enhancement of acroporid corals and *Acropora* critical habitat at each grounding site. The specific effects of each restoration action outlined in this programmatic opinion are discussed below. First response emergency restoration activities are meant to aid injured corals and stabilize the habitat upon which corals rely. These activities typically include: handling individual corals or fragments, coral branch or colony reattachment, and the removal of fouling substances, all of which are covered by the 4(d) rule. In addition, other types of activities conducted during first response restoration may include the sealing of cracks or fissures and stabilizing displaced substrates; these techniques are not included in the 4(d) rule, but are not likely to adversely affect acroporid corals, as discussed below. Reattachment of branches or colonies usually involves the use of epoxy or cement, with mechanical devices such as cable ties being used less often.

Long-term restorations of grounding sites are aimed at not only providing aid to injured corals (i.e. reattachment or removal of fouling substances), but also restoring and enhancing the substrates upon which the corals rely. This may involve the sealing of fractures, addition of boulders or artificial structures to stabilize the substrate, or the removal/relocation of rubble. Such methods are not covered by the 4(d) rule, but if performed carefully are unlikely to cause adverse effects to corals. Typically, monitoring is also associated with long-term restorations.

NMFS believes that, overall, restoration activities directed at *Acropora* spp. and *Acropora* critical habitat in BNP, conducted under the guidance of NPS, will have beneficial long-term effects to these species. In our evaluation of restoration projects eligible for the export and take exemptions from the ESA Section 9 prohibitions extended by the ESA 4(d) regulations for elkhorn and staghorn corals, NMFS found that the coral restoration conducted under the guidance of the NPS within BNP would provide for the conservation of these species.

1. **No active restoration/No monitoring:** Leave injured site as is with no restoration and no monitoring

Potential Effects on Acroporid Corals

When restoration funding is not available or when safety or other constraints are a concern, no action will be taken following vessel groundings. Under this approach coral reefs would have to recover naturally which may take longer than active restoration and may result in further deterioration of the coral reef due to storm events or high current velocities. NMFS believes this action would have no effect on protected coral species, and may be used anytime without consultation.

Potential Effects on Designated Critical Habitat for Acroporid Corals

Designated critical habitat for acroporid corals can be found in Biscayne Bay (50 CFR 226.216 (b)). NMFS has identified the following essential feature for the conservation of staghorn and elkhorn corals: substrate of suitable quality and availability to support larval settlement and recruitment, and reattachment and recruitment of asexual fragments. Taking no restoration action following a vessel grounding will not affect the essential feature.

2. **Monitoring only:** Collect quantitative and qualitative data about the biological recovery at grounding sites including photographs and direct measurements of injuries.

Potential Effects on Acroporid Corals

Monitoring of coral recovery can be used as a stand-alone method or in conjunction with other restoration methods. Under this action, corals affected by the vessel groundings would be monitored via direct measurements or photo-documentation for recovery over time. Duration of monitoring is dependent upon whether other restoration actions are used to augment recovery. Natural recovery could take longer and thus increase the duration of monitoring. NMFS believes that measurement or photo-documentation of individual corals or coral colonies may affect, but is not likely to adversely affect protected acroporid corals as any effects would be insignificant. None of the tools or methods used during these activities requires the permanent removal of tissues (i.e., polyps and/or branch tip fragments) or permanent attachment of materials to coral colonies, except for some coral colony markers. Markers attached directly to coral colonies are rarely used, and in the past, coral colonies have shown rapid tissue overgrowth of the marker. Given the temporary and superficial nature of these activities, it is not likely that elkhorn or staghorn coral colonies will be injured or killed by the monitoring and measuring activities mentioned above. This method may be used during either first response or long-term restoration.

Potential Effects on Designated Critical Habitat for Acroporid Corals
Monitoring activities following a vessel grounding will not affect the essential feature of designated critical habitat for *Acropora* corals.

3. **Reattach biota:** Reattach coral fragments or colonies disturbed by the grounding incident, and/or transplant species from nearby sources to the site.

Potential Effects on Acroporid Corals
The reattachment of biota is a method by which dislodged coral fragments from a grounding site or a nearby donor site are attached to bare substrates at the site of the disturbance. If acroporid corals were present before the grounding incident, this action will involve the collection and manipulation of protected elkhorn or staghorn coral to restore the site to pre-disturbance conditions. As discussed in Section 2.1 of this opinion, the collection of *Acropora* coral is considered a directed take of a protected species. However, under the restoration exception of the 4(d) rule, aid may be given to ESA listed corals if done under an existing legal authority. Therefore, under the PSRPA, the collection and reattachment of injured listed corals (live broken fragments at the impacted site or injured fragments from nearby colonies) is excepted from take prohibitions. The use of existing broken fragments of *Acropora* corals may be employed during either first response or the long-term restoration.

Permitted collection of naturally-available unattached fragments will have positive and negative effects on the species. Collected asexual fragments are reattached to appropriate substrate during restoration using a variety of methods. As identified in the life history of elkhorn and staghorn corals (Section 4.2.1) section of this opinion, these species have rapid growth rates and high potential for propagation via asexual fragmentation. Asexual fragmentation of wild elkhorn and staghorn coral colonies is the dominant mode of reproduction and results naturally from storm events (i.e., tropical storms and hurricanes). Highsmith (1982) describes fragmentation as an adaptive process for several reasons, including increased survival due to large size of offspring compared to a sexually produced offspring.

Fragments may be reattached and transplanted using epoxy, cement, or mechanical devices (e.g., plastic cable ties). Lindahl (2003) conducted a study on the effects of artificial stabilization and mechanical damages and found that coral fragments were not significantly affected by skilled handling. Furthermore, artificial reattachment and stabilization of fragments increases the likelihood of fragment survival by reducing mortality due to abrasion and additional breakage (Lindahl 2003). These stabilized, and likely monitored, fragments have a high probability for survivorship and for growing into coral colonies, which may contribute to an increase in numbers, reproduction, and distribution of elkhorn and staghorn coral colonies.

NMFS believes that the reattachment of coral colonies using epoxy, cement, or mechanical anchoring devices (e.g., plastic cable ties, metal threaded rods) will have a positive effect on acroporid corals through the establishment of new colonies to replace colonies destroyed by the event that damaged the reef. NMFS believes that the survival and reproductive output of elkhorn or staghorn coral colonies may be increased by biota reattachment in BNP, assuming that most of the transplants survive.

Potential Effects on Designated Critical Habitat for Acroporid Corals
Reattachment of biota following vessel groundings will not affect the essential feature of designated critical habitat for acroporid corals.

4. **Biological seeding:** Collect larvae during spawning events, maintain under laboratory conditions, and subsequently deploy within a mesh enclosure directly over the injured areas.

Potential Effects on Acroporid Corals
As discussed previously in section 2.1, this technique involves directed take (collection) of coral that cannot be authorized in the incidental take statement of this biological opinion. Such take may qualify for the scientific research/enhancement exception to the 4(d) rule, or would require an ESA Section 10 permit prior to implementation. If these techniques are used for a site-specific restoration then the NPS will need to initiate a second tier consultation and provide NMFS with documentation of either a Section 4(d) exception of an ESA Section 10 permit to authorize the take. In either case, since the take is a potential effect of NPS' proposed action, we will include those effects in our jeopardy analysis for this opinion.

Biologically seeding vessel grounding sites may have beneficial effects for *Acropora* spp. Collected gametes and larvae can be deployed in mesh bags directly over suitable habitat to encourage settlement. However, conditions onsite may not be optimal for larval recruitment thus impeding settlement success. To address this problem, attractants can be added to natural or artificial substrates to further promote settlement (Morse and Morse 1996), but it is unknown how elkhorn and staghorn larvae respond to these attractants. We believe the promotion of larval settlement could have beneficial effects for acroporid corals and the reef in general as it would stabilize the substrate and speed recovery; however, there is a lack of data to confirm our opinion.

NMFS believes that the collection of elkhorn or staghorn coral gametes may affect these species through a reduction in gamete biomass at a given location. However, the gametes will be collected with the intention of releasing them over available suitable habitat which may ultimately prove beneficial if the gametes develop into larvae, settle, and survive. Gametes are collected with nets, which are temporarily placed (< 24 hours) over spawning coral colonies. The nets are typically secured to the seafloor using nails, and larvae produced from collected gametes are typically released to the field after settlement or reaching the planktonic stage. Annual egg production in *A. palmata* and *A. cervicornis* populations studied in Puerto Rico was estimated to be 600 to 800 eggs per square centimeter of living coral tissue (Szmant 1986). As discussed in the "Life History" portion of Section 4.3, the estimated size at puberty for *A. palmata* was 1600 cm^2, and for *A. cervicornis* was 17 cm in branch length (Soong and Lang 1992). Therefore, an elkhorn coral colony at puberty will produce approximately 1 million eggs, and a staghorn coral colony at puberty (with branches approximately 0.25 to 1.5 cm in diameter) will produce approximately 70,000 eggs per branch. There are an estimated 1.6 million ± 1.4 million (± 95% confidence interval) elkhorn coral colonies and 13.7 million ± 12.0 million (± 95% confidence interval) staghorn colonies along the Florida Keys Reef Tract (from Key West to Fowey Rocks). These estimates are based on data gathered during the 2007 synoptic survey conducted by the University of North Carolina – Wilmington (Miller et al. 2008). Even at the low end of the confidence interval for these estimates, the number of gametes released during an annual synchronous spawning event is enormous, and the collection of gametes from individual colonies will result in the removal of an insignificant number of gametes from the total number spawned.

Furthermore, successful fertilization is dependent on the random chance that an egg and a sperm from colonies of separate genets (i.e., two colonies that are not clones of each other) will "find" each other in the water column. If fertilization occurs, then embryonic development culminates with the development of planktonic larvae called planulae. Planulae presumably experience considerable mortality (up to 90 percent or more) from predation or other factors prior to settlement and metamorphosis (Goreau et al. 1981). These factors influence the success rate for sexual reproduction in elkhorn and staghorn corals, and as stated in the final listing rule for these species, sexual recruitment is limited in some areas and unknown in most; fertilization success from clones is virtually zero; and settlement of larvae is often unsuccessful, given limited amount of appropriate habitat (71 FR 26852, May 9, 2006). Last, because collected gametes are typically released to the field after settlement or reaching the planktonic stage, there is increased potential for these larvae and planulae to survive and grow into coral colonies. Thus, the collection of gametes may result in an increase, though immeasurable, in reproductive output of elkhorn and staghorn corals.

Potential Effects on Designated Critical Habitat for Acroporid Corals

The collection of gametes and the seeding of substrates following vessel groundings may affect, but is not likely to adversely affect designated *Acropora* spp. critical habitat. Gamete collection devices may be anchored to the substrate with nails or weights to temporarily capture gametes, but effects to critical habitat from these techniques will be insignificant. Additionally, substrates could be modified to encourage larval settlement through the addition of natural or artificial substrates that contain attractants, but such additions would be beneficial.

5. **Remove bottom paint/fouling substance from reef:** Remove surficial portion of substrate with toxic material and dispose.

Potential Effects on Acroporid Corals

Bottom paint and other antifouling substances resulting from vessel groundings can introduce harmful chemicals directly to reef biota or indirectly through the degradation of water quality. These paints pose a significant ecological risk as they contain biocides specifically designed and chosen to prevent settlement and growth of algae and invertebrates. A study by Jones (2007), indicates that chemical analyses of the surficial sediments at an impact site from a cruise ship grounding in Bermuda clearly showed evidence of contamination by the copper and zinc-containing antifouling paint used on the cruise ship's hull. These chemicals can result in tissue toxicity involving injury, illness or death to coral species including *Acropora* spp. The removal of paints and other fouling substances from grounding site surfaces can reduce the impact of toxic contaminants on elkhorn and staghorn corals. Methods to eliminate toxic substances include scraping with hand tools, and the removal of fouled rubble or surficial portions of substrate. Surficial scraping may temporarily affect corals or substrates through tissue abrasion or by secondary dispersal of toxic materials caused by removal activities. In the long term, however, effects would be beneficial through the reduction/elimination of poisonous chemicals that cause tissue toxicity. This technique may be used during either first response actions or long-term restoration.

Potential Effects on Designated Critical Habitat for Acroporid Corals
The removal of bottom paints and other fouling substances following vessel groundings may affect designated *Acropora* spp. critical habitat. However, the elimination or reduction of toxic chemicals can be beneficial by improving water quality and providing suitable substrates for reattachment of fragments or future coral recruitment.

6. **Seal fractures:** Clean and roughen opposing substrate surfaces, work cement or epoxy into visible fissures and cracks, and seal fractures.

Potential Effects on Acroporid Corals
Breaks, cracks, or ruptures in the reef matrix can result from vessel collisions. These fractures can result in additional coral breakage and further erosion of unconsolidated substrates. The objective of this method is to stabilize the substrate by sealing fractures, thus preventing further damage to the reef and providing a stable substrate for coral recruitment. Fractures can be sealed using a variety of techniques. The most common involves the use of bonding agents such as cement or epoxy to fill the cracks. Larger fractures can first be filled with rubble or foreign materials prior to being capped with cement or epoxy. Fiberglass anchor rods or steel rebar can also be used to stabilize large fractures, whereby holes are drilled into adjacent stable substrate to accommodate the rods, before being filled with bonding agents. Trained divers would complete the work by hand and may affect protected species through incidental contact or the spilling of adhesive materials, but these effects would be discountable and/or insignificant. Any effects would be temporary while the divers are completing the restoration. These methods may be used during first response or long-term restoration.

A final approach for sealing fractures involves the use of electro-accretion, a relatively new technology that utilizes low-voltage electricity through seawater to promote mineral accretion. First described by Hilbertz and others in the 1970s, electrochemical deposition occurs when calcium and magnesium from seawater precipitate primarily as calcium carbonate on a cathode when low-voltage power is supplied between electrodes (Treeck and Schuhmacher 1997). Past experiments have used metal mesh (chicken wire) or grids of rebar as the cathode on which calcium carbonate forms (Treeck and Schuhmacher 1997, Schuhmacher et al. 2000). Biorock™ (a brand of electro-accretion structures) is reported to bond to hardbottom substrates (Global Coral Reef Alliance 2005) which would allow opposing substrate surfaces to bond across fractures. Although this technology has been used in restoration projects around the world and has been fairly successful in promoting *Acropora* coral growth (Goreau et al. 2004, Schuhmacher et al. 2000), a research project by Borell et al. (2010) indicated that this method should be used with caution as *Acropora yongei* was adversely affected by the method. Since no work has been conducted using this method on elkhorn or staghorn corals along the Florida Reef Tract, we must err on the side of caution and assume this method could adversely affect elkhorn or staghorn corals. In their Final PEIS, NPS states that "electro-accretion is an experimental technology that requires further practical evaluation prior to use by the NPS. As with any experimental approach or new technology, as more information becomes available, the NPS will evaluate it on a case-by-case basis for use on BNP resources." (FEIS at B-4). Therefore, this technique is only suitable for use in long-term restorations after project-specific consultation with NMFS on its use as described in a site specific restoration plan to include measures to avoid harm to the listed corals and their critical habitat. Use of this technique in a manner that would involve take of the listed corals, or adverse effects to their critical habitat, is not authorized under this programmatic opinion and would require independent Section 7 consultation with NMFS.

Potential Effects on Designated Critical Habitat for Acroporid Corals
The sealing of fractures following vessel groundings may affect designated *Acropora* spp. critical habitat. The use of bonding agents, such as concrete or epoxy and electro-accretion techniques to seal cracks and fractures can be beneficial by stabilizing substrates. This reduces the likelihood of further damage to corals and helps sustain suitable hard bottom habitat for reattachment of fragments or future coral recruitment. The use of fiberglass or steel anchor rods may affect the hard substrate as holes need to be drilled, but the amount of damage caused by this action is insignificant. Therefore, NMFS believes the restoration method "seal fractures" is not likely to adversely affect *Acropora* spp. critical habitat.

7. **Stabilize displaced substrate:** Reestablish topography by placing displaced substrate or non-native materials in natural reef depressions

Potential Effects on Acroporid Corals
Vessel groundings can break apart the reef, producing large amounts of unconsolidated reef substrate materials. This translates to an alteration of reef topography and a reduction of both habitat stability and complexity. Unconsolidated substrates can also cause collateral biological damage from burial and abrasion of associated biota. Therefore, following vessel groundings on reef environments, it is necessary to stabilize the displaced substrates to prevent further reef injury and to reconstruct the reef topography. This method of restoration involves: (1) the use of bonding agents such as cement and epoxy, or mechanical anchoring devices to stabilize the reef; (2) moving displaced substrates back into place on the reef; and (3) the addition of quarried limestone boulders to recreate 3-dimensional structure. Restoration actions may require the use of divers in the water and crane-mounted barges on the surface.

NMFS believes that the stabilization of displaced substrates or coral colonies using epoxy, cement, or mechanical devices (e.g., plastic cable ties) will have positive effects on elkhorn and staghorn coral colonies. The stabilization of substrates will prevent unconsolidated substrates from rubbing up against or burying nearby acroporid corals. Although surviving elkhorn and staghorn corals could be affected during the restoration process if bumped by divers or construction equipment, through spilled adhesive materials, or through decreased water clarity while boulders or substrates are moved into place, we feel these temporary effects are insignificant and/or discountable. Over the long term, effects will be beneficial, by preventing further damage to living corals and maximizing preservation of recruitment habitat. NMFS concurs that the technique of moving displaced substrates back into place is appropriate for first response or long-term restoration; however, techniques involving the addition of quarried limestone would need to be outlined in a site-specific restoration plan and can only be used during long-term restoration, after project-specific consultation as described in this opinion.

Potential Effects on Designated Critical Habitat for Acroporid Corals
The stabilization of displaced substrates or the recreation of reef topography following vessel groundings may affect designated *Acropora* spp. critical habitat. Bonding agents such as concrete or epoxy have been used extensively in the past to stabilize substrates and should cause no adverse effects to *Acropora* spp. critical habitat, but rather enhance the substrate for coral fragment reattachment or future coral recruitment. Moving substrates or adding limestone boulders would increase the structural complexity of the reef, providing suitable substrate for larval settlement and recruitment. Although there is a chance that these boulders or substrates could move and adversely affect *Acropora* spp. critical habitat, it is unlikely given that smaller substrates and boulders will be bonded in place and large boulders will be of sufficient size and weight to resist movement; therefore, these effects are discountable.

8. **Stabilize displaced substrate with artificial structures:** Use fabricated artificial structures (e.g., articulated mats, Reef Balls™) to mimic naturally-occurring outcrops.

Potential Effects on Acroporid Corals
Vessel groundings can break apart the reef, producing large amounts of unconsolidated reef substrate materials. This translates to an alteration of reef topography and a reduction of both habitat stability and complexity. Unconsolidated substrates can also cause collateral biological damage from burial and abrasion of associated biota. Therefore, following vessel groundings on reef environments, it is necessary to stabilize the displaced substrates to prevent further reef injury and to reconstruct the reef topography. This method of restoration can involve the use of artificial structures to stabilize displaced substrates and to add structural complexity to the topography. A variety of artificial structures can be used including prefabricated molded concrete, reinforcing steel or fiberglass, and structures such as EcoReefs™ or Reef Balls™. Other structures can be fabricated in situ. While adding structural complexity to the reef is important for the restoration of coral reefs, it is not known how each type of structure will affect elkhorn and staghorn corals. Structures need to be large enough and heavy enough to withstand the high-energy environment where corals are located. While large cement structures typically achieve this, it is not definitively known how stable EcoReefs™, articulated mats, or other artificial structures can be. Megan Johnson of The Nature Conservancy reported breakage of EcoReefs™ at sites where these were used in the Florida Keys, particularly in high-energy environments (pers. comm. to Audra Livergood). Similarly, Schmahl et al. (2006) indicated articulated mats moved and broke apart following the passage of a Category I hurricane in the Florida Keys.

Unstable structures and fragments can negatively impact nearby elkhorn or staghorn coral colonies through direct breakage or abrasion. It is NMFS' opinion that the method of stabilizing displaced substrate with artificial structures could result in adverse effects to protected *Acropora* coral species. The NPS recognized these issues in their response to comments on the DEIS: "The NPS is aware of past issues associated with the use of articulated concrete mats; however, such use can be a viable method for stabilizing sediment within certain engineering parameters. The NPS will ensure that appropriate stability analyses and engineering evaluations are performed prior to implementing this method." (FEIS at B-5 – B-6). This restoration technique is only appropriate for use in long-term restorations and any site-specific restoration plans proposing the use of these methods will require the stability analyses and engineering evaluations discussed by NPS, project-specific consultation, and continued monitoring.

Potential Effects on Designated Critical Habitat for Acroporid Corals
The stabilization of displaced substrates using artificial structures following vessel groundings may affect designated *Acropora* spp. critical habitat. Using artificial structures to recreate topographic complexity would improve a reef's substrate quality, thus supporting transplants and larval recruitment; however, if these structures are not stable, they could result in damage to the critical habitat, by breaking apart consolidated substrates or unearthing unconsolidated sands. As noted above, coral researchers have indicated that some of these artificial structures are not stable or strong enough to safely be used in restoration. NPS is aware of this potential instability and will require site-specific stability analyses with long-term restoration plans prior to any use.

9. **Stabilize rubble:** Stabilize and/or relocate rubble onsite to more stable locations, and use barge, crane, and diver assistance to place concrete blocks of articulating mats to stabilize rubble.

Potential Effects on Acroporid Corals
Vessel groundings can break apart the reef, producing large amounts of unconsolidated reef rubble. Unconsolidated rubble can cause collateral biological damage from burial and abrasion of associated biota. Therefore, following vessel groundings on reef environments it is necessary to stabilize the rubble to prevent further reef injury. This method of restoration can involve the relocation of rubble onsite and securing rubble using cement, epoxy, or artificial structures. Rubble located in high-energy areas would be relocated to lower-energy areas onsite, or used to fill blowholes or fractures. This would prevent the rubble from becoming mobile and injuring adjacent corals. In areas where large amounts of rubble are present, cement can be used to bind rubble together into a cohesive unit. In these circumstances, any rubble pieces are pressed into the concrete, creating rugosity and a more natural surface area. The introduction of sponges can be a more natural approach to stabilizing rubble but it is a technique that yields a slower return. A final alternative is to place artificial structures such as quarried limestone boulders or articulated mats over the rubble fields to stabilize the substrate. Structures need to be large enough and heavy enough to withstand the high-energy environment where corals are located. While large cement structures typically achieve this, it is not definitively known whether articulated mats can be stable enough. Schmahl et al. (2006) indicated articulated mats moved and broke apart following the passage of a Category I hurricane in the Florida Keys. Unstable structures and fragments can negatively impact nearby elkhorn or staghorn coral colonies through direct breakage or abrasion.

It is NMFS' opinion that stabilizing rubble using the techniques presented above, with the exception of using articulated mats, would have wholly beneficial effects for elkhorn and staghorn coral. However, as discussed in Section 8 above, articulated mats could result in adverse effects to protected *Acropora* coral species if they were to break apart and any proposed use of this technique in a long term restoration plan would require accompanying stability and engineering analyses. The removal or relocation of rubble, and the use of cement or epoxy to stabilize rubble are appropriate for use during first response or long-term restoration. The methods of adding boulders, sponges, or articulated mats are appropriate for long term restorations and must be described in a site-specific restoration plan submitted to NMFS for project-specific consultation under this opinion prior to use.

Potential Effects on Designated Critical Habitat for Acroporid Corals
The stabilization of rubble following vessel groundings may affect designated *Acropora* spp. critical habitat by producing a substrate of suitable quality to support larval settlement and recruitment. Relocating rubble to lower energy areas will keep rubble from negatively affecting stable substrates. Using artificial structures to stabilize rubble would improve a reef's substrate quality, thus supporting transplants and larval recruitment; however, if these structures are not stable, they could result in damage to the critical habitat. The use of a bonding agent or quarried limestone boulders would stabilize the substrate and provide 3-dimensional habitat suitable for larval recruitment or coral fragment reattachment. In contrast, articulated mats have been shown to break apart and become mobile during storm events, which could cause adverse impacts to designated *Acropora* spp. critical habitat. Therefore, the choice of artificial substrate may ultimately determine the success of the restoration and the protection of endangered species.

10. **Rubble removal from injury site:** Remove loose onsite substrate with a small barge or pontoon boat, winch/crane, and dive assistance.

Potential Effects on Acroporid Corals
Vessel groundings can break apart the reef, producing large amounts of unconsolidated reef rubble. Unconsolidated rubble can cause collateral biological damage from burial and abrasion of associated biota. Therefore, following vessel groundings on reef environments it is necessary to stabilize the rubble to prevent further reef injury. This method of restoration involves the removal and disposal of rubble from the injury site. Rubble removal may require the use of vessels and heavy equipment (davits, winches, and cranes) when large amounts or sizes of rubble are present. Removal of a small amount of rubble can be done by divers using buckets, nets, lift bags, and hand-operated suction dredges (water lifts). The disposal of rubble would require proper permits through the COE and the FDEP. The removal of unconsolidated rubble would prevent rubble from becoming mobile and injuring adjacent corals during storms or high-current events. Removing rubble may affect elkhorn and staghorn coral temporarily while the work is being conducted, through increased turbidity or accidental abrasion, but these effects are temporary and insignificant. This method is appropriate for long-term restoration plans, provided it is described in a site-specific restoration plan and submitted to NMFS for project-specific consultation under this opinion.

Potential Effects on Designated Critical Habitat for Acroporid Corals
The removal of unconsolidated rubble following vessel groundings may affect designated *Acropora* spp. critical habitat by producing a substrate of suitable quality to support larval settlement and recruitment. Removing rubble from the injury site will keep rubble from negatively affecting stable substrates, thus supporting transplants and larval recruitment. Therefore, NMFS believes the restoration method "remove rubble from injury site" may benefit designated *Acropora* spp. critical habitat.

6.1.4.1 Additive Effects of Restoration

Based on past coral restoration practices of both the NPS and NMFS, and previous ESA Section 7 consultations on similar activities, PDCs have been identified (see Table 1, Section 2.3) that have typically been applied to prevent adverse effects to listed corals, or limit adverse effects to predictable levels that will not jeopardize the continued existence of the corals or destroy or adversely modify their critical habitat.

Restoration activities directed at *Acropora* spp. in BNP and any take of the species that may occur will have temporary or insignificant effects on elkhorn and staghorn corals and will never result in mortality of whole coral colonies in the wild. Restoration may result in positive benefits to these species following injury caused by vessel groundings. Reattachment, stabilization, or transplantation of coral colonies or fragments will have positive effects on the species through reduced mortality associated with abrasion and breakage, and likely increased survival and reproductive output of elkhorn and staghorn coral colonies and fragments. Transplanted fragments have a high probability of survivorship and growing into coral colonies, which may contribute to an increase in numbers, reproduction, and distribution of elkhorn and staghorn coral colonies. Similarly, the stabilization of substrates and rubble, the sealing of fractures, and the removal of rubble could all be beneficial for acroporid corals by reducing the potential for abrasion during storm events and providing a stable surface for coral recruitment and growth. Measuring, monitoring, or marking will have no detectable effect on coral colonies. These temporary and superficial restoration activities are not likely to result in injury or death of wild elkhorn or staghorn coral colonies. Overall, restoration actions should benefit elkhorn and staghorn corals with very low levels of risk involved. Any additive effects should be beneficial as an injured site is restored and heals over time.

Designated critical habitat for *Acropora* corals is not likely to be adversely affected by restoration activities conducted in BNP, but rather enhanced. NMFS believes any additive effects of reef restoration following vessel groundings in BNP should promote larval settlement and recruitment, and reattachment of asexual fragments.

6.2 Effects on Sea Turtles and Smalltooth Sawfish

We have organized the effects to sea turtles and smalltooth sawfish similar to the effects on *Acropora spp.* (Section 6.1 above) by specific components of the GMP. We have also grouped the components to avoid repetition. The components are grouped based on their effects to each species as well as having similar PDCs (see Table 1, Section 2.3). For example, components 6, 8, and 13 all have similar PDCs and effects, therefore they will be evaluated together under a single heading (Effects of installation of channel markers and mooring buoys).

We believe that green, loggerhead, and hawksbill sea turtles, and smalltooth sawfish may be affected through recreational and commercial fishing (Component 2), vessel strikes associated with use of existing marinas and boat launch areas (Components 5 and 14), installation of channel markers and mooring buoys (Components 6, 8, and 13), maintenance dredging (Component 7), and the potential installation of a boardwalk/loop trail (Component 10).

6.2.1 Effects on Sea Turtles and Smalltooth Sawfish from Commercial and Recreational Fishing (Component 2)

As stated in Section 6.1.1 above, there are several methods used within BNP for commercial and recreational fishing. These include hook-and-line, SCUBA diving, use of roller frame trawls and lampara nets, and use of crab and lobster traps.

SCUBA Diving

The distribution of spiny lobster diving effort overlaps spatially with areas known to be inhabited by sea turtles and smalltooth sawfish. However, divers only occasionally encounter sea turtles and rarely encounter smalltooth sawfish, if at all. Anecdotal information from encounters indicates some sea turtles and smalltooth sawfish change their route to avoid coming in close proximity to divers, whereas others appear unaware of their presence. There are no reports of incidental sea turtle or smalltooth sawfish takes by spiny lobster divers (NMFS 2005 biological opinion on Spiny Lobster Fishery in Federal Waters [F/SER/2005/07518]). Based on the similarities of spiny lobster fishing within BNP and the previously issued NMFS biological opinion on the spiny lobster fishery in the Gulf of Mexico and South Atlantic, we believe that given the selectivity of the gears used and the visual nature of the hunt and capture of spiny lobsters, spiny lobster divers will easily be able to avoid sea turtles and smalltooth sawfish. We therefore conclude that the presence of divers affecting sea turtles and smalltooth sawfish is insignificant and diving for spiny lobster is not likely to adversely affect sea turtles or smalltooth sawfish.

Roller Frame Trawl and Lampara Nets

We believe that roller frame trawls, purse seine nets (lampara nets) are not likely to entrap sea turtles or smalltooth sawfish. Roller frame trawls consist of a frame outfitted with rigid vertical deflector bars; spaces between the bars do not exceed 4 inches (10.2 cm) and are therefore exempted from TED requirements. It is unlikely that a sea turtle would become entrapped within a roller frame trawl due to the required deflector bars positioned across the trawl mouth which prevent turtles from entering the nets. Lampara nets will only be used for capture of small baitfish. These nets consist of a relatively loose and open design with two "wings." The amount of bycatch in this lampara net fishery is virtually zero because of the net design, the fishing methods, and the surface-oriented behaviors of the targeted fish. Therefore, we believe that effects to sea turtles and smalltooth sawfish from roller frame trawls and lampara nets are discountable.

Hook-and-Line Gear

Sea Turtles

Hook-and-line gear is known to adversely affect sea turtles via hooking, entanglement, trailing line, and forced submergence. Most of the commercial and recreational fishing within BNP will likely be hook-and-line, more specifically, rod and reel fishing for yellowtail snapper. 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 or from exacerbated trauma from fishing hooks or lines that were ingested, entangled, or otherwise still attached when they were released. Of the sea turtles hooked or entangled that do not die from their wounds, some may suffer impaired swimming or foraging abilities, altered migratory behavior, and altered breeding or reproductive patterns. The following discussion summarizes in greater detail the available information on how individual sea turtles are likely to respond to interactions with hook-and-line gear.

Entanglement
Sea turtles are particularly prone to entanglement as a result of their body configuration and behavior. Records of stranded or entangled sea turtles from the STSSN reveal that hook-and-line gear can wrap around the neck, flipper, or body of a sea turtle and severely restrict swimming or feeding. If the sea turtle is entangled when young, the fishing line becomes tighter and more constricting as the sea turtle grows, cutting off blood flow and causing deep gashes, some severe enough to remove an appendage.

Fishing gear can drift according to oceanographic conditions, including wind and waves, surface and subsurface currents, etc.; therefore, depending on sea turtle behavior, environmental conditions, and location of the set, turtles can become entangled in the gear. On longline gear, sea turtles have been found entangled in branchlines (gangions), mainlines, and float lines. Pelagic longline data indicates sea turtles entangled in longline are most often entangled around the neck and foreflippers (e.g., Hoey 2000). If sea turtles become entangled in monofilament line the gear can inflict serious wounds, including cuts, constriction, or bleeding anywhere on a turtle's body. In addition, entangling gear can interfere with a turtle's ability to swim or impair its feeding, breeding, or migration and can force the turtle to remain submerged, causing it to drown.

Hooking
In addition to being entangled in hook-and-line gear, sea turtles are also injured and killed by being hooked. Hooking can occur as a result of a variety of scenarios, some of which will depend on foraging strategies and diving and swimming behavior of the various species of sea turtles. Sea turtles are either hooked externally (generally in the flippers, head, shoulders, armpits, or beak) or internally (inside the mouth or when the animal has swallowed the bait and the hook is ingested into the gastro-intestinal tract, often a major site of hooking) (E. Jacobson in Balazs et al. 1995). Pelagic longline hooking data indicates entanglement and foul hooking are the primary forms of interaction between leatherback turtles and longline gear, whereas internal hooking is much more prevalent in hard-shelled turtles, especially loggerheads. Data on hooking location from the Atlantic longline observer program in 1999 and 2000 (NMFS SEFSC 2001) and from the Northeast Distant experiment (Watson et al. 2003) agreed closely. For loggerheads, almost all interactions result from taking the bait and hook; only a very small percentage of loggerheads are entangled or foul-hooked externally. Loggerheads caught on J-hooks most often swallow the hooks (67 percent of interactions in Watson et al. 2003). The J-hook was the standard hook style in the HMS pelagic longline fishery until July 2004. The use of circle hooks, however, has been shown to significantly reduce the rate of hook ingestion by loggerheads, reducing the post-hooking mortality associated with the interactions. This is because circle hooks, the predominant gear used in the South Atlantic snapper-grouper fishery, are designed so that they typically result in hooking of the lower jaw and are not swallowed (Watson et al. 2003).

Turtles that have swallowed hooks are of the greatest concern. The esophagus is lined with strong conical papillae directed caudally towards the stomach (White 1994). The presence of these papillae in combination with an S-shaped bend in the esophagus make it difficult to see hooks when looking through a turtle's mouth, especially if the hooks have been deeply ingested. Because of a turtle's digestive structure, deeply ingested hooks are also very difficult to remove without seriously injuring the turtle. A turtle's esophagus is attached firmly to underlying tissue; thus, if a turtle swallows a hook and tries to free itself or is hauled on board a vessel, the hook can pierce the turtle's esophagus or stomach and can pull organs from their connective tissue. These injuries can cause the turtle to bleed internally or can result in infections, both of which can kill the turtle.

If a hook does not lodge into, or pierce, a turtle's digestive organs, it can pass through to the turtle's colon or it can pass through the turtle entirely (E. Jacobson in Balazs et al. 1995; Aguilar et al. 1995) with little damage (Work 2000). Of 38 loggerheads deeply hooked by the Spanish Mediterranean longline fleet and subsequently held in captivity, six loggerheads expelled hooks after 53 to 285 days (average 118 days) (Aguilar et al. 1995). If a hook passes through a turtle's digestive tract without getting lodged, the hook probably has not harmed the turtle. Tissue necrosis that may have developed around the hook may also get passed along through the turtle as a foreign body (E. Jacobson in Balazs et al. 1995).

Trailing Line

Trailing line (i.e., line left on a turtle after it has been captured and released), particularly line trailing from an ingested hook, poses a serious risk to sea turtles. Line trailing from an ingested hook is likely to be swallowed, which may occlude the gastrointestinal tract. It may also prevent or hamper foraging eventually leading to death. Sea turtles that swallow monofilament still attached to an embedded hook may suffer from the "accordion effect" which is often fatal. In this condition the intestine, perhaps by its peristaltic action in attempting to pass the unmoving monofilament line through the alimentary canal, coils and wraps upon itself (Pont pers. comm. 2001). Trailing line may also become snagged on a floating or fixed object, further entangling a turtle and potentially slicing its appendages and affecting its ability to swim, feed, avoid predators, or reproduce. Sea turtles have been found trailing gear that has been snagged on the bottom, or has the potential to snag, thus anchoring them in place (Balazs 1985, Hickerson pers. comm. 2001). Long lengths of trailing gear are likely to entangle the turtle eventually, leading to impaired movement, constriction wounds, and potentially death.

Forcible Submergence

Sea turtles can be forcibly submerged by longline gear or snagged trailing line. Forcible submergence may occur through a hooking or entanglement event, where the turtle is unable to reach the surface to breathe. This can occur at any time during a longline set, including the setting and hauling of the gear. Forced submergence can occur when the sea turtle encounters a line deep below the surface and the line is too short and/or too heavy to be brought up to the surface by the swimming sea turtle, as would generally be the case with bottom longline gear.

Sea turtles forcibly submerged for extended periods show marked, even severe, metabolic acidosis as a result of high blood lactate levels. With such increased lactate levels, lactate recovery times may be as long as 20 hours. Kemp's ridley turtles stressed from capture in an experimental trawl (7.3 minute forcible submergence) experienced significant blood acidosis, which originated primarily from non-respiratory (metabolic) sources. Visual observations indicated that the average breathing frequency increased from approximately 1-2 breaths/minute pre-trawl to 11 breaths/minute post-trawl. Given the magnitude of the observed acid-base imbalance created by these trawl experiments, complete recovery of homeostasis may have required 7 to 9 hours (Stabenau et al. 1991). Similar results were reported for Kemp's ridleys captured in entanglement nets, where turtles showed significant physiological disturbance, and post-capture recovery depended greatly on holding protocol (Hoopes et al. 2000).

Observed long recovery times suggest that turtles would be more susceptible to lethal metabolic acidosis if they experience multiple captures in a short period of time (Lutcavage et al. 1997). Presumably, a sea turtle recovering from a forced submergence would most likely remain resting on the surface (given it had the energy stores to do so), which would reduce the likelihood of being recaptured by a submerged bottom longline or vertical line. Recapture would also depend on the condition of the turtle and the intensity of fishing pressure in the area. NMFS has no information on the likelihood of recapture of sea turtles by hook-and-line. However, turtles in the Atlantic Ocean have been captured more than once by pelagic longliners (on subsequent days), as observers reported clean hooks already in the jaws of captured turtles. Such multiple captures were thought to be most likely on three or four trips that had the highest number of interactions (Hoey 1998).

Stabenau and Vietti (2003) studied the physiological effects of multiple forced submergences in loggerhead turtles. The initial submergence produced severe and pronounced metabolic and respiratory acidosis in all turtles. Successive submergences produced significant changes in blood pH, PCO_2, and lactate, but as the number of submergences increased, the acid-base imbalances were substantially reduced relative to the imbalance caused by the first submergence. Increasing the time interval between successive submergences resulted in greater recovery of blood homeostasis. The authors conclude that as long as sea turtles have an adequate rest interval at the surface between submergences, their survival potential should not change with repetitive submergences.

Respiratory and metabolic stress from forcible submergence is also correlated with additional factors such as size and activity of the sea turtle (including dive limits), water temperature, and biological and behavioral differences between species. These factors affect the survivability of an individual turtle. For example, larger sea turtles are capable of longer voluntary dives than small turtles, so juveniles may be more vulnerable to the stress of forced submergence than adults. Gregory et al. (1996) found that corticosterone concentrations of captured small loggerheads were higher than those of large loggerheads captured during the same season. During the warmer months, routine metabolic rates are higher, so the impacts of the stress from entanglement or hooking may be magnified (e.g., Gregory et al. 1996). In addition, disease factors and hormonal status may play a role in anoxic survival during forced submergence. Any disease that causes a reduction in the blood oxygen transport capacity could severely reduce a sea turtle's endurance on a longline. Because thyroid hormones appear to have a role in setting metabolic rate, they may also play a role in increasing or reducing the survival rate of an entangled sea turtle (Lutcavage et al. 1997). Turtles necropsied following capture (and subsequent death) by pelagic longliners were found to have pathologic lesions. Two of the seven turtles (both leatherbacks) had lesions severe enough to cause probable organ dysfunction, although whether or not the lesions predisposed these turtles to being hooked could not be determined (Work 2000).

Sea turtles also exhibit dynamic endocrine responses to stress. In male vertebrates, androgen and glucocorticoid hormones (corticosterone (CORT) in reptiles) can mediate physiological and behavioral responses to various stimuli, influencing both the success and costs of reproduction. Typically, the glucocorticoid hormones increase in response to a stressor in the environment, including interaction with fishing gear. For example, Jessop et al. (2002) state, "during reproduction, elevated circulating CORT levels in response to a stressor can inhibit synthesis of testosterone or other hormones mediating reproduction, thus leading to a disruption in the physiology or behavior underlying male reproductive success." A study in Australia examined whether adult male green turtles decreased CORT or androgen responsiveness to a capture/restraint stressor to maintain reproduction. Researchers found that migrant breeders, which typically had overall poor body condition because they were relying on stored energy to maintain reproduction, had decreased adrenocortical activity in response to a capture/restraint stressor. Smaller males in poor condition exhibited a pronounced and classic endocrine stress response compared to the larger males with good body condition. The authors state: "We speculate that the stress-induced decrease in plasma androgen may function to reduce the temporary expression of reproductive behaviors until the stressor has abated. Decreased androgen levels, particularly during stress, are known to reduce the expression of reproductive behavior in other vertebrates, including reptiles." Small males with poor body condition that are exposed to stressors during reproduction and experience shifting hormonal levels may abandon their breeding behavior (Jessop et al. 2002). Female green turtles have also been studied to evaluate their stress response to capture/restraint. Studies showed that female green turtles during the breeding season exhibited a limited adrenocortical stress response when exposed to ecological stressors and when captured and restrained. Researchers speculate that the apparent adrenocortical modulation could function as a hormonal tactic to maximize maternal investment in reproductive behavior such as breeding and nesting (Jessop et al. 2002).

In the worst scenario, sea turtles will drown from being forcibly submerged. Such drowning may be either "wet" or "dry." With wet drowning, water enters the lungs, causing damage to the organs and/or causing asphyxiation, leading to death. In the case of dry drowning, a reflex spasm seals the lungs from both air and water. Before death due to drowning occurs, sea turtles may become comatose or unconscious. Studies have shown that sea turtles that are allowed time to stabilize after being forcibly submerged have a higher survival rate. This depends on the physiological condition of the turtle (e.g., overall health, age, size), time of last breath, time of submergence, environmental conditions (e.g., sea surface temperature, wave action, etc.), and the nature of any sustained injuries at the time of submergence (NRC 1990).

Smalltooth Sawfish

Although sawfish encounters in the South Atlantic are far fewer than those in the Gulf of Mexico, incidental captures of smalltooth sawfish by commercial and recreational hook-and-line fisheries have been documented in the South Atlantic and the impacts of those encounters are discussed below. Data from the NSED indicates that approximately 1,867 sawfish were captured by hook-and-line between 1999 and May 2011 (NSED 2011). Of these captures, 877 sawfish were collected from within the state of Florida, though mostly along the Gulf coast.

Vertical line gear can adversely affect smalltooth sawfish via hooking and entanglement. Based on hooking observation data from reported recreational rod and reel fishing encounters, the vast majority of smalltooth sawfish are hooked in the mouth (Simpfendorfer pers. comm. 2003; Burgess pers. comm. 2003; Seitz and Poulakis pers. comm. 2003). Once hooked, the gangion or leader most commonly becomes wrapped around the animal's saw (Burgess pers. comm. 2003; Seitz and Poulakis pers. comm. 2003). This may be from slashing during the fight, spinning on the line as it is retrieved, or any other action bringing the rostrum in contact with the line. Foul hooking (i.e., hooking in fin, near eye, etc.) reports are not nearly as frequent, but do occasionally occur. There are no reports, however, of smalltooth sawfish being deeply hooked.

Smalltooth sawfish captured on vertical line gear have all been observed or reported as alive upon capture and as released in good condition. Dr. Colin Simpfendorfer of MML has been conducting smalltooth sawfish surveys since 2000 using bottom longline, nets, and rod and reel. As of February 2005, he has caught and handled over 50 individuals ranging in size from 87 cm to 450 cm, about half of which were caught on bottom longlines. All of these fish were alive upon capture and safely released with no apparent harm to the fish. There are no studies on the post-release mortality of smalltooth sawfish. Based on their lively condition at capture, physiology, and MML tagging recapture data, we believe post-release mortality is extremely rare.

Temporary sub-lethal effects on smalltooth sawfish may occur. A few rare reports from recreational fishers indicate smalltooth sawfish can damage their rostrum by hitting it against the vessel or other nearby objects (e.g., piling, bridge) while the fishers are preparing to release the fish. Reported damage ranges from broken rostral teeth to broken rostrums. Smalltooth sawfish have been caught missing their entire rostrum, otherwise appearing healthy, so they appear to be able to survive without it. Given the rostrum's role in smalltooth sawfish feeding activities, however, damage to their rostrum, depending on the extent, is likely to hinder their ability to feed and may ultimately impact the affected animal's growth and reproductive abilities.

Traps

Sea Turtles

Commercial lobster traps are known to adversely affect sea turtles via entanglement and forced submergence. 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. The following discussion summarizes in detail the available information on how individual sea turtles may respond to interactions with spiny lobster trap gear.

Entanglement
The primary effect on sea turtles from traps is entanglement in buoy lines. Sea turtles are particularly prone to entanglement as a result of their body configuration and behavior. Records of stranded or entangled sea turtles reveal that trap lines can wrap around the neck, flipper, or body of a sea turtle and severely restrict swimming or feeding. If a sea turtle is entangled when young, the line could become tighter and more constricting as the sea turtle grows, cutting off blood flow and causing deep gashes, some severe enough to remove an appendage.

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 epibonts growing on traps, trap lines, and floats (NMFS and USFWS 1991b).

Forcible Submergence
Sea turtles can be forcibly submerged by trap gear. 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.

Sea turtles that are forcibly submerged undergo respiratory and metabolic stress that can lead to severe disturbance of their acid-base balance (i.e., pH level of the blood). Most voluntary dives by sea turtles appear to be an aerobic metabolic process, showing little if any increases in blood lactate and only minor changes in acid-base status. In contrast, sea turtles that are stressed as a result of being forcibly submerged due to entanglement eventually consume all their oxygen stores. This oxygen consumption triggers anaerobic glycolysis, which can significantly alter their acid-base balance, sometimes leading to death (Lutcavage and Lutz 1997).

Numerous factors affect the survival rate of forcibly submerged sea turtles. It is likely that the rapidity and extent of the physiological changes that occur during forced submergence are functions of the intensity of struggling, as well as the length of submergence (Lutcavage and Lutz 1997). Other factors influencing the severity of effects from forced submergence include the size, activity level, and condition of the sea turtle; the ambient water temperature, and if multiple forced submergences have recently occurred. Disease factors and hormonal status may also influence survival during forced submergence. Larger sea turtles are capable of longer voluntary dives than small sea turtles, so juveniles may be more vulnerable to the stress from forced submergence. During the warmer months, routine metabolic rates are higher. Increased metabolic rates lead to faster consumption of oxygen stores, which triggers anaerobic glycolysis. Subsequently, the onset of impacts from forced submergence may occur more quickly during these months. With each forced submergence event, lactate levels increase and require a long (up to 20 hours) time to recover to normal levels. Sea turtles are probably more susceptible to lethal metabolic acidosis if they experience multiple forced submergence events in a short period. Recurring submergence does not allow sea turtles sufficient time to process lactic acid loads (Lutcavage and Lutz 1997). Stabenau and Vietti (2003) illustrated that sea turtles given time to stabilize their acid-base balance after being forcibly submerged have a higher survival rate. The rate of acid-base stabilization depends on the physiological condition of the turtle (e.g., overall health, age, size), time of last breath, time of submergence, environmental conditions (e.g., sea surface temperature, wave action, etc.), and the nature of any injuries sustained at the time of submergence (NRC 1990).

Smalltooth Sawfish

Commercial spiny lobster traps may adversely affect smalltooth sawfish via entanglement. Entangled smalltooth sawfish may suffer impaired swimming or foraging abilities, altered migratory behavior, and altered breeding or reproductive patterns. Entanglement of a smalltooth sawfish's toothed rostrum in a spiny lobster trap's float line is the primary route of effect between these species and this gear type. While no specific information exists on the effects of spiny lobster trap entanglement on smalltooth sawfish, Seitz and Poulakis (2006) list chafing and irritation of the skin, as well as the loss of rostral teeth, as consequences of entanglement in other types of marine debris. The loss of rostral teeth could be especially detrimental because, unlike other elasmobranchs, smalltooth sawfish do not replace lost teeth (Slaughter and Springer 1968). Since the smalltooth sawfish's rostrum is its primary means for acquiring food, the loss of rostral teeth may impact an animal's ability to forage and hunt effectively. Entanglement injuries could also impair an animal's ability to swim. All such injuries could affect an individual's growth and reproductive abilities.

6.2.2 Effects on Sea Turtles and Smalltooth Sawfish from Vessel Strikes associated with Recreational Boating and the Use of Existing Marinas and Boat Launch Areas (Components 5 and 14)

We believe that recreational boating and the use of existing marinas and boat launch areas is likely to adversely affect sea turtles and is not likely to adversely affect smalltooth sawfish. The use of existing marinas will not increase the number of vessels within the action area. However, sea turtles may be struck by vessels once they have launched from the marina or boat launch areas, or by vessels entering from other areas outside of BNP. Table 8, below, indicates that a large majority of observed sea turtle mortalities within BNP between 2004 and 2011 have occurred due to vessel strikes. Although BNP will work with FWCC to establish several slow speed zones, we still believe that sea turtles will be adversely affected by vessel strikes.

Speed restrictions have been in place in several locations in Florida since the 1990s; however there is little evidence that these restrictions have reduced the number of vessel collisions with marine life (Hazel et al. 2007). Generally we expect that speed restrictions would allow more time for vessel operators to spot a turtle and avoid a collision. However, even the most observant vessel crews are unlikely to see an animal in rough seas or low-light conditions. A study of green sea turtles conducted by Hazel et al. (2007) determined that sea turtles primarily use visual detection to avoid threats (including approaching vessels). They also found that sea turtles are generally unable to avoid a collision with any vessel traveling at speeds in excess of 4km/h, which is much slower than the typical travelling speeds of most vessels.

6.2.3 Effects on Sea Turtles Smalltooth Sawfish from Installation of Mooring Buoys and Channel Markers (Components 6, 8, and 13)

We believe that the installation and use of mooring buoys and channel markers may affect but is not likely to adversely affect green, loggerhead, and hawksbill sea turtles, and smalltooth sawfish. The installation of any mooring buoys or channel markers will be conducted in accordance with the PDCs (see Table 1, Section 2.3), including mandatory compliance with NMFS' *Sea Turtle and Smalltooth Sawfish Construction Conditions*. Channel marker and mooring buoy installation would only encompass a very small area (only a few square feet) at any given time. The installation process would be completed during a very short, daylight-only, construction time period and not all markers and buoys would be done simultaneously. This would allow sea turtles and sawfish within BNP to easily avoid the area during installation while still maintaining suitable habitat for forage/shelter nearby. Although sea turtles and smalltooth sawfish are likely to temporarily avoid the area during installation, they would not be excluded from using the area afterward. Due to the species' mobility and the implementation of NMFS' *Sea Turtle and Smalltooth Sawfish Construction Conditions*, the risk of injury will be discountable.

6.2.4 Effects on Sea Turtles and Smalltooth Sawfish from Maintenance Dredging (Component 7)

We believe that maintenance dredging the existing channels within BNP may affect but is not likely to adversely affect green, loggerhead, and hawksbill sea turtles, and smalltooth sawfish. Effects to sea turtles and smalltooth sawfish include the risk of injury from construction machinery, which will be discountable due to the species' mobility and compliance with the PDCs (see Table 1, Section 2.3) including NMFS' *Sea Turtle and Smalltooth Sawfish Construction Conditions*. Sea turtles and smalltooth sawfish may be affected by being temporarily unable to use the site for forage/shelter habitat due to avoidance of construction activities, related noise, and physical exclusion from areas blocked by turbidity curtains, but these effects will be insignificant, given the project's small footprint and short, daylight-only construction time. Limiting construction to daylight hours only will help ensure that the construction workers will be able to spot any ESA-listed species near the project area and avoid interactions with these species. Disturbance from construction activities and related noise will be intermittent and only occur during daytime hours for part of the construction period. The channels will not all be dredged simultaneously. Turbidity controls will only enclose a small portion of the project site at any time, will be removed after construction, and will not appreciably block use of the area by sea turtles or smalltooth sawfish. Therefore, we believe that effects to sea turtles and smalltooth sawfish from maintenance dredging will be discountable.

6.2.5 Effects on Sea Turtles and Smalltooth Sawfish from Construction of a Boardwalk/Loop Trail (Component 10)

We believe that the construction of a piling-supported boardwalk/loop trail will not adversely affect sea turtles and smalltooth sawfish. If the structure is constructed it will be in accordance with the PDCs (see Table 1, Section 2.3), including mandatory compliance with NMFS' *Sea Turtle and Smalltooth Sawfish Construction Conditions* and assurance through the 2nd tier consultation process that no adverse effects will result to listed species from noise generated through any pile driving associated with the project, which may require implementation of measures commonly available and used to prevent harm to marine animals from pile driving noise.

6.3 Estimating Levels of Take and Adverse Effects to Critical Habitat

6.3.1 Estimating Adverse Effects to Acropora from Trap Interactions

As noted in section 6.1.4, above, based on the data provided by the creel surveys and the FWCC regarding active lobster permits and trap certificates, we estimate that there are approximately 1,505 spiny lobster traps within BNP. We believe that *Acropora* spp. may be adversely affected by derelict traps mobilized by weather events. Based on data from FWCC commercial mail surveys (unpublished data), we believe there is a 20 percent trap loss rate. Approximately 5.5 percent of these are recovered annually (FDEP 2001) through marine debris recovery programs. Therefore we can estimate that approximately 301 traps would be lost within BNP (20 percent of 1,505 traps = 301) and approximately 17 of those would be recovered through marine debris recovery programs (5.5 percent of 301 traps = 17). After two years a derelict trap will have degraded to a point where storm mobilization is unlikely and the trap no longer poses a threat to *Acropora* spp. (T. Matthews, FWCC, pers. comm. 2007). Because specific trap degradation rates are unknown, we assumed half of the unrecovered traps have degraded to a point where they would not damage *Acropora* spp. Therefore, we reduced our estimates of unrecovered derelict traps by half, which leaves 142 derelict traps which could damage *Acropora* spp. (301 derelict traps – 17 recovered traps = 284/2 = 142).

In our 2005 biological opinion on the Spiny Lobster Fishery in Federal Waters [F/SER/2005/07518] (NMFS 2005), we determined that 15 percent of traps may land on habitat supporting *A. cervicornis* and 4 percent may land on habitat supporting *A. palmata.* This was based on studies done by Miller et al. (2007) which surveyed 235 sites in the Florida Keys National Marine Sanctuary (FKNMS) and BNP and recorded colonial density and size of *Acropora* where found. The average size was 4.94×10^{-6} acres for *A. cervicornis* and 2.96×10^{-5} acres for *A. palmata.* We determined in Section 6.1.1 (above) that there are 0.009 colonies of *A.cervicornis* and 4.16×10^{-5} colonies of *A. palmata* per acre of reef tract.

Using this data we can calculate that 9.47×10^{-7} acres or 0.04 square feet (15 percent of 142 traps = 21.3 X 0.009 colonies per acre X 4.94×10^{-6} acres = 9.47×10^{-7}) of *A. cervicornis* and 7.02×10^{-9} acres or 0.0003 square feet (4 percent of 142 traps = 5.7 X 4.16×10^{-5} colonies per acres X 2.96×10^{-5} acres = 7.02×10^{-9} acre) of *A. palmata* may be affected each year by derelict traps mobilized by storms.

6.3.2 Sources of Data for Estimating Sea Turtle Take Rates

NMFS believes that the sea turtle stranding data reported by Alan Foley, FWRI, in Table 7 (below) and by BNP (Tables 8 and 9) represent the best information available to determine the number of turtles that may be captured annually by commercial and recreational fishing within BNP. According to the data provided by Alan Foley, there were 213 total sea turtle strandings in Miami-Dade County, Florida, between January 2008 and December 2011 (Table 7). Of these, 128 involved green, 17 involved hawksbill, 0 involved Kemp's ridley, and 67 involved loggerheads.

Table 7. Reported Sea Turtle Strandings in Miami-Dade County, Florida, between January 2008 and December 2011.

Species	2008	2009	2010	2011
Loggerhead	17	24	12	14
Green	20	50	32	26
Leatherback	1	0	0	0
Hawksbill	5	4	4	4
Kemps	0	0	0	0
Totals	43	78	48	44

BNP provided the information in Table 8 to summarize the reported sea turtle mortalities within BNP between 2004 and 2011 (Vanessa McDonough, NPS, pers. comm. to A. Livergood, NMFS, May 31, 2011). Table 8 reports one incidental capture of sea turtles caught on hook-and-line and 1 from trap entanglement. Additionally, 11 sea turtles were killed by vessel strikes and 34 due to unknown causes. Approximately 34 percent of the reported sea turtle mortalities involved green sea turtles, 42 percent were loggerheads, 0.09 percent were hawksbill, and 15 percent were unknown species. This data indicates that there is a significant level of sea turtle mortalities attributed to vessel strikes within BNP (approximately 85 percent of the sea turtles with known causes of death were killed by vessel strikes). Table 9 summarizes total numbers of sea turtles observed within BNP by various staff, volunteers, and patrons between 1979 and 2011. During this time frame there were approximately 231 total sea turtles observed within BNP. Most of these were loggerheads (approximately 35 percent), the rest were either green turtles or hawksbill turtles (16 percent and 14 percent, respectively). Thirty-five percent were not identified by species. Most of the turtles observed within BNP were alive and most likely healthy, only 47 turtles observed were injured or dead, although the cause of death was generally unknown or was attributed to vessel strikes. None of the turtles observed showed signs of interaction with fishing gear. The data from both tables likely indicates an under-reporting of fishing related captures because it is based on reports by staff and visitor observers who may not be trained to determine cause of death.

Table 8. Summary of sea turtle mortalities within BNP, 2004-2011.

Year	Boat strike	Fishing Line entanglement	Trap or Trap Line Entanglement	Unknown	TOTAL
2004	1 Loggerhead, 1 Green	1 Hawksbill	1 Loggerhead	4 Loggerheads, 1 Green, 1 Hawksbill	10
2005	1 Hawksbill, 1 Green	0	0	2 Greens, 1 Unknown, 1 Hawksbill	6
2006	1 Loggerhead, 1 Unknown	0	0	1 Loggerhead, 1 Green	4
2007	1 Loggerhead	0	0	2 Loggerheads, 1 Unknown, 1 Green	5
2008	0	0	0	1 Loggerhead	1
2009	2 Greens	0	0	1 Unknown, 2 Loggerheads, 3 Greens	8
2010	1 Green	0	0	2 Unknown, 2 Loggerheads, 1 Green	6
2011	1 Loggerhead	0	0	3 Loggerheads, 2 Green, 1 Unknown	7
TOTAL	11	1	1	34	47

Table 9. Observed Sea Turtles Within BNP, 1979-2011

Scientific name	Location	Date	Description
Chelonia mydas	Elliot Key, western shore, beach immediately north of campground	29-Jan-11	1 dead turtle, turtle has papillomas on fins and no other abnormalities
Chelonia mydas	Southern End of Adelle Beach	21-Jun-11	Just a skelton remaining, no wounds could be determined
Chelonia mydas	Northwest of Ajax Reef	16-Aug-79	Small turtle at surface. Dove.
Chelonia mydas	Elliot/Adams Keys	27-Oct-79	Observed by anchored fishermen
Chelonia mydas	Hawk Channel, marker 19	09-Jun-80	3-4' individual on surface, but dove upon our approach.
Chelonia mydas	Ball Buoy Reef	01-Dec-94	Individual swimming above reef observed from glass bottom boat ~2' carapace.
Chelonia mydas	South of the schooner wreck	08-Jun-95	Noticed ~300 yds from Reef Rover IV. Pulled in closer. Mating pair. As we approched, female submerged but male was still visible. They swam in a tight clockwise circle. Witnessed by 12 visitors. Captured on video.
Chelonia mydas	West of schooner wreck	09-Jun-95	Swimming beneath surface. Came up for air & departed area as Reef Rover IV approached.
Chelonia mydas	East of West Arsenicker	19-Jun-95	~30" long from carapace to base of tail. Surfaced from turtle grass bed.
Chelonia mydas	Off pacific reef (light)	14-Apr-96	Shell ~2' long. Swam up & ate Portuguese Man-o-War.
Chelonia mydas	Ball Buoy Reef	08-Nov-97	swimming among sea fans
Chelonia mydas	mouth of Caesar Creek, near Marker 1	01-May-98	2 turtles mating
Chelonia mydas	1 mile east of east end of Caesar Creek	06-Jun-98	fleeing rapidly from Reef Rover
Chelonia mydas	Sea grass bottom near patch reef	12-Aug-99	swimming
Chelonia mydas	Mid-bay	08-Apr-01	diving
Chelonia mydas	Reefs (on boat tour)	14-May-01	swimming
Chelonia mydas	Marker 3 off Pacific Light	25-Oct-01	breathing at surface
Chelonia mydas		11-Dec-02	Dead. No obvious injuries/wounds
Chelonias mydas	Elliott Key, bayside, 1000 ft North of harbor	01-Feb-03	Incomplete data
Chelonia mydas	Elliott Key harbor	10-Nov-03	Individual covered fibropapilloma tumors
Chelonia mydas	Elliott Key harbor	18-Nov-03	Incomplete data
Chelonia mydas	ICW, Southwest of Cape Florida	08-Apr-04	Swimming south on surface, dived upon approach
Chelonia mydas	Ceasar Creek, south of Adams Key Dock	08-Jun-04	Large ~200 lbs. Dead. Left Flipper missing. Sharks biting at remaining flippers
Chelonia mydas	Biscayne Bay, Convoy Point Channel	08-Oct-04	Death by boat impact/prop damage. Carapace cracked. Large cut on back of head. RT. Front flipper missing.
Chelonia mydas	Convoy Point Channel	08-Oct-04	Small(<25lbs), immature turtle with rt front flipper missing. Gash on back of head and carapace. Taken live to Seaquarium

Chelonia mydas	GBB tour path	22-Jan-05	2 swimming
Chelonia mydas	Mowrey Canal	06-Feb-05	Found dead, V shaped notch/wound on carapace, severly decomposed
Chelonia mydas	Oceanside Elliott Key	16-Feb-05	Adult (200lbs) found dead near Palm Beach. Carapace intact, flesh decomposing
Chelonia mydas	in the Bay, on the way to Boca Chita	17-Mar-06	3 adults were seen swimming
Chelonias mydas	Biscayne Bay, west of Sand's Cut	13-Sep-06	Killed by boat/prop impact. Measured 71 CM Long, Est 75 LBS
Chelonia mydas	Triumph Reef	02-Aug-07	Napping under a rocky ledge
Chelonias mydas	Biscayne Bay, between Snad's Cut & Turkey Point headpin	14-Aug-07	Freshly killed turtle found floating. Missing head and rear flippers. Gash on plastron- no visible damage to carapace. EST 44 CM across. EST 30 LBS
Chelonia mydas	bay, just past jetty	07-May-08	swimming
Chelonia mydas	Bay	21-Dec-08	swimming
Chelonia mydas	In bay near boardwalk and jetty	06-Jan-09	stranded turtle, seriously ailing and barely alive with severe papilloma, missing front left flipper, photos taken; reported to FWC
Chelonia mydas	Mid Bay, 1 mile west of Elliott Key harbor	29-Jan-09	fresh dead juvenile found floating, salvaged for FWC necropsies
Chelonia mydas	5 miles east of Elliott Key, Ajax Reef	30-Jan-09	fresh dead juvenile found floating with head missing
Eretmochelys imbriata	west of Elliot harbot	08-Jan-10	1 hawksbill turtle, flapping flippers at surface of bay just west of Elliot harbor. Probably cold stunned, but descended when closely approached
Eretmochelys imbricata	Ajax 60'	10-Jul-79	Medium turtle observed swimming in open ~10' off bottom.
Eretmochelys imbricata	Elkhorn Reef	11-Oct-79	Small turtle in octocoral zone of reef
Eretmochelys imbricata	1 Mile East of Convoy Point	11-Nov-79	Individual headed East by sailboat crew
Eretmochelys imbricata	.5 mile East of Elliott Key	24-Nov-79	Dead. Carapace crushed, 1 flipper severed
Eretmochelys imbricata	Star Reef	28-Mar-80	One
Eretmochelys imbricata	Star Reef	09-Apr-80	One
Eretmochelys imbricata	Elkhorn	04-Jun-80	Small individual swimming among gorgonians
Eretmochelys imbricata	Star Reef	09-Jun-80	~ 2' long under coral at 15' depth
Eretmochelys imbricata	Ball Buoy reef	24-Jan-95	Individual seen among coral from glass bottom boat. Apeared to be eating sea rod. Carapace ~ 1.5' long
Eretmochelys imbricata	Near pelican bank	17-Jun-98	resting on bottom, swam away when boat approached
Eretmochelys imbricata	Patch reef, maybe Shark reef?	28-Nov-98	swimmin
Eretmochelys imbricata	Near pelican bank	11-Jul-00	probable ID, swimming away from Glass Bottom Boat
Eretmochelys imbricata	Near pelican bank	11-Jul-00	postive ID, swimming away from Glass Bottom Boat

Eretmochelys imbricata	Elkhorn Coral Marker 3	03-Nov-02	swimming away from boat
Eretmochelys imbricata	Schooner Patch Reef	09-Mar-03	swimming
Eretmochelys imbricata	One mile East of Dinner Key Marina	24-Aug-03	Incomplete data
Eretmochelys imbricata	West Arsenicker Key	09-Sep-03	Released
Eretmochelys imbricata	patch reef south of Schooner	01-Jan-04	stayed clear of glass bottom boat
Eretmochelys imbricata	Convoy Point Channel	30-Jun-04	Dead. Rear portion missing. Large diagonal crack in carapace
Eretmochelys imbricata	East side of Caesars, near Schooner wreck	30-Jun-04	breathing
Eretmochelys imbricata	Safety Valve	18-Jul-04	Floating dead, ~ 80 Lbs. Entangled by monofilament
Eretmochelys imbricata	GBB tour path	22-Jan-05	1 swimming
Eretmochelys imbricata	Biscayne Bay, University Dock	16-Apr-05	Cause of death undetermined. No external damage, except eyeballs missing. Est 6.5 LBS. measured 7.5 CM across
Eretmochelys imbricata	Biscayne Bay, S. of Featherbeds	02-Aug-05	Death by boat impact/prop damage. 2 large diagonal prop scars. One with hole at the end. Measured 15" across. Est. 20 LBs
Eretmochelys imbricata	Marker 3 reef	03-Feb-08	swimming
Eretmochelys imbricata	Elkhorn Reef	19-Jul-08	Swimming around reef, took off when approached
Eretmochelys imbricata	outside (west) of EK harbor	08-Jan-10	Flapping flippers on surface. Probably cold stunned. Dove upon approach
Dermochelys coriacea	1-2 miles South-Southeast of pacific	22-Mar-95	~3-4' carapace. Individual floating in weed line. Approached within 2-4' of boat
Dermochelys coriacea	Legare Anchorage	29-Dec-79	Feeding on bottom at 20' depth
Dermochelys coriacea	Whistler Bouy	08-Feb-80	Dead. ~400 lbs. Turned over to Pennekamp Park
Dermochelys coriacea	Pacific Light Channel marker 3	02-Mar-00	Lone individual floating ~1 ft. under the surface. Only observed ~ 20 seconds.
Dermochelys coriacea	marker 3 elkhorn reef coral area	02-Mar-00	floating in the surface
Caretta caretta	Sands Cut	05-Feb-10	1 dead loggerhead
Caretta caretta	Turkey Point Channel	05-Jun-11	Found on the surface, lethargic, unable to swim, taken to Miami Seaquarium
Caretta caretta	Biscayne Bay, 1 mile outside Black Point Marina	23-Jun-11	Sea turtle was freshly hit by a boat, the driver informed us and we found the animal floating just of the bottom in the bay. The intestinal tract was out. Trhe shell was
Caretta caretta	At the mouth of Convoy Point Channel	17-Sep-11	dead turtle, 5 Propellor cuts on carapace
Caretta Caretta	Along the S. boundary of BISC, about 4 miles offshore	01-Oct-11	dead turtle, no markings or abnormalities
Caretta caretta	West of 60' BNM marker	16-Aug-79	Large turtle stayed at surface, lingered , dove.
Caretta caretta	.6 mile Southeast of Black Point	28-Aug-79	Found dead. Head and rear portion of carapace removed

Caretta caretta	Northwest Biscayne Bay	30-Aug-79	Killed by prop. Flashing on surface.
Caretta caretta	1 mile East of marker #4	25-Oct-79	Observed swimming near surface; dived on our approach.
Caretta caretta	Near Stiltsville	21-Mar-80	1 small turtle~12-15" diameter
Caretta caretta	Pacific Light	22-Mar-80	Individual sighted by fishermen
Caretta caretta	North of Pacific Light	23-Mar-80	4 turtles observed by fishermen. 1 over 4' in diameter
Caretta caretta	Pacific Light	29-Mar-80	6 turtles sighted by fishermen ~1-2 ' diameter
Caretta caretta	Bache Shoal	12-Apr-80	Very large turtle, barnacle fouled. Dove upon our approach.
Caretta caretta	Billy's Elliot Key harbor	13-Apr-80	Observed swimming
Caretta caretta	Billy's Point	20-Apr-80	Swimming
Caretta caretta	300' offshore just South of Elliott Key oceanside campground	26-Apr-80	Pair of large turtles mating pair at the surface
Caretta caretta	2 miles East of Pelican Bank	29-Apr-80	Sole individual swimming at surface
Caretta caretta	South of Pelican Bank	03-May-80	One small turtle ~ 1-2' by Loftus
Caretta caretta	Pacific Light	03-May-80	4, 1-2' diameter according to divers
Caretta caretta	1 mile East of Ceasar's Creek	03-May-80	lage individual observed by fishermen
Caretta caretta	Between Adams Key & Convoy Point	06-May-80	One large turtle
Caretta caretta	Ceasar's Creek	04-Jun-80	Small individual swimming in creek
Caretta caretta	Marker 4	22-Jun-80	Incomplete data
Caretta caretta	2 miles East of Pelican Bank	26-Jun-80	~1-2' on surface, but dove upon approach of boat
Caretta caretta	.25 mile West of Adams Key	08-Jul-80	~1-2' on surface, but dove upon approach of boat
Caretta caretta	.5 mile East of Military canal	26-Jul-80	~2'
Caretta caretta	North boundary. East of Lewis Cut.	01-Aug-80	~2-3' carapace
Caretta caretta	~2 miles West of Featherbed Bank	02-Aug-80	~2-3' carapace
Caretta caretta	2 miles East of central Elliott Key	02-Aug-80	~2-3' carapace
Caretta caretta	Just behind Pacific Light	02-Aug-80	~2-3' carapace
Caretta caretta	Ball Bouy Reef	30-Aug-80	~2-3' carapace
Caretta caretta	.5 mile West of Billy's Point	30-Sep-80	1-2' carapace

Caretta caretta	.5 mile West of Billy's Point	31-Oct-80	1-2' carapace. Swimming along bottom
Caretta caretta	Hurricane Creek	03-Nov-80	~1' carapace way back in creek.
Caretta caretta	Hurricane Creek	10-Nov-80	~1' carapace way back in creek.
Caretta caretta	Hurricane Creek	14-Nov-80	~1' carapace way back in creek.
Caretta caretta	West of Star Reef	02-Dec-80	1-2' carapace. Resting on surface
Caretta caretta	Hawk Channel, marker 16	10-Dec-80	~3' carapace on surface. Dived on approach
Caretta caretta	North of Billy's Point	12-Dec-80	1-2' carapace
Caretta caretta	Sands Cut	18-Jun-95	Surfaced in middle channel for 2 seconds & dove.
Caretta caretta	1 mile North of Carysfort Reef	19-Jun-95	2 turles surfaced, swam at surface for ~20 ', and sank out of sight.
Caretta caretta	near marker 12 off Caesar Creek	15-Nov-97	swimming and bobbing in boat wake
Caretta caretta	North of S marker near Featherbeds	11-Jan-98	basking; most scutes were gone
Caretta caretta	Bayside of Elliott	06-May-98	swimming
Caretta caretta	Billy's Point	01-Aug-98	swimming
Caretta caretta	Caesar Creek, near Adams	12-Sep-98	Floating at surface, raised head 4 times to breathe
Caretta caretta	Near marker 3 between Caesar Creek and Pacific Reef	13-Jul-99	swimming
Caretta caretta	Caesar's Creek	11-Mar-01	Dead. Left in water. No signs of entanglement or damage
Caretta caretta	Sands Cut	24-Mar-01	Unable to dive. Miami-Dade Parks Dept. transported to Seaquarium
Caretta caretta	Caesar Creek	08-Apr-01	diving
Caretta caretta	east side of Caesar Creek	30-May-03	swimming
Caretta caretta	Convoy Point jetty	20-Jul-03	Incomplete data
Caretta caretta	Marker 3	09-Jan-04	breathing at surface
Caretta caretta	Caesar Creek	25-May-04	surfaced and dove
Caretta caretta	Marker 3, Elkhorn Reef	28-May-04	5 seen total; 3 swimming, 2 possibly mating
Caretta caretta	Biscayne Bay, Convoy Point Channel	03-Jun-04	Severly decomposed.
Caretta caretta	North of Convoy Point near mangroves	03-Jun-04	Dead. Missing 1/3 of carapace. Missing right front and both rear flippers. Severely decomposed
Caretta caretta	Biscayne Bay, boardwalk near VC	16-Jun-04	Decomposing. Washed up on rocks

Caretta caretta	East side of Caesars, near Schooner wreck	30-Jun-04	breathing
Caretta caretta	West of Ceasar Creek	08-Jul-04	Dead. Head and right flipper missing. Most entrails also missing.
Caretta caretta	Old Rhodes Key, Oceanside	08-Jul-04	Recently killed. Large (~250lbs) . Few pappillomas. Carapace intact. No sign of external damage. Ensnared by trap line.
Caretta caretta	East side of Sands Cut	22-Jul-04	Very recently killed. Small >50 lbs. Carapace busted laterally. No other damage
Caretta caretta	Biscayne Bay, 1KM west of Boca Chita	22-Aug-04	Severly decomposed. Lower portion of body missing. Remaining portion EST ~100 LBS
Caretta caretta	end of jetty	22-Aug-04	swimming
Caretta caretta	Biscayne Bay, south end by ICW.	19-Dec-05	Death by boat impact/prop damage. Missing both rear flippers
Caretta caretta	N. Tannehill beach, Elliott Key.	30-May-06	Dried carcass. Bleached carapace. Measured 93 CM across
Caretta caretta	Biscayne Bay, University Dock	26-Sep-06	Adult male found alive with 3 prop gashes on left rear portion of carapace. Died enroute to rehab center. Est 200 LBS. Measured 92CM across
Caretta caretta	Biscayne Bay, south of Featherbeds at ICW	11-Jan-07	Moderately decomposed. No obvious physical damage. Est~ 100LBS
Caretta caretta	Biscayne Bay, Convoy Point, near Visitor Center boardwalk	07-Jun-07	Killed by boat/prop impact. 3-4 gashes/prop scars. Measured 74 CM across, EST. 95 LBS. Fresh
Caretta caretta	N. Tannehill beach, ocean side Elliott Key	12-Jul-07	Fresh dead, no signs of impacts or damage. Measured 66 CM across, EST 65 LBS
Caretta caretta	Ocean side Elliott Key at Adelle Cove.	15-Feb-08	Dead. Severly decomposed. Head & flippers missing. No visible damage to carapace or plastron. Measured 69 CM across. EST 40 LBS
Caretta caretta	Biscayne Bay, 1KM west of Boca Chita channel	17-Mar-08	Alive, found floating at surface with large cut on neck, missing scutes. No other damage visible. EST 150 LBS. measured 24" long. Transported to Seaquarium
Caretta caretta	Northern tip of Elliott Key	05-Feb-10	DEAD. Stuck in mangroves near Sands Cut. Measured & painted carapace
Species not defined.	Aprrox. 200 ft West Elliott Key harbor	21-Jan-95	Dead 1 individual floating at surface ~ 30" from head to tail. Body appeared intact, no scars. Missing 1 eyeball. Species not defined
Species not defined	boat channel along boardwalk	01-Jan-99	stuck head out of water
Species not defined	2 miles west of Elliott	04-Apr-99	on surface then diving to bottom
Species not defined	Coral reef	01-Sep-00	swimming away from boat
Species not defined	Biscayne Bay	25-Oct-01	data not collected
Species not defined	glass bottom boat tour	24-Mar-02	8 turtles seen
Species not defined	channel side of jetty	03-Apr-02	swimming out to open water
Species not defined	marker 3	01-May-02	3 swimming
Species not defined	midbay between CP and Caesar Creek	18-Dec-02	swimming
Species not defined	marker 3	28-Feb-03	3 seen
Species not defined	data not collected	30-Dec-03	unknown species

Species not defined	Patch reef	14-Oct-04	swimming
Species not defined	GBB tour path	22-Jan-05	2 swimming
species not defined	boat tour	13-Apr-07	swimming
species not defined	mid bay	06-Jan-10	solitary turtle dove upon approach
species not defined	mid-bay	08-Jan-10	solitary turtle dove upon approach
species not defined	Marker 8 intercoastal waterway, just west of rubicon keys	20-Feb-11	1 dead turtle, moderately decomposed
species not defined	SE waters of Biscayne, east of Caesar Creek, near Pacific Channel	11-May-11	1 dead turtle, front left flipper is completely gong, also some loss observed in neck and head area. Appears to be the result of a natural event (eg shark attack) and not
species not defined	Ceasar's Creek	24-Aug-79	Individual swimming in shallows along creek
species not defined	Ajax Reef	29-Sep-79	Large turtle swimming away from fishing boat
species not defined	West end of Sands Cut	26-Nov-79	Individual observed by fishermen
species not defined	Billy's Point	11-Dec-79	Small turtle observed swimming underwater
species not defined	Between Billy's Point & Pelican Bank	08-Jan-80	Large turtle swimming along bottom
species not defined	Off Pelican Bank	11-Jan-80	Small turtle popped head above water.
species not defined	Pacific Light	26-Jan-80	Fishermen observered 2 turtles of different species. Both large
species not defined	South of Elliott Key harbor	10-Feb-80	Individual observed swimming at surface by fishermen
species not defined	Jones Lagoon	24-Feb-80	1.5' across according to snorkelers
species not defined	.5 mile East of Christmas Pt.	02-Apr-80	Individual seen at surface
species not defined	Hurricane Creek	08-Apr-80	Individual seen at surface ~150'
species not defined	Hawk Channel, marker 18	08-Apr-80	Very large individual seen at surface
species not defined	1 mile East of Elliott Ranger	22-Apr-80	~2'
species not defined	.5 mile NW of Pacific Reef	22-Apr-80	Small~ 1'
species not defined	Oceanside entrance to Ceasar's Creek	26-Apr-80	Observed swimming seaward by family boaters
species not defined	Southeast of Star Reef	22-Jun-80	Incomplete data
species not defined	.25 mile South of Dome	30-Jun-80	1-2'
species not defined	Star Reef	13-Jul-80	2-3' carapace length
species not defined	Bayside entrance to Ceasar's Creek	17-Jul-80	~2'

species not defined	East of Marker 20, oceanside of Ceasar's Creek	28-Jul-80	2-3' carapace. Dived on approach
species not defined	.5 mile West of Billy's Point	01-Aug-80	~1' carapace. Swimming along bottom
species not defined	Oceanside of Ceasar's Creek	03-Aug-80	~2-3' carapace
species not defined	Hawk Channel, Petrel Point	30-Aug-80	2' carapace
species not defined	Ceasar's Creek	06-Sep-80	1' carapace
species not defined	Behind Pacific Light	06-Sep-80	2' carapace
species not defined	.5 mile Northwest of Pelican Bank	03-Oct-80	Dove upon approach of boat
species not defined	Dome	21-Oct-80	Standard turtle
species not defined	North of Billy's Point	12-Dec-80	1-2' carapace
species not defined	Featherbed Bank	02-Feb-90	Individual observed at surface by fishermen
species not defined	Hawk Channel near Pacific light.	17-Apr-94	In ~30' of water. turtle broke surface; dove & swam towards Pacific light
species not defined	intersection near park	01-Jan-04	crossing road
species not defined	Mid-North End of Palm Beach, EK.	25-Mar-05	Skeleton & carapace. Submerged, half buried in sand at ebbing tide. Originally reported 2/16.
species not defined	"Bus stop" near E. Featherbeds Cut.	09-Jul-06	Severly decomposed turtle found floating. No measurements taken.
species not defined	Pacific Channel	27-Jul-07	Numerous (6+) turtles surfacing in close proximity to boat
species not defined	South of Sands Cut, ocean side Elliott Key	07-Aug-07	Severly decomposed. Only carapace & plastron remaining

Based on the data provided in Table 8, above, we believe that the majority of sea turtle takes within BNP are due to vessel strikes. Over the 7 year period, from 2004 through 2011, there were 11 observed sea turtle mortalities due to vessel strikes, or 1.6 sea turtles per year. Although these were "observed" mortalities, we believe that they accurately predict actual mortalities because of the nature of the project area. The project area is within Biscayne Bay, which contains fairly shallow waters and is surrounded by shore line on 3 sides. This design means that any sea turtle killed by vessel strikes within the area are likely to strand along the shoreline and be observed by park employees or volunteers. Therefore, we believe that "observed" take will accurately reflect the actual take in this instance. BNP will work with FWCC to establish several slow speed zones which may help to reduce the number of sea turtle mortalities associated with vessel strikes. However, the proposed slow speed zones do not encompass the majority of the shallow water reef habitat where turtles are likely to be foraging. Given that most vessels travel at speeds more than triple the recommended 4km/h necessary to allow sea turtles to avoid a collision with an approaching vessel (Hazel et al. 2007), and that vessel traffic within BNP will likely increase over the next 25 years, we believe that there will still be two (1.6 rounded to the nearest whole number equals 2) lethal sea turtle takes per year due to vessel strikes within BNP. Hazel et al. (2007) observed that green turtles move upwards and across the vessels track toward deeper waters as part of their avoidance response. This increases the risk of a collision with the hull and/or propeller, especially if the vessel is travelling at speeds in excess of 4km/h. It is expected that other species of turtles react in a similar manner. As a result of this behavior, sea turtles are likely to be severely injured or killed by collisions with vessels. Therefore, we will assume that all vessel strikes to sea turtles will be lethal.

We believe that the data in Tables 8 and 9 above may under represent the number of sea turtle mortalities due to fishing because some fishermen may not voluntarily report encounters. We know that approximately 85 percent of sea turtle mortalities with a known cause of death were from vessel strikes and the remaining 15 percent were fishing related. In order to account for unobservered/unreported fishing encounters, we will assume that approximately 15 percent of the 34 sea turtle mortalities from unknown causes are also fishing related. Therefore, we assume that a total of 7 sea turtles were killed due to hook-and-line capture or entanglement in traps over the 8 year period, or approximately 0.9 turtles per year (7 sea turtles ÷ 8 years = 0.9 sea turtles/year). BNP intends for this GMP to extend for the next 25 years. Therefore, we estimate a total of 23 sea turtles may be taken due to fishing related impacts (from both hook-and-line and trap related incidents combined) over the life of this GMP. Given what we know about the immediate mortality of sea turtles in similar hook-and-line fisheries, we believe the gear employed within BNP is just as likely to cause sea turtle mortalities. For example, the immediate mortality of sea turtles taken in the Atlantic shark bottom longline and Gulf of Mexico reef fish fishery is estimated to be 23 percent and 27 percent, respectively (NMFS 2003a, NMFS 2005b). Because the mortality rates of these two fisheries are similar, we will make the conservative assumption that 27 percent of sea turtles taken by hook-and-line fishing in BNP will also be mortalities. Therefore, we believe 7 interactions will result in lethal captures (27 percent of 23 sea turtles) and the remaining 16 will be non-lethal captures (23-7=16).

Based on the data in Table 8 (above), we believe that there may be a combination of green, loggerhead, and hawksbill sea turtles taken as a result of the implementation of the GMP. Given that the majority of sea turtle mortalities observed within BNP are loggerheads (42 percent), followed closely by greens (34 percent) we believe these are more likely to be taken than hawksbills which were only observed 0.09 percent of the time. We believe that anywhere from 1-2 loggerhead sea turtles may be lethally taken over any 3 year period and an additional 1-2 loggerheads will be taken by non-lethal capture and released. We also believe that anywhere from 0-1 green turtle will be lethally taken over any 3 year period and an additional 1-2 green turtles will be non-lethally captured and released. Furthermore, we believe that 0-1 hawksbill sea turtle will be lethally captured during any 3 year period and an additional 0-1 hawksbill turtle will be non-lethally captured and released. Table 10, below, shows the anticipated 3 year estimates by species for fishing and vessel related interactions combined.

Table 10. Three Year Sea Turtle Estimates by Species

Species	Lethal Combinations From Fishing	Non-Lethal Combinations From Fishing	Lethal From Vessel Strikes
Green Loggerhead Hawksbill	0 1 0 2 1 1 0 0 1	2 1 2 2 2 1 0 1 1	3 2 2 3 1 1
Total Turtles	2	4	6

6.3.3 Estimating Smalltooth Sawfish Take Rates

The best available data for estimating smalltooth sawfish takes come from two encounter databases, one maintained by Gregg Poulakis (Florida Fish and Wildlife Commission, Fish and Wildlife Research Institute) and Jason Seitz (Florida Museum of Natural History), and another maintained by Mote Marine Laboratory (MML). Each of these datasets is discussed below.

Poulakis and Seitz Database

Biologists Gregg Poulakis and Jason Seitz maintain a non-validated database of recent smalltooth sawfish encounters (1990 to present) from Gulf of Mexico and South Atlantic waters off south Florida. Poulakis and Seitz (2004) document 1,632 sawfish encounters in Florida Bay and the Keys between 1990 and 2002; approximately 89 percent of these occurred between 1998 and 2002 and a much higher percentage of smalltooth sawfish records occurred in the Gulf of Mexico than in the South Atlantic. From 1990 through 2005, only 11 percent of smalltooth sawfish observations were in the South Atlantic. Most sawfish encounters were reported as a single fish caught on hook-and-line or observed in the water by divers/swimmers, but several sawfish were also observed together. Virtually all of the captured sawfish were the bycatch of fishers targeting sharks, tarpon, snook, or red drum. At least 52 percent of sawfish reported as encountered were in water greater than 10 meters. Longline vessels, shrimp trawlers, anglers, and scuba divers provided these reports.

To date, Poulakis and Seitz have not documented an interaction between the commercial South Atlantic snapper-grouper fishery and a smalltooth sawfish. They have documented three interactions[10] with HMS shark bottom longline gear since 1996. It should be noted that those

[10]One encounter occurred off Georgia in 2002, and two occurred off the Florida Keys in 1996 and 1997.

interactions that occurred off the Florida Keys took place in waters where South Atlantic snapper-grouper bottom longline fishing is prohibited. There have been no reports of commercial vertical line smalltooth sawfish encounters.

MML Database
MML maintains a statewide database for Florida of validated smalltooth sawfish encounters from 1998 through the present. From January 1998 through May 2006, MML validated 840 observations of smalltooth sawfish (1,177 individuals) (MML unpublished data). The majority of these encounters (66 percent) occurred during fishing. The encounter data presented in Simpfendorfer and Wiley (2004) suggests that outside of its core range, the smalltooth sawfish appears more common on the west coast of Florida and the Florida Keys. Although the overall latitudinal spread of encounters was similar off both coasts, encounters off the east coast were much less common. The majority of the east coast encounters occurred south of 27.2°N with no east coast areas having encounters rates greater than 0.03 per km (Simpfendorfer and Wiley 2004). Observations are based on sightings densities that have not been corrected for sightings effort, however, so may be somewhat biased by the amount of fishing effort (i.e., more fishing effort in the Gulf of Mexico state waters than off the Atlantic coast).

These datasets note only two smalltooth sawfish entanglements in lobster trap gear within the last 10 years (Seitz and Poulakis 2006, T. Wiley, pers. comm. 2007) and none between 2004-2005 and 2006-2007. Both occurred off the Florida Keys in 2001 and 2002. One animal was released alive; the condition of the other upon release is not known.

Shark Bottom Longline Observer Data
The HMS shark fishery operates in both the Atlantic and the Gulf of Mexico EEZ. Twelve smalltooth sawfish were observed caught in the HMS shark bottom longline fishery between 1994 and 2005. Ten of the twelve captures were located in the Atlantic EEZ: nine off the Florida Keys, including four that were caught on one set in 1997, and one off of Georgia in 2002. The remaining two observed captures were in the Gulf of Mexico EEZ (NMFS 2003a).

No smalltooth sawfish takes by commercial South Atlantic snapper-grouper vertical line gear have been documented. However, the Poulakis and Seitz database, and MML database, report takes of smalltooth sawfish in the South Atlantic EEZ on recreational vertical line gear. Without any documented interactions we will use a precautionary approach and apply the take estimates establish in the Gulf of Mexico opinion (NMFS 2005b). That opinion estimated the take of two smalltooth sawfish off the coast of southwest Florida, and an additional take in the northern and central Gulf. We do not believe the estimated take in the northern and central Gulf is applicable to our estimate because of spatial differences. Therefore, we conclude that up to two smalltooth sawfish were taken by snapper-grouper vertical line gear.

Smalltooth sawfish are occasionally hooked with rod-and-reel gear during recreational fishing. Fishers who captured smalltooth sawfish most commonly reported that they were fishing for snook, red drum, tarpon, or sharks (Poulakis and Seitz 2004, Simpfendorfer and Wiley 2004). The majority of reported captures are from state waters and mainly within their core distribution in Florida.

The majority of recreational fishing effort in the South Atlantic EEZ occurs off of Florida, where smalltooth sawfish may be present. Although mature smalltooth sawfish are known to occur, at least intermittently, in this area, encounter reports in the South Atlantic are relatively rare. Of the reported encounters since 2002, four had the possibility of being the result of snapper-grouper fishing. These takes were documented over substrate known to be habitat for snappers and groupers and occurred within a depth range also known to be inhabited by smalltooth sawfish (Poulaski and Seitz 2004). These encounter reports do not distinguish the target species of the angler. Therefore, we believe up to four smalltooth sawfish were taken by recreational snapper-grouper vertical gear. As noted in Section 6.2.1, we believe any effects on smalltooth sawfish were sub-lethal and short-term.

The MML and Poulakis and Seitz data represent the best available for estimating smalltooth sawfish interactions with spiny lobster trap gear. As noted above, those data show two smalltooth sawfish entanglements in the last 10 years. Smalltooth sawfish is an easily identifiable species that was not listed under the ESA until 2003. Because they are relatively rare, easily distinguishable, and only recently protected by law, we believe smalltooth sawfish entanglements in spiny lobster trap gear are rare and likely to have been reported when they do occur. Therefore, we believe that the two documented smalltooth sawfish encounters are likely a good representation of the actual number of smalltooth sawfish takes that have occurred in the trap sector of the Gulf of Mexico/South Atlantic spiny lobster fishery.

One of the smalltooth sawfish entanglements records stated the animal was released alive and in good condition. The condition of the other animal at the time of release was not noted in the other record. The records suggest that smalltooth sawfish survive at least some portion of entanglements, if not all. Smalltooth sawfish physiology may help reduce the severity of impacts resulting from entanglement. They naturally lay on the sea floor, using their spiracles to breathe (Simpfendorfer pers. comm. 2003). This adaptation allows them to breathe normally without actively swimming. Thorson (1982) reports examples of largetooth sawfish caught by fishermen at night or when no one was present to tag them, surviving, tethered by their rostrums, in the water for several hours with no apparent harmful effects. This evidence leads us to believe entanglement is extremely unlikely to result in mortality. Therefore, based on this information we believe the smalltooth sawfish takes that occurred in the past were non-lethal.

Given the overall rarity of smalltooth sawfish in the action area, the chance of a smalltooth sawfish being encountered within BNP is minimal. Based on the data from Seitz and Poulaski, which reported 2 smalltooth sawfish encounters due to entanglement in spiny lobster traps and 2 from entanglement in hook-and-line gear (a total of 4 encounters over a 10 year period), we estimate two smalltooth sawfish takes could occur over a triennial period (one from hook-and-line fishing and one from trap interactions with spiny lobster traps). This estimate allows for some annual variability in smalltooth sawfish abundance or fishing effort. Fluctuations in abundance or effort can influence smalltooth sawfish/fishery interactions, and could account for the recent increase in documented interactions. Selecting a 3-year period for estimating future takes allows us to acknowledge these potential fluctuations. Based on previous interaction observations, it is likely all of these captures were released alive with only short-term sub-lethal effects. Based on this information, we believe the two smalltooth sawfish takes will be non-lethal.

7 Cumulative Effects

Cumulative effects include the effects of future state, tribal, or local private actions that are reasonably certain to occur in the action area considered in this opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA. Within the action area, major future changes are not anticipated in ongoing human activities described in the environmental baseline. The present, major human uses of the action area, such as commercial fishing and recreational boating and fishing, are expected to continue at the present levels of intensity in the near future as are their associated risks of injury or mortality to sea turtles and smalltooth sawfish posed by incidental capture by fishermen, accidental oil spills, vessel collisions, marine debris, chemical discharges, and man-made noises.

Several examples of stressors to *Acropora* are outlined in the Atlantic *Acropora* Status Review (BRT 2005). Abrasion and breakage of *Acropora* induced by divers/snorkelers, improper anchoring, vessel groundings, marine debris, and destructive fishing practices are the primary ways humans impact corals directly. Sedimentation occurring from activities like dredging and nutrient and contaminant loading from both point and non-point source pollution are examples of activities that can indirectly impact these species. Although the interaction of individual stressors is difficult to study in a rigorous, controlled experimental manipulation, it is clear that acroporid corals are facing a myriad of threats, some of which might be new (such as contaminants or novel pathogens). It is also clear that the corals are experiencing many of these stressors in new and severe combinations and it is logical to conclude that the synergistic effects of these combined stressors represent a larger threat than any individual stressor by itself (BRT 2005).

State-regulated commercial and recreational boating and fishing activities in local waters currently result in the incidental take of threatened and endangered species. It is expected that Florida will continue to license and permit large vessel and thrill-craft operations that do not fall under the purview of a federal agency, and will issue regulations that will affect fishery activities. Recreational hook-and-line fisheries have been known to take sea turtles and smalltooth sawfish. Future cooperation between NMFS and the FWCC on these issues should help decrease take of sea turtles caused by recreational activities. NMFS will continue to work with FWCC to develop ESA Section 6 agreements and Section 10 permits to enhance programs to quantify and mitigate these takes.

NMFS is not aware of any proposed or anticipated changes in other human-related actions (e.g., habitat degradation, poaching) or natural conditions (e.g., changes in oceanic conditions, etc.) that would substantially change the impacts that each threat has on the sea turtles or smalltooth sawfish covered by this opinion. Therefore, NMFS expects that the levels of take of these species described for each of the fisheries and non-fisheries will continue at similar levels into the foreseeable future.

8 Jeopardy Analysis

The analyses conducted in the previous sections of this opinion serve to provide a basis to determine whether the proposed action would be likely to jeopardize the continued existence of any ESA-listed sea turtles, smalltooth sawfish, or *Acropora* species and critical habitat for *Acropora*. In Section 6, we outlined how the proposed action would affect these species at the individual level and the extent of those effects in terms of the number of associated interactions, captures, and mortalities of each species to the extent possible with the best available data. Now we assess each of these species' response to this impact, in terms of overall population effects, and whether those effects of the proposed action, in the context of the status of the species (Section 4), the environmental baseline (Section 5), and the cumulative effects (Section 7), will jeopardize their continued existence.

"To jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly to reduce appreciably the likelihood of both the survival and the recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). Thus, in making this conclusion for each species, we typically first look at whether there will be a reduction in the reproduction, numbers, or distribution. Then, if there is a reduction in one or more of these elements, we explore whether it will cause an appreciable reduction in the likelihood of both the survival and the recovery of the species.

The NMFS and USFWS' ESA Section 7 Handbook (USFWS and NMFS 1998) defines *survival* and *recovery*, as they apply to the ESA's jeopardy standard. *Survival* means "the species' persistence… beyond the conditions leading to its endangerment, with sufficient resilience to allow recovery from endangerment." Survival is the condition in which a species continues to exist into the future while retaining the potential for recovery. This condition is characterized by a sufficiently large population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter. *Recovery* means "improvement in the status of a listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Act." Recovery is the process by which species' ecosystems are restored and/or threats to the species are removed so self-sustaining and self-regulating populations of listed species can be supported as persistent members of native biotic communities.

All of our species analyses focus on the effects of lethal interactions attributed to the proposed action. Non-lethal interactions from the proposed action are not expected to have any measurable impact on the reproduction, numbers, or distribution on any species. We have approached the number of captures and mortalities conservatively to ensure that sea turtles, sawfish, and sturgeon that are likely to be seriously injured via interactions with shrimp trawls are counted as lethal interactions. The anticipated non-lethal interactions are not expected to impact the reproductive potential, fitness, or growth of any of the captured species because they will be released unharmed shortly after entering a trawl, or released with only minor injuries. The individuals are expected to fully recover such that no reductions in reproduction or numbers from the nonlethal interactions are anticipated. Also since these interactions may generally occur anywhere in the action area and would be released within the general area where each individual is caught, no changes in the distribution of any affected species are anticipated.

8.1 Elkhorn and Staghorn Corals

In the following analyses, we demonstrate that no reduction in numbers, reproduction, or distribution is expected. Therefore, the take of elkhorn or staghorn corals will not appreciably reduce the likelihood that the species will survive and recover in the wild.

As discussed in Section 6 ("Effects of the Action"), restoration activities directed at *Acropora* spp. in BNP conducted in compliance with this opinion will not result in the mortality of any wild elkhorn and staghorn coral colonies. NMFS previously determined, in the biological opinion on the coral reef restoration plan (incorporated herein), that the proposed action will potentially result in an increased number of elkhorn and staghorn coral colonies because of the expected increased survival of reattached, stabilized, or transplanted fragments, and the potential growth of new coral colonies from settled or planktonic larvae. Thus, the proposed restoration plan does not constitute a reduction in numbers of the species in the wild. Similarly, that the proposed action will not measurably reduce sexual and asexual reproductive output of elkhorn or staghorn coral colonies, and that the net effect of the action on coral reproduction is likely to be positive, the proposed action will not result in a reduction in elkhorn and staghorn coral reproduction. Furthermore, given that the action will not result in mortality of wild elkhorn or staghorn coral colonies, and that both species are present throughout their ranges, the proposed restoration plan will not result in a reduction in the distribution of elkhorn and staghorn corals.

Based on the above effects analysis (Section 6), we have determined *Acropora* is likely to be adversely affected by derelict traps used in the spiny lobster fishery portion of the FMP. We must now determine if the action would reasonably be expected to appreciably reduce, either directly or indirectly, the likelihood of *Acropora* survival and recovery in the wild. Given what we know about the action and the stressors impacting *Acropora* throughout its range, we do not believe that the proposed action will cause an appreciable reduction in the likelihood of survival of these coral species in the wild.

The following analysis considers the effects of the take resulting from this proposed action on the likelihood of recovery in the wild. Although a recovery plan has not been finalized at this time, we consider the recovery vision statement from the *Acropora* Recovery Outline (available at http://sero.nmfs.noaa.gov/pr/protres.htm) relevant to analyze the effects on recovery:

> *Elkhorn and staghorn populations should be large enough so that reproducing individuals comprise numerous populations across their historical geographic range (wider Caribbean) and also should be large enough to protect the species' genetic diversity. Threats to the species and habitat loss and degradation will be sufficiently abated to ensure a high probability of survival into the future.*

The above effects analysis (Section 6) on the effects of the action on the likelihood of the species' survival in the wild considered the current status of the species and effects of the amount of take anticipated for the species. We determined that the proposed action will not appreciably reduce the distribution of the *A. cervicornis* or *A. palmata* throughout its range, leaving its geographic range intact. The proposed action may adversely affect up to 0.04 square feet of *A. cervicornis* and 0.003 square feet of *A. palmata* each year that spiny lobster trapping is permitted. These numbers will be reduced if/when the NPS establishes trap-free zones near corals. The action area represents only a small portion of the species current range. Such a small reduction would have no measurable effect on the distribution of the species throughout its range.

The proposed action is also not likely to appreciably reduce the likelihood of survival via a reduction in numbers. The potential loss of 0.04 square feet of *A. cervicornis* and 0.003 square feet of *A. palmata* would reduce the population by that amount, compared to the population in the absence of the continued authorization of the spiny lobster trapping within BNP. However, viewed against the large number of colonies still in existence throughout the range of the species, the effects from the proposed action will not be detectable range wide. Miller et al. (2008), estimate over 13 million *A. cervicornis* colonies and over 1.6 million *A. palmata* colonies likely exist currently in the Florida Keys, and while the absolute number of *Acropora* colonies is unknown, it is estimated that as many as a billion individual colonies may exist range wide (71 FR 26852; May 9, 2006). Therefore, the proposed action is not likely to measurably reduce the large number of colonies thought to exist range wide.

No reduction in reproductive potential or distribution will result from the proposed actions under this programmatic biological opinion. Restoration activities directed at *Acropora* spp. in BNP following vessel groundings will contribute to the identified recovery vision of increasing individuals within the population by improving our understanding of the status of, and risks facing, these species, by reducing mortality due to abrasion and breakage through the transplantation and reattachment of fragments and coral colonies, and by releasing collected gametes to the field after they settle or reach the planktonic stage. The implementation of the FMP regulations (specifically the marine reserve zone and the trap-free zones) will contribute to a reduction in fishing gear near elkhorn and staghorn corals. The data derived from monitoring the restorations of *Acropora* spp. in BNP will likely inform future recovery actions. Therefore, we have determined that the proposed action is not expected to reduce appreciably the likelihood of recovery of these coral species in the wild.

8.2 Sea Turtles

Section 6 describes the effects of the proposed action on the three species of sea turtles and the extent of those effects in terms of an estimate of the number of individuals that would be killed or otherwise taken. The following jeopardy analysis first considers the effects of the action to determine if we would reasonably expect the action to result in reductions in reproduction, numbers, or distribution of these species. The analysis next considers whether any such reduction would in turn result in an appreciable reduction in the likelihood of survival, and the likelihood of recovery of these species in the wild.

All life stages are important to the survival and recovery of a species; however, it is important to note that individuals of one life stage are not equivalent to those of other life stages. For example, the take of male juveniles may affect survivorship and recruitment rates into the reproductive population in any given year, and yet not significantly reduce the reproductive potential of the population. However, the death of mature, breeding females can have an immediate effect on the reproductive rate of a species. Sub-lethal effects on adult females may also reduce reproduction by hindering foraging success, as sufficient energy reserves are probably necessary for producing multiple clutches of eggs in a breeding year. Different age classes may be subject to relative rates of mortality, resilience, and overall effects of population dynamics. Ontogenetic shifts (changes in the developmental history of an organism within its own lifetime), or changes in location and habitat, have a major impact on where sea turtles and smalltooth sawfish occur and what human hazards they may encounter. Young juvenile sea turtles are generally not subject to hook-and-line capture because of their pelagic oceanic stage of life. However, a shift in diet for all sea turtles occurs when juvenile sea turtles shift to a neritic habitat and benthic feeding, at which time they would become more susceptible to fishing impacts. In the case of loggerhead sea turtles, this ontogenetic shift occurs rather late in their juvenile stages of life and they do not recruit to nearshore habitat until they are 10 to 30 years of age (Lutz and Musick 1996). For the proposed action, we would not expect early juvenile stage sea turtles of any of these species to be subject to take from any aspect of the pier construction or continued use of the re constructed pier. However, later stage juveniles and adults of these species are more likely to be subject to incidental take as a result of foraging in the area of increased fishing activity which would occur as a result of the proposed project.

Loggerhead Sea turtles
The proposed action is anticipated to result in the non-lethal capture of up to 2 loggerhead sea turtles from commercial and recreational fishing activities or entanglement in fishing gear every 3 years. Injuries resulting from non-lethal loggerhead sea turtle takes are not expected to have any measurable impact on the numbers, reproduction, or distribution of loggerhead sea turtles. Injuries resulting from 2 non-lethal takes are unlikely to affect the reproductive potential, fitness, or growth of the captured sea turtles because they will be released unharmed shortly after capture, be released with only minor injuries from which they are expected to recover, or strand alive as a result of injuries, subjecting them to rescue, rehabilitation, and eventual release as viable members of their respective sea turtle populations.

The potential lethal take of 5 loggerhead sea turtle every 3 years (up to 3 from vessel strikes and up to 2 from fishing) would reduce the number of loggerhead sea turtles compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. A lethal take could also result in a potential reduction in future reproduction, assuming the individual was a female and would have survived to reproduce. For example, an adult loggerhead sea turtle can lay egg clutches every 2 to 3 years with a mean clutch size of 100-126 eggs (Tucker 2010). The loss of a single adult female sea turtle, on average, could preclude the production of thousands of eggs and hatchlings over the course of her reproductive lifespan, of which a fractional percentage are expected to survive to sexual maturity. Because only up to 2 loggerhead sea turtles may be removed per year, this species' population is believed to be large enough to maintain a viable reproductive population and the lethal take is not expected to result in a reduction in reproduction, even if a reproductive age individual is affected by the action.

Whether or not the reductions in loggerhead sea turtle numbers and reproduction attributed to the proposed action would appreciably reduce the likelihood of survival for loggerheads depends on what effect these reductions in numbers and reproduction would have on overall population sizes and trends, i.e., whether the estimated reductions, when viewed within the context of the environmental baseline and status of the species, are to such extent that adverse effects on population dynamics are appreciable. In Section 4.2., we reviewed the status of the species in terms of nesting and female population trends and several recent assessments based on population modeling [i.e., (Conant et al. 2009; NMFS-SEFSC 2009d)]. Below we synthesize what that information means in general terms and also in the more specific context of the proposed action and the environmental baseline.

The best available information indicates that the NWA loggerhead DPS is still large, but is possibly experiencing more mortality than it could withstand. All of the results of population models in both NMFS SEFSC (2009d) and Conant et al. (2009) indicated western North Atlantic loggerheads were likely to continue to decline in the future unless action was taken to reduce anthropogenic mortality. With the availability of newer nesting data beyond the 2007 data used in those analyses, the status of loggerhead nesting began to show improvement. As previously described in the Status of the Species section, in 2008 nesting numbers were high, but not enough to change the negative trend line. Nesting dipped again in 2009, but rose substantially in 2010. The 2010 Florida index nesting number was the largest since 2000. With the addition of data through 2010, the nesting trend for the NWA DPS of loggerheads is only slightly negative and not statistically different from zero (no trend) (NMFS and USFWS 2010). Additionally, although the best fit trend line is slightly negative, the range from the statistical analysis of the nesting trend includes both negative and positive growth (NMFS and USFWS 2010). The 2011 nesting was on par with 2010, providing further evidence that the nesting trend may have stabilized. It is important to note, however, that even if the trend has stabilized, overall numbers have a long way to go to meet the goals of the recovery plan.

We believe that the effects on loggerhead turtles associated with the proposed action are not reasonably expected to cause an appreciable reduction in the likelihood of survival of the NWA loggerhead DPS, even in light of the impacts of the DWH oil release event. We believe the currently large population is still under the threat of possible future decline until large mortality reductions in all fisheries and other sources of mortality (including impacts outside U.S. jurisdiction) are achieved and/or the impacts of past efforts are realized within the population. However, over at least the next several decades, we expect the western North Atlantic population of adult females to remain large (tens or hundreds of thousands of individuals) and to retain the potential for recovery. The effects of the proposed action will most directly affect the overall size of the population, which we believe will remain sufficiently large for several decades to come even if the population were still in a minor decline, and the action will not cause the population to lose genetic heterogeneity, broad demographic representation, or successful reproduction, nor affect loggerheads' ability to meet their lifecycle requirements, including reproduction, sustenance, and shelter.

We believe that the proposed action is also not reasonably expected to cause an appreciable reduction in the likelihood of recovery of the NWA loggerhead DPS. Recovery is the process of removing threats so self-sustaining populations persist in the wild. The proposed changes to the sea turtle conservation regulations support or implement the Service's recovery plan developed for the NWA loggerhead DPS (NMFS and USFWS 2008). The proposed action would not impede progress on carrying out any aspect of the recovery program or achieving the overall recovery strategy. The recovery plan estimates that the population will reach recovery in 50 to

150 years, as recovery actions are implemented. The minimum end of the range assumes a rapid reversal of the current declining trends; the higher end assumes that additional time will be needed for recovery actions to bring about population growth.

Loggerhead sea turtles are highly migratory, and individuals may range throughout the Gulf of Mexico, Atlantic Ocean, and Caribbean Sea. While the potential take would result in the displacement of individuals from important developmental habitat, the loss is not significant in terms of local, regional, or global distribution as a whole.

Based on the discussion above, the anticipated impacts are not expected to appreciably reduce the species' likelihood of survival in the wild.

We also consider the recovery objectives in the recovery plan prepared for the U.S. populations of loggerhead sea turtles that may be affected by the predicted reduction in numbers. In this biological opinion we only consider the recovery objectives related to sea turtles in the marine environment.

The recovery plan for the population of the loggerhead sea turtles (NMFS and USFWS 2008) lists the following relevant recovery objectives for the Northern Recovery Unit (NRU), which would be represented disproportionately in the action area as a result of proximity to the NRU nesting beaches. However, loggerhead aggregations on foraging grounds tend to be from mixed recovery units and thus recovery goals for other recovery units would also be pertinent.

(1) There is statistical confidence (95 percent) that the annual rate of increase over a generation time of 50 years is statistically detectable (1 percent), resulting in a total annual number of nests of 106,100 or greater for this recovery unit.

(2) This increase in number of nests must be a result of corresponding increases in number of nesting females (estimated from nests, clutch frequency, and remigration interval).

Status: Annual nest totals for peninsular Florida averaged 64,513 nests from 1989-2007. Standardized ground surveys of 26 nesting beaches in peninsular Florida showed a decrease of 26 percent over the 20-year period of 1989-2008, with a mean annual decrease of 1 .6 percent. Since 1998 the decrease in loggerhead turtle nests has jumped to 41 percent.

Status: In other parts of Florida a similar trend is observed. The Florida Panhandle nesting subpopulation showed a significant declining trend of 4.7 percent annually. No trend in the annual number of nests was detected in the Dry Tortugas nesting subpopulation from 1995-2004; because of the annual variability in nest totals, a longer time series is needed to detect a trend.

Status: Analysis of nesting data from 1989-2005 by the FWRI indicates there is a significant declining trend in nesting at beaches utilized by the South Florida nesting subpopulation (McRae letter to NMFS, October 25, 2006). Data obtained for the

2006 and 2007 nesting seasons are also consistent with the decline in loggerhead nests. In 2008, overall nesting trend data still indicate a significant declining trend (FWRI Index Nesting Beach web site: http://research.myfwc.com/features/view article. asp?id= 10690). It has been unclear whether the nesting decline reflects a decline in population, or is indicative of a failure to nest by the reproductively mature females as a result of other factors (resource depletion, nesting beach problems, oceanographic conditions, etc.). However, recent analysis of the data has led to the conclusion that the nesting decline can best be explained by an actual decline in the number of adult female loggerheads in the population (Witherington et al. 2009).

The potential lethal take of 5 loggerhead sea turtles every 3 years will result in a reduction in numbers, but will not have any detectable influence on the nesting trends noted above because the average loss of less than one nesting sea turtle per year will not have a measurable, discernible, or appreciable impact on total recruitment of new sea turtles to the population. If the take were non-lethal, it is expected that it would not affect these trends either as it is not expected to impact the survival, distribution, or fecundity of the individual taken. Thus, the proposed action will not interfere with achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of loggerhead sea turtles' recovery in the wild.

Green Sea Turtles

The proposed action may result the potential non-lethal take (capture or entanglement) of up to 2 green sea turtle, every 3 years. This non-lethal take is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. Injuries resulting from the capture or entanglement of sea turtles are not expected to have any measurable impact on the numbers, reproduction, or distribution of green sea turtles. Injuries resulting from 2 non-lethal takes are unlikely to affect the reproductive potential, fitness, or growth of the captured sea turtle because it will be released unharmed shortly after capture, be released with only minor injuries from which it is expected to recover, or strand alive as a result of injuries, subjecting it to rescue, rehabilitation, and eventual release as a viable member of the sea turtle population.

The potential lethal take of 4 green sea turtles (3 from vessel strikes and 1 from fishing activities) every 3 years would reduce the number of green sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. Lethal takes could also result in a potential reduction in future reproduction, assuming the individuals were females and would have survived to reproduce. For example, an adult green sea turtle can lay 1-7 clutches (usually 2-3) of eggs every 2 to 4 years, with 110-115 eggs/nest. The loss of a single adult female sea turtle, on average, could preclude the production of thousands of eggs and hatchlings, of which a fractional percentage are expected to survive to sexual maturity. Because only up to 4 green sea turtle may be removed every 3 years, this species' population is believed to be large enough to maintain a viable reproductive population and the lethal take is not expected to result in a reduction in reproduction, even if reproductive age individuals are affected by the action. Further, the anticipated take is expected to occur in the action area (within BNP) and sea turtles generally have large ranges in which they disperse; thus, no reduction in the distribution of green sea turtles is expected from these takes.

Whether the reductions in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. The 5-year status review for green sea turtles states that of the seven green sea turtle nesting concentrations in the Atlantic Basin for which abundance trend information is available, all were determined to be either stable or increasing (NMFS and USFWS 2007a). That review also states that the annual nesting female population in the Atlantic basin ranges from 29,243-50,539 individuals. Additionally, the pattern of green sea turtle nesting shows biennial peaks in abundance, with a generally positive trend during the 21 years of regular monitoring since establishment of index beaches in Florida in 1989. An average of 8,207 green turtle nests were laid annually in Florida between 2005 and 2009 with a low of 4,462 in 2009 and a high of 12,751 in 2007 (FWRI 2009).

Although the anticipated mortality of up to 4 green sea turtle every 3 years would result in an instantaneous reduction in absolute population numbers, the U.S. populations of green sea turtles would not be appreciably affected. For a population to remain stable, sea turtles must replace themselves through successful reproduction at least once over the course of their reproductive lives, and at least one offspring must survive to reproduce itself. If the hatchling survival rate to maturity is greater than the mortality rate of the population, the loss of breeding individuals would be replaced through recruitment of new breeding individuals from successful reproduction of nontaken sea turtles. Since the abundance trend information for green sea turtles is either stable or increasing, we believe the loss of up to 4 green turtle every 3 years will not have any measurable effect on that trend.

Based on the above analysis, we believe the proposed action is not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival of the green sea turtle in the wild.

Although no change in distribution was concluded for green sea turtles, we concluded a lethal take would result in a reduction in absolute population numbers that may also reduce reproduction, but this reduction is not expected to appreciably reduce the likelihood of survival of green sea turtles in the wild. The following analysis considers the effects of the anticipated take on the likelihood of recovery in the wild.

The Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991b) lists the following relevant recovery objectives over a period of 25 continuous years. Note that there are no known nesting beaches in the proposed action area of Texas and the Recovery Plan focuses on the major nesting areas for the State of Florida for green turtles:

(1) The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years; Green turtle nesting in Florida over the past six years has been documented as follows: 2005 - 9,644 nests, 2006 - 4,970 nests, 2007 - 12,752 nests, 2008 - 9,228, and 2009 - 4,462. This averages 8,211 nests annually over the past 5 years (FWRI 2009).

(2) A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.

--Several actions are being taken to address this objective; however, there are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds.

The potential lethal take of up to 4 green sea turtle every 3 years is not likely to reduce population numbers over time due to current population sizes and expected recruitment. Non-lethal takes of sea turtles would not affect the adult female nesting population or number of nests per nesting season. It is worth noting that this level of take has already occurred in the past, yet we have still seen positive trends in the status of this species. Thus, the proposed action is not in opposition to the recovery objectives above and will not result in an appreciable reduction in the likelihood of green sea turtles' recovery in the wild. However, the Atlantic Recovery Plan states as a priority that several state and federal agencies, "identify important marine foraging habitat and determine seasonal distribution, abundance, and population characteristics, and status of inshore and nearshore waters."

Hawksbill Sea Turtles

The proposed action may result in up to 1 non-lethal capture or entanglement of a hawksbill sea turtle every 3 years. Injuries resulting from a non-lethal hawksbill sea turtle take are not expected to have any measurable impact on the numbers, reproduction, or distribution of hawksbill sea turtles. Injuries resulting from a single non-lethal take are unlikely to affect the reproductive potential, fitness, or growth of the captured sea turtle because it will be released unharmed shortly after capture, be released with only minor injuries from which it is expected to recover, or strand alive as a result of injuries, subjecting it to rescue, rehabilitation, and eventual release as a viable member of its respective sea turtle population.

The possible lethal take of up to 2 hawksbill sea turtles (1 from vessel strikes and 1 from fishing activities) every 3 years would reduce the number of hawksbill sea turtles, compared to the number that would have been present in the absence of the proposed action, assuming all other variables remained the same. Potential lethal interactions could also result in a reduction in future reproduction, assuming one or more individuals would be female and would survive otherwise to reproduce in the future. For example, an adult hawksbill sea turtle can lay 3-5 clutches of eggs every few years (Meylan and Donnelly 1999; Richardson et al. 1999) with up to 250 eggs/nest (Hirth 1980). Thus, the loss of any females could preclude the production of thousands of eggs and hatchlings, of which a fraction would otherwise survive to sexual maturity and contribute to future generations. Sea turtles generally have large ranges in which they disperse; thus, no reduction in the distribution of hawksbill sea turtles is expected from these takes. Likewise, as explained in the Environmental Baseline section, while a few individuals were found to have been impacted, there is no information to indicate, or basis to believe, that a significant population-level impact has occurred that would have changed the species' status to an extent that the expected interactions from southeast shrimp fisheries would result in a detectable change in the population status of hawksbill turtles in the Atlantic. Any impacts are not thought to alter the population status to a degree in which the number of mortalities from the proposed action could be seen as reducing the likelihood of survival and recovery of the species.

We believe hawksbill sea turtles have a sufficiently large population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter. Thus, we believe the proposed action will not result in an appreciable reduction in the likelihood of hawksbill sea turtles' survival in the wild.

The Recovery Plan for the population of the hawksbill sea turtles (NMFS and USFWS 1993) lists the following relevant recovery objectives over a period of 25 continuous years:

- The adult female population is increasing, as evidenced by a statistically significant trend in the annual number of nests at five index beaches, including Mona Island and Buck Island Reef National Monument.
- The numbers of adults, subadults, and juveniles are increasing, as evidenced by a statistically significant trend on at least five key foraging areas within Puerto Rico, USVI, and Florida.

The recovery plan lists six major actions that are needed to achieve recovery, including:

- Provide long-term protection to important nesting beaches.
- Ensure at least 75 percent hatching success rate on major nesting beaches.
- Determine distribution and seasonal movements of turtles in all life stages in the marine environment.
- Minimize threat from illegal exploitation.
- End international trade in hawksbill products.
- Ensure long-term protection of important foraging habitats

Of the hawksbill sea turtle rookeries regularly monitored: Jumby Bay (Antigua/Barbuda), Barbados, Mona Island, and Buck Island Reef National Monument all show increasing trends in the annual number of nests (NMFS and USFWS 2007b). In-water research projects at Mona Island (Puerto Rico) and the Marquesas, Florida, which involve the observation and capture of juvenile hawksbill turtles, are underway. Although there are 15 years of data for the Mona Island project, abundance indices have not yet been incorporated into a rigorous analysis or a published trend assessment. The time series for the Marquesas project is not long enough to detect a trend (NMFS and USFWS 2007b).

Unlike for other sea turtle species, none of the major actions specified for recovery are specific to fishery bycatch. While incidental capture in commercial and recreational fisheries is listed as one of the threats to the species, the only related action, "Monitor and reduce mortality from incidental capture in fisheries" is ranked as a priority 3.

The potential lethal take of up to 2 hawksbill turtles every 3 years is not likely to reduce population numbers over time due to current population sizes and expected recruitment. Non-lethal takes of sea turtles would not affect the adult female nesting population or number of nests per nesting season. It is worth noting that this level of take has already occurred in the past, yet we have still seen positive trends in the status of this species. Thus, the proposed action is not in opposition to the recovery objectives above and will not result in an appreciable reduction in the likelihood of hawksbill sea turtles' recovery in the wild.

8.3 Smalltooth Sawfish

The proposed action may result in up to 2 live captures or entanglements of smalltooth sawfish every 3 years. Injuries resulting from non-lethal smalltooth sawfish take are not expected to have any measurable impact on the numbers, reproduction, or distribution of this species. Injuries resulting from non-lethal take are unlikely to affect the reproductive potential, fitness, or growth of the captured smalltooth sawfish because they will be released unharmed shortly after capture or released with only minor injuries from which they are expected to recover. Since there is no expected lethal take of smalltooth sawfish, there will be no reduction in smalltooth sawfish numbers and reproduction and no additional jeopardy analysis is necessary for this species.

9 Destruction and Adverse Modification Analysis

This section analyzes the effects of this action, in the context of the status of the critical habitat, the environmental baseline and cumulative effects, relative to the ecological function of designated critical habitat for elkhorn and staghorn corals, i.e., when the essential features will continue to provide suitable habitat for elkhorn and staghorn corals and that the effects of the project will not impede (i.e., delay or limit) the conservation of elkhorn and staghorn corals. This biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02, which has been invalidated by several federal district and circuit courts. Instead, we have relied upon the statutory provisions of the ESA and agency guidance on applying the "destruction or adverse modification" standard (Hogarth 2005). Ultimately, we seek to determine if, with the implementation of the proposed action, critical habitat would remain functional (or retain the current ability for the essential features to be functionally established) to serve the intended conservation role for the species

Destruction or adverse modification analyses consider the effects of an action, in the context of the status of the designated critical habitat, the environmental baseline and cumulative effects, relative to the ecological function of designated critical habitat for elkhorn and staghorn corals, i.e., when the essential features will continue to provide *Acropora* corals suitable habitat and that the effects of proposed actions will not impede (i.e., delay or limit) the conservation of elkhorn and staghorn corals.

The only permanent impact will be to less than one square foot of coral critical habitat from the installation of anchor pins for new mooring buoys near the proposed marine reserve zone. As noted above, the key objective for the conservation and recovery of listed coral species is the facilitation of an increase in the incidence of sexual and asexual reproduction. Recovery cannot occur without protecting the essential feature of critical habitat from destruction or adverse modification because the quality and quantity of suitable substrate for listed corals affects their reproductive success. However, we believe that the loss of the extremely small area of habitat containing the essential feature due to the installation of anchor pins buoys is infinitesimal and does not constitute an appreciable impact on the ability of critical habitat in the Florida unit to support the conservation of elkhorn and staghorn corals by providing sufficient, appropriate settlement and attachment substrate. Therefore, we believe that the GMP will not result in the destruction or adverse modification of coral critical habitat.

10 Conclusion

The proposed action consists of a programmatic approach to the implementation of the GMP for BNP. The proposed action includes PDCs that will be applicable to all activities covered by this programmatic consultation, effects anticipated given implementation of the PDCs, project-specific consultation procedures, and required monitoring and reporting incorporated into all components of the GMP to ensure proposed restoration is consistent with the programmatic consultation. After reviewing the current statuses of green, loggerhead, and hawksbill sea turtles, smalltooth sawfish, and elkhorn and staghorn corals, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of any ESA-listed sea turtles, smalltooth sawfish, elkhorn or staghorn corals, and will not destroy or adversely modify *Acropora* critical habitat.

11 Incidental Take Statement

Section 9 of the ESA and protective regulations issued pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the RPMs and terms and conditions of the ITS.

Section 7(b)(4)(c) of the ESA specifies that to provide an ITS for an endangered or threatened species of marine mammal, the taking must be authorized under Section 101(a)(5) of the MMPA. Since no incidental take of listed marine mammals is expected or has been authorized under Section 101(a)(5) of the MMPA, no statement on incidental take of protected marine mammals is provided and no take is authorized. Nevertheless, BNP must immediately notify (within 24 hours, if communication is possible) NMFS' Office of Protected Resources should a take of a listed marine mammal occur.

11.1 Anticipated Amount or Extent of Incidental Take

NMFS anticipates the following incidental takes may occur in the future as a result of commercial and recreational fishing and vessel strikes related to the continued operation of BNP under the GMP. The "total turtles" row presents the 3-year estimates of impacts to turtles, and the "combination" columns indicate the potential make-up of the total take categories over 3-year periods. For example, 6 lethal strikes of sea turtles are anticipated over each 3-year period, and those 6 could consist of either 3 green, 2 loggerhead, and 1 hawksbill, or 2 green, 3 loggerhead and 1 hawksbill sea turtles.

Table 11. Anticipated Take in BNP

	3-Year Take		
Species	Lethal Combinations From Fishing	Non-Lethal Combinations From Fishing	Lethal From Vessel Strikes
Green	0 1 0	2 1 2	3 2
Loggerhead	2 1 1	2 2 1	2 3
Hawksbill	0 0 1	0 1 1	1 1
Total Turtles	2	4	6
Smalltooth Sawfish	0	2	0
	Annual Take		
Acropora cervicornis	0.04 square feet		
Acropora palmata	0.003 square feet		

11.2 Effect of the Take

NMFS has determined the level of anticipated take specified in Section 11.1 is not likely to jeopardize the continued existence of green, hawksbill, or loggerhead sea turtles, acroporid corals, or smalltooth sawfish.

11.3 Reasonable and Prudent Measures (RPMs)

Section 7(b)(4) of the ESA requires NMFS to issue to any agency whose proposed action is found to comply with Section 7(a)(2) of the ESA, but may incidentally take individuals of listed species, a statement specifying the impact of that taking. It also states that RPMs necessary to minimize the impacts from the agency action, and terms and conditions to implement those measures, must be provided and followed. Only incidental taking that complies with the specified terms and conditions is authorized.

The RPMs and terms and conditions are required, per 50 CFR 402.14 (i)(1)(ii) and (iv), to document the incidental take by the proposed action and to minimize the impact of that take on ESA-listed species. These measures and terms and conditions are non-discretionary, and must be implemented by BNP for the protection of Section 7(o)(2) to apply. BNP has a continuing duty to regulate the activity covered by this incidental take statement. If it fails to adhere to the terms and conditions of the incidental take statement through enforceable terms, and/or fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of

Section 7(o)(2) may lapse. To monitor the impact of the incidental take, BNP must report the progress of the action and its impact on the species to NMFS as specified in the Incidental Take Statement [50 CFR 402.14(i)(3)].

We have determined that the following RPMs are necessary and appropriate to minimize the impacts of future takes of acroporid corals, sea turtles, and smalltooth sawfish within BNP and to monitor levels of incidental take.

1. Sea Turtle and Smalltooth Sawfish Handling Requirements:
   As noted in Section 6.2.4, spiny lobster trap and hook-and-line gear can adversely affect sea turtles and smalltooth sawfish via entanglement and/or forced submergence. Most, if not all, sea turtles and smalltooth sawfish released after entanglement events have experienced some degree of physiological injury from forced submergence and/or abrasions/lacerations caused by trap ropes. The ultimate severity of these events is dependent not only upon actual interaction (i.e., physical trauma from entanglement/forced submergence), but the amount of gear remaining on the animal at the time of release. The handling of an animal also greatly affects its chance of recovery. Therefore, the experience, ability, and willingness of fishers to remove gear, is crucial to the survival of sea turtles and smalltooth sawfish following release. NMFS requires that captured sea turtles and smalltooth sawfish are handled to minimize adverse effects from incidental take and reduces mortality.
2. Monitoring the Frequency and Magnitude of Incidental Take:
   The jeopardy analyses for sea turtles and smalltooth sawfish are based on the assumption that the frequency and magnitude of adverse effects that occurred in the past will continue into the future. In order to verify these estimated potential adverse effects to the sea turtles and smalltooth sawfish, NMFS requires monitoring and tracking of take levels within BNP. Therefore, BNP must ensure that monitoring and reporting of any sea turtles or smalltooth sawfish: (1) detects any adverse effects resulting from commercial and recreational fishing within BNP, (2) assesses the actual level of incidental take in comparison with the anticipated incidental take documented in this opinion; and (3) detects when the level of anticipated take is exceeded.

3. Vessel Strike Avoidance Measures:
   In Section 6.3.2 we determined that vessels strikes are the main cause of sea turtle mortalities within BNP. NMFS requires the NPS to implement measures to help alleviate vessel strikes within BNP.

4. Measures to Reduce Impacts to *Acropora* and Critical Habitat:
   As noted in Section 6, weather induced movement of derelict lobster traps and installation of mooring buoys can adversely affect *Acropora* and its critical habitat, respectively. NMFS requires spiny lobster fishing within BNP to be conducted in such a manner and area that adverse impacts to *Acropora* are minimized. NMFS also requires that installation of mooring buoys is conducted in such a manner that adverse impacts to *Acopora* critical habitat are minimized.

11.4 Terms and Conditions

In order to be exempt from liability for take prohibited by Section 9 of the ESA, BNP must comply with the following terms and conditions, which implement the RPMs described above. These terms and conditions are non-discretionary.

The following terms and conditions implement RPM No. 1.

BNP must require compliance with the most current careful release protocols including any updates to these requirements. BNP must include information specifying handling and/or resuscitation requirements that fishers must implement for any sea turtles taken, as stated in 50 CFR 223.206(d)(1-3), as mandatory conditions of the NPS Special Use Permits issued to commercial fishermen and recreational boaters. The conditions in the recreational boating permits are applicable only if the permittees engage in fishing activities in the Park.

BNP must also require as mandatory conditions of the NPS Secial Use Permits that all fishermen take the following actions to safely handle and release an incidentally caught smalltooth sawfish:

Leave the sawfish, especially the gills, in the water as much as possible.
Do not remove the saw (rostrum) or injure the animal in any way.
Remove as much fishing gear as safely possible, from the body of the animal.
If it can be done safely, untangle any line wrapped around the saw.

BNP will display educational signage regarding smalltooth sawfish (http://www.flmnh.ufl.edu/fish/education/sawfishsign.pdf) wherever practical on BNP property, including along the jetty/boardwalk areas of Convoy Point and Black Point, explaining the possibility of their capture by hook-and-line and spiny lobster traps, and what to do in the event of a hooking or entanglement within BNP.

BNP will also suggest to Miami-Dade County officials that they install similar signage at all marinas and vessel entry points that are owned/operated by the county.
This signage must identify the telephone and e-mail contact information where an individual may report a sawfish incidental capture or sighting to the National Sawfish Encounter Database.

BNP will also display educational signage regarding sea turtles (http://sero.nmfs.noaa.gov/sf/pdfs/Sea Turtle_Release Protocols April2011.pdf.) wherever practical on BNP property, including along the jetty/boardwalk areas of Convoy Point and Black Point, explaining the possibility of their capture by hook-and-line and spiny lobster traps, and what to do in the event of a hooking or entanglement within BNP.

BNP will also suggest to Miami-Dade County officials that they install similar signage at all marinas and vessel entry points that are owned/operated by the county.

The signs must warn anglers to avoid casting in the direction of sighted sea turtles, to avoid the possibility of their capture.

Signs must clearly display the 24-hour phone number for the Florida Sea Turtle Strandings Hotline [1-888-404-3922] and e-mail (Allen.Foley@MyFWC.com).
Signs should clearly direct anglers to immediately call the Florida Sea Turtle Strandings Hotline to report any turtle catch and request assistance if necessary.

BNP will install monofilament recycling bins and educational signage wherever practical on BNP property, including along the jetty/boardwalk areas of Convoy Point and Black Point to reduce the risk of turtle or sawfish entanglement in or ingestion of marine debris within BNP.

BNP will also suggest to Miami-Dade County officials that they install similar bins and signage at all marinas and vessel entry points that are owned/operated by the county.

Monofilament recycling bins must:
Be constructed and labeled according to the instructions provided at: http://mrrp.myfwc.com/media/1517/MRRPProtocol.pdf.
Be maintained in working order and emptied frequently so that they do not overflow.

The following terms and conditions implement RPM No. 2

BNP will coordinate with the STSSN and State of Florida to monitor sea turtle strandings. If stranding trends show a significant increase in spiny lobster trap gear and/or hook-and-line related strandings, this may represent new information that would require reinitation of Section 7 consultation.

BNP, in collaboration with the SEFSC, must submit STSSN stranding reports (which will be forwarded to NMFS by the STSSN), including the information below, that show evidence of trap and/or hook-and-line gear entanglements of sea turtles to NMFS by May 1 of each year.

The STSSN report must include information on: species, sex, date (day, month, and year), location where the take occurred (latitude and longitude, if possible) the animal condition and disposition, and the curved and/or straight carapace length (when available).

These reports must be forwarded to the Assistant Regional Administrator for Protected Resources, Southeast Regional Office, Protected Resources Division (PRD), 263 13th Avenue South, St. Petersburg, Florida 33701.

BNP will include, as mandatory conditions of its Special Use Permits for commercial fishing and boating, that permit holders report any accidental hooking or other incidental fishing interaction with sea turtles or sawfish, or any accidental vessel strike of a sea turtle, resulting from their permitted activity.

The following terms and conditions implement RPM No. 3

BNP will enforce the slow speed zones and will attach the Vessel Strike Avoidance Measures (enclosed) to the NPS Special Use Permits.

BNP will display educational materials wherever practical on BNP property, including along the jetty/boardwalk areas of Convoy Point and Black Point, alerting boaters to the presence of sea turtles and educating them regarding the effects of vessel strikes.

BNP will also suggest to Miami-Dade County officials that they install similar vessel strike avoidance signage at all marinas and vessel entry points around the park that are owned/operated by the county.

The following terms and conditions implement RPM No. 4

BNP will distribute (as part of the NPS Secial Use Permits) outreach material describing the appearance and likely habitat of *Acropora*, and inform fishers that there are potential civil penalties for damage caused to corals from placement of traps or traps mobilized in storms, to aid fishers in avoiding potential interactions with these species.

BNP will recommend to FWCC that new closed areas be established where trapping is prohibited. If agreed upon by the FWCC, then BNP must work with FWCC to accomplish this action. This will reduce the likelihood of spiny lobster traps affecting *Acropora*.

BNP will conduct *Acropora* surveys prior to installation of any mooring buoys or markers in accordance with the Recommended Survey Protocol for *Acropora* spp. in Support of Section 7 Consultation (Revised October 2007) (Attachment D).

Mooring buoys and/or markers will be installed in sandy substrate wherever possible and anchor pins will be used in any area where a buoy/marker must be installed into hardbottom. Anchor pins must NOT be installed directly in/on *Acropora* colonies.

12 Conservation Recommendations

NMFS believes the following conservation recommendations further the conservation of listed species. NMFS strongly recommends that these measures be considered and implemented by the COE, and requests to be notified of their implementation.

1. Gather data on the species and numbers of hook-and-line captures within BNP that would help to determine the makeup of majority of marine fauna found at the site.

2. Gather data documenting the numbers, size, species, locations, behavior, etc., of all threatened and endangered species observed within BNP by BNP patrons. Continue public outreach and education on smalltooth sawfish and sea turtles, in an effort to minimize interactions, injury, and mortality.

3. Provide funding to directed research on smalltooth sawfish that will help further our understanding about the species, i.e., implement a relative abundance monitoring program which will help define how spatial and temporal variability in the physical and biological environment influence smalltooth sawfish, in an effort to predict long-term changes in smalltooth sawfish distribution, abundance, extent, and timing of movements.

4. Provide NMFS' Southeast Region PRD with data collected and any resulting publications from all restoration and monitoring concerning elkhorn and staghorn corals, including any research that is not covered by this programmatic opinion.

5. Conduct a more comprehensive *Acropora* abundance survey to document the location and abundance of *Acropora* within BNP.

6. Work with FWCC to establish a no-take marine reserve area.

7. Work with FWCC to establish a trap-free zone near Convoy Point and around other designated coral reef protection areas.

In order for NMFS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, NMFS requests notification of the implementation of any conservation recommendations.

13 Reinitiation of Consultation

As provided in 50 CFR Section 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) 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, (2) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion, or (3) a new species is listed or critical habitat designated that may be affected by the identified action.

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APPENDIX A

Anticipated Incidental Take of ESA-Listed Species in NMFS-Authorized Federal Fisheries in the Southeast Region

Table A.1. Fishery Incidental Take Authorized in the Southeast Region

Fishery	ITS Authorization Period	Listed Species					
		Loggerhead	Leatherback	Kemp's Ridley	Green	Hawksbill	Smalltooth Sawfish
Coastal Migratory Pelagics	3-Year	33-All lethal	2 lethal takes for Leatherbacks, Hawksbill, and Kemp's Ridley-both lethal take		14-All Lethal	See leatherback entry	2 Non-lethal Takes
Dolphin-Wahoo	1-Year	12-No more than 2 lethal	12-No more than 1 lethal	3 for all species in combination-no more than 1 lethal take			None
Gulf of Mexico Reef Fish	3-Year	1,044-No more than 572 lethal	11-All lethal	108-No more than 41 lethal	116-No more than 75 lethal	9-No more than 8 lethal	8 Non-lethal Takes
HMS-Pelagic Longline	3-Year	1,905-No more than 339 lethal	1,764-No more than 252 lethal	105-No more than 18 lethal for these species in combination			None
HMS-Shark	3-Year	679-No more than 346 lethal	74-No more than 47 lethal	2 – No more than 1 lethal	2 – No more than 1 lethal	2 – No more than 1 lethal	51–No more than 1 lethal take
Gulf of Mexico and South Atlantic Spiny Lobster	3-Year	3-Lethal or Non-Lethal Take	1 –Lethal or Non-Lethal take for Leatherbacks, Hawksbill, and Kemp's Ridley		3-Lethal or Non-Lethal Take	1 –Lethal or Non-Lethal take for Leatherbacks, Hawksbill, and Kemp's Ridley	2 Non-lethal Takes
South Atlantic Snapper-Grouper	3-Year	202-No more than 67 lethal	25-No more than 15 lethal	19-No more than 8 lethal	39-No more than 14 lethal	4-No more than 1 lethal	8 Non-lethal Takes

APPENDIX B

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

The permittee shall comply with the following protected species construction conditions:

a. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles and smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of these species.

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.

c. Siltation barriers shall be made of material in which a sea turtle or smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers may not block sea turtle or smalltooth sawfish entry to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.

d. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

e. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

f. Any collision with and/or injury to a sea turtle or smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

ATTACHMENT A

ENDANGERED SEA TURTLES
HOOK AND LINE CAPTURE GUIDANCE

IF YOU HAVE A FISHING INTERACTION WITH A SEA TURTLE IMMEDIATELY CALL

THE STRANDING NETWORK HOTLINE AND FOLLOW REPRESENTATIVES INSTRUCTIONS.

If you cannot reach a representative release the turtle by cutting line as close to hook as possible.

Please leave a message on the hotline including your contact information.

Report ALL Injured, Entangled, and Hooked Sea Turtles to the Sea Turtle Stranding Network Hotline:

1-888-404-3922

DO NOT attempt to reel in or raise turtle to the pier by fishing line.

This may cause greater injury to the turtle.

RECREATIONAL FISHING RECOMMENDATIONS TO AVOID SEA TURTLE INJURY:

- DO NOT cast in the direction of sea turtles.
- Properly dispose of fishing line in monofilament recycling bins.

For more information please visit: http://sero.nmfs.noaa.gov

ATTACHMENT B

Monofilament recycling bin assembly and installation

Assembly:

- Cut PVC pipe into approximately 2' long pieces using a hacksaw, reciprocating saw (metal blade; 12" long blades work well), bandsaw or table saw. Use a deburring tool or sandpaper to remove PVC "burrs" around edges.
- Working in a well-aerated area, apply PVC glue to inside (non-threaded part) of adapter. With adapter sitting squarely on the ground, press the pipe down into the adapter until snug. Note that PVC glue works by dissolving the PVC, then sets rapidly, so you don't have a lot of "play" time with it.
- Apply PVC glue to the inside of one end of the elbow (it does not matter which end). Press the elbow onto the pipe. Try and make sure that any blemishes on the pipe end up on the back side of the bin.
- Apply stickers.
- Drill 2 holes (about ¼ or 3/8") in the center of the screw plug. Thread plug into adapter.

Installation:

- Decide where you are going to install the bin and sign. Using a long drill bit (8"), drill 2 holes in the supporting wood (post or railings). The holes should be placed such that the upper hole will line up with the lower part of the elbow and the lower hole lines up with the collar of the adapter. Drill a hole through the base of the elbow at the back of the bin.
- Use bolts or all-thread to attach the bin to the post at the top hole. Lok-tite may be used on the threads to try and keep the nuts from coming loose.
- From the back side of the post, drill through the existing hole and through the collar of the adapter. Use a second bolt or piece of all-thread to attach the bin through these holes.
- If using all-thread, use a reciprocating saw or bolt cutters to cut off the excess material.

Alternate method of installation:

In relatively secure areas (paid-access fishing piers, for example), or where you must attach the bin to a concrete railing, you can use long cable-ties (tie-wraps) to wrap around the post and bin in 2 or 3 places. You can purchase tightening tools for the cable ties which will allow you to get a snug fit. The cable ties are available from Home Depot in 34" and 48" lengths. The excess part of the cable tie should be cut off using the tightening tool or snips.

Deterring vandals

You can help prevent removal of 4x4 posts in one of two ways: 1. Use concrete to help set the post in the ground; 2. Nail or screw a piece of 2x4 perpendicular to the 4x4 post, as close to the ground as you can. This will prevent people from being able to rock the post back and forth.

If the container is attached to a pier/railing, you can attach a 2x4 or 4x4 to the pier adjacent to both sides of the container—this helps stop people from rocking the container back and forth and breaking it loose.

Suggested tool list

Tools listed as "optional" will make your life easier, but may be fairly expensive. However, if you or a volunteer happen to already own them, plan to bring them along!

Bin assembly:

- Hacksaw (there are specific PVC hacksaws which can be purchased from plumbing supply companies, but a regular hacksaw should work)
- Tape measure
- Sandpaper (any grit is fine; if purchasing specifically for this project, get 100 grit)

Optional: reciprocating saw with 12" metal cutting blade; OR bandsaw OR table saw with fine-toothed blade (the more teeth the better), de-burring tool (available from plumbing supply company)

Bin installation:

- Post-hole diggers (if installing 4x4 post)
- Cordless drill with long (8") drill bit (3/8" preferred)
- Wrenches to fit nuts you will be using to install (2 wrenches or ratchets with sockets or combination of the 2)
- Hacksaw or bolt-cutters (if using all-thread)
- Screwdriver (or screwdriver bit for drill) (if attaching signs; use stainless steel screws)
- Cable-tie tightener (available from Home Depot online or at A/C supply companies) (if using cable ties)

Optional: Bucket and small shovel/trowel for mixing concrete, reciprocating saw with metal-cutting blade (if using all-thread)

Suggested items for volunteers who are collecting line from containers:

- Grocery store bags (to collect line)
- Nail clippers or small pair of scissors (to remove hooks, etc.)
- Large pair of pliers or large wrench (in case plug is too tight)
- Short stick with cuphook on the end (used to reach inside container and pull down line without having to put one's hand inside it)
- Spray bottle with 10% bleach (for occasional rinsing of inside of containers)

ATTACHMENT C

CONSTRUCTION OF PVC FISHING LINE RECYCLING CONTAINERS

Materials needed (per station)

2' of 6" PVC pipe

1 6" elbow

1 6" female threaded adapter

1 6" threaded male plug

Glue the elbow to one end of the pipe and the adapter to the other. Drill two holes in the plug (this is for drainage in case water gets into the recycling container) and attach (hand tight). Affix stickers.

ATTACHMENT D

Recommended Survey Protocol for *Acropora* spp. in Support of Section 7 Consultation

(Revised October 2007)

Objective:
To outline recommended survey methods for determining the distribution and abundance of *Acropora* spp. at sites under permit review. The methods should be applicable to a broad range of project scales.

Problem:
Two aspects make quantitative sampling for *Acropora* spp. difficult:

1. Patchy and clumped distribution, with colonies as small as 0.01 m^2, which may be clumped together within a sub-area of the project area; and
2. Stratified distribution, with occurrence perhaps limited to a particular depth gradient or substrate type within a project area.

Recommended Methods:
The most appropriate approach depends on scale, and the amount of expected error depends on the approach. Unless a complete survey of the entire area is done, the estimated distribution and abundance of these species may be significantly in error. With the exception of very small project areas, efficient field sampling may require sampling in two stages. A preliminary visual reconnaissance of the site should be conducted to locate any occurrences of *Acropora* spp. Following the preliminary reconnaissance, a more comprehensive sampling should be initiated.

When using following survey methods, the survey personnel should record the following:

1. Species;
2. Single largest linear dimension of the colony or length, height, and width (units = mm) ;
3. Rank of percentage live tissue (i.e., > or < 50%);
4. GPS coordinate of each colony (if possible) or each survey site (unit = decimal degrees and state datum); and
5. Site map with locations of each colony.

Small Project Area (< ~0.1 hectare or 0.25 acre)
Conduct a visual reconnaissance of entire project area. This can be accomplished either with scooter assisted snorkel (if visibility and depth is sufficient to collect required data) or SCUBA. If a benthic habitat map is available, reconnaissance can be limited to hard bottom.

Intermediate to Large Project Area (> ~0.1 hectare or ~0.25 acre)
Data should be collected at 1 sampling site per every 10,000 m^2. If a benthic habitat map is available for the site, sampling can be limited to the portion of the project site that contains hard bottom (i.e., where the species may occur). The portion that contains unconsolidated sediment can be omitted from sampling area. If a benthic habitat map is unavailable, then samples must be collected per every 10,000 m^2 of project area. At each sampling site, a 2-tiered survey will be conducted.

1. Conduct a structured 20-min timed swim from a referenced center point (i.e., downline). If 5 or less colonies are encountered, collect the required data on those colonies and proceed to next sampling site. If more than 5 colonies are encountered, process to 2nd tier.
2. Conduct 3 belt transects from the referenced center point at 3 random bearings. Each belt transect should measure 4 m X 50 m, for a total of 200 m^2 sampled. Record all required data for all colonies encountered along the transect.