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National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
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F/SER31:MET

FEB 22 2018

MEMORANDUM FOR: F/HC3 – Leslie Craig

FROM: F/SE – Roy E. Crabtree, Ph.D.

SUBJECT: Deepwater Horizon-Early Restoration Plan Phase III, Endangered Species Act Section 7 Consultations for 3 public park/fishing pier projects on the Gulf Coast of northwest Florida

Enclosed is the National Marine Fisheries Service's (NMFS) Biological Opinion issued in accordance with Section 7 of the Endangered Species Act (ESA) of 1973. The National Oceanic and Atmospheric Administration Restoration Center (NOAA RC), on behalf of *Deepwater Horizon* Trustees, proposes to create 3 new public fishing piers in Gulf and Bay Counties, Florida. The applicant for the project is the Florida Department of Environmental Protection (FDEP). Portions of this project will take place within loggerhead sea turtle critical habitat.

Project Name	Applicant	SER Number	Project Type
Windmark Beach Fishing Pier	FDEP	SER-2014-13881	Public Fishing Pier Construction and Operation
Oak Shore Drive Fishing Pier	FDEP	SER-2014-13883	Public Fishing Pier Construction and Operation
Panama City Marina Fishing Pier	FDEP	SER-2014-13884	Public Fishing Pier Construction and Operation

The Biological Opinion ("Opinion") analyzes the projects' effects on 3 species of sea turtles, smalltooth sawfish, Gulf sturgeon, and designated loggerhead sea turtle critical habitat LOGG-N-32. This Opinion is based on project-specific information provided by the NOAA RC, the FDEP, and our review of published literature. It is NMFS's Opinion that the actions, as proposed, will not affect leatherback or hawksbill sea turtles, and may affect, but are not likely to adversely affect Gulf sturgeon, or loggerhead sea turtle critical habitat. It is also our Opinion that the actions are likely to adversely affect loggerhead, green, and Kemp's ridley sea turtles; and smalltooth sawfish, but are not likely to jeopardize the continued existence of these species.

No taking of marine mammals, whether listed under the ESA or not, is authorized. Incidental taking of marine mammals must be authorized under Section 101(a)(5)(E) of the Marine Mammal Protection Act (MMPA). If NOAA RC believes marine mammals may be taken by their proposed actions or wishes to discuss requirements for obtaining MMPA take authorization, NOAA RC should contact the Office of Protected Resources, at (301) 427-8400.

We look forward to further cooperation with you on other NOAA RC projects to ensure the conservation and recovery of our threatened and endangered marine species. If you have any questions regarding this consultation, please contact Mike Tucker, Consultation Biologist, at (727) 209-5981, or by email at michael.tucker@noaa.gov.

Enc.: 1. *Sea Turtle and Smalltooth Sawfish Construction Conditions* (Revised March 23, 2006)
2. *Construction Guidelines in Florida for Minor Piling-Supported Structures Constructed in or over Submerged Aquatic Vegetation (SAV), Marsh or Mangrove Habitat,* (August, 2011)
3. *PCTS Access and Additional Considerations for ESA Section 7 Consultations* (Revised June 11, 2013)

File: 1514-22.C

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency:	NOAA Restoration Center (RC), on behalf of *Deepwater Horizon* Trustees
Activity:	Development of 3 new public fishing piers on the northern Florida Gulf coast.
Consulting Agency:	National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida Consultation Numbers SER-2014-13881, SER-2014-13883, and SER-2014-13884
Approved by:	FOR Roy E. Crabtree, Ph.D., Regional Administrator NMFS, Southeast Regional Office St. Petersburg, Florida
Date Issued:	February 22, 2018

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Acronyms and Abbreviations

BMP	Best management practice
CFR	Code of Federal Regulations
CPUE	Catch Per Unit Effort
DPS	Distinct Population Segment
DWH	*Deepwater Horizon*

DTRU	Dry Tortugas Recovery Unit
ESA	Endangered Species Act
FDEP	Florida Department of Environmental Protection
FP	Fibropapillomatosis disease
FWRI	Fish and Wildlife Research Institute
GADNR	Georgia Department of Natural Resources
GCRU	Greater Caribbean Recovery Unit
IMMS	Institute of Marine Mammal Studies
ITS	Incidental Take Statement
NA	North Atlantic
NMFS	National Marine Fisheries Service
NCWRC	North Carolina Wildlife Resources Commission
NGMRU	Northern Gulf of Mexico Recovery Unit
NOAA	National Oceanic and Atmospheric Association
NRU	Northern Recovery Unit
NWA	Northwest Atlantic
PCB	Polychlorinated biphenyls
PRM	Post-release mortality
RC	Restoration Center
RPMs	Reasonable and Prudent Measures
SA	South Atlantic
SAV	Submerged aquatic vegetation
SCDNR	South Carolina Department of Natural Resources
SCL	Straight carapace length
SEFSC	Southeast Fisheries Science Center
STSSN	Sea Turtle Stranding and Salvage Network
TEDs	Turtle Exclusion Devices
TEWG	Turtle Expert Working Group
USFWS	U.S. Fish and Wildlife Service

Units of Measurement

°C	Degrees Celsius
°F	Degrees Fahrenheit
cm	Centimeter(s)
ft	Feet
ft^2	Square feet
in	Inch(es)
g	Grams
kg	Kilograms
lb	Pound(s)
mi	Mile(s)

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 shall ensure that any action authorized, funded, or carried out by such 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 such species. Section 7(a)(2) requires federal agencies to consult with the appropriate Secretary on any action that "may affect" listed species or designated critical habitat. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) share responsibilities for administering the ESA. Consultations on most listed marine species and their designated critical habitat are conducted between the action agency and NMFS.

Consultation is concluded after NMFS determines the proposed action is not likely to adversely affect listed species or their critical habitat, or issues a Biological Opinion ("Opinion") that identifies whether a proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify critical habitat. The Opinion states the amount or extent of incidental take of the listed species that may occur and recommends conservation measures to further conserve the species.

This document represents NMFS's Opinion based on our review of impacts associated with the creation of 3 new public fishing piers along the northern Gulf coast in Gulf and Bay Counties, Florida. This Opinion analyzes project effects on 3 species of sea turtles (loggerhead, green, and Kemp's ridley), smalltooth sawfish, Gulf sturgeon, and designated loggerhead sea turtle critical habitat (LOGG-N-32) in accordance with Section 7 of the ESA. This Opinion is based on project information provided by the NOAA Restoration Center (RC), the applicant Florida Department of Environmental Protection (FDEP), and other sources of information including published literature cited herein.

BIOLOGICAL OPINION

1 CONSULTATION HISTORY

- NMFS received requests for formal consultation from the NOAA RC on April 9, 2014, for the 3 fishing pier projects.
- NMFS sent an email to the NOAA RC on April 18, 2014, requesting additional information necessary for the initiation of formal consultation.
- NMFS received a final response containing the requested information on April 24, 2014, at which time NMFS initiated formal consultation.
- Due to the departure of NMFS's lead biologist for this project, the consultation process was delayed, and in May of 2015, at the request of the NOAA RC, the consultation was put on hold while the next phases of the Deepwater Horizon (DWH) Early Restoration Program (Phases IV & V) were completed.
- On March 22, 2016, a new NMFS biologist was assigned to complete the subject consultation.
- In May and June of 2017, several issues arose concerning potential changes to the design plans for two of the piers (Windmark Beach and Panama City Marina) which led to several telephone conversations and email exchanges between NMFS, NOAA RC, and FDEP.
- On July 31, 2017, a final agreement was achieved on facility designs and NOAA RC requested NMFS resume the consultation process.

2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

NOAA RC, acting as a co-trustee on behalf of *Deepwater Horizon* Trustees under the Oil Pollution Act (OPA), is proposing to fund the Florida Department of Environmental Protection (FDEP), to construct and operate 3 public fishing piers in Gulf and Bay Counties as part of the DWH Early Restoration Program. This section describes the 3 proposed fishing pier projects.

2.1 Windmark Beach Fishing Pier

The FDEP proposes to construct a fishing pier on Windmark Beach extending southwest from the beach into the waters of St. Joseph Bay (Figure 1). The pier will be 1,200 feet [ft] long by 16 ft wide, with a terminal section oriented perpendicular to the main pier that is 60 ft by 16 ft. Based on these dimensions, the pier will have an overall total area of 20,160 square feet (ft^2).

The foundation of the fishing pier will consist of up to 400 fiberglass piles that are 8-in-diameter and pre-filled with concrete. These piles will be placed using water-jetting to within 5 ft of the final depth and using a vibratory hammer to set the piles to their final depth. All decking, cross members, and railings for the pier will be made of timber. Following placement of the piles, the timber cross members will be placed from the water, using a combination of small workboats and barges with heavy equipment to support the lifting and placement of materials and worker access to elevated positions. Once the cross members are in place the rest of the pier will be built out from shore. Total construction time is estimated to take approximately 12 months with an estimated 6 months to complete the in-water work.

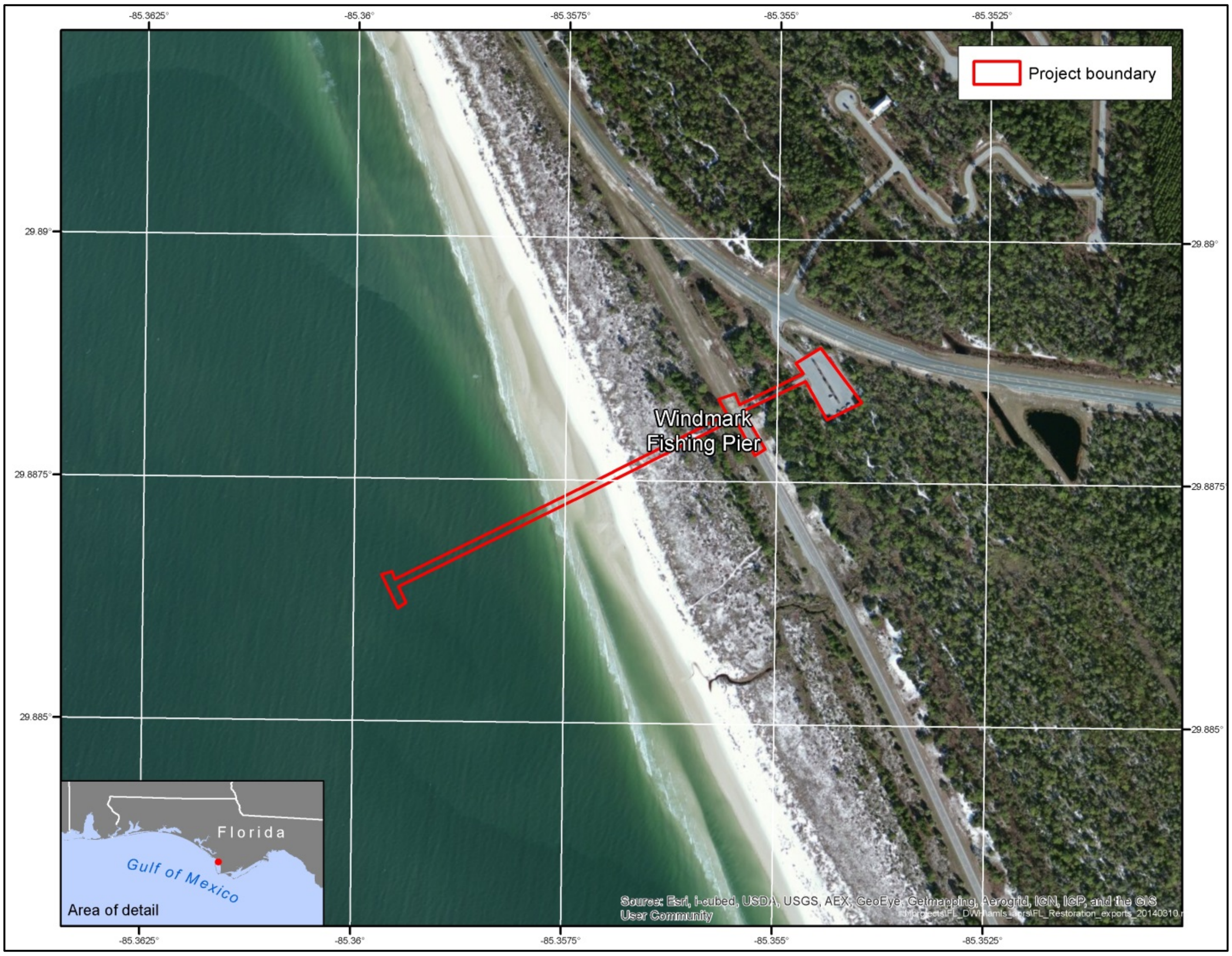

Figure 1. Proposed Windmark Beach fishing pier layout (©2014 Google, Date SIO, NOAA, U.S. Navy, NGA, GEBCO)

2.2 Oak Shore Drive Fishing Pier

The FDEP proposes to construct and operate a fishing pier (500 ft by 16 ft) extending southwest from the end of Oak Shore Drive, adjacent to and on the southeast side of an existing boat ramp (Figure 2). At the end of the pier a terminal section will be oriented perpendicular to the main pier and will have dimensions of 60 ft by 16 ft. Based on these dimensions, the pier will have an overall total area of 8,960 ft^2.

The foundation of the fishing pier will consist of up to 150 fiberglass piles that are 8-in-diameter and pre-filled with concrete. These piles will be placed using water-jetting to within 5 ft of the final depth and using a vibratory hammer to set the piles to their final depth. All decking, cross members, and railings for the pier will be made of timber. Following placement of the piles, the timber cross members will be placed from the water, using a combination of small workboats and barges with heavy equipment to support the lifting and placement of materials and worker access to elevated positions. Once the cross members are in place the rest of the pier will be built out from shore. Total construction time is estimated to take approximately 12 months with an estimated 6 months to complete the in-water work.

Figure 2. Proposed Oak Shore Drive fishing pier layout (©2014 Google, Date SIO, NOAA, U.S. Navy, NGA, GEBCO)

2.3 Panama City Marina Fishing Pier and Boat Ramp

The FDEP proposes to construct and operate a new fishing pier (200 ft by 14 ft) extending southwest from the Panama City Marina into St. Andrews Bay (Figure 3). At the end of the pier, a terminal section will be oriented perpendicular to the main stem of the pier and will have dimensions of 60 ft by 14 ft, giving the pier an overall total area of 3,640 ft^2.

The foundation of the fishing pier will consist of up to 80 fiberglass piles that are 8-in-diameter and pre-filled with concrete. These piles will be placed using water-jetting to within 5 ft of the final depth and using a vibratory hammer to set the piles to their final depth. All decking, cross members, and railings for the pier will be made of timber. Following placement of the piles, the timber cross members will be placed from the water, using a combination of small workboats and barges with heavy equipment to support the lifting and placement of materials and worker access to elevated positions. Once the cross members are in place the rest of the pier will be built out from shore.

In addition to the new fishing pier, FDEP proposes to replace an ageing boat ramp located in the marina, and construct 2 new staging docks adjacent to the boat ramp. The existing boat ramp is approximately 60 ft by 20 ft. This ramp will be removed and replaced with a concrete boat ramp with a similar footprint and dimensions (Figure 3). At the base of the new boat ramp, 12-in riprap will be placed, extending 10 ft beyond the end of the concrete ramp. Turbidity curtains will be installed to encapsulate the work area and other erosion control methods will be put in place on the landward side of the project to prevent excessive turbidity from entering the waterway.

A bladder dam will be installed around the in-water work area and the water will be pumped out to upland storage ponds or ran through a filter system to remove any sediment before returning it to the receiving waterbody. Construction of the ramp will begin once the area is sufficiently dry. The soil will be compacted to specification and base material will be placed on top. Reinforcing steel rebar will be placed and then the concrete poured and finished. Once the construction of the ramp is completed, the de-watering pumps will be shut down and the dam removed. Every day, before the start of construction activities, the turbidity screen will be checked and repaired, if necessary. The foreman, or other designated individual, will check the area inside the screen to see make sure no protected species have gotten trapped within the work area or in the screen. No work will begin until the area is cleared of any protected species.

Staging docks will be constructed on both sides and parallel to the new boat ramp (Figure 3). The dock on the southeast side of the ramp will be 250 ft by 6 ft. The dock on the northwest side of the ramp will be handicap accessible with dimension of 72 ft by 8 ft. Based on these dimensions, it is expected that up to 80 piles will be needed to support the 2 structures. These will be either concrete or timber piles with diameters not exceeding 8 in. Piles will be installed using a combination of mechanical augering and water jetting. Placement of the piles and framing cross pieces will be conducted from a work barge in the water. The remainder of the work to construct the docks will proceed from shore and will not require additional in-water work.

All 3 construction elements will be conducted simultaneously and total construction time is estimated to be approximately 12-24 months with an estimated 6-12 months to complete all in-water work.

Figure 3. Proposed fishing pier and boat ramp layout at the Panama City Marina (©2014 Google, Date SIO, NOAA, U.S. Navy, NGA, GEBCO)

2.4 Common Features and Best Management Practices (BMPs)

The following activities will be implemented in all 3 proposed fishing pier projects. A survey of submerged aquatic vegetation (SAV) in the action areas will be completed prior to the completion of final plans. While SAV is not expected in the Windmark Beach or Panama City Marina fishing pier sites, existing information suggests there is SAV in the general area where the Oak Shore Drive fishing pier will be constructed. As Figure 2 shows, the pier is proposed to be built in a "path" that was free of SAV at the time the photo was taken. Should the upcoming site surveys identify SAV in any of the proposed pier footprints, the conditions in the U. S. Army Corps of Engineers/NMFS's *Construction Guidelines in Florida for Minor Piling-Supported Structures Constructed in or over Submerged Aquatic Vegetation (SAV), Marsh or Mangrove Habitat*, dated August 2001, will be implemented. Among other elements, this would require placing piles for the docks a minimum of 10 ft apart.

During all in-water construction activities, the applicants will implement the conditions of NOAA's *Sea Turtle and Smalltooth Sawfish Construction Conditions*, dated March 23, 2006. Among the significant aspects of these provisions is the requirement to stop operation of any equipment if sea turtles or smalltooth sawfish come within 50 ft of the equipment until the time when the animals leave the project area of their own volition.

During construction, BMPs for erosion control will be implemented and maintained at all times during upland activity to prevent sediment discharges into surface waters. Methods could include, but are not limited to, the use of staked hay bales, staked filter cloth, sodding, seeding, and mulching; staged construction; and installation of turbidity screens around the immediate project site. The direct goal of these actions is to limit sediment discharges into the water that could adversely affect turbidity. Staging of most construction materials will occur in the existing parking areas, although some materials may be delivered by barge.

Prior to the opening of the piers to the public, fixed signs that are consistent with NOAA's and the state of Florida's guidelines on what to do in the event of hooking a listed species will be placed at the entrance to the fishing piers and at fixed intervals along their lengths. Additionally, a kiosk/booth will be placed at the entrance to each pier with additional information for best practices on catch and release and other fishing practices (e.g., placing unused bait and hooks for disposal in trash cans, not feeding wildlife) designed to limit potential adverse impacts to species. Monofilament recycling bins will be installed at regular intervals along the piers. These will be emptied regularly as part of the project maintenance activities, and the fishing line recycled. Further, any lighting installed as part of the projects will be sea turtle-friendly and comply with the guidance provided in the current edition of the FWC *Lighting Technical Manual*, dated April 26, 2011, to reduce lighting impacts to sea turtles. No fish cleaning stations will be included in the designs of these piers to help mitigate/avoid issues of listed species' attraction to the pier. FDEP has confirmed that they will conduct assessments of actual levels of use of the piers as part of the proposed monitoring for these projects.

2.5 Action Areas

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 actions are not expected to produce any direct or indirect effects on aquatic species or habitats outside of the nearshore areas immediately adjacent to the piers themselves. Therefore, the action areas at each pier site include the nearshore areas in which construction will take place including the areas within a 72.2 ft (22 m) radius surrounding the proposed piers where behavioral effects related to construction-noise may occur (see noise analyses in Section 3.1).

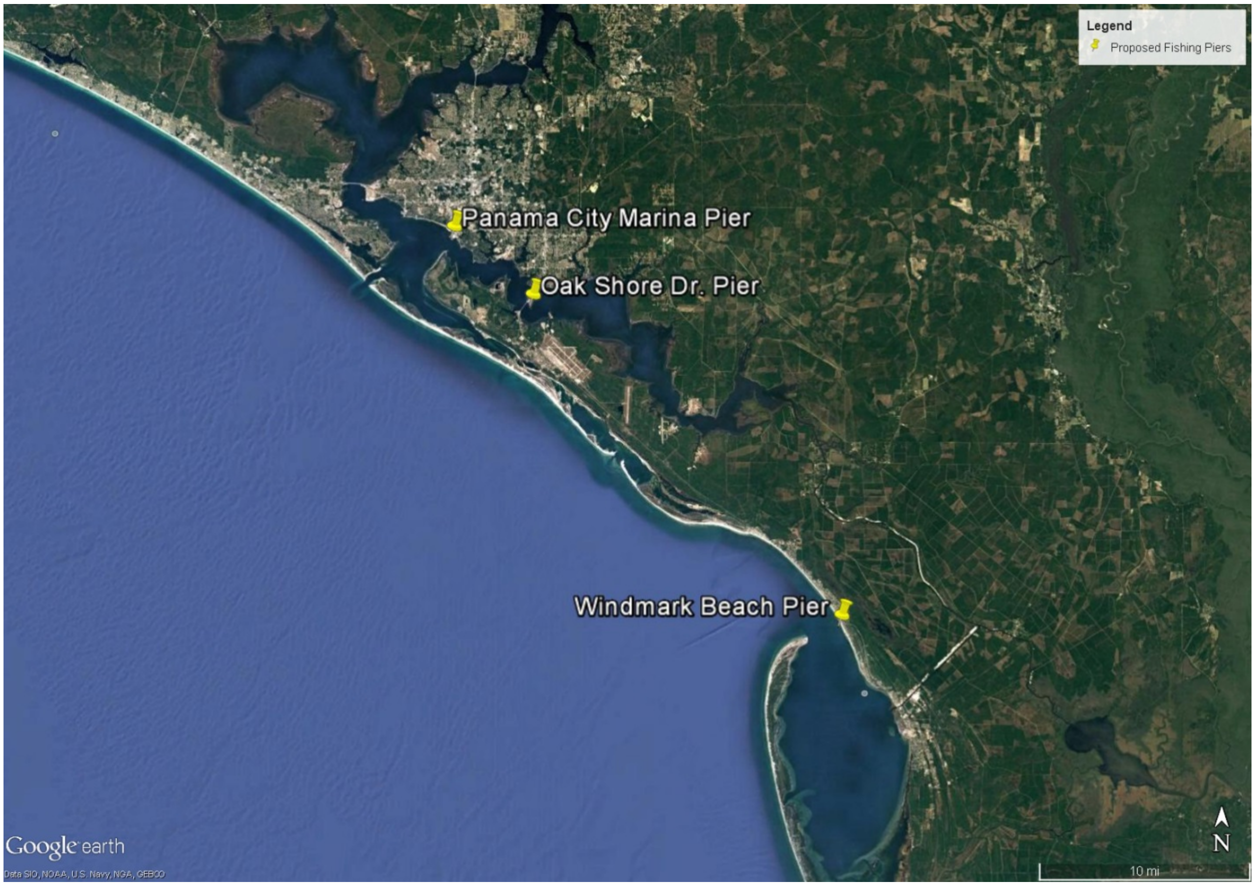

Figure 4. Location of all 3 proposed piers and the surrounding areas (©2016 Google)

Windmark Beach Fishing Pier

The proposed Windmark Beach Fishing Pier project is located at 29.88663°N, 85.35983°W (North American Datum [NAD] 1983) immediately south of St. Joe Beach at Windmark Beach Park, on US Hwy 98, Port St Joe, Florida near the mouth of St. Joseph Bay (Figures 1 & 4). St. Joseph Bay is a natural sound separated from the Gulf of Mexico by St. Joseph Peninsula in the Florida panhandle region. Water depths within St. Joseph Bay range from less than 5 ft at the southern, enclosed end to 30 ft near the northern tip of the spit. Bottom sediments are predominantly sand, silt and clay.

Oak Shore Drive Fishing Pier

The proposed Oak Shore Drive Fishing Pier project is located at 30.10493°N, 85.60347°W, at the end of Oak Shore Drive in Parker, Florida (Figures 2 & 4). The location is inside East Bay, a connecting embayment to St. Andrew Bay, approximately 9 miles (by water) from the nearest pass open to the Gulf of Mexico. Bottom sediments in East Bay range from fine sands to silt. Nearly 20,000 acres of seagrasses extend through St. Andrew Bay and St. Joseph Bay to the southeast, the most extensive and diverse seagrass habitat in the Florida Panhandle. Based on the aerial photo from 2014 (Figure 2), no seagrasses or other aquatic vegetation are present within the footprint of the proposed fishing pier. Additional on-site surveys will be conducted prior to construction to confirm that the project footprint is still clear of seagrasses and other aquatic vegetation.

Panama City Marina Fishing Pier and Boat Ramp
The proposed Panama City Marina Fishing Pier and Boat Ramp project is located in open, shallow estuarine/marine habitat at 30.150882°N, 85.665899°W, at the Panama City Marina in Panama City, Florida (Figures 3 & 4). The Panama City Marina is situated on St. Andrew Bay approximately 4.5 miles from the nearest pass open to the Gulf of Mexico. Bottom sediments in St. Andrew Bay range from fine sands to silt. No seagrasses or other aquatic vegetation are known to exist within the footprint of the proposed fishing pier.

3 STATUS OF LISTED SPECIES

The following endangered (E) and threatened (T) species under the jurisdiction of NMFS may occur in or near the action area.

Table 1. Effects Determinations for Species the Applicant Believes May be Affected by the Proposed Action and NMFS's Effects Determinations

Species	ESA Listing Status	Applicant Effect Determination	NMFS Effect Determination
Sea Turtles			
Leatherback	E	NLAA	NE
Hawksbill	E	NLAA	NE
Green (North Atlantic Distinct Population Segment [DPS])	T	NLAA	LAA
Green (South Atlantic DPS)	T	NLAA	LAA
Kemp's ridley	E	NLAA	LAA
Loggerhead (Northwest Atlantic Ocean [NWA] DPS)	T	NLAA	LAA
Fish			
Gulf sturgeon (Atlantic sturgeon, Gulf subspecies)	T	NLAA	NLAA
Smalltooth Sawfish (U.S. DPS)	E	NLAA	LAA
Critical Habitat			
Gulf Sturgeon Critical Habitat (Unit 11)		NLAA	NE
Loggerhead Sea Turtle Critical Habitat (LOGG-N-32)		NE	NLAA
E = endangered; T = threatened; LAA = likely to adversely affect; NLAA = may affect, not likely to adversely affect; NE = No Effect			

We believe the project will have no effect on hawksbill and leatherback sea turtles, due to the species' very specific life history strategies, which are not supported at the project sites. Leatherback sea turtles have a pelagic, deepwater life history, where they forage primarily on jellyfish. Hawksbill sea turtles typically inhabit inshore reef and hard bottom areas (not present at these sites) where they forage primarily on encrusting sponges. We found no documented incidences of either species being hooked or entangled at any fishing piers in either of the counties where the proposed action will take place.

The project proponent's Biological Assessment for the Windmark Beach Pier Project concluded that this project is located in Gulf sturgeon critical habitat in Unit 11 (Nearshore Florida). However, based on NMFS's geographical information system data, the project site is just outside of the boundary of Gulf sturgeon critical habitat (approximately ½ mile) and we believe that there are no potential routes of effects from the project on Gulf sturgeon critical habitat. Additionally, on July 10, 2014, final rules were published in the Federal Register, designating loggerhead sea turtle critical habitat. One element of the proposed project (the Windmark Beach Fishing Pier) is located in loggerhead sea turtle critical habitat LOGG-N-32, and has the potential to affect that critical habitat.

3.1 Project Elements Not Likely to Adversely Affect Listed Species and Critical Habitat

Three species of sea turtles (loggerhead, green, and Kemp's ridley), smalltooth sawfish, and Gulf sturgeon can be found in or near the action area and may be affected by the proposed action.

Potential effects to the identified sea turtles, smalltooth sawfish, and Gulf sturgeon include the risk of injury from being struck by construction vessels, machinery and materials (e.g., barge movement, anchoring, and construction equipment operation) during in-water construction activities. Due to the species' mobility and natural avoidance behaviors, and the applicant's compliance with NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions*, dated March 2006, injury through direct impact from construction vessels, machinery and materials is extremely unlikely to occur, and, therefore, discountable.

Sawfish, sea turtles, and Gulf sturgeon may be temporarily unable to use the project sites for forage and shelter habitat due to avoidance of construction activities including placement of pier piles and turbidity barriers. However, we believe any potential effects will be insignificant considering the projects are located in open-water, unconfined areas surrounded by large expanses of similar habitats (see images above) which would allow individuals avoiding the construction sites to forage and shelter throughout the surrounding area.

Sawfish, sea turtles, and Gulf sturgeon may be affected by noise associated with the driving of piles for dock construction. Injurious effects can occur in 2 ways. First, effects can result from a single noise event's exceeding the threshold for direct physical injury to animals, and these constitute an immediate adverse effect on these animals. Second, effects can result from prolonged exposure to noise levels that exceed the daily cumulative exposure threshold for the animals, and these can constitute adverse effects if animals are exposed to the noise levels for sufficient periods. Behavioral effects can be adverse if such effects interfere with animals' migrating, feeding, resting, or reproducing, for example. Our evaluation of effects to listed species as a result of noise created by construction activities is based on the analysis prepared in support of the Biological Opinion for SAJ-82.[1] The noise analysis in this consultation evaluates effects to ESA-listed fish and sea turtles identified by NMFS as potentially affected in Table 1, above.

1. NMFS. Biological Opinion on Regional General Permit SAJ-82 (SAJ-2007-01590), Florida Keys, Monroe County, Florida. June 10, 2014.

With regard to the proposed use of water jetting to create pilot holes and install the pier piles, acoustic testing has shown that water jetting does not produce noise levels that could result in injurious effects or behavioral effects to any of the listed species. Additionally, with regard to the potential use of a vibratory hammer to "finish" pile installation, based on our noise calculations, the installation of 8-in concrete piles (or concrete-filled fiberglass piles) by vibratory hammer will not produce noise levels (either peak pressure level or a cumulative sound exposure level) that could result in injurious effects to any of the listed species. However, our noise analysis does indicate that vibratory pile installation could produce noise levels known to cause behavioral effects at radii of 16.4 ft (5 m) for sea turtles and 72.2 ft (22 m) for smalltooth sawfish and Gulf sturgeon. Due to the mobility of these species, we expect them to move away from noise disturbances. Because this will involve only normal physical movement by the animals and there is abundant similar habitat surrounding the construction zones, we believe any effects of this behavioral response would be insignificant.

Vessel traffic related to the proposed rehabilitation of the boat launching facilities at the Panama City Marina may cause both direct and indirect effects on sea turtles. Vessels that may be launched at this facility, particularly high-speed recreational vessels, can strike sea turtles leading to injury or death. However, the proposed rehabilitation of this boat ramp is not expected to result in increases in vessel traffic in the surrounding waters, and a 2013 NMFS PRD analysis[2] found that it would take the introduction of at least 300 new vessels to an area to result in the take of 1 sea turtle in any single year. Therefore, the effect of rehabilitating the old boat ramp will be discountable in terms of increasing the risk of vessel strikes on sea turtles.

Fishing piers can threaten sea turtles, smalltooth sawfish, and Gulf sturgeon via incidental hooking and entanglement either by actively fished lines, discarded, remnant, or broken-off fishing lines, and/or other debris. There are no documented hook-and-line takes of Gulf sturgeon associated with fishing piers in Florida. The feeding anatomy and behavior of Gulf sturgeon makes the hooking of this species by standard hook-and-line anglers highly unlikely. Therefore, NMFS concludes that Gulf sturgeon are not likely to be adversely affected by angling activities associated with the proposed fishing piers as the likelihood of any incidental hooking is considered discountable.

The potential take of sea turtles and smalltooth sawfish due to angling activities and debris such as discarded, remnant, or broken-off fishing lines will be discussed in Section 5.

3.1.1 Assessment of Potential Effects of the Proposed Action on the Essential Features of Loggerhead Sea Turtle Critical Habitat

Loggerhead sea turtle critical habitat was designated by NMFS on July 10, 2014 (50 CFR 226.223). The proposed activities at Windmark Beach in Gulf County, Florida, fall within loggerhead sea turtle critical habitat area LOGG-N-32 (nearshore reproductive habitat). The boundaries of the unit are from the eastern boundary of Tyndall Air Force Base to Gulf County Canal in St. Joseph Bay from the MHW line seaward 1.6 km.

2. Barnette, M. Threats and Effects Analysis for Protected Resources on Vessel Traffic Associated with Dock and Marina Construction. NMFS SERO PRD Memorandum. April 18, 2013.

These nearshore habitat areas are adjacent to nesting beaches that are used by nesting females to transit between beach and open water during the nesting season as well as by hatchlings to egress to the open-water environment after hatching. The physical and biological features identified in the final critical habitat rule as essential for the conservation of the loggerhead sea turtles are the following: (1) nearshore waters with direct proximity to nesting beaches that support critical aggregations of nesting turtles seaward to 1.6 km offshore; (2) waters sufficiently free of obstructions or artificial lighting to allow transit through the surf zone and outward toward open water; and (3) waters with minimal manmade structures that could promote predators, disrupt wave patterns necessary for orientation, and/or create excessive longshore currents.

Based on a review of potential impacts in support of the critical habitat designation, NMFS identified activities or byproducts of human activities that would result in a loss of necessary habitat conditions in nearshore reproductive habitat. These activities could come from, but are not limited to, the following: (1) offshore structures including breakwaters, groins, jetties, and artificial reefs, that block or otherwise impede efficient passage of hatchlings or females and/or which concentrate hatchling predators and thus result in greater predation on hatchlings; (2) lights on land or in the water, which can disorient hatchlings and nesting females and/or attract predators, particularly lighting that is permanent or present for long durations and has a short wave length (below 540 nanometers [nm]); and (3) commercial fishing or aquaculture gear that blocks or impedes efficient passage of hatchlings or females.

The Windmark Beach Fishing Pier would not create a solid barrier that could impede passage of sea turtle hatchlings or nesting females to or from nesting sites. The pier is also not expected to have sufficient in-water structure to disrupt wave patterns, affect longshore currents or attract significant sea turtle predators. The pier will be built on 8-in piles, perpendicular to the beach and is proposed to be only 16 ft wide. There will be no fish cleaning stations and signage will instruct anglers to dispose of excess bait and fish parts into available trash bins to avoid attracting sea turtles and turtle predators to the area. Therefore, we believe the potential for the proposed pier to disrupt passage or concentrate predators is discountable.

Light pollution can deter female sea turtles from coming onto the beach to nest and females attempting to return to sea after nesting can be disoriented by beach lighting and have difficulties making it back to the ocean. Artificial beach lighting is even more detrimental to hatchling sea turtles, which emerge from nests at night. Under natural conditions, hatchlings move toward the brightest, most open horizon, which is over the ocean. Unfortunately, when bright light sources are present on the beach, they attract hatchlings in the wrong direction, making them more vulnerable to predators, desiccation, and exhaustion.

The applicant proposes to install sea turtle-friendly lighting per specifications listed in FWC's *Lighting Technical Manual*.[3] The manual includes requirements such as: the use of low pressure sodium lights; shielded lights, or use of lighting sources that produce a wave length of 560 nm or longer. Witherington et al. (2014) found that low pressure sodium lights, fully shielded lights, and lighting sources that produce a wave length of 560 nm or longer had no discernable effect on nesting female loggerheads or their hatchlings' ability to orient towards the ocean upon

3 http://myfwc.com/media/418417/SeaTurtle_LightingGuidelines.pdf

emergence. Therefore, the effects of the proposed pier lighting on this essential feature of critical habitat are expected to be insignificant.

3.2 Project Elements Likely to Adversely Affect Listed Species

Fishing piers can threaten sea turtles and sawfish via incidental hooking and entanglement either by actively fished lines, discarded, remnant, or broken-off fishing lines, and/or other debris.

Data from the NOAA Southeast Fisheries Science Center's (SEFSC) Sea Turtle Stranding and Salvage Network (STSSN) for 2005-2014 (https://grunt.sefsc.noaa.gov/stssnrep/SeaTurtleReportII.do?action=reportIIqueryp) show that reported incidental takes of Kemp's ridley, loggerhead and green sea turtles by hook-and-line fishing occurred at fishing piers in Gulf and Bay Counties, Florida. These data indicate that during this 10 year period, 3 Kemp's ridley sea turtles, 2 loggerhead sea turtles, and 1 green sea turtle were reported incidentally taken by hook-and-line fishing at public fishing piers in these 2 counties.

Data from the International Sawfish Encounter Database for 2000-2015 (unpublished data) include one documented incidental take of a sawfish by hook-and-line from a fishing pier in Bay County in 2004. This was a small juvenile sawfish (90 cm total length) caught from a large Gulf-side pier (Russell-Fields Pier) off Panama City Beach.

3.3 General Threats Faced by All Sea Turtle Species

Sea turtles face numerous natural and man-made threats that shape their status and affect their ability to recover. Many of the threats are either the same or similar in nature for all listed sea turtle species, those identified in this section are discussed in a general sense for all sea turtles. Threat information specific to a particular species are then discussed in the corresponding status sections where appropriate.

Fisheries

Incidental bycatch in commercial fisheries is identified as a major contributor to past declines, and threat to future recovery, for all of the sea turtle species (NMFS and USFWS 1991; NMFS and USFWS 1992; NMFS and USFWS 1993; NMFS et al. 2011a; NMFS and USFWS 2008). Domestic fisheries often capture, injure, and kill sea turtles at various life stages. Sea turtles in the pelagic environment are exposed to U.S. Atlantic pelagic longline fisheries. Sea turtles in the benthic environment in waters off the coastal United States are exposed to a suite of other fisheries in federal and state waters. These fishing methods include trawls, gillnets, purse seines, hook-and-line gear (including bottom longlines and vertical lines [e.g., bandit gear, handlines, and rod-reel]), pound nets, 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). The 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 sea turtles each year.

In addition to domestic fisheries, sea turtles are subject to direct as well as incidental capture in numerous foreign fisheries, further impeding the ability of sea turtles to survive and recover on a global scale. For example, pelagic stage sea turtles, especially loggerheads and leatherbacks, circumnavigating the Atlantic are susceptible to international longline fisheries including the Azorean, Spanish, and various other fleets (Aguilar et al. 1994; Bolten et al. 1994). Bottom longlines 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.

Non-Fishery In-Water Activities

There are also many non-fishery impacts affecting the status of sea turtle species, both in the ocean and on land. 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 also 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, in-water construction activities, and scientific research activities.

Coastal Development and Erosion Control

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 (Bouchard et al. 1998; Lutcavage et al. 1997a). These factors may decrease the amount and/or quality of nesting habitat available to females and change the natural behaviors of both adults and hatchlings, directly or indirectly, through loss of beach habitat or changing thermal profiles and increasing erosion, respectively (Ackerman 1997; Witherington et al. 2003; Witherington et al. 2007). In addition, coastal development is usually accompanied by artificial lighting which can 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). In-water erosion control structures such as breakwaters, groins, and jetties can impact nesting females and hatchling as they approach and leave the surf zone or head out to sea by creating physical blockage, concentrating predators, creating longshore currents, and disrupting of wave patterns.

Environmental Contamination

Multiple municipal, industrial, and household sources, as well as atmospheric transport, introduce various pollutants such as pesticides, hydrocarbons, organochlorides (e.g., dichlorodiphenyltrichloroethane, PCB, and perfluorinated chemicals), and others that may cause adverse health effects to sea turtles (Garrett 2004; Grant and Ross 2002; Hartwell 2004; Iwata et al. 1993). 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 April 20, 2010, explosion of the *Deepwater Horizon* (DWH) oil rig affected sea turtles in the Gulf of Mexico. An assessment has been completed on the injury to Gulf of Mexico marine life, including sea turtles, resulting from the spill (DWH Trustees 2015). Following the spill, juvenile Kemp's ridley, green, and loggerhead sea turtles were found in *Sargassum* algae mats in the convergence zones, where currents meet and oil collected. Sea turtles found in these areas were often coated in oil and/or had ingested oil. The spill resulted in the direct mortality of many sea turtles and may have had sublethal effects or caused environmental damage that will impact other sea turtles into the future. Information on the spill impacts to individual sea turtle species is presented in the Status of the Species sections for each species.

Marine debris is a continuing problem for sea turtles. Sea turtles living in the pelagic environment commonly eat or become entangled in marine debris (e.g., tar balls, plastic bags/pellets, balloons, and ghost fishing gear) as they feed along oceanographic fronts where debris and their natural food items converge. This is especially problematic for sea turtles that spend all or significant portions of their life cycle in the pelagic environment (i.e., leatherbacks, juvenile loggerheads, and juvenile green turtles).

Climate Change

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 be predicted with any degree of certainty; however, significant impacts to the hatchling sex ratios of sea turtles may result (NMFS and USFWS 2007b). In sea turtles, sex is determined by the ambient sand temperature (during 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 2007b).

The effects from increased temperatures may be intensified 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 (Baker et al. 2006; Daniels et al. 1993; Fish et al. 2005). 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) could influence the distribution and abundance of lower trophic levels (e.g., phytoplankton, zooplankton, SAV, crustaceans, mollusks, forage fish) which could ultimately affect the primary foraging areas of sea turtles.

Other Threats
Predation by various land predators is a threat to developing nests and emerging hatchlings. The major natural predators of sea turtle nests are mammals, including raccoons, dogs, pigs, skunks, and badgers. Emergent hatchlings are preyed upon by these mammals as well as ghost crabs, laughing gulls, and the exotic South American fire ant (*Solenopsis invicta*). In addition to natural predation, direct harvest of eggs and adults from beaches in foreign countries continues to be a problem for various sea turtle species throughout their (NMFS and USFWS 2008).

Diseases, toxic blooms from algae and other microorganisms, and cold stunning events are additional sources of mortality that can range from local and limited to wide-scale and impacting hundreds or thousands of animals.

3.4 Loggerhead Sea Turtle – Northwest Atlantic DPS

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 which designated 9 DPSs for loggerhead sea turtles (76 FR 58868, September 22, 2011, and effective October 24, 2011). This rule listed the following DPSs: (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 (NWA) DPS is the only one that occurs within the action area, and, therefore, it is the only one considered in this Opinion.

Species Description and Distribution
Loggerheads are large sea turtles. Adults in the southeast United States average about 3 ft (92 cm) long, measured as a straight carapace length (SCL), and weigh approximately 255 lb (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, 5 pairs of costals, 5 vertebrals, and a nuchal (precentral) scute that is in contact with the first pair of costal scutes (Dodd Jr. 1988).

The loggerhead sea turtle inhabits continental shelf and estuarine environments throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans (Dodd Jr. 1988). Habitat uses within these areas vary by life stage. Juveniles are omnivorous and forage on crabs, mollusks, jellyfish, and vegetation at or near the surface (Dodd Jr. 1988). Subadult and adult loggerheads are primarily found in coastal waters and eat benthic invertebrates such as mollusks and decapod crustaceans in hard bottom habitats.

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). For the NWA DPS, most nesting occurs along the coast of the United States, from southern Virginia to Alabama. Additional nesting beaches for this DPS are found along the northern and western Gulf of Mexico, eastern Yucatán Peninsula, at Cay Sal Bank in the eastern Bahamas (Addison 1997; Addison and Morford 1996), off the southwestern coast of Cuba (Moncada 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 U.S. Atlantic, Gulf of Mexico, and Caribbean Sea. Little is known about the distribution of adult males who are seasonally abundant near nesting beaches. Aerial surveys suggest that loggerheads as a whole are distributed in U.S. waters as follows: 54% off the southeast U.S. coast, 29% off the northeast U.S. coast, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico (TEWG 1998a).

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 5 western Atlantic subpopulations, divided geographically as follows: (1) a Northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29ºN; (2) a South Florida nesting subpopulation, occurring from 29°N on the east coast of the state 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 2001).

The recovery plan for the Northwest Atlantic population of loggerhead sea turtles concluded that there is no genetic distinction between loggerheads nesting on adjacent beaches along the Florida Peninsula. It also concluded that specific boundaries for subpopulations could not be designated based on genetic differences alone. Thus, the recovery 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 as follows: (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
The Northwest Atlantic Loggerhead Recovery Team defined the following 8 life stages for the loggerhead life cycle, which include the ecosystems those stages generally use: (1) egg (terrestrial zone), (2) hatchling stage (terrestrial zone), (3) hatchling swim frenzy and transitional stage (neritic zone[4]), (4) juvenile stage (oceanic zone), (5) juvenile stage (neritic zone), (6) adult stage (oceanic zone), (7) adult stage (neritic zone), and (8) nesting female (terrestrial zone) (NMFS and USFWS 2008). Loggerheads are long-lived animals. They reach sexual maturity between 20-38 years of age, although age of maturity varies widely among populations (Frazer and Ehrhart 1985; NMFS 2001). The annual mating season occurs from late March to early June, and female turtles lay eggs throughout the summer months. Females deposit an average of 4.1 nests within a nesting season (Murphy and Hopkins 1984), but an individual female only nests every 3.7 years on average (Tucker 2010). Each nest contains an average of 100-126 eggs (Dodd Jr. 1988) which incubate for 42-75 days before hatching (NMFS and USFWS 2008). Loggerhead hatchlings are 1.5-2 inches long and weigh about 0.7 oz (20 g).

As post-hatchlings, loggerheads hatched on U.S. beaches enter the "oceanic juvenile" life stage, migrating offshore and becoming associated with *Sargassum* habitats, driftlines, and other convergence zones (Carr 1986; Conant et al. 2009a; Witherington 2002). Oceanic juveniles grow at rates of 1-2 inches (2.9-5.4 cm) per year (Bjorndal et al. 2003; Snover 2002) over a period as long as 7-12 years (Bolten et al. 1998) before moving to more coastal habitats. 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 (Bolten and Witherington 2003; Laurent et al. 1998). These studies suggest some turtles may either remain in the oceanic habitat in the North Atlantic longer than hypothesized, or they move back and forth between oceanic and coastal habitats interchangeably (Witzell 2002). Stranding records indicate that when immature loggerheads reach 15-24 in (40-60 cm) SCL, they begin to reside in coastal inshore waters of the continental shelf throughout the U.S. Atlantic and Gulf of Mexico (Witzell 2002).

After departing the oceanic zone, neritic juvenile loggerheads in the Northwest Atlantic inhabit continental shelf waters from Cape Cod Bay, Massachusetts, south through Florida, The Bahamas, Cuba, and the Gulf of Mexico. Estuarine waters of the United States, including areas such as Long Island Sound, Chesapeake Bay, Pamlico and Core Sounds, Mosquito and Indian River Lagoons, Biscayne Bay, Florida Bay, as well as numerous embayments fringing the Gulf of Mexico, comprise important inshore habitat. Along the Atlantic and Gulf of Mexico shoreline, essentially all shelf waters are inhabited by loggerheads (Conant et al. 2009a).

Like juveniles, non-nesting adult loggerheads also use the neritic zone. However, these adult loggerheads do not use the relatively enclosed shallow-water estuarine habitats with limited ocean access as frequently as juveniles. Areas such as Pamlico Sound, North Carolina, and the Indian River Lagoon, Florida, are regularly used by juveniles but not by adult loggerheads. Adult loggerheads do tend to use estuarine areas with more open ocean access, such as the Chesapeake Bay in the U.S. mid-Atlantic. Shallow-water habitats with large expanses of open ocean access,

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4 Neritic refers to the nearshore marine environment from the surface to the sea floor where water depths do not exceed 200 meters.

such as Florida Bay, provide year-round resident foraging areas for significant numbers of male and female adult loggerheads (Conant et al. 2009a).

Offshore, adults primarily inhabit continental shelf waters, from New York south through Florida, The Bahamas, Cuba, and the Gulf of Mexico. Seasonal use of mid-Atlantic shelf waters, especially offshore New Jersey, Delaware, and Virginia during summer months, and offshore shelf waters, such as Onslow Bay (off the North Carolina coast), during winter months has also been documented (Hawkes et al. 2007); Georgia Department of Natural Resources, unpublished data; South Carolina Department of Natural Resources, unpublished data). Satellite telemetry has identified the shelf waters along the west Florida coast, The Bahamas, Cuba, and the Yucatán Peninsula as important resident areas for adult female loggerheads that nest in Florida (Foley et al. 2008; Girard et al. 2009; Hart et al. 2012). The southern edge of the Grand Bahama Bank is important habitat for loggerheads nesting on the Cay Sal Bank in The Bahamas, but nesting females are also resident in the bights of Eleuthera, Long Island, and Ragged Islands. They also reside in Florida Bay in the United States, and along the north coast of Cuba (A. Bolten and K. Bjorndal, University of Florida, unpublished data). Moncada et al. (2010) report the recapture of 5 adult female loggerheads in Cuban waters originally flipper-tagged in Quintana Roo, Mexico, which indicates that Cuban shelf waters likely also provide foraging habitat for adult females that nest in Mexico.

Status and Population Dynamics

A number of stock assessments and similar reviews (Conant et al. 2009a; Heppell et al. 2003; NMFS-SEFSC 2009a; NMFS 2001; NMFS and USFWS 2008; TEWG 1998a; TEWG 2000; TEWG 2009) 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. Nesting beach surveys, though, can provide a reliable assessment of trends in the adult female population, due to the strong nest site fidelity of female loggerhead sea turtles, as long as such studies are sufficiently long and survey effort and methods are standardized (e.g., (NMFS and USFWS 2008). NMFS and USFWS (2008) concluded that the lack of change in 2 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.

<u>Peninsular Florida Recovery Unit</u>

The Peninsular Florida Recovery Unit 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 an average of 64,513 loggerhead nests per year, representing approximately 15,735 nesting females per year (NMFS and USFWS 2008). The statewide estimated total for 2015 was 89,295 nests (Florida Fish and Wildlife Research Institute (FWRI) nesting database).

In addition to the total nest count estimates, the FWRI uses an index nesting beach survey method. The index survey uses standardized data-collection criteria to measure seasonal nesting and allow accurate comparisons between beaches and between years (Figure 5). This provides a better tool for understanding the nesting trends. FWRI performed a detailed analysis of the long-term loggerhead index nesting data (1989-2016; http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trend/). Over that time period, 3 distinct trends were identified. From 1989-1998, there was a 24% increase that was followed by a sharp decline over the subsequent 9 years. A large increase in loggerhead nesting has occurred since, as indicated by the 71% increase in nesting over the 10-year period from 2007 and 2016. Nesting in 2016 also represents a new record for loggerheads on the core index beaches. FWRI examined the trend from the 1998 nesting high through 2016 and found that the decade-long post-1998 decline was replaced with a slight but nonsignificant increasing trend. Looking at the data from 1989 through 2016, FWRI concluded that there was an overall positive change in the nest counts although it was not statistically significant due to the wide variability between 2012-2016 resulting in widening confidence intervals (http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trend/).

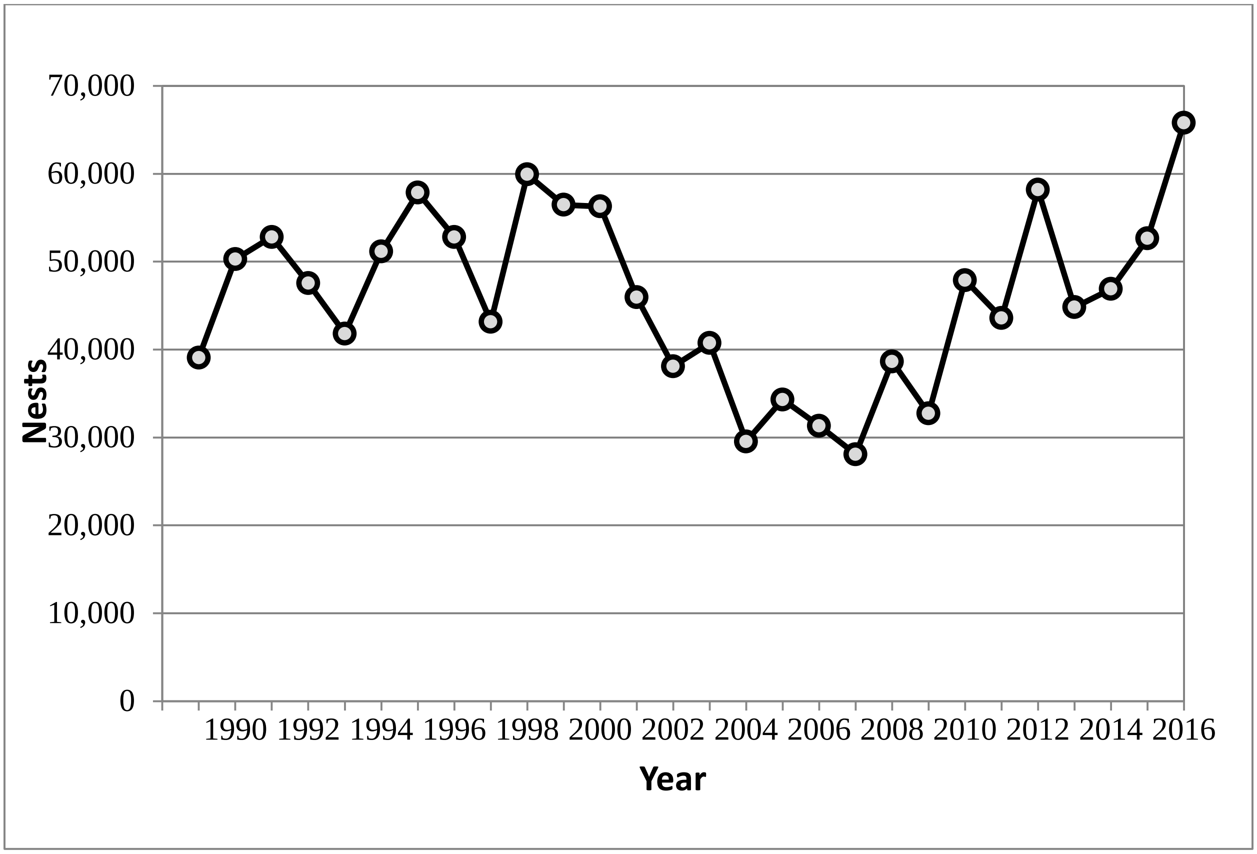

Figure 5. Loggerhead sea turtle nesting at Florida index beaches since 1989

Northern Recovery Unit

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 [GADNR] 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, assuming 4.1 nests per female (Murphy and Hopkins 1984). The loggerhead nesting trend from daily beach surveys showed a significant decline of 1.3% annually from 1989-2008. Nest totals from aerial surveys conducted by SCDNR showed a 1.9% annual decline in nesting in South Carolina from 1980-2008. Overall, there are strong statistical data to suggest the NRU had experienced a long-term decline over that period of time.

Data collected since that analysis (Table 2) are showing improved nesting numbers and a departure from the declining trend. Georgia nesting has rebounded to show the first statistically significant increasing trend since comprehensive nesting surveys began in 1989 (Mark Dodd, GADNR press release, http://www.georgiawildlife.com/node/3139). South Carolina and North Carolina nesting have also begun to shift away from the past declining trend. Loggerhead nesting in Georgia, South Carolina, and North Carolina all broke records in 2015 and then topped those records again in 2016.

Table 2. Total Number of NRU Loggerhead Nests (GADNR, SCDNR, and NCWRC nesting datasets compiled at Seaturtle.org)

Nests Recorded	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Georgia	1,649	998	1,760	1,992	2,241	2,289	1,196	2,319	3,265
South Carolina	4,500	2,182	3,141	4,015	4,615	5,193	2,083	5,104	6,443
North Carolina	841	302	856	950	1,074	1,260	542	1,254	1,612
Total	**6,990**	**3,472**	**5,757**	**6,957**	**7,930**	**8,742**	**3,821**	**8,677**	**11,320**

South Carolina also conducts an index beach nesting survey similar to the one described for Florida. Although the survey only includes a subset of nesting, the standardized effort and locations allow for a better representation of the nesting trend over time. Increases in nesting were seen for the period from 2009-2012, and 2012 shows the highest index nesting total since the start of the program (Figure 6).

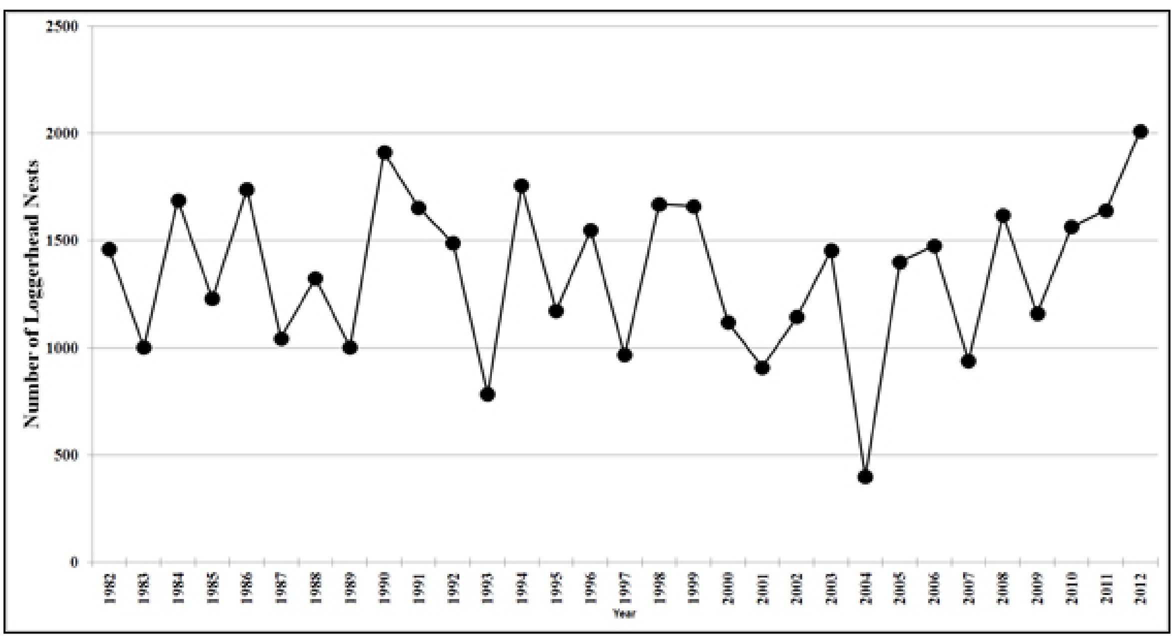

Figure 6. South Carolina index nesting beach counts for loggerhead sea turtles (from the SCDNR website: http://www.dnr.sc.gov/seaturtle/nest.htm)

Other Northwest Atlantic DPS Recovery Units

The remaining 3 recovery units—Dry Tortugas (DTRU), Northern Gulf of Mexico (NGMRU), and Greater Caribbean (GCRU)—are much smaller nesting assemblages, but they are 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 the 2002 year was missed. Nest counts ranged from 168-270, with a mean of 246, but there was 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 statistically significant declining trend of 4.7% annually. 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. Nesting survey effort has been inconsistent among the GCRU nesting beaches, and no trend can be determined for this subpopulation (NMFS and USFWS 2008). Zurita et al. (2003) found a statistically significant increase in the number of nests on 7 of the beaches on Quintana Roo, Mexico, from 1987-2001, where survey effort was consistent during the period. Nonetheless, nesting has declined since 2001, and the previously reported increasing trend appears to not have been sustained (NMFS and USFWS 2008).

In-water Trends

Nesting data are the best current indicator of sea turtle population trends, but in-water data also provide some insight. In-water research suggests the abundance of neritic juvenile loggerheads is steady or increasing. Although Ehrhart et al. (2007) found no significant regression-line trend in a long-term dataset, researchers have observed notable increases in catch per unit effort (CPUE) (Arendt et al. 2009; Ehrhart et al. 2007; Epperly et al. 2007). Researchers believe that this increase in CPUE is likely linked to an increase in juvenile abundance, although it is unclear whether this increase in abundance represents a true population increase among juveniles or merely a shift in spatial occurrence. Bjorndal et al. (2005), cited in NMFS and USFWS (2008), 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 oceanic/neritic juveniles (historically referred to as small benthic juveniles), which could indicate a relatively large number of individuals around the same age may mature in the near future (TEWG 2009). In-water studies throughout the eastern United States, however, indicate a substantial decrease in the abundance of the smallest oceanic/neritic juvenile loggerheads, a pattern corroborated by stranding data (TEWG 2009).

Population Estimate

The NMFS Southeast Fisheries Science Center developed a preliminary stage/age demographic model to help determine the estimated impacts of mortality reductions on loggerhead sea turtle population dynamics (NMFS-SEFSC 2009a). 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. Resulting trajectories of model runs for each individual recovery unit, and the western North Atlantic population as a whole, were found to be very similar. The model run estimates from the adult female population size for the western North Atlantic (from the 2004-2008 time frame), suggest the adult female population size is approximately 20,000-40,000 individuals, with a low likelihood of females' numbering up to 70,000 (NMFS-SEFSC 2009a). A less robust estimate for total benthic females in the western North Atlantic was also obtained, yielding approximately 30,000-300,000 individuals, up to less than 1 million (NMFS-SEFSC 2009a). A preliminary regional abundance survey of loggerheads within the northwestern Atlantic continental shelf for positively identified loggerhead in all strata estimated about 588,000 loggerheads (interquartile range of 382,000-817,000). When correcting for unidentified turtles in proportion to the ratio of identified turtles, the estimate increased to about 801,000 loggerheads (interquartile range of 521,000-1,111,000) (NMFS-NEFSC 2011).

Threats (Specific to Loggerhead Sea Turtles)
The threats faced by loggerhead sea turtles are well summarized in the general discussion of threats in Section 3.3. Yet the impact of fishery interactions is a point of further emphasis for this species. The joint NMFS and USFWS Loggerhead Biological Review Team determined that the greatest threats to the NWA DPS of loggerheads result from cumulative fishery bycatch in neritic and oceanic habitats (Conant et al. 2009a).

Regarding the impacts of pollution, loggerheads may be particularly affected by organochlorine contaminants; they have the highest organochlorine concentrations (Storelli et al. 2008a) and metal loads (D'Ilio et al. 2011) in sampled tissues among the sea turtle species. It is thought that dietary preferences were likely to be the main differentiating factor among sea turtle species. Storelli et al. (2008a) 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. 1991b).

While oil spill impacts are discussed generally for all species in Section 3.3, specific impacts of the DWH oil spill event on loggerhead sea turtles are considered here. Impacts to loggerhead sea turtles occurred to offshore small juveniles as well as large juveniles and adults. A total of 30,800 small juvenile loggerheads (7.3% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. Of those exposed, 10,700 small juveniles are estimated to have died as a result of the exposure. In contrast to small juveniles, loggerheads represented a large proportion of the adults and large juveniles exposed to and killed by the oil. There were 30,000 exposures (almost 52% of all exposures for those age/size classes) and 3,600 estimated mortalities. A total of 265 nests (27,618 eggs) were also translocated during response efforts, with 14,216 hatchlings released, the fate of which is unknown (DWH Trustees 2015). Additional unquantified effects may have included 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, and loss of foraging resources which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

Unlike Kemp's ridleys, the majority of nesting for the Northwest Atlantic Ocean loggerhead DPS occurs on the Atlantic coast, and thus loggerheads were impacted to a relatively lesser degree. However, it is likely that impacts to the NGMRU of the NWA loggerhead DPS would be proportionally much greater than the impacts occurring to other recovery units. Impacts to nesting and oiling effects on a large proportion of the NGMRU recovery unit, especially mating and nesting adults likely had an impact on the NGMRU. Based on the response injury evaluations for Florida Panhandle and Alabama nesting beaches (which fall under the NFMRU), the Trustees estimated that approximately 20,000 loggerhead hatchlings were lost due to DWH oil spill response activities on nesting beaches. Although the long-term effects remain unknown, the DWH oil spill event impacts to the Northern Gulf of Mexico Recovery Unit may result in some nesting declines in the future due to a large reduction of oceanic age classes during the DWH oil spill event. Although adverse impacts occurred to loggerheads, the proportion of the population that is expected to have been exposed to and directly impacted by the DWH oil spill event is relatively low. Thus, we do not believe a population-level impact occurred due to the widespread distribution and nesting location outside of the Gulf of Mexico for this species.

Specific information regarding potential climate change impacts on loggerheads is also available. Modeling suggests an increase of 2°C in air temperature would result in a sex ratio of over 80% female offspring for loggerheads nesting near Southport, North Carolina. The same increase in air temperatures at nesting beaches in Cape Canaveral, Florida, would result in close to 100% female offspring. Such highly skewed sex ratios could undermine the reproductive capacity of the species. More ominously, an air temperature increase of 3°C is likely to exceed the thermal threshold of most nests, leading to egg mortality (Hawkes et al. 2007). Warmer sea surface temperatures have also been correlated with an earlier onset of loggerhead nesting in the spring (Hawkes et al. 2007; Weishampel et al. 2004), short inter-nesting intervals (Hays et al. 2002), and shorter nesting seasons (Pike et al. 2006).

3.5 **Green Sea Turtle** (Information Relevant to All DPSs)

The green sea turtle was originally 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. On April 6, 2016, the original listing was replaced with the listing of 11 distinct population segments (DPSs) (81 FR 20057 2016). The Mediterranean, Central West Pacific, and Central South Pacific DPSs were listed as endangered. The North Atlantic, South Atlantic, Southwest Indian, North Indian, East Indian-West Pacific, Southwest Pacific, Central North Pacific, and East Pacific were listed as threatened. For the purposes of this consultation, only the South Atlantic DPS (SA DPS) and North Atlantic DPS (NA DPS) will be considered, as they are the only two DPSs with individuals occurring in the Atlantic and Gulf of Mexico waters of the United States.

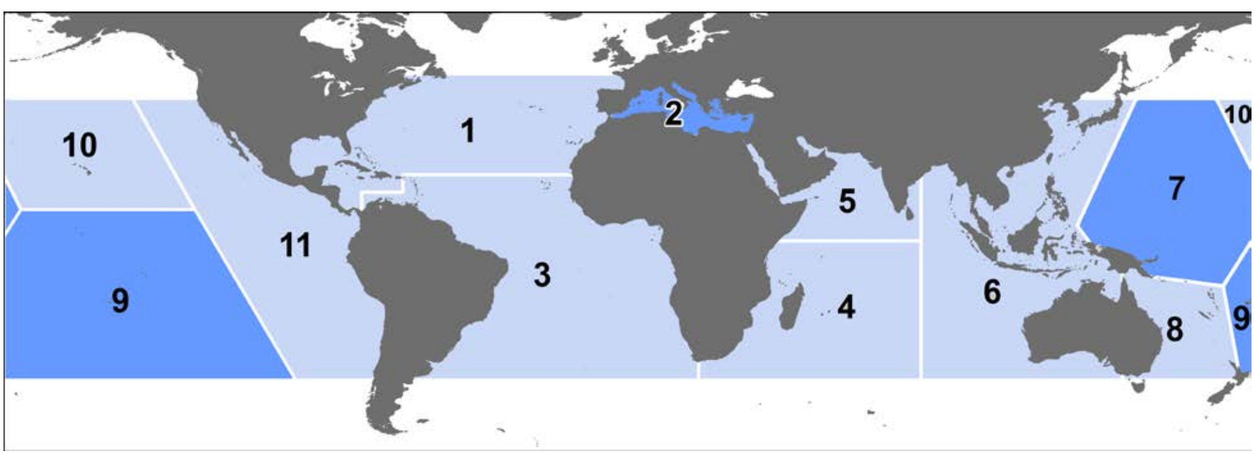

Figure 7. Threatened (light) and endangered (dark) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11. East Pacific.

Life History Information

Green sea turtles reproduce sexually, and mating occurs in the waters off nesting beaches and along migratory routes. Mature females return to their natal beaches (i.e., the same beaches where they were born) to lay eggs (Balazs 1982; Frazer and Ehrhart 1985) every 2-4 years while males are known to reproduce every year (Balazs 1983). In the southeastern United States, females generally nest between June and September, and peak nesting occurs in June and July (Witherington and Ehrhart 1989b). During the nesting season, females nest at approximately 2-week intervals, laying an average of 3-4 clutches (Johnson and Ehrhart 1996). Clutch size often varies among subpopulations, but mean clutch size is approximately 110-115 eggs. In Florida, green sea turtle nests contain an average of 136 eggs (Witherington and Ehrhart 1989b). Eggs incubate for approximately 2 months before hatching. Hatchling green sea turtles are approximately 2 inches (5 cm) in length and weigh approximately 0.9 ounces (25 g). Survivorship at any particular nesting site is greatly influenced by the level of man-made stressors, with the more pristine and less disturbed nesting sites (e.g., along the Great Barrier Reef in Australia) showing higher survivorship values than nesting sites known to be highly disturbed (e.g., Nicaragua) (Campell and Lagueux 2005; Chaloupka and Limpus 2005).

After emerging from the nest, hatchlings swim to offshore areas and go through a post-hatchling pelagic stage where they are believed to live for several years. During this life stage, green sea turtles feed close to the surface on a variety of marine algae and other life associated with drift lines and debris. This early oceanic phase remains one of the most poorly understood aspects of green sea turtle life history (NMFS and USFWS 2007a). Green sea turtles exhibit particularly slow growth rates of about 0.4-2 inches (1-5 cm) per year (Green 1993), which may be attributed to their largely herbivorous, low-net energy diet (Bjorndal 1982). At approximately 8-10 inches (20-25 cm) carapace length, juveniles leave the pelagic environment and enter nearshore developmental habitats such as protected lagoons and open coastal areas rich in sea grass and marine algae. Growth studies using skeletochronology indicate that green sea turtles in the western Atlantic shift from the oceanic phase to nearshore developmental habitats after approximately 5-6 years (Bresette et al. 2006; Zug and Glor 1998). Within the developmental habitats, juveniles begin the switch to a more herbivorous diet, and by adulthood feed almost exclusively on seagrasses and algae (Rebel 1974), although some populations are known to also feed heavily on invertebrates (Carballo et al. 2002). Green sea turtles mature slowly, requiring 20-50 years to reach sexual maturity (Chaloupka and Musick 1997a; Hirth 1997).

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 sea turtles have been identified through flipper tagging and/or satellite telemetry. Based on these studies, the majority of adult female Florida green sea turtles are believed to reside in nearshore foraging areas throughout the Florida Keys and in the waters southwest of Cape Sable, and some post-nesting turtles also reside in Bahamian waters as well (NMFS and USFWS 2007a).

Species Description and Distribution

The green sea turtle is the largest of the hardshell marine turtles, growing to a weight of 350 lb (159 kg) with a straight carapace length of greater than 3.3 ft (1 m). Green sea turtles have a smooth carapace with 4 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, or brown and black in starburst or irregular patterns (Lagueux 2001).

With the exception of post-hatchlings, green sea turtles live in nearshore tropical and subtropical waters where they generally feed on marine algae and seagrasses. They have specific foraging grounds and may make large migrations between these forage sites and natal beaches for nesting (Hays et al. 2001). Green sea turtles nest on sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands in more than 80 countries worldwide (Hirth 1997). The 2 largest nesting populations are found at Tortuguero, on the Caribbean coast of Costa Rica (part of the NA DPS), and Raine Island, on the Pacific coast of Australia along the Great Barrier Reef.

Differences in mitochondrial DNA properties of green sea turtles from different nesting regions indicate there are genetic subpopulations (Bowen et al. 1992; FitzSimmons et al. 2006). Despite the genetic differences, sea turtles from separate nesting origins are commonly found mixed together on foraging grounds throughout the species' range. Within U.S. waters individuals from both the NA and SA DPSs can be found on foraging grounds. While there are currently no in-depth studies available to determine the percent of NA and SA DPS individuals in any given location, two small-scale studies provide an insight into the degree of mixing on the foraging grounds. An analysis of cold-stunned green turtles in St. Joseph Bay, Florida (northern Gulf of Mexico) found approximately 4% of individuals came from nesting stocks in the SA DPS (specifically Suriname, Aves Island, Brazil, Ascension Island, and Guinea Bissau) (Foley et al. 2007). On the Atlantic coast of Florida, a study on the foraging grounds off Hutchinson Island found that approximately 5% of the turtles sampled came from the Aves Island/Suriname nesting assemblage, which is part of the SA DPS (Bass and Witzell 2000). All of the individuals in both studies were benthic juveniles. Available information on green turtle migratory behavior indicates that long distance dispersal is only seen for juvenile turtles. This suggests that larger adult-sized turtles return to forage within the region of their natal rookeries, thereby limiting the potential for gene flow across larger scales (Monzón-Argüello et al. 2010). While all of the mainland U.S. nesting individuals are part of the NA DPS, the U.S. Caribbean nesting assemblages are split between the NA and SA DPS. Nesters in Puerto Rico are part of the NA DPS, while those in the U.S. Virgin Islands are part of the SA DPS. We do not currently have information on what percent of individuals on the U.S. Caribbean foraging grounds come from which DPS.

North Atlantic DPS Distribution

The NA DPS boundary is illustrated in Figure 7. Four regions support nesting concentrations of particular interest in the NA DPS: Costa Rica (Tortuguero), Mexico (Campeche, Yucatan, and Quintana Roo), U.S. (Florida), and Cuba. By far the most important nesting concentration for green turtles in this DPS is Tortuguero, Costa Rica. Nesting also occurs in the Bahamas, Belize, Cayman Islands, Dominican Republic, Haiti, Honduras, Jamaica, Nicaragua, Panama, Puerto Rico, Turks and Caicos Islands, and North Carolina, South Carolina, Georgia, and Texas, U.S.A. In the eastern North Atlantic, nesting has been reported in Mauritania (Fretey 2001).

The complete nesting range of NA DPS green sea turtles within the southeastern United States includes sandy beaches between Texas and North Carolina, as well as Puerto Rico (Dow et al. 2007; NMFS and USFWS 1991). 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 south through Broward counties.

In U.S. Atlantic and Gulf of Mexico waters, green sea turtles are distributed throughout 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 (Doughty 1984; Hildebrand 1982; Shaver 1994), the Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Caldwell and Carr 1957), 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 sea 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 Yucatán Peninsula.

South Atlantic DPS Distribution

The SA DPS boundary is shown in Figure 7, and includes the U.S. Virgin Islands in the Caribbean. The SA DPS nesting sites can be roughly divided into four regions: western Africa, Ascension Island, Brazil, and the South Atlantic Caribbean (including Colombia, the Guianas, and Aves Island in addition to the numerous small, island nesting sites).

The in-water range of the SA DPS is widespread. In the eastern South Atlantic, significant sea turtle habitats have been identified, including green turtle feeding grounds in Corisco Bay, Equatorial Guinea/Gabon (Formia 1999); Congo; Mussulo Bay, Angola (Carr and Carr 1991); as well as Principe Island. Juvenile and adult green turtles utilize foraging areas throughout the Caribbean areas of the South Atlantic, often resulting in interactions with fisheries occurring in those same waters (Dow et al. 2007). Juvenile green turtles from multiple rookeries also frequently utilize the nearshore waters off Brazil as foraging grounds as evidenced from the frequent captures by fisheries (Lima et al. 2010; López-Barrera et al. 2012; Marcovaldi et al. 2009). Genetic analysis of green turtles on the foraging grounds off Ubatuba and Almofala, Brazil show mixed stocks coming primarily from Ascension, Suriname and Trindade as a secondary source, but also Aves, and even sometimes Costa Rica (North Atlantic DPS)(Naro-Maciel et al. 2007; Naro-Maciel et al. 2012). While no nesting occurs as far south as Uruguay and Argentina, both have important foraging grounds for South Atlantic green turtles (Gonzalez Carman et al. 2011; Lezama 2009; López-Mendilaharsu et al. 2006; Prosdocimi et al. 2012; Rivas-Zinno 2012).

Status and Population Dynamics
Accurate population estimates for marine turtles do not exist because of the difficulty in sampling turtles over their geographic ranges and within their marine environments. Nonetheless, researchers have used nesting data to study trends in reproducing sea turtles over time. A summary of nesting trends and nester abundance is provided in the most recent status review for the species (Seminoff et al. 2015), with information for each of the DPSs.

<u>North Atlantic DPS</u>

The NA DPS is the largest of the 11 green turtle DPSs, with an estimated nester abundance of over 167,000 adult females from 73 nesting sites. Overall this DPS is also the most data rich. Eight of the sites have high levels of abundance (i.e., <1000 nesters), located in Costa Rica, Cuba, Mexico, and Florida. All major nesting populations demonstrate long-term increases in abundance (Seminoff et al. 2015).

Tortuguero, Costa Rica is by far the predominant nesting site, accounting for an estimated 79% of nesting for the DPS (Seminoff et al. 2015). Nesting at Tortuguero appears to have been increasing since the 1970’s, when monitoring began. For instance, from 1971-1975 there were approximately 41,250 average annual emergences documented and this number increased to an average of 72,200 emergences from 1992-1996 (Bjorndal et al. 1999). 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 nesting 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’s growing at 4.9% annually.

In the continental United States, green sea 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 (Meylan et al. 1995). Green sea turtle nesting is documented annually on beaches of North Carolina, South Carolina, and Georgia, though nesting is found in low quantities (nesting databases maintained on www.seaturtle.org).

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, the pattern of green sea turtle nesting has generally shown biennial peaks in abundance with a positive trend during the 10 years of regular monitoring (Figure 8). According to data collected from Florida’s index nesting beach survey from 1989-2016, green sea turtle nest counts across Florida have increased approximately ten-fold from a low of 267 in the early 1990s to a high of 27,975 in 2015. Two consecutive years of nesting declines in 2008 and 2009 caused some concern, but this was followed by increases in 2010 and 2011, and a return to the trend of biennial peaks in abundance thereafter (Figure 8). Modeling by Chaloupka et al. (2008) 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%.

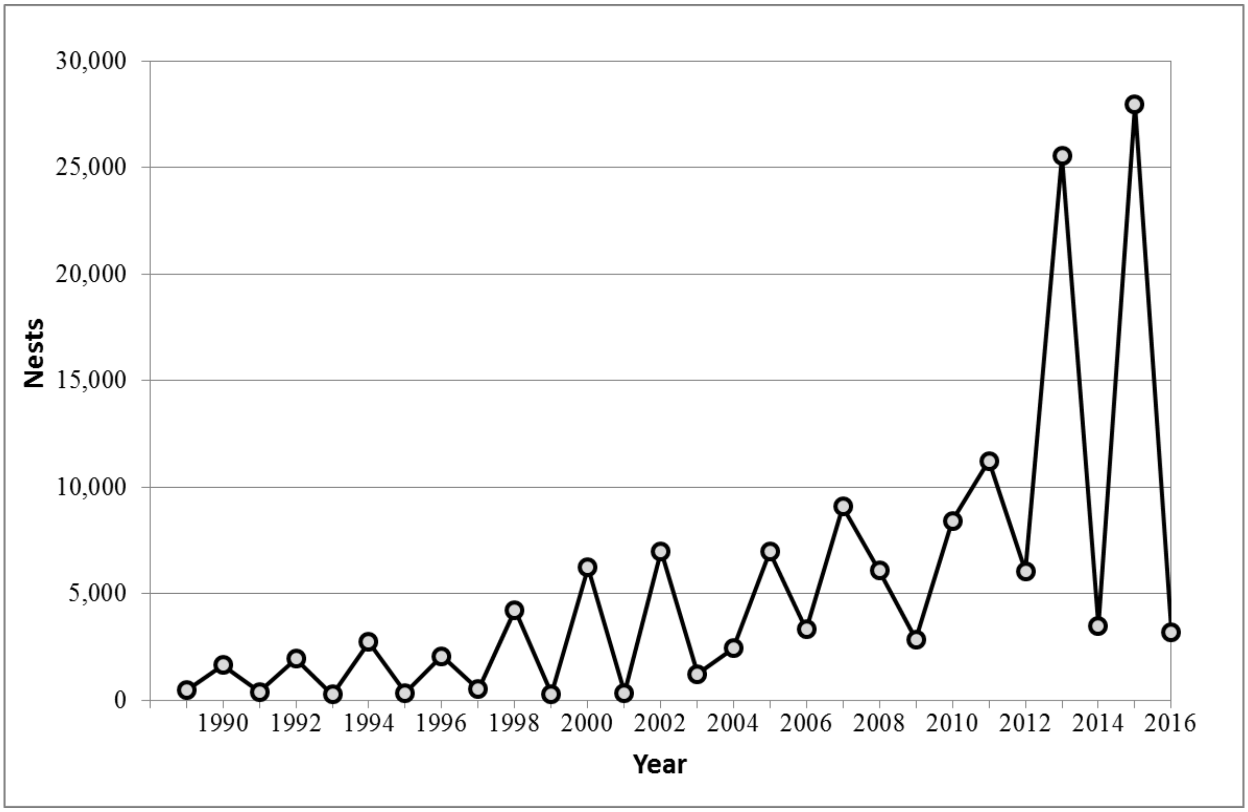

Figure 8. Green sea turtle nesting at Florida index beaches since 1989

Similar to the nesting trend found in Florida, in-water studies in Florida have also recorded increases in green turtle captures at the Indian River Lagoon site, with a 661 percent increase over 24 years (Ehrhart et al. 2007), and the St Lucie Power Plant site, with a significant increase in the annual rate of capture of immature green turtles (SCL<90 cm) from 1977 to 2002 or 26 years (3,557 green turtles total; M. Bressette, Inwater Research Group, unpubl. data; (Witherington et al. 2006).

South Atlantic DPS

The SA DPS is large, estimated at over 63,000 nesters, but data availability is poor. More than half of the 51 identified nesting sites (37) did not have sufficient data to estimate number of nesters or trends (Seminoff et al. 2015). This includes some sites, such as beaches in French Guiana, which are suspected to have large numbers of nesters. Therefore, while the estimated number of nesters may be substantially underestimated, we also do not know the population trends at those data-poor beaches. However, while the lack of data was a concern due to increased uncertainty, the overall trend of the SA DPS was not considered to be a major concern as some of the largest nesting beaches such as Ascension Island, Aves Island (Venezuela), and Galibi (Suriname) appear to be increasing. Others such as Trindade (Brazil), Atol das Rocas (Brazil), and Poilão and the rest of Guinea-Bissau seem to be stable or do not have sufficient data to make a determination. Bioko (Equatorial Guinea) appears to be in decline but has less nesting than the other primary sites (Seminoff et al. 2015).

In the U.S., nesting of SA DPS green turtles occurs on the beaches of the U.S. Virgin Islands, primarily on Buck Island. There is insufficient data to determine a trend for Buck Island nesting, and it is a smaller rookery, with approximately 63 total nesters utilizing the beach (Seminoff et al. 2015).

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the overexploitation of the species 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 U.S. jurisdiction, where exploitation is still a threat. Green sea turtles also face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (e.g., plastics, petroleum products, petrochemicals), ecosystem alterations (e.g., nesting beach development, beach nourishment and shoreline stabilization, vegetation changes), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 3.3.

In addition to general threats, green sea turtles are susceptible to natural mortality from Fibropapillomatosis (FP) disease. FP results in the growth of tumors on soft external tissues (flippers, neck, tail, etc.), the carapace, the eyes, the mouth, and internal organs (gastrointestinal tract, heart, lungs, etc.) of turtles (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). These tumors range in size from 0.04 inches (0.1 cm) to greater than 11.81 inches (30 cm) in diameter and may affect swimming, vision, feeding, and organ function (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). Presently, scientists are unsure of the exact mechanism causing this disease, though it is believed to be related to both an infectious agent, such as a virus (Herbst et al. 1995), and environmental conditions (e.g., habitat degradation, pollution, low wave energy, and shallow water (Foley et al. 2005). FP is cosmopolitan, but it has been found to affect large numbers of animals in specific areas, including Hawaii and Florida (Herbst 1994; Jacobson 1990; Jacobson et al. 1991).

Cold-stunning is another natural threat to green sea turtles. Although it is not considered a major source of mortality in most cases, as temperatures fall below 46.4°-50°F (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 1989a). 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, and hundreds found dead or dying. A large cold-stunning event occurred in the western Gulf of Mexico in February 2011, resulting in approximately 1,650 green sea turtles found cold-stunned in Texas. Of these, approximately 620 were found dead or died after stranding, while approximately 1,030 turtles were rehabilitated and released. During this same time frame, approximately 340 green sea turtles were found cold-stunned in Mexico, though approximately 300 of those were subsequently rehabilitated and released.

Whereas oil spill impacts are discussed generally for all species in Section 3.3, specific impacts of the DWH spill on green sea turtles are considered here. Impacts to green sea turtles occurred to offshore small juveniles only. A total of 154,000 small juvenile greens (36.6% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. A large number of small juveniles were removed from the population, as 57,300 small juveniles greens are estimated to have died as a result of the exposure. A total of 4 nests (580 eggs) were also translocated during response efforts, with 455 hatchlings released (the fate of which is unknown) (DWH Trustees 2015). Additional unquantified effects may have included 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, and loss of foraging resources which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

While green turtles regularly use the northern Gulf of Mexico, they have a widespread distribution throughout the entire Gulf of Mexico, Caribbean, and Atlantic, and the proportion of the population using the northern Gulf of Mexico at any given time is relatively low. Although it is known that adverse impacts occurred and numbers of animals in the Gulf of Mexico were reduced as a result of the Deepwater Horizon oil spill of 2010 (DWH), the relative proportion of the population that is expected to have been exposed to and directly impacted by the DWH event, as well as the impacts being primarily to smaller juveniles (lower reproductive value than adults and large juveniles), reduces the impact to the overall population. It is unclear what impact these losses may have caused on a population level, but it is not expected to have had a large impact on the population trajectory moving forward. However, recovery of green turtle numbers equivalent to what was lost in the northern Gulf of Mexico as a result of the spill will likely take decades of sustained efforts to reduce the existing threats and enhance survivorship of multiple life stages (DWH Trustees 2015).

3.6 Kemp's Ridley Sea Turtle

The Kemp's ridley sea turtle was listed as endangered on December 2, 1970, under the Endangered Species Conservation Act of 1969, a precursor to the ESA. Internationally, the Kemp's ridley is considered the most endangered sea turtle (Groombridge 1982; TEWG 2000; Zwinenberg 1977).

Species Description and Distribution
The Kemp's ridley sea turtle is the smallest of all sea turtles. Adults generally weigh less than 100 lb (45 kg) and have a carapace length of around 2.1 ft (65 cm). Adult Kemp's ridley shells are almost as wide as they are long. Coloration changes significantly during development from the grey-black dorsum and plastron of hatchlings, a grey-black dorsum with a yellowish-white plastron as post-pelagic juveniles, and then to the lighter grey-olive carapace and cream-white or yellowish plastron of adults. There are 2 pairs of prefrontal scales on the head, 5 vertebral scutes, usually 5 pairs of costal scutes, and generally 12 pairs of marginal scutes on the carapace. In each bridge adjoining the plastron to the carapace, there are 4 scutes, each of which is perforated by a pore.

Kemp's ridley habitat largely consists of sandy and muddy areas in shallow, nearshore waters less than 120 ft (37 m) deep, although they can also be found in deeper offshore waters. These areas support the primary prey species of the Kemp's ridley sea turtle, which consist of swimming crabs, but may also include fish, jellyfish, and an array of mollusks.

The primary range of Kemp's ridley sea turtles is within the Gulf of Mexico basin, though they also occur in coastal and offshore waters of the U.S. Atlantic Ocean. Juvenile Kemp's ridley sea turtles, possibly carried by oceanic currents, have been recorded as far north as Nova Scotia. Historic records indicate a nesting range from Mustang Island, Texas, in the north to Veracruz, Mexico, in the south. Kemp's ridley sea turtles have recently been nesting along the Atlantic Coast of the United States, with nests recorded from beaches in Florida, Georgia, and the Carolinas. In 2012, the first Kemp's ridley sea turtle nest was recorded in Virginia. The Kemp's ridley nesting population had been exponentially increasing prior to the recent low nesting years, which may indicate that the species' population as a whole had been experiencing a similar increase. Additional nesting data in the coming years will be required to determine what the recent nesting declines means for the population trajectory.

Life History Information

Kemp's ridley sea turtles share a general life history pattern similar to other sea turtles. Females lay their eggs on coastal beaches where the eggs incubate in sandy nests. After 45-58 days of embryonic development, the hatchlings emerge and swim offshore into deeper, ocean water where they feed and grow until returning at a larger size. Hatchlings generally range from 1.65-1.89 in (42-48 mm) straight carapace length (SCL), 1.26-1.73 in (32-44 mm) in width, and 0.3-0.4 lb (15-20 g) in weight. Their return to nearshore coastal habitats typically occurs around 2 years of age (Ogren 1989), although the time spent in the oceanic zone may vary from 1-4 years or perhaps more (TEWG 2000). Juvenile Kemp's ridley sea turtles use these nearshore coastal habitats from April through November, but they move towards more suitable overwintering habitat in deeper offshore waters (or more southern waters along the Atlantic coast) as water temperature drops.

The average rates of growth may vary by location, but generally fall within 2.2-2.9 ± 2.4 in per year (5.5-7.5 ± 6.2 cm/year) (Schmid and Barichivich 2006; Schmid and Woodhead 2000). Age to sexual maturity ranges greatly from 5-16 years, though NMFS et al. (2011) determined the best estimate of age to maturity for Kemp's ridley sea turtles was 12 years. It is unlikely that most adults grow very much after maturity. While some sea turtles nest annually, the weighted mean remigration rate for Kemp's ridley sea turtles is approximately 2 years. Nesting generally occurs from April to July. Females lay approximately 2.5 nests per season with each nest containing approximately 100 eggs (Márquez M. 1994).

Population Dynamics

Of the 7 species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. Most of the population of adult females nests on the beaches of Rancho Nuevo, Mexico (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the mid-1980s, however, nesting numbers from Rancho Nuevo and adjacent Mexican beaches were below 1,000, with a low of 702 nests in 1985. Yet, nesting steadily increased through the 1990s, and then accelerated during the first decade of the twenty-first century (Figure 9), which indicates the species is recovering.

It is worth noting that when the Bi-National Kemp's Ridley Sea Turtle Population Restoration Project was initiated in 1978, only Rancho Nuevo nests were recorded. In 1988, nesting data from southern beaches at Playa Dos and Barra del Tordo were added. In 1989, data from the northern beaches of Barra Ostionales and Tepehuajes were added, and most recently in 1996, data from La Pesca and Altamira beaches were recorded. Currently, nesting at Rancho Nuevo accounts for just over 81% of all recorded Kemp's ridley nests in Mexico. Following a significant, unexplained 1-year decline in 2010, Kemp's ridley nests in Mexico increased to 21,797 in 2012 (Gladys Porter Zoo 2013). From 2013 through 2014, there was a second significant decline, as only 16,385 and 11,279 nests were recorded, respectively. Recent data, however, indicates an increase in nesting. In 2015 there were 14,006 recorded nests, and in 2016 overall numbers increased to 18,354 recorded nests (Gladys Porter Zoo 2016). Preliminary information indicates a record high nesting season in 2017, with 24,570 nests recorded (J. Pena, pers. comm., August 31, 2017). At this time, it is unclear if future nesting will steadily and continuously increase, similar to what occurred from 1990-2009, or if nesting will continue to exhibit sporadic declines and increases as recorded in the past 8 years.

A small nesting population is also emerging in the United States, primarily in Texas, rising from 6 nests in 1996 to 42 in 2004, to a record high of 353 nests in 2017 (National Park Service data, http://www.nps.gov/pais/naturescience/strp.htm, http://www.nps.gov/pais/naturescience/current-season.htm). It is worth noting that nesting in Texas has paralleled the trends observed in Mexico, characterized by a significant decline in 2010, followed by a second decline in 2013-2014, but with a rebound in 2015.

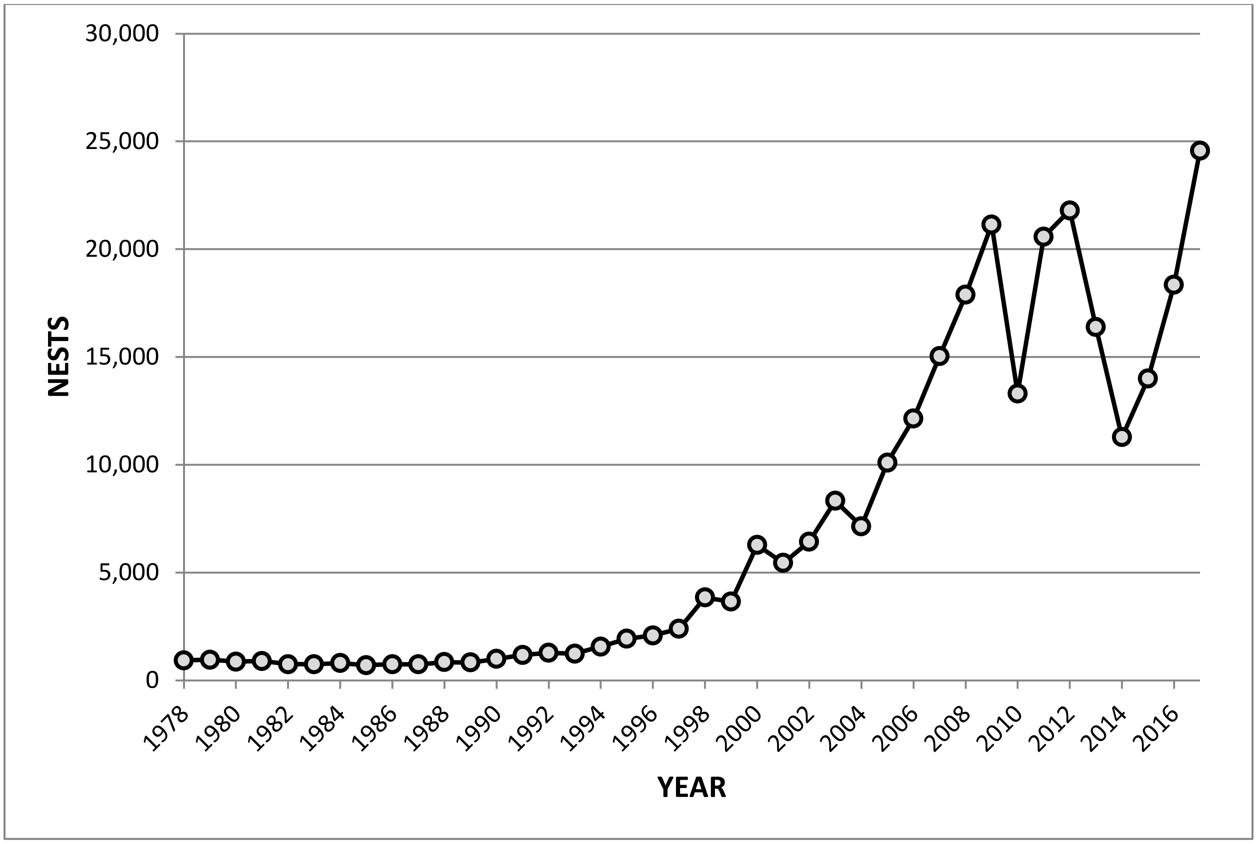

Figure 9. Kemp's ridley nest totals from Mexican beaches (Gladys Porter Zoo nesting database 2017)

Through modelling, Heppell et al. (2005) predicted the population was expected to increase at least 12-16% per year and could reach at least 10,000 females nesting on Mexico beaches by 2015. NMFS et al. (2011) produced an updated model that predicted the population to increase 19% per year and to attain at least 10,000 females nesting on Mexico beaches by 2011. Approximately 25,000 nests would be needed for an estimate of 10,000 nesters on the beach, based on an average 2.5 nests/nesting female. While counts did not reach 25,000 nests by 2015, it is clear that the population has increased over the long term. The increases in Kemp's ridley sea turtle nesting over the last 2 decades is likely due to a combination of management measures including elimination of direct harvest, nest protection, the use of TEDs, reduced trawling effort in Mexico and the United States, and possibly other changes in vital rates (TEWG 1998; TEWG 2000). While these results are encouraging, the species' limited range as well as low global abundance makes it particularly vulnerable to new sources of mortality as well as demographic and environmental randomness, all factors which are often difficult to predict with any certainty. Additionally, the significant nesting declines observed in 2010 and 2013-2014 potentially indicate a serious population-level impact, and there is cause for concern regarding the ongoing recovery trajectory.

Threats

Kemp's ridley sea turtles face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (plastics, petroleum products, petrochemicals, etc.), ecosystem alterations (nesting beach development, beach nourishment and shoreline stabilization, vegetation changes, etc.), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 3.3; the remainder of this section will expand on a few of the aforementioned threats and how they may specifically impact Kemp's ridley sea turtles.

As Kemp's ridley sea turtles continue to recover and nesting arribadas[5] are increasingly established, bacterial and fungal pathogens in nests are also likely to increase. Bacterial and fungal pathogen impacts have been well documented in the large arribadas of the olive ridley at Nancite in Costa Rica (Mo 1988). In some years, and on some sections of the beach, the hatching success can be as low as 5% (Mo 1988). As the Kemp's ridley nest density at Rancho Nuevo and adjacent beaches continues to increase, appropriate monitoring of emergence success will be necessary to determine if there are any density-dependent effects.

Over the past 6 years, NMFS has documented (via the Sea Turtle Stranding and Salvage Network data, http://www.sefsc.noaa.gov/species/turtles/strandings.htm) elevated sea turtle strandings in the Northern Gulf of Mexico, particularly throughout the Mississippi Sound area. In the first 3 weeks of June 2010, over 120 sea turtle strandings were reported from Mississippi and Alabama waters, none of which exhibited any signs of external oiling to indicate effects associated with the DWH oil spill event. A total of 644 sea turtle strandings were reported in 2010 from Louisiana, Mississippi, and Alabama waters, 561 (87%) of which were Kemp's ridley sea turtles. During March through May of 2011, 267 sea turtle strandings were reported from Mississippi and Alabama waters alone. A total of 525 sea turtle strandings were reported in 2011 from Louisiana, Mississippi, and Alabama waters, with the majority (455) having occurred from March through July, 390 (86%) of which were Kemp's ridley sea turtles. During 2012, a total of 384 stranded sea turtles were reported from Louisiana, Mississippi, and Alabama waters. Of these reported strandings, 343 (89%) were Kemp's ridley sea turtles. During 2014, a total of 285 stranded sea turtles were reported from Louisiana, Mississippi, and Alabama waters, though the data is incomplete. Of these reported strandings, 229 (80%) were Kemp's ridley sea turtles. These stranding numbers are significantly greater than reported in past years; Louisiana, Mississippi, and Alabama waters reported 42 and 73 sea turtle strandings for 2008 and 2009, respectively. It should be noted that stranding coverage has increased considerably due to the DWH oil spill event.

Nonetheless, considering that strandings typically represent only a small fraction of actual mortality, these stranding events potentially represent a serious impact to the recovery and survival of the local sea turtle populations. While a definitive cause for these strandings has not been identified, necropsy results indicate a significant number of stranded turtles from these events likely perished due to forced submergence, which is commonly associated with fishery interactions (B. Stacy, NMFS, pers. comm. to M. Barnette, NMFS PRD, March 2012). Yet, available information indicates fishery effort was extremely limited during the stranding events. The fact that 80% or more of all Louisiana, Mississippi, and Alabama stranded sea turtles in the past 5 years were Kemp's ridleys is notable; however, this could simply be a function of the species' preference for shallow, inshore waters coupled with increased population abundance, as reflected in recent Kemp's ridley nesting increases.

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5 Arribada is the Spanish word for "arrival" and is the term used for massive synchronized nesting within the genus *Lepidochelys.*

In response to these strandings, and based on the theory that fishery interactions may be the cause, fishery observer effort was shifted to evaluate the inshore skimmer trawl fishery during the summer of 2012. During May-July of that year, observers reported 24 sea turtle interactions in the skimmer trawl fishery. All but a single sea turtle were identified as Kemp's ridleys (1 sea turtle was an unidentified hardshell turtle). Encountered sea turtles were all very small juvenile specimens, ranging from 7.6-19.0 in (19.4-48.3 cm) curved carapace length (CCL). All sea turtles were released alive. The small average size of encountered Kemp's ridleys introduces a potential conservation issue, as over 50% of these reported sea turtles could potentially pass through the maximum 4-in bar spacing of TEDs currently required in the shrimp fishery. Due to this issue, a proposed 2012 rule to require TEDs in the skimmer trawl fishery (77 FR 27411) was not implemented. Based on anecdotal information, these interactions were a relatively new issue for the inshore skimmer trawl fishery. Given the nesting trends and habitat utilization of Kemp's ridley sea turtles, it is likely that fishery interactions in the Northern Gulf of Mexico may continue to be an issue of concern for the species, and one that may potentially slow the rate of recovery for Kemp's ridley sea turtles.

While oil spill impacts are discussed generally for all species in Section 3.3, specific impacts of the DWH oil spill event on Kemp's ridley sea turtles are considered here. Kemp's ridleys experienced the greatest negative impact stemming from the DWH oil spill event of any sea turtle species. Impacts to Kemp's ridley sea turtles occurred to offshore small juveniles, as well as large juveniles and adults. Loss of hatchling production resulting from injury to adult turtles was also estimated for this species. Injuries to adult turtles of other species, such as loggerheads, certainly would have resulted in unrealized nests and hatchlings to those species as well. Yet, the calculation of unrealized nests and hatchlings was limited to Kemp's ridleys for several reasons. All Kemp's ridleys in the Gulf belong to the same population (NMFS et al. 2011), so total population abundance could be calculated based on numbers of hatchlings because all individuals that enter the population could reasonably be expected to inhabit the northern Gulf of Mexico throughout their lives (DWH Trustees 2015).

A total of 217,000 small juvenile Kemp's ridleys (51.5% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. That means approximately half of all small juvenile Kemp's ridleys from the total population estimate of 430,000 oceanic small juveniles were exposed to oil. Furthermore, a large number of small juveniles were removed from the population, as up to 90,300 small juveniles Kemp's ridleys are estimated to have died as a direct result of the exposure. Therefore, as much as 20% of the small oceanic juvenile population of this species was killed during that year. Impacts to large juveniles (>3 years old) and adults were also high. An estimated 21,990 such individuals were exposed to oil (about 22% of the total estimated population for those age classes); of those, 3,110 mortalities were estimated (or 3% of the population for those age classes). The loss of near-reproductive and reproductive-stage females would have contributed to some extent to the decline in total nesting abundance observed between 2011 and 2014. The estimated number of unrealized Kemp's ridley nests is between 1,300 and 2,000, which translates to between approximately 65,000 and 95,000 unrealized hatchlings (DWH Trustees 2015). This is a minimum estimate, however, because the sublethal effects of the DWH oil spill event on turtles, their prey, and their habitats might have delayed or reduced reproduction in subsequent years, which may have contributed substantially to additional nesting deficits observed following the DWH oil spill event. These sublethal effects could have slowed growth and maturation rates, increased remigration intervals, and decreased clutch frequency (number of nests per female per nesting season). The impact that the DWH oil spill event has had on reduced Kemp's ridley nesting abundance and associated hatchling production after 2010 requires further evaluation. It is clear that the DWH oil spill event resulted in large losses to the Kemp's ridley population across various age classes, and likely had an important population-level effect on the species. Still, we do not have a clear understanding of those impacts on the population trajectory for the species into the future.

3.7 Smalltooth Sawfish

The U.S. DPS of smalltooth sawfish was listed as endangered under the ESA effective May 1, 2003 (68 FR 15674; April 1, 2003).

Species Description and Distribution
The smalltooth sawfish is a tropical marine and estuarine elasmobranch. It has an extended snout with a long, narrow, flattened, rostral blade (rostrum) with a series of transverse teeth along either edge. In general, smalltooth sawfish inhabit shallow coastal waters of warm seas throughout the world and feed on a variety of small fish (e.g., mullet, jacks, and ladyfish) (Simpfendorfer 2001), and crustaceans (e.g., shrimp and crabs) (Bigelow and Schroeder 1953; Norman and Fraser 1937).

Although this species is reported to have a circumtropical distribution, NMFS identified smalltooth sawfish from the Southeast United States as a DPS, due to the physical isolation of this population from others, the differences in international management of the species, and the significance of the U.S. population in relation to the global range of the species (see 68 FR15674). Within the United States, smalltooth sawfish have been captured in estuarine and coastal waters from New York southward through Texas, although peninsular Florida has historically been the region of the United States with the largest number of recorded captures (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 is also the last U.S. stronghold for the species (Poulakis and Seitz 2004; Seitz and Poulakis 2002; Simpfendorfer and Wiley 2005). Water temperatures (no lower than 16-18°C) and the availability of appropriate coastal habitat (shallow, euryhaline waters and red mangroves) are the major environmental constraints limiting the northern movements of smalltooth sawfish in the western North Atlantic. Most specimens captured along the Atlantic coast north of Florida are large adults (over 10 ft) that likely represent seasonal migrants, wanderers, or colonizers from a historic Florida core population(s) to the south, rather than being members of a continuous, even-density population (Bigelow and Schroeder 1953).

Life History Information
Smalltooth sawfish fertilization is internal and females give birth to live young. The brood size, gestation period, and frequency of reproduction are unknown for smalltooth sawfish. Therefore, data from the closely related (in terms of size and body morphology) largetooth sawfish represent our best estimates of these parameters. The largetooth sawfish likely reproduces every other year, has a gestation period of approximately 5 months, and produces a mean of 7.3 offspring per brood, with a range of 1-13 offspring (Thorson 1976). Smalltooth sawfish are

approximately 31 in (80 cm) at birth and may grow to a length of 18 ft (548 cm) or greater during their lifetime (Bigelow and Schroeder 1953; Simpfendorfer 2002). Simpfendorfer et al. (2008) report rapid juvenile growth for smalltooth sawfish for the first 2 years after birth, with stretched total length increasing by an average of 25-33 in (65-85 cm) in the first year and an average of 19-27 in (48-68 cm) in the second year. By contrast, very little information exists on size classes other than juveniles, which make up the majority of sawfish encounters; therefore, much uncertainty remains in estimating life history parameters for smalltooth sawfish, especially as it relates to age at maturity and post-juvenile growth rates. Based on age and growth studies of the largetooth sawfish (Thorson 1982) and research by Simpfendorfer (2000), the smalltooth sawfish is likely a slow-growing (with the exception of early juveniles), late-maturing (10-20 years) species with a long lifespan (30-60 years). Juvenile growth rates presented by Simpfendorfer et al. (2008) suggest smalltooth sawfish are growing faster than previously thought and therefore may reach sexual maturity at an earlier age.

There are distinct differences in habitat use based on life history stage. Juvenile smalltooth sawfish, those up to 3 years of age or approximately 8 ft in length (Simpfendorfer et al. 2008), inhabit the shallow waters of estuaries and can be found in sheltered bays, dredged canals, along banks and sandbars, and in rivers (NMFS 2000). Juvenile smalltooth sawfish occur in euryhaline waters (i.e., waters with a wide range of salinities) and are often closely associated with muddy or sandy substrates, and shorelines containing red mangroves, *Rhizophora mangle* (Simpfendorfer 2001; Simpfendorfer 2003). Tracking data from the Caloosahatchee River in Florida indicate very shallow depths and salinity are important abiotic factors influencing juvenile smalltooth sawfish movement patterns, habitat use, and distribution (Simpfendorfer et al. 2011). Another recent acoustic tagging study in a developed region of Charlotte Harbor, Florida, identified the importance of mangroves in close proximity to shallow water habitat for juvenile smalltooth sawfish, stating that juveniles generally occur in shallow water within 328 ft (100 m) of mangrove shorelines, generally red mangroves (Simpfendorfer et al. 2010). Juvenile smalltooth sawfish spend the majority of their time in waters less than 13 ft (4 m) in depth (Simpfendorfer et al. 2010) and are seldom found in depths greater than 32 ft (10 m) (Poulakis and Seitz 2004). Simpfendorfer et al. (2010) also indicated developmental differences in habitat use: the smallest juveniles (young-of-the-year juveniles measuring < 100 cm in length) generally used water depths less than 0.5 m (1.64 ft), had small home ranges (4,264-4,557 m^2), and exhibited high levels of site fidelity. Although small juveniles exhibit high levels of site fidelity for specific nursery habitats for periods of time lasting up to 3 months (Wiley and Simpfendorfer 2007), they do undergo small movements coinciding with changing tidal stages. These movements often involve moving from shallow sandbars at low tide to within red mangrove prop roots at higher tides (Simpfendorfer et al. 2010), behavior likely to reduce the risk of predation (Simpfendorfer 2006). As juveniles increase in size, they begin to expand their home ranges (Simpfendorfer et al. 2010; Simpfendorfer et al. 2011), eventually moving to more offshore habitats where they likely feed on larger prey and eventually reach sexual maturity.

Researchers have identified several areas within the Charlotte Harbor Estuary that are disproportionately more important to juvenile smalltooth sawfish, based on intra- or inter-annual (within or between year) capture rates during random sampling events within the estuary (Poulakis 2012; Poulakis et al. 2011). These areas were termed "hotspots" and also correspond with areas where public encounters are most frequently reported. Use of these "hotspots" can vary within and among years based on the amount and timing of freshwater inflow. Smalltooth sawfish use hotspots further upriver during high salinity conditions (drought) and areas closer to the mouth of the Caloosahatchee River during times of high freshwater inflow (Poulakis et al. 2011). At this time, researchers are unsure what specific biotic or abiotic factors influence this habitat use, but they believe a variety of conditions in addition to salinity, such as temperature, dissolved oxygen, water depth, shoreline vegetation, and food availability, may influence habitat selection (Poulakis et al. 2011).

While adult smalltooth sawfish may also use the estuarine habitats used by juveniles, they are commonly observed in deeper waters along the coasts. Poulakis and Seitz (2004) noted that nearly half of the encounters with adult-sized smalltooth sawfish in Florida Bay and the Florida Keys occurred in depths from 200-400 ft (70-122 m) of water. Similarly, Simpfendorfer and Wiley (2005) reported encounters in deeper waters off the Florida Keys, and observations from both commercial longline fishing vessels and fishery-independent sampling in the Florida Straits report large smalltooth sawfish in depths up to 130 ft (~ 40 m) (ISED 2014). Even so, NMFS believes adult smalltooth sawfish use shallow estuarine habitats during parturition (when adult females return to shallow estuaries to pup) because very young juveniles still containing rostral sheaths are captured in these areas. Since very young juveniles have high site fidelities, we hypothesize that they are birthed nearby or in their nursery habitats.

Status and Population Dynamics

Few long-term abundance data exist for the smalltooth sawfish, making it very difficult to estimate the current population size. Simpfendorfer (2001) estimated that the U.S. population may number less than 5% of historic levels, based on anecdotal data and the fact that the species' range has contracted by nearly 90%, and south and southwest Florida the only areas which are known to support a reproducing population. Since actual abundance data are limited, researchers have begun to compile capture and sightings data (collectively referred to as encounter data) in the International Sawfish Encounter Database (ISED) that was developed in 2000. Although this data cannot be used to assess the population because of the opportunistic nature in which they are collected (i.e., encounter data are a series of random occurrences rather than an evenly distributed search over a defined period of time), researchers can use this database to assess the spatial and temporal distribution of smalltooth sawfish. We expect that as the population grows, the geographic range of encounters will also increase. Since the conception of the ISED, over 3,000 smalltooth sawfish encounters have been reported and compiled in the encounter database (ISED 2014).

Despite the lack of scientific data on abundance, recent encounters with young-of-the-year, older juveniles, and sexually mature smalltooth sawfish indicate that the U.S. 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-dependent monitoring program (angler interviews) indicate a slightly increasing trend in abundance within the park over the past decade (Carlson and Osborne 2012; Carlson et al. 2007). 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 0.08-0.13 per year and population doubling times from 5.4-

8.5 years. These low intrinsic rates[6] of population increase, suggest that the species is particularly vulnerable to excessive mortality and rapid population declines, after which recovery may take decades.

Threats

Past literature indicates smalltooth sawfish were once abundant along both coasts of Florida and quite common along the shores of Texas and the northern Gulf coast (NMFS 2010) and citations therein). Based on recent comparisons with these historical reports, the U.S. DPS of smalltooth sawfish has declined over the past century (Simpfendorfer 2001; Simpfendorfer 2002). The decline in smalltooth sawfish abundance has been attributed to several factors including bycatch mortality in fisheries, habitat loss, and life history limitations of the species (NMFS 2010).

<u>Bycatch Mortality</u>

Bycatch mortality is cited as the primary cause for the decline in smalltooth sawfish in the United States (NMFS 2010). While there has never been a large-scale directed fishery, smalltooth sawfish easily become entangled in fishing gears (gill nets, otter trawls, trammel nets, and seines) directed at other commercial species, often resulting in serious injury or death (NMFS 2009). This has historically been reported in Florida (Snelson and Williams 1981), Louisiana (Simpfendorfer 2002), and Texas (Baughman 1943). For instance, 1 fisherman interviewed by Evermann and Bean (1897) reported taking an estimated 300 smalltooth sawfish in just one netting season in the Indian River Lagoon, Florida. In another example, smalltooth sawfish landings data gathered by Louisiana shrimp trawlers from 1945-1978, which contained both landings data and crude information on effort (number of vessels, vessel tonnage, number of gear units), indicated declines in smalltooth sawfish landings from a high of 34,900 lb in 1949 to less than 1,500 lb in most years after 1967. The Florida net ban passed in 1995 has led to a reduction in the number of smalltooth sawfish incidentally captured, "…by prohibiting the use of gill and other entangling nets in all Florida waters, and prohibiting the use of other nets larger than 500 square feet in mesh area in nearshore and inshore Florida waters"[7] (Fla. Const. art. X, § 16). However, the threat of bycatch currently remains in commercial fisheries (e.g., South Atlantic shrimp fishery, Gulf of Mexico shrimp fishery, federal shark fisheries of the South Atlantic, and the Gulf of Mexico reef fish fishery), though anecdotal information collected by NMFS port agents suggest smalltooth sawfish captures are now rare.

In addition to incidental bycatch in commercial fisheries, smalltooth sawfish have historically been and continue to be captured by recreational fishers. Encounter data (ISED 2014) and past research (Caldwell 1990) document that rostrums are sometimes removed from smalltooth sawfish caught by recreational fishers, thereby reducing their chances of survival. 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 recreational fisheries remains a potential threat to the species.

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6 The rate at which a population increases in size if there are no density-dependent forces regulating the population

7 "nearshore and inshore Florida waters" means all Florida waters inside a line 3 mi seaward of the coastline along the Gulf of Mexico and inside a line 1 mi seaward of the coastline along the Atlantic Ocean.

Habitat Loss

Modification and loss of smalltooth sawfish habitat, especially nursery habitat, is another contributing factor in the decline of the species. Activities such as agricultural and urban development, commercial activities, dredge-and-fill operations, boating, erosion, and diversions of freshwater runoff contribute to these losses according to the South Atlantic Fishery Management Council (SAFMC 1998). Large areas of coastal habitat were modified or lost between the mid-1970s and mid-1980s within the United States (Dahl and Johnson 1991). Since then, rates of loss have decreased, but habitat loss continues. From 1998-2004, approximately 64,560 acres of coastal wetlands were lost along the Atlantic and Gulf coasts of the United States, of which approximately 2,450 acres were intertidal wetlands consisting of mangroves or other estuarine shrubs (Stedman and Dahl 2008). Further, Orlando et al. (1994) analyzed 18 major southeastern estuaries and recorded over 703 mi of navigation channels and 9,844 mi of shoreline with modifications. In Florida, coastal development often involves the removal of mangroves and the armoring of shorelines through seawall construction. Changes to the natural freshwater flows into estuarine and marine waters through construction of canals and other water control devices have had other impacts: altered the temperature, salinity, and nutrient regimes; reduced both wetlands and submerged aquatic vegetation; and degraded vast areas of coastal habitat utilized by smalltooth sawfish (Gilmore 1995; Reddering 1988; Whitfield and Bruton 1989).

While these modifications of habitat are not the primary reason for the decline of smalltooth sawfish abundance, it is likely a contributing factor and almost certainly hampers the recovery of the species. Juvenile sawfish and their nursery habitats are particularly likely to be affected by these kinds of habitat losses or alternations, due to their affinity for shallow, estuarine systems. Although many forms of habitat modification are currently regulated, some permitted direct and/or indirect damage to habitat from increased urbanization still occurs and is expected to continue to threaten survival and recovery of the species in the future.

Life History Limitations

The smalltooth sawfish is also limited by its life history characteristics as a slow-growing, relatively late-maturing, and long-lived species. Animals using this life history strategy are usually successful in maintaining small, persistent population sizes in constant environments, but are particularly vulnerable to increases in mortality or rapid environmental change (NMFS 2000). The combined characteristics of this life history strategy result in a very low intrinsic rate of population increase (Musick 1999) that make it slow to recover from any significant population decline (Simpfendorfer 2000). More recent data suggest smalltooth sawfish may mature earlier than previously thought, meaning rates of population increase could be higher and recovery times shorter than those currently reported (Simpfendorfer et al. 2008).

Current Threats

The 3 major factors that led to the current status of the U.S. DPS of smalltooth sawfish – bycatch mortality, habitat loss, and life history limitations – continue to be the greatest threats today. All the same, other threats such as the illegal commercial trade of smalltooth sawfish or their body parts, predation, and marine pollution and debris may also affect the population and recovery of smalltooth sawfish on smaller scales (NMFS 2010). We anticipate that all of these threats will continue to affect the rate of recovery for the U.S. DPS of smalltooth sawfish.

In addition to the anthropogenic effects mentioned previously, changes to the global climate are likely to be a threat to smalltooth sawfish and the habitats they use. The Intergovernmental Panel on Climate Change has stated that global climate change is unequivocal (IPCC 2007) and its impacts to coastal resources may be significant. Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, changes in the amount and timing of precipitation, and changes in air and water temperatures (EPA 2012; NOAA 2012). The impacts to smalltooth sawfish cannot, for the most part, currently be predicted with any degree of certainty, but we can project some effects to the coastal habitats where they reside. We know that the coastal habitats that contain red mangroves and shallow, euryhaline waters will be directly impacted by climate change through sea level rise, which is expected to exceed 1 meter globally by 2100 according to Meehl et al. (2007), Pfeffer et al. (2008), and Vermeer and Rahmstorf (2009). Sea level rise will impact mangrove resources, as sediment surface elevations for mangroves will not keep pace with conservative projected rates of elevation in sea level (Gilman et al. 2008). Sea level increases will also affect the amount of shallow water available for juvenile smalltooth sawfish nursery habitat, especially in areas where there is shoreline armoring (e.g., seawalls). Further, the changes in precipitation coupled with sea level rise may also alter salinities of coastal habitats, reducing the amount of available smalltooth sawfish nursery habitat.

4 ENVIRONMENTAL BASELINE

This section describes the effects of past and ongoing human and natural factors contributing to the current status of the species, their habitats (including designated critical habitat), and ecosystem within the action area, without the additional effects of the proposed action. In the case of ongoing actions, this section includes the effects that may contribute to the projected future status of the species, habitats, and ecosystem. The environmental baseline describes a species' and habitat's health based on information available at the time of this consultation.

By regulation (50 CFR 402.02), environmental baselines for Biological Opinions include the past and present impacts of all state, federal, or private actions and other human activities in, or having effects in, the action area. We identify the anticipated impacts of all proposed federal actions in the specific action area of the consultation at issue that have already undergone formal or early Section 7 consultation (as defined in 50 CFR 402.11), as well as the impact of state or private actions, or the impacts of natural phenomena, which are concurrent with the consultation in process (50 CFR 402.02).

Focusing on the impacts of the activities in the action area specifically allows us to assess the prior experience and state (or condition) of the endangered and threatened individuals. In addition, we can focus on areas of designated critical habitat that occur in an action area that may be exposed to effects from the action under consultation. This consideration is important because in some states or life history stages, or areas of their ranges, listed individuals or critical habitat features will commonly exhibit, or be more susceptible to, adverse responses to stressors than they would be in other states, stages, or areas within their distributions. These localized stress responses or stressed baseline conditions may increase the severity of the adverse effects expected from the proposed action.

4.1 Status of Sea Turtles and Smalltooth Sawfish within the Action Area

Sea Turtles

Based on the information discussed above, and their habitat and eating preferences, loggerhead, green, and Kemp's ridley sea turtles may be located in the action area and be affected by the proposed recreational fishing activities. All of these species are migratory, traveling for foraging or reproduction purposes. The nearshore and inshore waters of Gulf and Bay Counties may be used by these sea turtles as nearshore reproductive habitat, post-hatchling developmental habitat, or foraging habitat. NMFS believes that no individual sea turtles are likely to be permanent residents of the action areas, 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 throughout these areas; therefore, threats to turtles in the action area are considered to include those discussed in Section 3. All 3 species are known to nest on the Gulf-facing beaches of both counties. Loggerheads are by far the most abundant nesters in these counties, creating hundreds of nests along these beaches in recent years. Greens and Kemp's ridley sea turtles are only occasional nesters in these counties, generally producing only a few nests per year.

Smalltooth Sawfish

As discussed in Section 3.7, smalltooth sawfish have been documented throughout the state of Florida with the majority of sightings occurring in Lee, Charlotte, and Monroe Counties. Critical habitat was designated in these counties as a means of protecting sawfish nursery habitats. The project is located well north of this designated critical habitat but the ISED has documented several encounters in the inshore/nearshore waters of Gulf and Bay Counties since 2000. All reported encounters have been with juvenile fish (less than 2 meters total length). This suggests that juvenile (and possibly adult) sawfish are using the nearshore waters in the vicinity of the proposed action and could reasonably be expected to occur in the action area. It is important to note that the ISED data clearly indicates presence of sawfish in the area but most sawfish sightings and captures go unreported (this is discussed later in Section 5). It is likely that smalltooth sawfish use of inshore/nearshore waters of Gulf and Bay Counties is limited at present since the ISED only had 6 reported sightings including only a single reported capture of smalltooth sawfish over a 16-year period (2000-2015). The smalltooth sawfish recovery plan (NMFS 2009), if successfully implemented, would be expected to increase sawfish abundance not only within designated critical habitat (i.e., in the Charlotte Harbor Estuary Unit [CHEU] far south of the project area) but also in other areas with suitable habitat throughout Florida including Gulf and Bay counties. Therefore, we might reasonably expect that over the course of the proposed action as the species recovers, its population may expand and add more sawfish into other regional bays such as Saint Joseph and Saint Andrew Bays.

4.2 Factors Affecting the Species and Environment within the Action Area

<u>Federal Actions</u>

A search of NMFS records, found no specific projects in the action areas that have undergone Section 7 consultation. However, periodic dredging of the boating channels around the Oak Shore Drive and Panama City Marina project sites is known to occur which may affect sea turtles and sawfish through increased turbidity, temporary avoidance of active dredging zones, and potential direct impacts from dredging equipment (depending on the type of equipment used). The effects of these periodic maintenance dredging activities are analyzed in the Gulf of Mexico Regional Biological Opinion completed in 2003 and most recently revised in 2007.

State or Private Actions

Recreational boating and fishing as regulated by the state of Florida can affect protected species or their habitats within the action area. Recreational boating in the shallow waters of the action area can damage sea grass beds, increase turbidity, and directly impact sea turtles through vessel strikes. Recreational fishing can threaten sea turtles and sawfish via incidental hooking and entanglement either by actively fished lines, discarded, remnant, or broken-off fishing lines, and/or other debris. Effects from recreational boating and fishing around the action area are likely to continue at levels similar to those currently experienced in these areas.

Other Potential Sources of Impacts in the Environmental Baseline

Stochastic events

Stochastic (i.e., random) events, such as hurricanes and cold snaps, occur in Florida and can affect the action area. These events are by nature unpredictable, and their effect on the recovery of the species is unquantifiable. Stochastic events have the potential to impede recovery if animals are injured or killed as a direct result of the event, or if important habitats are damaged.

Marine Pollution and Environmental Contamination

Coastal runoff, dredging, and contaminant spills can degrade nearshore habitats used by sea turtles (Colburn et al. 1996) and smalltooth sawfish and negatively impact nearshore habitats. Public and private facilities such as marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats.

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 DWH oil spill in 2010, the Ixtoc I oil well blowout and fire in the Bay of Campeche in 1979, and the explosion and destruction of the loaded supertanker, the Mega Borg, near Galveston in 1990). 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. 1997b).

The accumulation of organic contaminants and trace metals has been studied in loggerhead, green, and leatherback sea turtles (Aguirre et al. 1994; Caurant et al. 1999; Corsolini et al. 2000) (McKenzie et al. 1999). Omnivorous loggerhead sea turtles had the highest organochlorine contaminant concentrations in all the tissues sampled, including those from green and leatherback turtles (Storelli et al. 2008b). It is thought that dietary preferences were likely to be the main differentiating factor among species. Sakai et al. (1995) found the presence of metal residues occurring in loggerhead sea turtle organs and eggs. Storelli et al. (1998) analyzed tissues from 12 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. 1991a). No information on detrimental threshold concentrations is available for sea turtles or smalltooth sawfish, and little is known about the consequences of exposure of organochlorine compounds to these species. Research is needed on the short- and long-term health and fecundity effects of chlorobiphenyl, organochlorine, and heavy metal accumulation in sea turtles and smalltooth sawfish.

Conservation and Recovery Actions Shaping the Environmental Baseline
As discussed in Section 3, NMFS and cooperating states have established an extensive network of STSSN participants along the Atlantic and Gulf of Mexico coasts that not only collect data on dead sea turtles, but also rescue and rehabilitate live stranded sea turtles. This program has recently been enhanced through funding provided under the BP DWH settlement which will improve the infrastructure and response capabilities of the STSSN by funding new personnel, mobile sea turtle rescue units, and other essential equipment. In addition to the STSSN efforts, there are many local organizations such as "Share the Beach" in Alabama that count and monitor sea turtle nests, and protect them from natural predators and human impacts, thereby increasing the survival of hatchlings reaching the ocean. Similarly, the Florida Program for Shark Research at the Florida Museum of Natural History operates and maintains a sawfish encounter database that monitors the population of smalltooth sawfish in the southeastern United States.

5. EFFECTS OF THE ACTION

Effects of the action include direct and indirect effects of the action under consultation. Indirect effects are those that result from the proposed action, occur later in time (i.e., after the proposed action is complete), but are still reasonably certain to occur (40 CFR 402.02).

5.1 Effects on Sea Turtles from Recreational Fishing at the Proposed Fishing Piers

Sea turtles may be adversely affected by recreational fishing activity through incidental hooking or entanglement in actively fished or discarded fishing line. Sea turtles have historically been captured in both recreational and commercial fisheries and are known to become entangled in fishing debris. Most sea turtle captures on rod-and-reel, as reported to the STSSN, have occurred during pier fishing. Fishing piers are suspected to attract sea turtles that learn to forage there for discarded bait and fish carcasses. Sea turtles are particularly prone to entanglement as a result of their body morphologies and behaviors. Records of stranded or entangled sea turtles reveal that fishing line can wrap around the neck, flipper, or body of a sea turtle and severely restrict swimming or feeding. If an individual sea turtle is entangled when young, the fishing line can become tighter and more constricting as the individual grows, cutting off blood flow and causing deep gashes, some severe enough to remove an appendage.

In this section, we will estimate the number of sea turtles anticipated to be captured at the proposed fishing piers based on available data regarding the number that have been reported caught during recreational fishing in the surrounding area, the estimated number of unreported hook-and-line captures, and the estimated survival rate of each species post-capture.

5.1.1 Estimated Reporting of Hook-and-Line Captures at Fishing Piers

In 2013, a fishing pier survey was completed at 26 fishing piers in Charlotte Harbor on the west coast of Florida in smalltooth sawfish critical habitat (Hill 2013). During the survey, 93 fishers were asked a series of questions regarding captures of sea turtles, smalltooth sawfish, and dolphins including whether or not they knew these encounters were required to be reported and if they did report the encounter. The interviewer also noted conditions about the pier including if educational signs regarding reporting of hook-and-line captures were present at the pier. At the time of the survey, none of the piers had these types of educational signs. Interviewed fishers were asked open-ended questions about what they would do if they were to accidently capture a sea turtle or sawfish. Of those interviewed, 46% responded they would cut the line, while 28% would either cut the line or remove the hook depending on the situation, and 22% would try to remove the hook. It was reported that 88% did not know to report incidental captures of either sea turtles or sawfish; only 12% stated that they would report an accidently hooked sawfish, and only 8% would have reported an accidently hooked sea turtle. This demonstrates the high level of underreporting likely occurring, the lack of awareness regarding reporting, and the lack of educational signs regarding reporting at fishing piers.

5.1.2 Estimating Sea Turtle Take

While we believe the best available information for estimating future interactions at fishing piers are the documented incidental captures at public piers in the surrounding area, we also recognize the need to account for underreporting especially in areas where educational signs have not been present. We believe that it is reasonable to assume that the reporting level identified by the fishing pier survey discussed above is applicable to the proposed action as both are located in estuarine waters on the Gulf Coast of Florida and both areas lacked educational signs instructing anglers on requirements to report sea turtle encounters at fishing piers. For the proposed action, we will use the data set from the Charlotte Harbor fishing piers to estimate underreporting. In the following sections, we describe how we derived our estimates for potential future takes. In those calculations we will address underreporting by assuming that the sea turtles reported taken at fishing piers in Gulf and Bay Counties from 2005-2014 by the STSSN represents only 8% of the actual take, and that 92% of sea turtle take in those 2 counties went unreported during that time period.

Now we incorporate the data from the STSSN for incidental sea turtle take at fishing piers in Gulf and Bay Counties from 2005-2014 to estimate future captures at the proposed fishing piers. The STSSN reported a total of 6 sea turtles (3 Kemp's ridley, 2 loggerhead and 1 green) taken by hook-and-line at 14 public fishing piers in the 2 counties over the 10-year period.

As discussed above, we will assume that 92% of sea turtle captures were not reported during this period, as per the findings in (Hill 2013). To determine the number of unreported sea turtle captures over the 10-year period (X) we use the equation:

Reported captures ÷ 8% = unreported captures ÷ 92%
$6 \div 8 = X \div 92$
$552 = 8X$
X (unreported sea turtle captures) = 69

Therefore, the total sea turtle captures estimated to have occurred from public fishing piers in these 2 counties, over the 10-year period, is 75 turtles, (6 reported and 69 unreported).

There are 14 public fishing piers across the 2 counties (4 in Gulf County, and 10 in Bay County). We will assume that the proposed new piers will have similar potential to experience sea turtle captures and species composition as the existing piers. Thus, we estimate that each new pier will average 0.54 captures per year (75 captured turtles ÷ 14 piers ÷ 10 years = 0.54 turtles per year per pier), or approximately 1.62 captures per year across all 3 proposed piers (0.54 turtles * 3 piers = 1.62 turtle captures per year). Based on the proportions of captured turtles reported for the 2 counties from 2005-2014 in the STSSN data, we expect that 50% of the turtles captured from the proposed new piers will be Kemp's ridleys, 33% will be loggerheads, and 17% will be green sea turtles.

5.1.3 Effects of Hook-and-Line Captures of Sea Turtles

Hook-and-line gear commonly used by recreational anglers fishing from piers can adversely affect sea turtles via entanglement, hooking, and trailing line. Sea turtles are hardy creatures with slow metabolisms, and it is therefore extremely rare for sea turtles, even when deeply hooked and badly injured, to die immediately upon being captured. However, 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 current understanding of the effects of hook-and-line gear on sea turtles is related primarily to the effects observed in association with commercial fisheries (particularly longline fisheries); few data exist on the effects of recreational fishing on sea turtles. Dead sea turtles found stranded with hooks in their digestive tract have been reported, though it is assumed that most sea turtles hooked by recreational fishers are released alive (Thompson 1991). Little information exists on the frequency of recreational fishing captures and the status of the sea turtles after they are caught. Regardless, effects that sea turtles are likely to experience as a result of interactions with recreational hook-and-line gear (i.e., entanglement, hooking, and trailing line) are expected to be the same as those that might occur in commercial fisheries. The following discussion summarizes in greater detail the available information on how individual sea turtles may be affected by 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 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. Sea turtles have been found entangled in many different types of hook-and-line gear. Entangling gear can interfere with a sea turtle's ability to swim or impair its feeding, breeding, or migration. Entanglement may even prevent surfacing and cause drowning.

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 depend on the

foraging strategies and diving and swimming behavior of the various species of sea turtles. Sea turtles are either hooked externally in the flippers, head, shoulders, armpits, or beak, or internally inside the mouth or further down the digestive track when the animal has swallowed the hook (Balazs et al. 1995). Observer data (specific to commercial fishing) indicate that internal hooking is the most common form of angling impact in hardshell sea turtles, especially loggerheads (NMFS unpublished data). Almost all interactions with loggerheads result from the turtle taking the bait and hook; only a very small percentage of loggerheads are foul-hooked externally or entangled.

Swallowed hooks are of the greatest concern. A sea turtle's esophagus (throat) is lined with strong conical papillae directed 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 sea turtle's mouth, especially if the hooks have been deeply ingested. Because of a sea turtle's digestive structure, deeply ingested hooks are also very difficult to remove without seriously injuring the turtle. A sea turtle's esophagus is also firmly attached to underlying tissue; thus, if a sea turtle swallows a hook and tries to free itself or is hauled on board a vessel, the hook can pierce the sea turtle's esophagus or stomach and can pull organs from its connective tissue. These injuries can cause the sea turtle to bleed internally or can result in infections, both of which can kill the sea turtle.

If a hook does not lodge into, or pierce, a sea turtle's digestive organs, it can pass through the digestive system entirely (Aguilar et al. 1995; Balazs et al. 1995) with little damage (Work 2000). For example, a study of loggerheads deeply hooked by the Spanish Mediterranean pelagic longline fleet found ingested hooks could be expelled after 53 to 285 days (average 118 days) (Aguilar et al. 1995). If a hook passes through a sea turtle's digestive tract without getting lodged, the hook probably has not harmed the turtle.

Trailing Line

Trailing line (i.e., line left on a sea turtle after it has been captured and released), particularly line trailing from a swallowed hook, poses a serious risk to sea turtles. Line trailing from a swallowed hook is also likely to be swallowed, which may irritate the lining of the digestive system. The line may cause the intestine to twist upon itself until it twists closed, creating a blockage ("torsion") or may cause a part of the intestine to slide into another part of intestine like a telescopic rod ("intussusception") which also leads to blockage. In both cases, death is a likely outcome (Watson et al. 2005). The line may also prevent or hamper foraging, eventually leading to death. Trailing line may also become caught 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 sea floor, or has the potential to snag, thus anchoring them in place (Balazs 1985). Long lengths of trailing gear are likely to entangle the sea turtle, eventually, leading to impaired movement, constriction wounds, and potentially death.

5.1.4 Estimating Injury and Post-Release Mortality Rates for Anticipated Future Takes

The injury to sea turtles from hook-and-line captures and ultimately the post-release mortality (PRM) will depend on numerous factors including how deeply the hook is embedded, whether it was swallowed or was an external hooking, whether the sea turtle was released with trailing line, how soon and how effectively the hooked sea turtle was de-hooked or otherwise cut loose and released, and other factors which are discussed in more detail below.

The preferred method to release a hooked sea turtle safely is to bring it ashore and de-hooked/disentangle it there and release it immediately. If that cannot be accomplished, the next preferred technique is to cut the line as close as possible to the sea turtle's mouth or hooking site, rather than attempt to pull the sea turtle up to the pier. Some incidentally captured sea turtles are likely to break free on their own and escape with embedded/ingested hooks and/or trailing line. We have no way of estimating how many will break free with trailing line and/or ingested or embedded hooks. Because of considerations such as current, pier height, and the weight and size of the hooked/entangled sea turtle, some will not be able to be de-hooked, and will be broken off or cut free by fishers. These sea turtles will escape with embedded or swallowed hooks, and/or trailing varying amounts of fishing line which may cause post-release injury or death.

In January 2004, NMFS convened a workshop of experts to develop criteria for estimating PRM of sea turtles caught in the pelagic longline fishery. In 2006, those criteria were revised and finalized (Ryder et al. 2006). In February 2012, the SEFSC updated the 2006 criteria by adding 3 additional hooking scenarios (Table 3). Overall mortality ratios are dependent upon the type of interaction (i.e., hooking, entanglement), the location of hooking if applicable (i.e., hooked externally, hooked in the mouth), and the amount/type of gear remaining on the animal at the time of release (i.e., hook remaining, amount of line remaining, entangled or not). Therefore, the experience, ability, and willingness of anglers to remove the gear, and the availability of gear-removal equipment, are very important factors that influence PRM. The new criteria also take into account differences in PRM between hardshell sea turtles and leatherback sea turtles, with slightly higher rates of PRM assigned to leatherbacks. While no specific analysis of PRM related to recreational hook-and-line gear are currently available, we believe that the commercial fishery information is a reasonable surrogate for recreational fishing as both techniques use similar gear (baited hooks attached to monofilament lines).

Table 3. Criteria for Assessing PRM, With Mortality Rates Shown as Percentages for Hardshell Sea Turtles (NMFS and SEFSC 2012)

Injury Category		Release Condition			
		(A) Released entangled (line is trailing or not trailing, turtle is entangled[8])	(B) Released with hook and with trailing line greater than or equal to half the length of the carapace (line is trailing, turtle is not entangled)	(C) Released with hook and with trailing line less than half the length of the carapace (line is trailing, turtle is not entangled)	(D) Released with all gear removed
I	Hooked externally with or without entanglement	55%	20%	10%	5%
II	Hooked in upper or lower jaw with or without entanglement—includes ramphotheca, but not any other jaw/mouth tissue parts (see Category III)	65%	30%	20%	10%
III	Hooked in cervical esophagus, glottis, jaw joint, soft palate, tongue, and/or other jaw/mouth tissue parts not categorized elsewhere, with or without entanglement—includes all events where the insertion point of the hook is visible when viewed through the mouth.	75%	45%	35%	25%
IV	Hooked in esophagus at or below level of the heart with or without entanglement—includes all events where the insertion point of the hook is not visible when viewed through the mouth	85%	60%	50%	75%[9]
V	Entangled only, no hook involved	Released Entangled 50%	n/a		Fully Disentangled 1%
VI	Comatose/resuscitated	n/a[10]		70%	60%

To estimate the expected release conditions of turtles captured at the proposed fishing piers, we consider that the applicants have agreed to post and maintain signage alerting anglers to the risk of hooking sea turtles, and contact information for local STSSN rescuers. We also look at the proposed size and elevation of the piers. Given the large size and high elevation off the water of

8 Length of line, as well as the presence or absence of the hook, is not relevant as turtle remains entangled at release.
9 Although per veterinary recommendations, hooks would not be removed if the insertion point of the hook is not visible when viewed through the open mouth, this has occurred and must be accounted for. We have interpolated the table's value to insert a value for this cell base on veterinary and expert opinion. Also, there are times when the hook location is unknown, but the hook-and-line are retrieved. Because these are coded in this row, we must also allow for the removal of all gear.
10 Assumes that the resuscitated turtle will always have the line cut to a length less than half the length of the carapace, even if the hook remains. Assumes that the turtle is not released entangled in the remaining line.

the proposed piers, we believe it is reasonable (and conservative) to conclude that fishers will not be able to remove the hook from turtles or even cut the line close to the hook. Therefore, turtles are assumed to be released with trailing line longer than half the length of the carapace (Release Condition B in Table 3).

To estimate the likely "Injury Category" of turtles captured at the proposed fishing piers we believe the best available information in NMFS' Southeast Region is reported by the Mississippi STSSN. In cooperation with Institute of Marine Mammal Studies (IMMS), the Mississippi STSSN have compiled extensive data on the hook-and-line captures of 924 sea turtles at fishing piers in Mississippi from 2010 to mid-2015 (Table 4). This data includes the location on the sea turtle's body where it was hooked. We looked at this data to determine the types of hooking injuries for sea turtles captured at fishing piers. The data provided includes 24.24% of turtle interactions that did not report the specific sea turtle hooking location. We believe that it is more accurate to estimate the future injury and post-release mortality by only analyzing the reported hook-and-line captures that also reported the hooking location because mortality rates differ depending on the hooking location, so no mortality rate can reliably be estimated from sea turtles that do not have the hooking location reported. Using this data, we estimate that 7% of turtles hooked at fishing piers will suffer a Category I injury defined in Table 3 above, followed by 4% of turtles that will suffer a Category II injury, 85% of turtles that will suffer a Category III injury, and 4% of turtles that will suffer a Category IV injury (Table 4).

Table 4. Category of Injury from Hook-and-Line Captures at Fishing Piers in Mississippi (January 1, 2010- June 10, 2013)

All Reporting Hook-and-Line Captures	Injury Category I	Injury Category II	Injury Category III	Injury Category IV	Unknown/ Blank/NA	Total - All
Records	52	26	596	26	224	924
Percent of Total	5.63%	2.81%	64.50%	2.81%	24.24%	100.00%
Hook-and-Line Captures with hooking location reported	**Injury Category I**	**Injury Category II**	**Injury Category III**	**Injury Category IV**	**Total - Known**	
Records	52	26	596	26	700	
Percent of Total	7.43%	3.71%	85.14%	3.71%	100.00%	

Injured sea turtles captured in Mississippi are sent to IMMS for rehabilitation. According to IMMS data provided by the STSSN, of 858 turtles sent to IMMS between 2010 and mid-2015, approximately 97% were released alive (either released immediately alive or rehabilitated and released alive), and the remaining 3% were removed from the population (either died or were deemed unreleasable).

There is a sea turtle rehabilitation facility close to the proposed piers (in Panama City Beach), and based on the reporting rates observed in Hill (2013), we assume that 8% of the sea turtles captured at these piers will be reported and sent to this facility for rehabilitation (if needed), and therefore achieve the 97% survival rate described above, regardless of how they are hooked.

Estimating Post-Release Mortality Rates for Sea Turtles Captured at the Proposed Piers
To estimate the fate of the 92% of turtle captures expected to go unreported and therefore unrehabilitated, we use the Injury Categories calculated in Table 4 along with the PRMs for Category B Release Condition shown in Table 3 to calculate the mortality rate expected for each injury category. We then sum these mortality rates across all injury categories to determine the overall PRM Rate for these turtles (Table 5). For example, we anticipate 7% of captures are likely to result in Category I injuries, and 20% of those animals are likely to die as a result of that injury. Therefore, we expect 1.4% of unreported turtles (7% x 20%) would suffer PRM as a result of a Category I injury. By following this same approach for each injury category and its corresponding mortality rate, we establish the expected mortality rates. By summing the mortality rates we can estimate the overall mortality rate for all future turtles captured at the piers but not reported, and not taken for rehabilitation (Table 5). This overall rate helps us account for the varying severity of future injuries and varying PRM rates associated with these injuries.

Table 5. Estimated Overall PRM Rate for Unreported Captures

Injury Category	Percentage of Total Captures in Each Injury Category from Table 4	PRM Rate per Category B from Table 3	Weighted Mortality Rate
I	7%	20%	1.4%
II	4%	30%	1.2%
III	85%	45%	38.3%
IV	4%	60%	2.4%
Overall Post-Release Mortality Rate			**43.3%***

*Overall mortality rate = Percent of Total Captures in Each Injury Category x PRM Rate per Category = Weighted Mortality; Weighted Mortality Rate for Injury Category I + Weighted Mortality Rate for Injury Category II + Weighted Mortality Rate for Injury Category III + Weighted Mortality Rate for Injury Category IV = Overall mortality rate.

Based on the assumptions we have made about the percentage of turtle captures that will go unreported, resulting in sea turtle release without rehabilitation, the likely hooking location on the turtles bodies, and the amount of fishing gear likely to remain on animals released immediately at a pier, we estimate a PRM rate of 43.3% for 92% of the turtles taken at the proposed piers. To get the overall mortality rate for all turtles taken at the proposed piers, we must add in the expected mortality rates for those turtles that are rescued and rehabilitated. The overall mortality rate for turtles taken at the proposed piers can be estimated through the following equation:

Mortality Rate = (PRM for turtles released at pier (from Table 5) * percent of turtles released at pier) **+** (mortality rate for rescued turtles (from IMMS data) * percent of turtles rescued)

Mortality Rate = (43.3% * 92%) + (3% * 8%)

Mortality Rate (average for all turtles taken at these piers) = 39.84% + 0.24% = 40.08%

When this mortality rate is applied to the estimated annual captures across all 3 piers (1.62 turtles), we can predict that approximately 0.65 turtles are expected to die as a result of the proposed action (1.62 * 40.08% = 0.65) each year (on average).

Estimated Captures and Mortality by Species

Data from the STSSN for 2005-2014 show that all reported incidental takes of sea turtles by hook-and-line fishing associated with public fishing piers in Gulf and Bay Counties were for Kemp's ridley, loggerhead and green sea turtles. During this 10 year period, 3 Kemp's ridley, 2 loggerhead, and 1 green sea turtle were captured, or 50% Kemp's ridley sea turtles, 33% loggerhead sea turtles, and 17% green sea turtles. In order to analyze the long-term effects of the proposed projects, and to derive meaningful numbers from our analysis (as it is difficult to analyze effects on fractions of turtles) we will expand the time period of the analysis out to a period of 30 years (a reasonable life expectancy for these fishing piers). Based on the analysis above, we expect approximately 48.6 turtles would be captured from the 3 piers, over a 30-year period (0.54 captures per year *3 piers * 30 years = 48.6 captures over 30 years). We use this information to estimate the capture and mortality rate for each species of sea turtle in Table 6 below.

Table 6. Estimated Captures and Mortality by Species for a 30-Year Period

Turtle Species	Estimated Percent of all Turtles Captured	Estimated Captures Over any 30-Year Period by Species	Estimated Captures Resulting in Mortality	Estimated Mortalities Rounded up to be conservative
Kemp's ridley	50%	48.6 x 0.5 = **24.3**	24.3 x 0.4008 = 9.74	10
Loggerhead	33%	48.6 x 0.33 = **16.0**	16.0 x 0.4008 = 6.41	7
Green*	17%	48.6 x 0.17 = **8.3**	8.3 x 0.4008 = 3.33	4
Total	100%	**48.6**	19.48	21

*Representation of the two DPSs in the expected take is discussed in the jeopardy analysis.

5.2 Effects on Smalltooth Sawfish from Recreational Fishing at the Proposed Fishing Piers

Smalltooth sawfish may be adversely affected by recreational fishing activity through incidental hooking or entanglement in actively fished or discarded fishing line. Smalltooth sawfish have historically been captured in both recreational and commercial fisheries and are known to become entangled in fishing debris. Most documented/reported recreational fishing captures for smalltooth sawfish involve recreational fishing from piers and small recreational vessels in shallow water within juvenile sawfish nursery habitat. Smalltooth sawfish are particularly prone to entanglement as a result of their body morphologies and behaviors. The configuration of the smalltooth sawfish rostrum is particularly prone to entanglement, likely affecting the ability of the fish to function if the rostrum is damaged during incidental capture. If an individual sawfish is entangled when young, the fishing line can become tighter and more constricting as the individual grows, cutting off blood flow and causing deep gashes, some severe enough to remove an appendage.

5.2.1 Estimating Smalltooth Sawfish Captures at the 3 Proposed Fishing Piers

The ISED was created during the smalltooth sawfish listing process and is now maintained by the Florida Program for Shark Research at the Florida Museum of Natural History. This database tracks sawfish encounters reported by fishers, boaters, and researchers. Collected data includes the date of the encounter, type of encounter (sighting or capture), species of sawfish, location and habitat of encounter, estimated total length, condition of the sawfish, and a variety of other information. While we believe the best available information for estimating future interactions at fishing piers are the ISED documented incidental captures at public piers in the surrounding area, we also recognize the need to account for underreporting especially in areas where educational signs have not been present. We believe that it is reasonable to assume that the reporting level identified by the fishing pier survey discussed above (Hill 2013) is applicable to the proposed action as both are located in estuarine waters on the Gulf Coast of Florida. For the proposed action, we will use the data set from the Charlotte Harbor fishing piers to estimate underreporting. In the following sections, we describe how we derived our estimates for potential future takes. In those calculations we will address underreporting by assuming that the smalltooth sawfish reported taken at fishing piers in Gulf and Bay Counties from 2000-2015 by the ISED represents only 12% of the actual take, and that 88% of sawfish take in those 2 counties went unreported during that time period.

Now we incorporate the data from the ISED for incidental smalltooth sawfish take at fishing piers in Gulf and Bay Counties from 2000-2015 to estimate future captures at the proposed fishing piers. The ISED reported just 1 smalltooth sawfish taken by hook-and-line at 14 public fishing piers in the 2 counties over the 16-year period.

To be precautionary, we will assume that 88% of smalltooth sawfish captures were not reported during this period, as per the findings in (Hill 2013). To determine the number of unreported smalltooth sawfish captures over the 16-year period (X) we use the equation:

Reported captures ÷ 12% = unreported captures ÷ 88%
1 ÷ 12 = X ÷ 88
88 = 12X
X (unreported smalltooth sawfish captures) = 7.33

Therefore, the total smalltooth sawfish captures estimated to have occurred from public fishing piers in these 2 counties, over the 16-year period, is 8.33 sawfish, (1 reported and 7.33 unreported).

There are 14 public fishing piers across the 2 counties (4 in Gulf County, and 10 in Bay County). Assuming that the proposed new piers will have similar potential to experience smalltooth sawfish captures as the existing piers, we can estimate that each new pier will average 0.037 captures per year (8.33 captured sawfish ÷ 14 piers ÷ 16 years = 0.037 sawfish per year per pier. In order to analyze the long-term effects of the proposed projects and to derive meaningful numbers from our analysis (as it is difficult to analyze effects on fractions of sawfish) we will expand the time period of the analysis out to a period of 30 years (a reasonable life expectancy for these fishing piers). Based on the analysis above, we expect approximately 1 smalltooth sawfish would be captured from each pier, over a 30-year period (0.037 captures per year * 30 years = 1.1 captures at each pier over 30 years).

Unlike sea turtles, there are no published studies or other available data on the effects to smalltooth sawfish from capture via recreational angling. However, the applicant proposes to install educational signs to inform anglers of how to handle and safely release accidentally captured smalltooth sawfish. Anecdotal information derived from captures related to fishery research on smalltooth sawfish juveniles and adults indicate that sawfish show little stress from capture by hook-and-line and gillnets used by researchers, demonstrating that this species may be less likely than sea turtles, for instance, to suffer post-release mortality from the type of fishing that would occur at the proposed fishing piers (D. Grubbs, Florida State University, pers. comm. to J. Cavanaugh, NMFS PRD, April 5, 2016, during the Smalltooth Sawfish Recovery Team Meeting). Additional research is planned to further study the physiological effects on sawfish from recreational fishing capture but these studies are just now being funded. Based on the above information, we believe that any smalltooth sawfish captured at the proposed piers are unlikely to suffer mortality at the time of capture or subsequently as post-release mortality; therefore, no lethal take of smalltooth sawfish is anticipated.

6. CUMULATIVE EFFECTS

ESA Section 7 regulations require NMFS to consider cumulative effects in formulating their Biological Opinions (50 CFR 402.14). Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion. Within the action area, major future changes are not anticipated in the ongoing human activities described in the environmental baseline. The present, major human uses of the action area are expected to continue at the present levels of intensity in the near future, and we did not identify any future state, tribal, local or private actions that are reasonably certain to occur in the action area and contribute cumulative effects.

7. JEOPARDY ANALYSIS

The analyses conducted in the previous sections of this Opinion provide a basis to determine whether the proposed action is likely to jeopardize the continued existence of smalltooth sawfish, Kemp's ridley, NA or SA DPS of green, or NWA DPS of loggerhead sea turtles, by identifying the nature and extent of adverse effects expected to impact each species. Next we consider how these species will be impacted by the proposed action in terms of overall population effects and whether those effects of the proposed action will jeopardize the continued existence of the species when considered in the context of the status of the species and their habitat (Section 3), the environmental baseline (Section 4), and cumulative effects (Section 6).

To jeopardize the continued existence of a species is defined as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). 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 of these species in the wild, and the likelihood of recovery of these species in the wild.

The NMFS and USFWS's 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. To determine the impacts of the action on the affected species' likelihood of recovery, we evaluate whether the action will appreciably interfere with achieving recovery objectives 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. Yet, the death of mature, breeding females can have an immediate effect on the reproductive potential of a species. Sublethal effects on adult females may also reduce reproduction if, for example, foraging success is impacted, thus reducing energy reserves to the point that the female is unable to produce 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, or changes in location and habitat, have a major impact on where sea turtles 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. Still, 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. 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 pier construction or continued use of the piers. 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 areas of increased fishing activity which would occur as a result of the proposed action.

7.1 NWA DPS of Loggerhead Sea Turtles

The proposed action is anticipated to result in the live capture of approximately 16 loggerhead sea turtles every 30 years (on average) due to fishing activities or entanglement in fishing gear associated with the proposed piers, of which 7 captures are expected to result in mortality. Injuries resulting from nonlethal takes have the potential to cause temporary impacts to the reproductive potential, fitness, or growth of the captured sea turtles, depending on the nature and severity of the injury. We expect these impacts to be temporary, as turtles with non-fatal injuries will eventually recover and resume normal feeding and reproductive activities. For example, a mature female that is severely, but not fatally injured may be forced to forego nesting activities that year, but eventually an ingested hook would decompose or pass, wounds would heal, and the turtle would be able to resume normal feeding and reproductive activities.

The potential lethal take of 7 turtles represents a reduction in numbers, and may also result in a reduction in reproduction as a result of lost reproductive potential, if any of the individuals are females who would have survived other threats and reproduced in the future. For example, an adult female loggerhead sea turtle can lay 3 or 4 clutches of eggs every 2-4 years, with 100-130 eggs per clutch. The loss of an adult female sea turtle could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity.

With regard to the potential for the effects of the proposed action to cause a reduction in the distribution of loggerhead sea turtles, this is an extremely wide ranging DPS with numerous, well established nesting beaches, each of which generally see dozens if not hundreds of females nesting each year. Therefore the small mortality rate expected to result from the proposed action is not expected to reduce the distribution of this DPS.

Whether the mortality of 7 loggerhead sea turtles over a 30-year period would appreciably reduce the likelihood of survival for the DPS depends on what effect this reduction in numbers and potentially reproduction would have on overall population sizes and trends, i.e., whether the estimated reduction, when viewed within the context of the current status of the species and the environmental baseline, is of such magnitude that adverse effects on population dynamics are appreciable. In Section 3.4, we reviewed the status of the species in terms of nesting and female population trends and several recent assessments based on population modeling (e.g., (Conant et al. 2009b; NMFS-SEFSC 2009b). 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.

Loggerhead sea turtles are a slow growing, late-maturing species. Because of these traits, loggerhead sea turtles require high survival rates throughout their life to maintain a population. In other words, late-maturing species cannot tolerate much anthropogenic mortality without going into decline. Conant et al. (2009b) concluded because loggerhead natural growth rates are low, natural survival needs to be high, and even low to moderate mortality can drive the population into decline. Because recruitment to the adult population is slow, population modeling studies suggest even small increases in mortality rates in adults and subadults could substantially impact population numbers and viability over the long term (Chaloupka and Musick 1997b; Crouse et al. 1987; Crowder et al. 1994; Heppell et al. 1995).

NOAA’s SEFSC (2009) estimates the adult female population size for the NWA DPS is likely between 20,000 and 40,000 individuals, with a low likelihood of being up to 70,000 individuals. A more recent conservative estimate for the entire western North Atlantic population was a mean of 38,334 adult females using data from 2001-2010 (Richards et al. 2011). 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 nearly 1 million. Further insight into the numbers of loggerhead sea turtles along the U.S. coast is available in NMFS-NEFSC (2011), which reported a conservative estimate of 588,000 juvenile and adult loggerhead sea turtles present on the continental shelf from the mouth of the Gulf of St. Lawrence to Cape Canaveral, Florida, when using only positively identified loggerhead sightings from an aerial survey. A less conservative analysis from the same study resulted in an estimate of 801,000 loggerheads in the same geographic area when a proportion of the unidentified hardshell turtles were categorized as loggerheads. This study did not include Florida’s east coast south of Cape Canaveral or the Gulf of Mexico, which are areas where large numbers of loggerheads occur.

A detailed analysis of Florida's long-term loggerhead nesting data (1989-2016) revealed 3 distinct annual trends (Figure 5). From 1989-1998 there was a 30% increase that was then followed by a sharp decline over the subsequent decade. Large increases in loggerhead nesting have occurred since then. FWRI examined the trend from the 1998 nesting high through 2013 and found the decade-long post-1998 decline had reversed and there was no longer a demonstrable trend. Looking at the data from 1989 through 2014 (an increase of over 32%), FWRI concluded that there was an overall positive change in the nest counts (http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/).

We believe that the incidental take and resulting mortality of loggerhead sea turtles associated with the proposed action are not reasonably expected to cause an appreciable reduction in the likelihood of survival of the NWA DPS of loggerhead sea turtles. We believe the current population is comparatively large (i.e., several hundred thousand individuals) and is showing encouraging signs of stabilizing and possibly increasing. Over at least the next several decades, we expect the DPS to remain large (i.e., hundreds of thousands of individuals) and to retain the potential for recovery. We also expect that the proposed action will not cause the DPS to lose genetic heterogeneity, broad demographic representation, or successful reproduction.

The Services' recovery plan for the NWA population of the loggerhead sea turtle (NMFS and USFWS 2008) which is the same population of sea turtles as the NWA DPS, anticipates that, with implementation of the plan, the western North Atlantic population will recover within 50-150 years, but notes that reaching recovery in only 50 years would require a rapid reversal of the then declining trends of the Northern, Peninsular Florida, and Northern Gulf of Mexico Recovery Units. The recovery plan provides additional explanation of the goals and vision for recovery for this population. The recovery objectives most pertinent to the threats posed by the proposed action are Numbers 1 and 2 (listed below):

1. Ensure that the number of nests in each recovery unit are increasing and that this increase corresponds to an increase in the number of nesting females.

2. Ensure the in-water abundance of juveniles in both neritic and oceanic habitats is increasing and is increasing at a greater rate than strandings of similar age classes.

Recovery Objective 1, "Ensure that the number of nests in each recovery unit is increasing…," is the plan's overarching objective and has associated demographic criteria. Currently, none of the plan's criteria are being met, but the plan acknowledges that it will take 50-150 years to do so. Further reduction of multiple threats throughout the North Atlantic, Gulf of Mexico, and Greater Caribbean will be needed for strong, positive population growth, following implementation of more of the plan's actions. While impacts that result in significant ongoing mortality can affect the potential for population growth, we believe the predicted loss of just 7 loggerhead sea turtles over a 30-year period as a result of the proposed action will not impede or prevent achieving this recovery objective. The NWA DPS of loggerhead sea turtles is thought to be recovering with a modest increasing population trend and the loss of 7 loggerhead sea turtles over 30 years will not impede this recovery. The loss of 7 loggerhead sea turtles over 30 years would not have an appreciable adverse effect on population dynamics of the NWA DPS because the potential reproductive loss would be so small in comparison to the overall DPS reproductive capacity. The population recovery would not be impacted by the loss of just 7 loggerhead sea turtles over 30 years considered along with potential impacts discussed in the environmental baseline for this species. Further, as discussed in Section 3.4, there has been a 74% increase in nesting between 2008 and 2015 in Florida that suggests an overall increase in the number of nesting females during that time. Even if all the mortalities resulting from the proposed action were nesting females (highly unlikely), the potential loss of 7 nesting females over 30 years would not cause an appreciable effect on the number of nesting females for the NWA DPS of loggerheads. The small loss of nesting females would not have a discernable impact when compared to the recent upward trend in nesting females with greater than 50,000 nesting females in Florida alone for 2015, for example.

Recovery Objective 2, "Ensure the in-water abundance of juveniles in both neritic and oceanic habitats is increasing and is increasing at a greater rate than strandings of similar age classes." Currently, there are not enough data on the population trends of juvenile loggerhead sea turtles to determine if this objective is being met. Because of scant and spatially deficient data on in-ocean population trends of loggerhead sea turtles, the most reliable information on population trends is derived from loggerhead nesting since nests are easier to accurately identify, count, and track annually. The NWA DPS nesting trend has modestly increased since 1998 (see Section 3.4). In addition, gulf-wide efforts to monitor sea turtle nests and protect them from natural predators and human impacts are likely to be improving the numbers and survival of hatchlings reaching the ocean. These efforts, along with the documented increasing trends in nesting indicate a commensurate increase in in-water abundance of juveniles. In other words, we assume a modest increase in juvenile abundance given the increasing trend in nesting females and protection of nests and hatchlings over the past several years, discussed above. Given the abundance estimate for loggerhead sea turtles along the east coast (excluding FL and the Gulf of Mexico) of 588,000 individuals (described above), and the current upward trend in these numbers, we do not believe that the loss of just 7 loggerhead sea turtles over a 30-year period would result in an appreciable reduction in in-water juvenile abundance.

The potential mortality of 7 loggerhead sea turtles over a 30–year period is not reasonably expected to cause an appreciable reduction in the likelihood of recovery of the NWA DPS of loggerheads. Recovery is the process of removing threats so self-sustaining populations persist in the wild. The effects of the proposed action would not appreciably impede progress on achieving the identified relevant recovery objectives or achieving the overall recovery strategy. The nonlethal takes of loggerhead sea turtles as discussed in this opinion would not affect population numbers or long-term reproductive success. Thus, the proposed action is not expected to impede the recovery objectives above and will not result in an appreciable reduction in the likelihood of the NWA DPS of loggerhead sea turtles' recovery in the wild.

7.2 Green Sea Turtles (North Atlantic and South Atlantic DPSs)

Mixed-stock analyses of foraging grounds show that green sea turtles from multiple nesting beaches commonly mix at feeding areas across the Caribbean and Gulf of Mexico, with higher contributions from nearby large nesting sites and some contribution estimated from nesting populations outside the DPS (Bass et al. 1998; Bass and Witzell 2000; Bjorndal and Bolten 2008; Bolker et al. 2007). In other words, the proportion of animals on the foraging grounds from a given nesting beach is proportional to the overall importance of that nesting beach to the entire DPS. For example, Tortuguero, Costa Rica, is by far the largest nesting beach in the NA DPS and the number of animals from that nesting beach on foraging grounds in the same area was much higher than from any other nesting beach within the NA DPS. However, in some foraging locations within the NA DPS closer to the border of the SA DPS, there may be significant mixing between the DPSs. More specifically, Lahanas et al. (1998) showed through genetic sampling that juvenile green sea turtles in The Bahamas originate mainly from the western Caribbean (Tortuguero, Costa Rica) (79.5%) (NA DPS) but that a significant proportion may be coming from the eastern Caribbean (Aves Island/Suriname; 12.9%) (SA DPS). In general, the proportion of individuals on a given foraging ground is roughly proportional to the numbers of individuals on nearby nesting beaches.

Flipper tagging studies provide additional information on the co-mingling of turtles from the NA DPS and SA DPS. Flipper tagging studies on foraging grounds and/or nesting beaches have been conducted in Bermuda (Meylan et al. 2011), Costa Rica (Troeng et al. 2005), Cuba (Moncada et al. 2006), Florida (Johnson and Ehrhart 1996; Kubis et al. 2009), Mexico (Zurita et al. 2003; Zurita et al. 1994), Panama (Meylan et al. 2011), Puerto Rico (Collazo et al. 1992; Patricio et al. 2011), and Texas (Shaver 1994; Shaver 2002). Nesters have been satellite tracked from Florida, Cuba, Cayman Islands, Mexico, and Costa Rica. Troeng et al. (2005) report that while there is some crossover of adult female nesters from the NA DPS into the SA DPS foraging grounds, particularly in the equatorial region where the DPS boundaries are in closer proximity to each other, NA DPS nesters primarily use the foraging grounds within the NA DPS.

While there are currently no in-depth studies available to determine the percent of NA and SA DPS individuals in any given location, an analysis of cold-stunned green turtles in St. Joseph Bay, Florida (northern Gulf of Mexico) found approximately 4% of individuals came from nesting stocks in the SA DPS and that the remainder were from the NA DPS (Foley et al. 2007). On the Atlantic coast of Florida, a study on the foraging grounds off Hutchinson Island found that approximately 5% of the turtles sampled came from the SA DPS (Bass and Witzell 2000). All of the individuals in both studies were benthic juveniles.

Taken together, this information suggests that the vast majority of the anticipated captures in the Gulf of Mexico are likely to come from the NA DPS. However, it is possible that animals from the SA DPS could be captured as a result of the proposed action. Since the cold-stun study of the northern Gulf of Mexico (Foley et al. 2007) represents the best available data teasing out the NA and SA DPS distribution for greens in the action area, we will assume that 96% of animals captured as a result of the proposed action will be from the NA DPS, and the remaining 4% will be from the SA DPS, per the breakdown in the study. For these reasons, we will act conservatively and conduct jeopardy analyses on the assumption that both the NA DPS and the SA DPS will be captured as a result of the proposed action but that the vast majority (96%) will be from the NA DPS.

We estimate up to 9 green sea turtles (8.3 rounded up to be conservative) may be taken at the proposed piers over a 30-year period, 4 lethal and 5 nonlethal (Table 6). In order to represent the SA DPS in the take estimate, we will assume that 1 of those takes will be a turtle from the SA DPS. However, because of the much lower probability that green sea turtles captured will be from the SA DPS, we will assume that the take from the SA DPS will be non-lethal (discussed further below).

NA DPS

The potential lethal take of 4 green sea turtles from the NA DPS over a 30-year period 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. If any of those turtles were to be females that would otherwise have survived to reproduce, this could result in a reduction in future reproduction. For example, a healthy green sea turtle can live for 80-100 years or more, and an adult female can lay 1-7 clutches (usually 2-3) of eggs every 2-4 years, with 110-115 eggs/nest, of which a small percentage is expected to survive to sexual maturity.

Injuries resulting from nonlethal takes have the potential to cause temporary impacts to the reproductive potential, fitness, or growth of the captured sea turtles, depending on the nature and severity of the injury. We expect these impacts to be temporary, as turtles with non-fatal injuries are likely to eventually recover and resume normal feeding and reproductive activities. For example, a mature female that is severely, but not fatally injured may be forced to forego nesting activities that year, but eventually an ingested hook would decompose or pass, wounds would heal, and the turtle would be able to resume normal feeding and reproductive activities.

With regard to the potential for the effects of the proposed action to cause a reduction in the distribution of NA DPS green sea turtles, this is an extremely wide ranging species with numerous, well established nesting beaches, each of which generally see dozens if not hundreds or even thousands of females nesting each year. Therefore the small mortality rate expected to result from the proposed action is not expected to reduce the distribution of the NA DPS.

Whether the reduction 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. Seminoff et al. (2015) estimate there are greater than 167,000 nesting females in the NA DPS. The nesting at Tortuguero, Costa Rica, accounts for approximately 79% of that estimate (approximately 131,000 nesters), with Quintana Roo, Mexico (approximately 18,250 nesters; 11%), and Florida, USA (approximately 8,400 nesters; 5%) also accounting for a large portion of the overall nesting (Seminoff et al. 2015).

At Tortuguero, Costa Rica, the number of nests laid per year from 1999 to 2003, was approximately 104,411 nests/year, which corresponds to approximately 17,402-37,290 nesting females each year (Troëng and Rankin 2005). The number of nests laid per year increased to an estimated 180,310 nests during 2010, corresponding to 30,052-64,396 nesters. This increase occurred despite substantial human impacts to the population at the nesting beach and at foraging areas (Campell and Lagueux 2005; Troëng 1998; Troëng and Rankin 2005).

Nesting locations in Mexico along the Yucatan Peninsula also indicate the number of nests laid each year has increased (Seminoff et al. 2015). In the early 1980s, approximately 875 nests/year were deposited, but by the year 2000 this increased to over 1,500 nests/year (NMFS and USFWS 2007a). By 2012, more than 26,000 nests were counted in the Mexican state of Quintana Roo on the Yucatan Peninsula (J. Zurita, CIQROO, unpubl. data, 2013, in Seminoff et al. 2015)

In Florida, most nesting occurs along the Atlantic coast of eastern central Florida, where a mean of 5,055 nests were deposited each year from 2001 to 2005 (Meylan et al. 2006) and 10,377 each year from 2008 to 2012 (B. Witherington, Florida Fish and Wildlife Conservation Commission, pers. comm., 2013). As described in the Section 3.5, nesting has increased substantially over the last 20 years and peaked in 2015 with 27,975 nests statewide. In-water studies conducted over 24 years in the Indian River Lagoon, Florida, suggest similar increasing trends, with green sea turtle captures up 661% (Ehrhart et al. 2007). Similar in-water work at the St. Lucie Power Plant site revealed a significant increase in the annual rate of capture of immature green sea turtles over 26 years (Witherington et al. 2006).

Seminoff et al. (2015) also conducted a population viability analysis for the Tortuguero, Costa Rica, and Florida, USA nesting sites (as well as 2 others: Isla Aguada, Mexico and Guanahacabibes, Cuba).[11] The population viability analysis evaluated the probabilities of nesting populations declining to 2 separate biological thresholds after 100 years: (1) a trend-based reference point where nesting populations decline by 50% and (2) the number of total adult females falls to 300 or fewer at these sites (Seminoff et al. 2015).[12] Seminoff et al. (2015) point out that population viability analyses do not fully incorporate spatial structure or threats. They also assume all environmental and man-made pressures will remain constant in the forecast period, while also relying solely on nesting data.

The Tortuguero, Costa Rica, population viability analysis indicated a 0.7% probability that this population will fall below the 50% decline threshold at the end of 100 years, and a 0% probability that this population will fall below the absolute abundance reference point of 100 nesting females per year at the end of 100 years (Seminoff et al. 2015). For the Florida, USA, population, the population viability analysis indicated there is a 0.3% probability that this population will fall below the 50% decline threshold at the end of 100 years, and a 0% probability this population falls below the absolute abundance threshold of 100 nesting females per year at the end of 100 years (Seminoff et al. 2015).

Since the abundance trend information for NA DPS green sea turtles is clearly increasing, and the potential for significant declines over the next 100 years is extremely low (Seminoff et al. 2015), we believe the potential lethal take of 4 green sea turtles from the NA DPS over a 30-year period as a result of the proposed action will not have any measurable effect on that trend. Therefore, we believe the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the NA DPS of green sea turtle in the wild.

The NA DPS of green sea turtles did not have a recovery plan in place at the time of listing. However, an Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991) does exist. Since the animals within the NA DPS all occur in the Atlantic Ocean and are subject to the recovery actions described in that plan, we believe it is appropriate to continue using that Recovery Plan as a guide until a new plan specific to the NA DPS is developed. The Atlantic Recovery Plan lists the following relevant recovery objectives over a period of 25 continuous years:

Objective: The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years.

Objective: A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.

11 Not enough information was available to conduct a population viability analysis on the Quintana Roo, Mexico, nesting population.

12 Since green sea turtles are believed to nest every 3 years, the analysis evaluated the likelihood that the population would fall to 100 or fewer nesters annually (300 adult females ÷ nesting every 3 years = 100 adult female nesters annually).

Given the estimated nesting abundance of over 167,000 adult females from 73 nesting sites, and the fact that all major nesting populations are experiencing long-term increases in abundance (Seminoff et al. 2015), the effects of 4 lethal takes along with 4 non-lethal takes of green sea turtles from the NA DPS over a 30-year period is not expected to have any detectable influence on the average annual nesting levels or the overall numbers of individuals on foraging grounds in Florida. Therefore, the proposed action will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of the NA DPS of green sea turtles' recovery in the wild.

SA DPS

The potential nonlethal take of 1 green sea turtle from the SA DPS over a 30-year period is not expected to have any measurable impact on the reproduction, numbers, or distribution of this DPS. The individual suffering nonlethal injury is expected to eventually recover, and even if that individual is a mature female, and the injury is severe enough to prevent that individual from nesting that year, the loss of a single nesting season by a single turtle in a 30-year period would not be expected to have an appreciable effect on the overall reproduction or numbers of a DPS estimated to include over 63,000 nesters across 51 identified nesting sites . The take will occur anywhere in a small, discrete action area which in turn encompasses a tiny portion of the SA DPS of green sea turtles' overall range/distribution. Since any incidentally caught animal is likely to be released within the general area where caught, and the animal is expected to survive post-release, no reduction in the distribution of SA DPS green sea turtles is expected. Therefore, the proposed action is not expected to appreciably reduce the SA DPS of green sea turtle's likelihood of survival or recovery in the wild.

7.3 Kemp's Ridley Sea Turtles

The proposed action is anticipated to result in the live capture of up to 25 Kemp's ridley sea turtles (24.3 rounded up to be conservative) over a 30-year period due to fishing activities associated with the proposed piers. Of these captures, up to 10 (9.7 rounded up to be conservative) are expected to result in mortality. Injuries resulting from nonlethal takes have the potential to cause temporary impacts to the reproductive potential, fitness, or growth of the captured sea turtles, depending on the nature and severity of the injury. We expect these impacts to be temporary, as turtles with non-fatal injuries are likely to eventually recover and resume normal feeding and reproductive activities. For example, a mature female that is severely, but not fatally injured may be forced to forego nesting activities that year, but eventually an ingested hook would decompose or pass, wounds would heal, and the turtle would be able to resume normal feeding and reproductive activities.

The potential lethal take of 10 Kemp's ridley sea turtles over a 30-year period would reduce the species' numbers compared to what would have been present in the absence of the proposed action, assuming all other variables remained the same. The Turtle Expert Working Group (TEWG 1998b) estimates age at maturity for Kemp's ridley sea turtles to be anywhere from 7-15 years. Females return to their nesting beach about every 2 years (TEWG 1998b). The mean clutch size for Kemp's ridleys is 100 eggs/nest, with an average of 2.5 nests/female/season. Lethal take could also result in a potential reduction in future reproduction, assuming at least 1 of these individuals would be female and would have survived to reproduce in the future. The loss of up to 10 adult female Kemp's ridley sea turtles could preclude the production of thousands of eggs and hatchlings, of which a fractional percentage would be expected to survive to sexual maturity. Thus, the death of any females would eliminate their contribution to future generations, and result in a proportionate reduction in Kemp's ridley sea turtle reproduction.

With regard to the potential for the effects of the proposed action to cause a reduction in the distribution of Kemp's ridley sea turtles, this is wide ranging species with numerous, well established nesting beaches, each of which generally see dozens if not hundreds of females nesting each year. Therefore the small mortality rate expected to result from the proposed action is not expected to reduce the distribution of Kemp's ridley sea turtles.

In the absence of any total population estimates for Kemp's ridley sea turtles, nesting trends are the best proxy we have for estimating population changes (Figure 9). Heppell et al. (2005a) predicted in a population model that the Kemp's ridley sea turtle population was expected to increase at least 12-16% per year and that the population could attain at least 10,000 females nesting on Mexico beaches by 2015. Research by NMFS et al. (2011b) included an updated model, which predicted that the population was expected to increase 19% per year and that the population could attain at least 10,000 females nesting on Mexico beaches by 2011. Approximately 25,000 nests would be needed for an estimate of 10,000 nesting females on a beach, based on an average 2.5 nests/nesting female. While counts did not reach 25,000 nests by 2012, it is clear that the population is steadily increasing over the long term. Following a significant, unexplained 1-year decline in 2010, Kemp's ridley nests in Mexico reached a record high of 21,797 in 2012 (Gladys Porter Zoo nesting database 2013). In 2013 through 2014, there was a second significant decline, with only 16,385 and 11,279 nests recorded, respectively. In 2015 nesting again began to increase with 14,006 recorded nests, and in 2016 overall numbers reached 18,354 recorded nests (Gladys Porter Zoo 2016). Preliminary information indicates a record high nesting season in 2017, with 24,570 nests recorded (J. Pena, pers. comm., August 31, 2017), indicating that the number of nesting females on Mexican beaches has reached close to 10,000. A small nesting population is also emerging in the United States, primarily in Texas, rising from 6 nests in 1996 to 209 nests in 2012, and a record high of 353 nests in 2017 (National Park Service data, http://www.nps.gov/pais/naturescience/strp.htm, http://www.nps.gov/pais/naturescience/current-season.htm). It is worth noting that nesting in Texas has paralleled the trends observed in Mexico, characterized by a significant decline in 2010, followed by a second decline in 2013-2014, and a corresponding rebound from 2015 to 2017.

We believe this increasing trend in nesting numbers and locations is evidence of an increasing population, as well as a population that is maintaining (and potentially increasing) its genetic diversity. We also believe these nesting trends are indicative of a species with a significant number of sexually mature individuals. However, it is unknown whether the significant fluctuations in nesting numbers observed from 2010 through 2017 indicate a serious, reoccurring problem, or a temporary setback in the generally increasing population trend. It is important to remember that with sea turtle species that exhibit normal inter-annual variation in nesting levels, population trends necessarily are measured over decades and the long-term trend line better reflects the population trajectory in Kemp's ridleys. The recent fluctuations may also be an indication that the trend line is changing from an asymptotic upward curve to a more leveled increase. Either way, long-term data from 1990 to present support that Kemp's ridleys are increasing in population size. Therefore, we do not believe the limited impacts anticipated from the proposed action will have a measurable effect on the overall nesting trends for Kemp's ridley sea turtles. Nor do we believe the anticipated takes will affect the future production of viable offspring to an extent that changes current population trends or genetic diversity. We therefore conclude that the proposed action will not cause an appreciable reduction in the likelihood of survival of Kemp's ridley sea turtles.

The recovery plan for the Kemp's ridley sea turtle (NMFS et al. 2011b) lists the following relevant recovery objective:

- A population of at least 10,000 nesting females in a season (as measured by clutch frequency/female/season) distributed at the primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) in Mexico is attained. Methodology and capacity to implement and ensure accurate nesting female counts have been developed.

The recovery plan states the average number of nests per female is 2.5; it sets a recovery goal of 10,000 nesting females associated with 25,000 nests. The 2012 nesting season recorded approximately 22,000 nests and preliminary numbers from 2017 are very close to 25,000, indicating that the goal of 10,000 nesting females may have been reached. However, the steep declines experienced in 2010, 2013 and 2014, indicate that the current population levels may not be completely stable and it will take several years of additional nesting data to determine whether this goal has been fully achieved.

The lethal take of up to 10 Kemp's ridley sea turtles over a 30-year period as a result of the proposed action will result in a reduction in numbers, but it is unlikely to have any detectable influence on the nesting population trends noted above. The nonlethal takes of Kemp's ridley sea turtles as discussed in this opinion would not affect the adult female nesting population or long-term nesting levels. Thus, we believe the proposed action will not have an appreciable effect on the recovery objective above, and it will not result in an appreciable reduction in the likelihood of Kemp's ridley sea turtles' recovery in the wild.

7.4 Smalltooth Sawfish

The proposed action is anticipated to result in the capture and live release of 3.3 smalltooth sawfish across all 3 piers, over a 30-year period. Injuries resulting from non-lethal take that could impact the reproductive potential, fitness, or growth of the captured smalltooth sawfish are unlikely to occur based on available information, which indicates captured sawfish are typically 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 no reductions in reproduction or distribution are expected from the capture and release of these sawfish. Therefore, the proposed action will not jeopardize the continued existence of the species because it will have no effect on the survival and recovery of smalltooth sawfish.

8. CONCLUSION

We have analyzed the best available data on the current status of the species, environmental baseline, effects of the proposed action, and cumulative effects to the species and determined that the proposed action is not likely to jeopardize the continued existence of the NA DPS or the SA DPS of green sea turtles, the NWA DPS of loggerhead sea turtles, or Kemp's ridley sea turtles.

9. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation 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 to 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. Section 7(b)(4) and Section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA, if that action is performed in compliance with the terms and conditions of this incidental take statement.

9.1 Anticipated Amount or Extent of Incidental Take

The take estimates shown in Table 6 are our best estimates of the total amount of take over the life of the project (30 years). However, as described in Section 5 above, many captures are not expected to be reported/documented. We must therefore estimate the corresponding number of each species that we would expect to be reported to local authorities and documented by the STSSN. These are the numbers we will use to determine if take estimates have been exceeded and reinitiation of ESA Section 7 consultation is necessary.

In 2013, NMFS conducted a fishing pier survey in Mississippi that interviewed 382 anglers (Cook et al. 2014). This survey indicated that approximately 60% of anglers that had captured a sea turtle actually reported it, where educational signs similar to those that will be posted on the proposed new piers were displayed at all fishing piers in Mississippi alerting anglers to the requirement to report accidental hook-and-line captures of sea turtles. We will assume that a similar reporting rate of captured sea turtles and sawfish will occur at the proposed piers with similar signage, and therefore 60% of captures will be reported to the STSSN and ISED. Given this assumption, the numbers of each species expected to be reported over a 30-year period are displayed in Table 7 below. As some of these numbers come out as fractions of individual animals, we also include the periods of time expected between reported captures (30-years, divided by the number of expected reported captures = the average number of years between reported captures) to help specify the expected extent of incidental take and clearly define reinitiation triggers.

Table 7. Estimated Reported Captures by Species for all 3 piers over a 30-year period

Species (DPS)	Total Estimated Captures Reported to the STSSN and ISED	Incidental Take Limits/Reinitiation Triggers
Kemp's ridley	14.6	No more than 1 reported capture over any 2 consecutive years.
Loggerhead (NWA DPS)	9.6	No more than 1 reported capture over any 3 consecutive years.

Green (NA and SA DPS')	5.0	No more than 1 reported capture over any 6 consecutive years.
Smalltooth Sawfish	2.0	No more than 1 reported capture over any 15 consecutive years.

9.2 Effect of the Take

NMFS has determined the anticipated incidental take depicted above and detailed in Section 5 is not likely to jeopardize the continued existence of sea turtles (NA DPS of green, SA DPS of green, NWA DPS of loggerhead, and Kemp's ridley) or smalltooth sawfish.

9.3 Reasonable and Prudent Measures (RPMs)

Section 7(b)(4) of the ESA requires NMFS to issue a statement specifying the impact of any incidental take on listed species, which results from an agency action otherwise found to comply with Section 7(a)(2) of the ESA. It also states that the RPMs necessary to minimize the impacts of take and the terms and conditions to implement those measures must be provided and must be followed to minimize those impacts. Only incidental taking by the federal agency or applicant that complies with the specified terms and conditions is authorized.

The RPMs and terms and conditions are specified as required by 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 sea turtles. These measures and terms and conditions are nondiscretionary, and must be implemented by the NOAA RC or the applicant (FDEP) in order for the protection of Section 7(o)(2) to apply. The NOAA RC has a continuing duty to regulate the activity covered by this incidental take statement. If the NOAA RC or the FDEP fail to adhere to the terms and conditions of this Incidental Take Statement (ITS) through enforceable terms, and/or fail 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, the NOAA RC or the FDEP must report the progress of the action and its impact on the species to NMFS as specified in this ITS [50 CFR 402.14(i)(3)].

NMFS has determined that the following RPM is necessary and appropriate to minimize impacts of the incidental take of sea turtles related to the proposed action. The following RPM and associated terms and conditions are established to implement these measures, and to document incidental takes. Only incidental takes that occur while these measures are in full implementation are authorized. These restrictions remain valid until reinitiation and conclusion of any subsequent Section 7 consultation.

1. The NOAA RC must ensure that monofilament recycling bins and trash receptacles, along with educational signage are installed and maintained at all fishing piers included in the proposed action. The signs should be placed at the entrance to the piers where the view of these signs is unobstructed. These signs should contain information on the

possibility of sea turtle and sawfish captures by hook-and-line and what to do in the event of a capture.

2. The NOAA RC must track the STSSN capture data [13] to determine if any sea turtles are reported as captured from any of the proposed new piers. The NOAA RC must then submit a report detailing the available data on any such captures at the end of each calendar year in which such a capture is reported. As the ISED data is not publicly available, NMFS PRD will track any reported captures of smalltooth sawfish at the proposed new piers, and will keep NOAA RC appraised of any issues related to take limits or reinitiation triggers.

3. The FDEP has already committed to assessing the levels of public use of the new piers as part of the monitoring for this project. As part of that assessment, the FDEP shall also conduct angler surveys at the piers to help determine the frequency and type of encounters with listed species that occur at these piers. The results of this monitoring shall be reported to NMFS per the terms and conditions below.

4. The NOAA RC and/or the FDEP shall conduct annual underwater debris cleanups around the new fishing piers.

9.4 Terms and Conditions

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

The following terms and conditions (T&Cs) implement the above RPMs:

1.a. The applicant stated that informational signs will be displayed and maintained on the fishing piers to educate the public on safe fishing practices that can reduce or prevent sea turtle injuries and information on who to notify in the event a dead, injured, or entangled sea turtle is encountered (see Section 2). To implement RPM No. 1, NOAA RC must ensure that the applicant installs and maintains NMFS Protected Species Educational Signs including “Save the Sea Turtles, Sawfish, and Dolphins” signs at the entrance to all fishing piers. Sign designs and installation methods are provided on our website at: http://sero.nmfs.noaa.gov/protected_resources/section_7/protected_species_educational_signs/index.html.

1.b. The applicant has agreed to place and maintain monofilament recycling bins on the fishing piers (see Section 2). To implement RPM No. 1, NOAA RC must ensure that the applicant installs and maintains both monofilament recycling bins and trash receptacles at the piers to reduce the probability of trash and debris entering the water.

2.a. To implement RPM No. 2, NOAA RC must monitor the STSSN Sea Turtle Stranding Narrative Report (https://grunt.sefsc.noaa.gov/stssnrep/SeaTurtleReportII.do?

13 publicly available at: https://grunt.sefsc.noaa.gov/stssnrep/SeaTurtleReportII.do?action=reportIIqueryp

action=reportIIqueryp) and submit a report describing any captures reported at the proposed new piers at the end of each calendar year in which such a capture is reported. Reports shall be submitted to:

NOAA Fisheries Service – Protected Resources Division
DWH Restoration Program Monitoring Reports
263 13th Avenue South
Saint Petersburg, Florida 33701

3.a. FDEP shall conduct semiannual surveys at each pier with questions designed to inform the frequency and type of encounters with listed species that occur at these piers, and the level of reporting of these encounters to the STSSN and ISED.

3.b. Annual reports describing the results of these surveys shall be submitted to:

NOAA Fisheries Service – Protected Resources Division
DWH Restoration Program Monitoring Reports
263 13th Avenue South
Saint Petersburg, Florida 33701

4.a. The NOAA RC and/or the FDEP shall perform annual underwater fishing debris cleanup around the new fishing piers to remove any fishing line, nets, and other debris and trash from the water. Reports of the each cleaning event should be submitted to:

NOAA Fisheries Service – Protected Resources Division
DWH Restoration Program Monitoring Reports
263 13th Avenue South
Saint Petersburg, Florida 33701

10. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authority to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species, to help implement recovery plans, or to develop information. NMFS believes the NOAA RC and the FDEP should implement the following conservation recommendations:

1. The NOAA RC and/or the FDEP are encouraged to conduct research to develop deterrents to discourage turtles from using fishing piers as a habitualized food source.

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.

11. REINITIATION OF CONSULTATION

This concludes formal consultation on the creation of 3 new public fishing piers within Gulf and Bay Counties, Florida. As provided in 50 CFR 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) the amount or extent of taking specified in the incidental take statement is exceeded; specifically, if the number of reported captures depicted in Table 7 above is exceeded, (2) new information reveals effects of the action may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the Biological Opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

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