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NATIONAL MARINE FISHERIES SERVICE
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Kristi N. McMillan
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Department of the Army
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Galveston, TX 77553-1229

Ref.: SWG-2015-00477, Brazoria County Engineering Department, Restoration and Extension of the Quintana County Pier, Quintana, Brazoria County, Texas

Dear Ms. McMillan:

The enclosed Biological Opinion ("Opinion") was prepared by the National Marine Fisheries Service (NMFS) pursuant to Section 7(a)(2) of the Endangered Species Act (ESA). The Opinion considers the effects of a proposal by the Galveston District of the U.S. Army Corps of Engineers (USACE) to authorize the restoration and extension of a public fishing pier. We base this Opinion on project-specific information provided in the consultation package as well as NMFS's review of published literature. This Opinion analyzes the project effects on green (North Atlantic and South Atlantic DPSs), Kemp's ridley, and loggerhead (Northwest Atlantic DPS) sea turtles.

We look forward to further cooperation with you on other USACE projects to ensure the conservation and recovery of our threatened and endangered marine species. If you have any questions regarding this consultation, please contact Dana Bethea, Consultation Biologist, by phone at 727-209-5974, or by email at Dana.Bethea@noaa.gov.

Sincerely,

for Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosures:
Biological Opinion
Sea Turtle and Smalltooth Sawfish Construction Conditions, dated March 23, 2006

File: 1514-22.F.8

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency:	U.S. Army Corps of Engineers (USACE), Galveston District
Applicant:	Brazoria County Engineering Department
Activity:	Pier Restoration and Extension, Quintana, Brazoria County, Texas
Consulting Agency:	National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida
	Consultation Number SER-2017-18384
Approved by:	6/9/17
	For Roy E. Crabtree, Ph.D., Regional Administrator NMFS, Southeast Regional Office St. Petersburg, Florida

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ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
CPUE	Catch per Unit Effort
cSEL	Cumulative Sound Exposure
DPS	Distinct Population Segment
DWH	*Deepwater Horizon*
DTRU	Dry Tortugas Recovery Unit
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FP	Fibropapillomatosis disease
FWRI	Fish and Wildlife Research Institute
GADNR	Georgia Department of Natural Resources
GCRU	Greater Caribbean Recovery Unit
ITS	Incidental Take Statement
MHW	Mean High Water
NCWRC	North Carolina Wildlife Resources Commission
NGMRU	Northern Gulf of Mexico Recovery Unit
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Association
NPS	National Park Service
NRU	Northern Recovery Unit
NWA	Northwest Atlantic
PRM	Post-release mortality
RPMs	Reasonable and Prudent Measures
SAFMC	South Atlantic Fishery Management Council
SCDNR	South Carolina Department of Natural Resources
SCL	Straight carapace length
SEFSC	Southeast Fisheries Science Center
STSSN	Sea Turtle and Stranding Network
TEDs	Turtle Exclusion Devices
TEWG	Turtle Expert Working Group
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

UNITS OF MEASURE

°C	Degrees Celsius
°F	Degrees Fahrenheit
cm	Centimeter(s)
ft	Feet
ft^2	Square feet
in	Inch(es)
kg	Kilograms

lb	Pound(s)
mi	Mile(s)
mi^2	Square miles

1. BACKGROUND

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

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

This Opinion analyzes project effects on green, Kemps' ridley, and loggerhead sea turtles based on our review associated with United States Army Corp of Engineers (USACE) Galveston District's proposal to restore, extend, and create a T-head at the end of Quintana Pier in Brazoria County, Texas (SWG-2015-00477). Our determinations are based on project information provided by USACE, National Oceanic and Atmospheric Association (NOAA) Southeast Fisheries Science Center (SEFSC) Sea Turtle and Stranding Network (STSSN), and other sources of information including the published literature cited herein.

2. CONSULTATION HISTORY

NMFS received a request for an informal consultation from USACE dated December 28, 2016. We requested additional information via e-mail on January 17 and February 2, 2017. We received a final response on February 9, 2017, and initiated formal consultation that day.

3. DESCRIPTION OF THE PROPOSED ACTION

3.1 Proposed Action

The Quintana Pier was damaged during Hurricane Ike in 2008 and is in need of major repairs mainly to decking and hand rails. The Brazoria County Engineering Department proposes to restore the existing Quintana Pier in order to upgrade the facility to meet current safety standards, improve stability, and remain in compliance with Americans with Disabilities Act (ADA) requirements for recreational saltwater fishing facilities. The applicant also proposes to extend the current pier 190 feet (ft) with an additional 150-ft T-head because the pier no longer reaches water sufficient for fishing and wildlife observations, especially during low tide. Depth at the end of the current pier is typically 5-10 ft mean high water (MHW). The area of these additions will total 3,300 square feet (ft^2) over the Gulf of Mexico.

Construction of the extension and T-head will require the installation of 104 wood piles. The piles will have a diameter of 15 inches (in) at the base and 9 in at the top. Piles will be installed from a construction barge via impact hammer, issuing approximately 45 strikes per pile; a maximum of 10 piles will be driven per day. Our noise analysis for this Opinion is based on this information. Pile driving activity is expected to take a maximum of 90 days, will occur mid-May through mid-July, and will begin each day with a construction "ramp up" to avoid noise disturbances. Nesting season for Kemp's ridley (April to July) and loggerhead sea turtle (April to September) overlaps with the proposed project timeline. The reason for this overlap is due to concerns regarding noise disturbance of piping plovers and red knots (endangered bird species under USFWS jurisdiction) as these species will be using Quintana Beach during wintering season just before and after the proposed timeline.

Construction of the new decking and hand rails will be completed from atop the structure. New stringers will be installed atop the structure. Staging of these materials will be located 0.32 miles upland in Quintana City Park and atop a construction barge. Post-pile driving construction is expected to take 90 days. All work will be completed during daylight hours.

The construction barge and tender skiff (20-ft long) will travel from Freeport Harbor to the existing Quintana Pier. The barge will take one roundtrip to and from the site at the start and end of construction, while the tender skiff will travel to and from the site once daily. All work vessels will travel at "no wake/idle" speeds at all times (< 5 knots).

The applicant proposes the following:

- Turbidity curtains will be placed around the construction area prior to construction and will remain in place until all pile driving is complete and sediment has settled.
- The applicant agrees to use the NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions*, dated March 23, 2006.Additionally, environmental monitors will be present one hour prior to the start of construction activity each day and will continue to monitor throughout the duration of the daily work. If at any point a listed species is observed within 500 ft of the work site, all construction will cease until NMFS has been notified and the listed species have vacated on their own or the agencies have granted permission to proceed.
- The applicant will provide NMFS Galveston with all reports of sea turtles observed during monitoring and construction, using the Texas strandings hotline (1-866-TURTLE5).
- The applicant will e-mail NOAA Southeast Regional Office copies of all written reports of sea turtles observed during monitoring and construction to takereport.nmfsser@noaa.gov with reference to this Opinion (Quintana Pier Restoration and Extension, NMFS tracking number SER-2017-18384).

- Fishing will not be explicitly restricted at the pier; however, based on water depth, fishing is generally only anticipated on the T-head.
- The applicant will post signage asking anglers to not dispose of fish carcasses, debris, or remains in the water. There will be no fish cleaning stations associated with the pier.
- Monofilament receptacles will be placed along the pier in order to prevent fishing lines from being disposed of in the ocean or on the beaches, where sea turtles may be entangled. Receptacles will be clearly marked and will be emptied regularly to ensure they do not overfill and that fishing lines are disposed of properly.
- Educational signs already in place on Quintana Pier will be updated to provide current information to the public on how to handle potential encounters with ESA-listed species. The applicant has agreed to use the "Save the Sea Turtle, Sawfish, and Dolphins" and "Help Stranded Marine Mammals" signs available for download on our website at: http://sero.nmfs.noaa.gov/protected_resources/section_7/protected_species_educational_signs/index.html.
- The applicant will allow, and aid as needed, volunteer groups to complete in-water and out-of-water pier cleanup on an annual/biennial basis. Project Aware (http://www.projectaware.org/action/diving-against-debris-port-aransas-texas) and Sea Grant Texas (https://mrrp.tamu.edu/) offer such volunteer groups.
- Recommended guidelines for sea turtle friendly pier lighting will be used (i.e., long wavelength amber, orange, or red LED lighting, mounting such lights as low to the ground as possible, and adding shielding structures).

3.2 Action Area

The proposed project area is located at 28.930521°N, 95.305982°W (World Geodetic System 1984), at the terminal end of 8th Street in the city of Quintana, Brazoria County, Texas (Figure 1), adjacent to the Freeport Harbor Entrance Channel. The action area includes the existing pier, beach, and surrounding waters that may be affected by the proposed project. Based on our analysis of the project effects below, we consider the action area to be within 151 ft (46 meters [m]) from the end of the current pier structure and from each of the west and east ends of the new T-head, as this is the anticipated extent of behavioral noise impacts (discussed in Section 4.1) (Figure 2). The on-site habitat is characterized as shallow open water and intertidal regions of the Gulf of Mexico and is comprised of sandy substrate. Submerged aquatic vegetation, hard bottom, mangroves, and corals are not present within the action area. While infrequent, the action area is a known nesting beach for Kemp's ridley and loggerhead sea turtles.

Figure 1. Image showing the existing Quintana Pier and surrounding area (©2016 Google)

Figure 2. Image showing the proposed 190-ft extension and 150-ft T-head (red) and the anticipated extent of behavioral noise impacts (blue) (©2016 Google)

4. STATUS OF THE LISTED SPECIES

Table 1 below provides a list of the ESA-listed species that may be affected by the proposed action. The project is not located in designated critical habitat, and there are no potential routes of effect to any designated critical habitat.

Table 1. Effects Determinations for Species the Action Agency or NMFS Believes May Be Affected by the Proposed Action

Species	ESA Listing Status	Action Agency Effect Determination	NMFS Effect Determination
Sea Turtles			
Green (North and South Atlantic distinct population segment [DPSs])	T	NLAA	LAA
Kemp's ridley	E	NLAA	LAA
Leatherback	E	NLAA	NE
Loggerhead (Northwest Atlantic Ocean DPS)	T	NLAA	LAA
Hawksbill	E	NLAA	NE
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 these species' very specific life history strategies, which are not supported at the project site. Leatherback sea turtles have pelagic, deep-water life history, where they forage primarily on jellyfish. Hawksbill sea turtles typically inhabit inshore reef and hard bottom areas where they forage primarily on encrusting sponges.

4.1 Analysis of Potential Routes of Effects Not Likely to Adversely Affect Listed Species

<u>Physical effects:</u> Listed sea turtles may be affected by construction activities. Sea turtles may be injured if struck by vessels, equipment, or materials. However, we believe this effect is discountable because these species are expected to exhibit avoidance behavior by moving away from physical disturbances. The applicant's implementation of NMFS's *Sea Turtle and Smalltooth Sawfish Construction Conditions* will further reduce the risk by requiring all construction workers watch for sea turtles. Further, the slow speed of vessels, the presence of an environmental monitor, and the applicant's agreement to stop work if a sea turtle is spotted within 500 ft of the construction area are also measures that will further reduce the likelihood of physical injury to sea turtles. The applicant has also agreed to install and maintain monofilament receptacles which will further reduce the likely of sea turtles becoming entangled in discarded fishing gear.

<u>Habitat effects:</u> Sea turtles may be adversely affected by their inability to access the in-water portion of the project area for foraging due to their avoidance of construction activities, related noise, and temporary physical exclusion from the project area due to blockage by turbidity curtains. Given the project's lack of seagrass habitat, use of the area by listed sea turtle species is expected to be infrequent and we believe these effects are insignificant. The existing pier will

result in over-water shadowing to approximately 3,300 square feet (ft^2) of the Gulf of Mexico; however, there are no seagrasses, mangroves, or corals, which sea turtles use for refuge and forage habitat, present at the project area and similar habitat is available nearby.

Kemp's ridley and loggerhead sea turtle nesting overlaps with the proposed project timeline, so there is some potential for the project to affect nesting activities for these species. On average, less than 1 sea turtle nest per year is observed near the action area (i.e., Quintana Beach) and these species more frequently use Surfside Beach for nesting (D. Shaver, NPS Padre Island National Seashore Division of Sea Turtle Science and Recovery, pers comm. to D. Bethea, NOAA NMFS SERO PRD, on May 22, 2017). Based on the known frequency of the action area's use as a nesting beach and the small project footprint, we believe use of the action area by Kemp's ridley and loggerhead sea turtle for nesting will be infrequent; thus, any effect to nesting is expected to be insignificant. The pier's footprint is not expected to obstruct access to the adjacent beaches if a sea turtle chooses to use Quintana Beach outside of the project footprint for nesting during the construction period. The applicant will employ environmental monitors to be present one hour prior to the start of construction activity each day and throughout the duration of the daily work to monitor the beach within 500 ft of the work site, stopping construction if a listed species is seen and not restarting construction until the list species has left the area of its own fruition. Additionally, all new pier lighting will be sea turtle friendly so as not to disrupt adult, female turtles entering or hatchlings leaving the adjacent nesting beaches. These two measures will further reduce the likelihood of nesting beach habitat effects to sea turtles.

<u>Noise effects:</u> Effects to listed species as a result of noise created by construction activities can physically injure animals in the affected areas or change animal behavior in the affected areas. Injurious effects can occur in 2 ways. First, immediate adverse effects can occur to listed species if a single noise event exceeds the threshold for direct physical injury. 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 prevent animals from 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 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.

Based on our noise calculations, the installation of 24-in concrete piles (as a proxy for 15-in wood piles) by impact hammer will not cause single-strike or peak-pressure injury to sea turtles. However, the cumulative sound exposure level of multiple pile strikes over the course of a day may cause injury to sea turtles up to 72 ft (22 m) away from the pile. Due to the mobility of sea turtles, and because the project occurs in open water, we expect them to move away from noise disturbances. Because we anticipate the animal will move away, we believe that an animal's suffering physical injury from noise is extremely unlikely to occur and is therefore discountable. An animal's movement away from the injurious sound radius is a behavioral response, with the same effects discussed below.

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

The installation of 24-in concrete piles (as a proxy for 15-in wood piles) using an impact hammer could also result in behavioral effects at radii 151 ft (46 m) for sea turtles. Due to the mobility of sea turtles, we expect them to move away from noise disturbances in this open-water environment. Because there is similar habitat nearby, we believe behavioral effects will be insignificant. If an individual chooses to remain within the behavioral response zone, it could be exposed to behavioral noise impacts during pile installation. Since installation will occur only during the day, these species will be able to resume normal activities during quiet periods between pile installations and at night. Therefore, we anticipate any behavioral effects will be insignificant.

4.2 Potential Routes of Effects Likely to Adversely Affect Listed Species

Fishing piers facilitate recreational fishing activities that could injure or kill sea turtles via incidental hooking and entanglement either by actively fished lines, discarded, remnant, or broken-off fishing lines, and/or other debris. To determine which sea turtle species are most likely to occur near the Quintana Pier, we reviewed recreational hook-and-line data from the NOAA Southeast Fisheries Science Center (SEFSC) Sea Turtle and Stranding and Salvage Network (STSSN). While we do have other information on sea turtles in the area (i.e., nesting data), nesting has been documented only for Kemp's ridley. As supported by the recreational hook-and-line data, we know other species are present in the general area and are likely to be in the action area for purposes other than nesting. For these reasons, we view this data as more reflective of the species likely to be in the area and potentially adversely affected by the action.

The STSSN in Texas has compiled a 14-year dataset (2003-2016) on recreational hook-and-line sea turtles captures along the Upper Texas Coast (which includes Aransas, Brazoria, Calhoun, Chambers, Galveston, Harris, Jefferson, and Matagora counties) (L. Howell, NOAA NMFS Galveston, pers comm. to D. Bethea, NOAA NMFS SERO PRD, on February 8, 2017). Of the 294 sea turtles in the dataset, 6.8% of reported captures were green sea turtle (n=20), 88.4% were Kemp's ridley sea turtle (n=260), and 4.8% were loggerhead sea turtle (n=14). The Upper Texas Coast is a much more expansive area than the proposed action area; thus, the absence of hawksbill and leatherback sea turtles in the dataset further confirms that we do not expect these two species to be present at Quintana Pier. However, we believe green, Kemp's ridley, and loggerhead sea turtles may occur in the proposed action area and are likely to be adversely affected by recreational fishing that will occur at Quintana Pier. These effects are discussed in greater detail in the Effects of the Action (Section 6).

4.3 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 is then discussed in the corresponding status sections where appropriate.

<u>Fisheries</u>

Incidental bycatch in commercial fisheries is identified as a major contributor to past declines, and a threat to future recovery, for all of the sea turtle species (NMFS and USFWS 1991a;

NMFS and USFWS 1992; NMFS and USFWS 1993; NMFS and USFWS 2008a; NMFS et al. 2011b). 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; Crouse 1999). Bottom longlines and gillnet fishing are 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 activities 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. 1997). These factors may decrease the amount of nesting area 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, confusing them on their approach to their native nesting beaches, and also subsequently drawing sea turtle hatchlings away from the water toward artificial lighting on shorefront properties (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 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 [DDT], polychlorinated biphenyls [PCB], and perfluorinated chemicals [PFC]), 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. A thorough assessment of the long-term effects of the spill on sea turtles has not yet been completed; however, 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. The population level effects of the spill and associated response activity are likely to remain unknown for some period into the future.

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, submerged aquatic vegetation, crustaceans, mollusks, forage fish) which could ultimately affect the primary foraging areas of sea turtles.

<u>Other Threats</u>

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 ranges (NMFS and USFWS 2008c).

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.

4.4 Green Sea Turtle – North Atlantic and South Atlantic 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 (NMFS). On April 6, 2016, the original listing was replaced with the listing of 11 distinct population segments (DPSs) (81 FR 20057 2016) (Figure 9). 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.

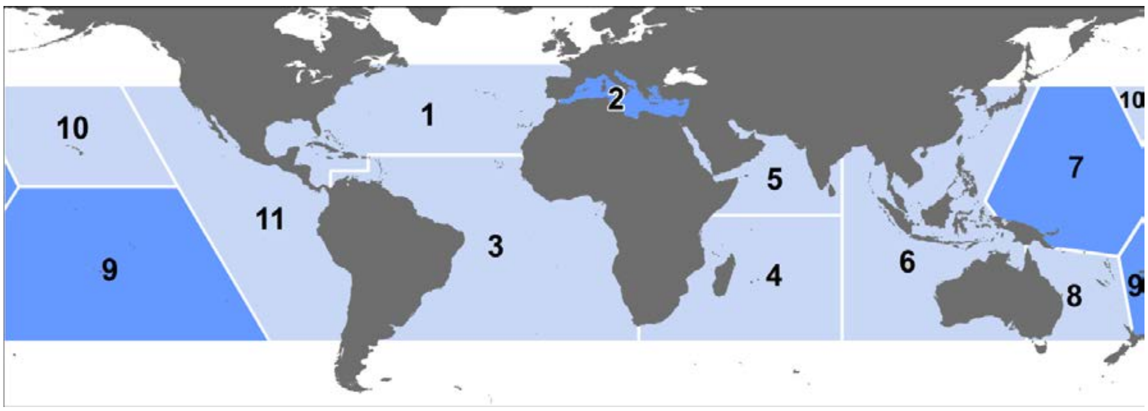

Figure 3. Threatened (light) and endangered (dark) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11.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

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 3. 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 1991b). 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 3, 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).

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 1985a) 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 grams). 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).

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 4). According to data collected from Florida's index nesting beach survey from 1989-2015, 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 4). 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%.

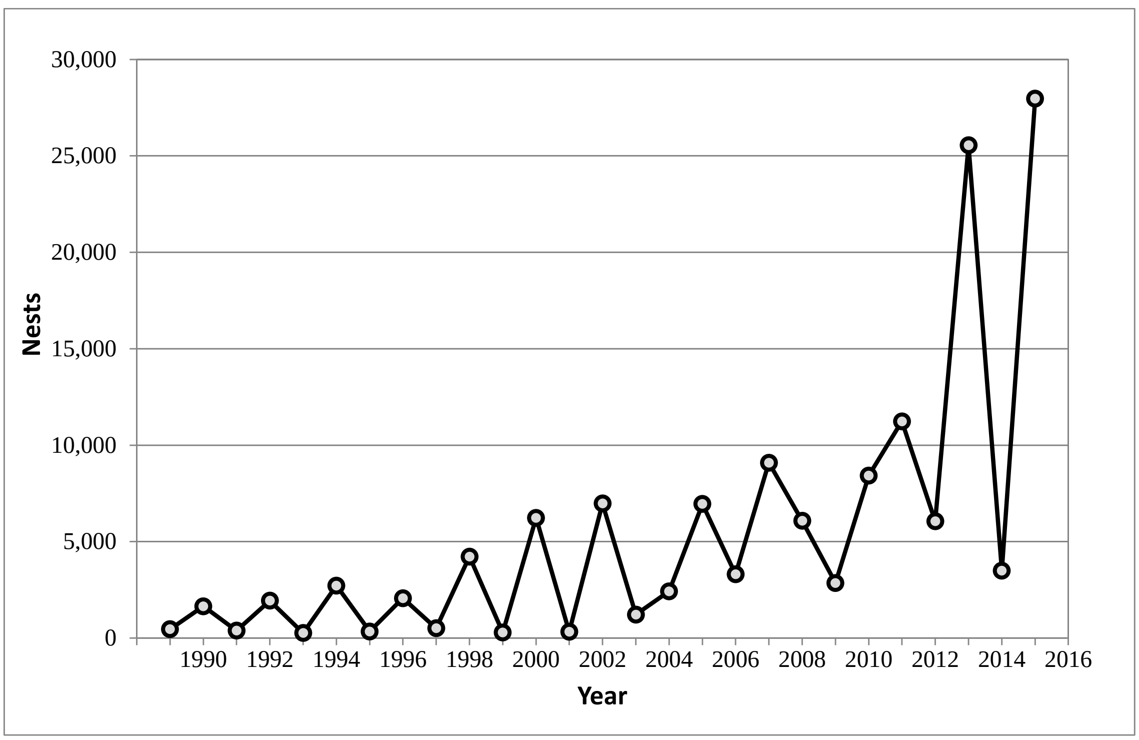

Figure 4. Green sea turtle nesting at Florida index beaches since 1989

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. 2007b), 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).

<u>South Atlantic DPS</u>
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 4.3.

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 4.3, 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).

4.5 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 population had been experiencing a similar increase. Additional nesting data in the coming years will be required to determine what the recent nesting decline 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 nest 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 5), 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 reached a record high of 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). 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 5 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 209 nests in 2012 (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, with a significant decline in 2010 followed by a second decline in 2013-2014. Nesting rebounded in 2015, as 159 nests were documented along the Texas coast (D. Shaver, National Park Service, pers. comm. to M. Barnette, NMFS PRD, October 28, 2015).

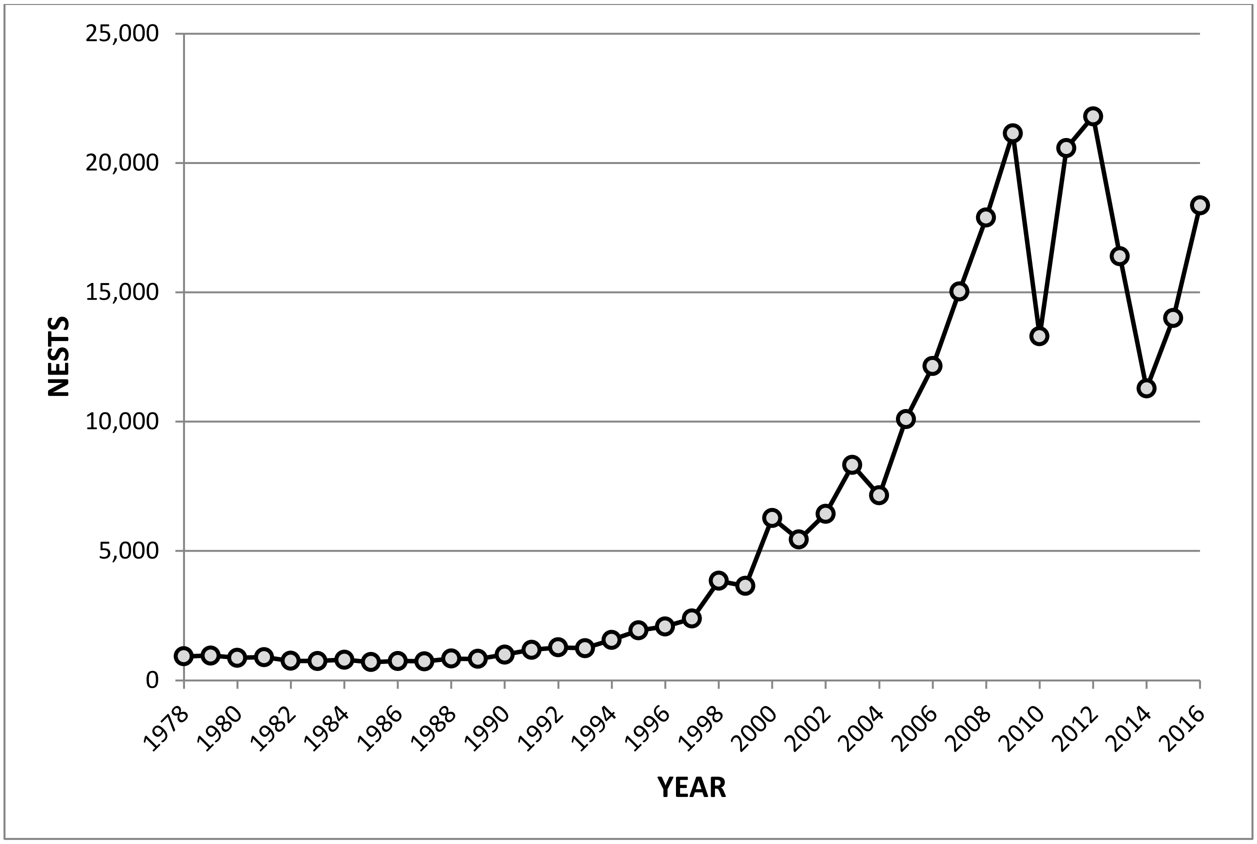

Figure 5. Kemp's ridley nest totals from Mexican beaches (Gladys Porter Zoo nesting database 2016)

Through modelling, Heppell et al. (2005) predicted the population is 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 4.3; 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[2] 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 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 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

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

species' preference for shallow, inshore waters coupled with increased population abundance, as reflected in recent Kemp's ridley nesting increases.

In response to these strandings, and due to speculation 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 4.3, 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 juveniles of this species were 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 nature of the DWH oil spill event effect 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.

4.6 Loggerhead Sea Turtle – Northwest Atlantic (NWA) 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 designating 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 NWA DPS is the only one that occurs within the action area and therefore 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 centimeters [cm]) long, measured as a straight carapace length (SCL), and weigh approximately 255 pounds (lb) (116 kilograms [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 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 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 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 (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 1998b).

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 2000b); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (NMFS-SEFSC 2001).

The recovery plan for the Northwest Atlantic population of loggerhead sea turtles concluded 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 2008b). 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[3]), (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 1985b; NMFS 2001). The annual mating season occurs from late March to early

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

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 1988) which incubate for 42-75 days before hatching (NMFS and USFWS 2008b). Loggerhead hatchlings are 1.5-2 in long and weigh about 0.7 ounces (20 grams).

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 in (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, and 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, 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 in Cuban waters of 5 adult female loggerheads originally flipper-tagged in Quintana Roo, Mexico, indicating 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 2001; NMFS-SEFSC 2009; NMFS and USFWS 2008b; TEWG 1998b; TEWG 2000b; 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 2008b). NMFS and USFWS (2008b) 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 1989-2007 showed an average of 64,513 loggerhead nests per year, representing approximately 15,735 nesting females per year (NMFS and USFWS 2008b). The statewide estimated total for 2013 was 77,975 nests (FWRI nesting database).

In addition to the total nest count estimates, the Florida Fish and Wildlife Research Institute (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. This provides a better tool for understanding the nesting trends (Figure 6). FWRI performed a detailed analysis of the long-term loggerhead index nesting data (1989-2015) (http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/). Over that time period, 3 distinct trends were identified. From 1989-1998 there was a 24% increase that was then followed by a sharp decline over the subsequent 9 years. A large increase in loggerhead nesting has occurred since, as indicated by the 74% increase in nesting between 2008 and 2015. FWRI examined the trend from the 1998 nesting high through 2015 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 2015 (an increase of over 38%), FWRI concluded that there was an overall positive change in the nest counts (http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/).

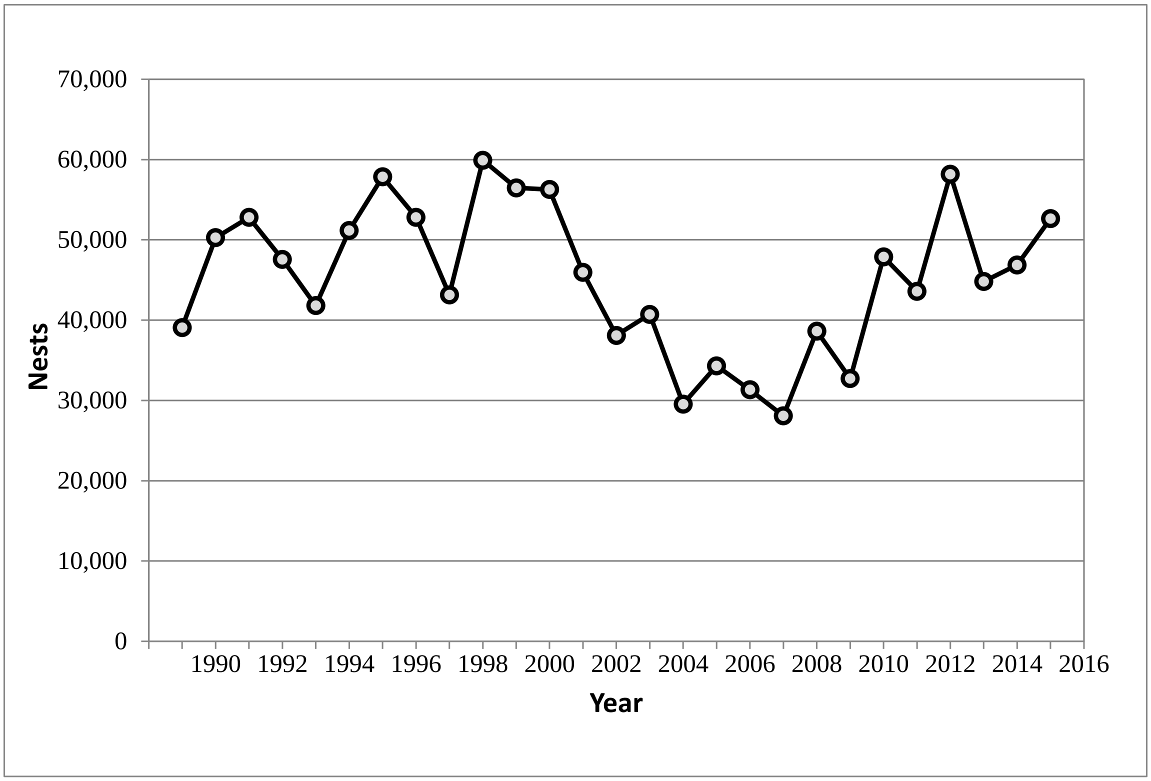

Figure 6. Loggerhead sea turtle nesting at Florida index beaches since 1989

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 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 show a shift away from the declining trend of the past.

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

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

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, with 2012 showing the highest index nesting total since the start of the program (Figure 7).

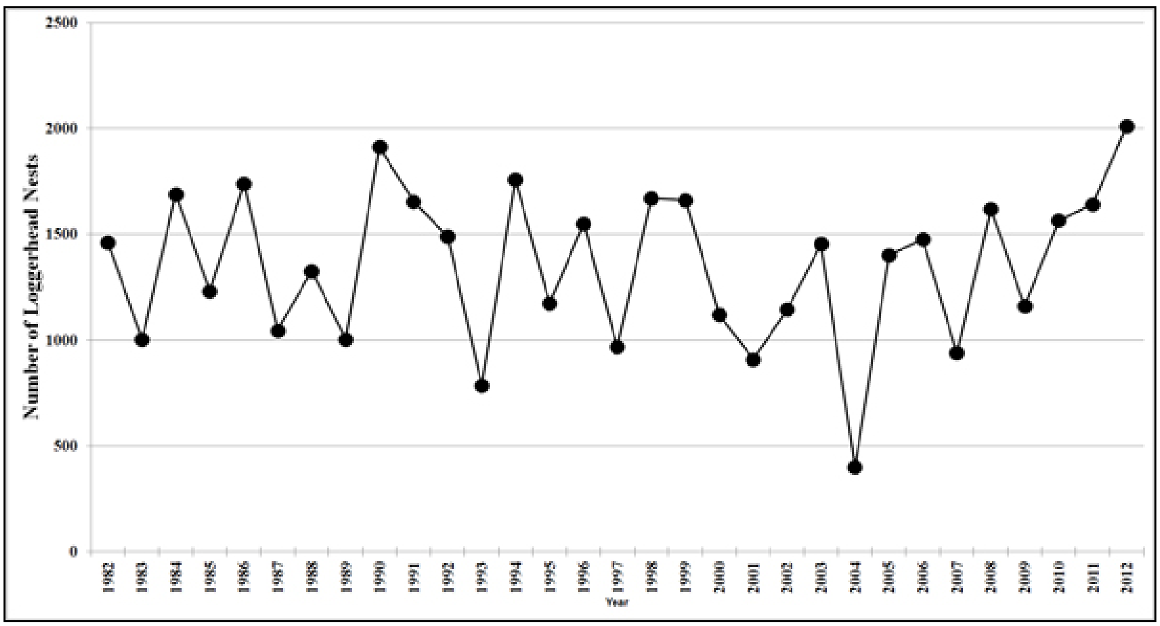

Figure 7. South Carolina index nesting beach counts for loggerhead sea turtles (from the SCDNR website, http://www.dnr.sc.gov/seaturtle/nest.htm)

<u>Other Northwest Atlantic DPS Recovery Units</u>

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 2008b). 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 2008b). Zurita et al. (2003b) 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 2008b).

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. (2007a) 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. 2007a; 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 (2008b), 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 2009). 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 to 40,000 individuals, with a low likelihood of being up to 70,000 (NMFS-SEFSC 2009). 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 2009). 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 4.3. 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. 2008) 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. (2008) analyzed tissues from stranded loggerhead sea turtles and found that mercury accumulates in sea turtle livers while cadmium accumulates in their kidneys, as has been reported for other marine organisms like dolphins, seals, and porpoises (Law et al. 1991a).

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).

5. ENVIRONMENTAL BASELINE

This section describes the effects of past and ongoing human and natural factors contributing to the current status of the species, its habitat (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, its habitat, 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 or natural phenomena in, or having effects in, the action area. We identify the anticipated impacts of all proposed federal projects 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. This consideration is important because in some states or life history stages, or areas of their ranges, listed individuals 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.

5.1 Status of Sea Turtles within the Action Area

The National Park Service (NPS), Padre Island National Seashore Division of Sea Turtle Science and Recovery, is responsible for maintaining records of all sea turtle nesting activity in Texas. According to their records for Quintana Beach, 1 Kemp's ridley sea turtle nest was observed during each of the 2016, 2015, and 2013 nesting seasons and 1 loggerhead sea turtle nest was observed during the 2012 nesting season (D. Shaver, NPS Padre Island National Seashore Division of Sea Turtle Science and Recovery, pers comm. to D. Bethea, NOAA NMFS SERO PRD, on May 22, 2017). There are no known green sea turtle nesting beaches along the Upper Texas Coast (D. Shaver, NPS Padre Island National Seashore Division of Sea Turtle Science and Recovery, pers comm. to D. Bethea, NOAA NMFS SERO PRD, on May 26, 2017). While nesting may be infrequent on Quintana Beach, the majority of the reported captures from recreational anglers within or near the action area are of juvenile green sea turtles (L. Howell, NOAA NMFS Galveston, pers comm. to D. Bethea, NOAA NMFS SERO PRD, on January 18, 2017).

Based on their nesting and foraging habitat preferences, green, Kemp's ridley, and loggerhead sea turtles may be located in the action area and may be affected by the proposed action. All of these sea turtle species are migratory, traveling for forage grounds or reproduction purposes. The nearshore waters of Brazoria County, Texas, are likely used by these species of sea turtles for post-hatchling developmental habitat or foraging habitat. NMFS believes that no individual sea turtles are likely to be permanent residents of the nearshore waters of this area, although some individuals may be present at any given time. These same individuals will migrate into offshore waters, as well as other areas of the Gulf of Mexico, Caribbean Sea, and North Atlantic Ocean at certain times of the year, and thus may be affected by activities occurring there; therefore, threats to sea turtles in the action area are considered to be the same as those discussed in Section 4.3-4.6.

5.2 Factors Affecting the Species and Environment within the Action Area

Federal Actions

While NMFS has consulted on many other federal actions along the Texas Coast, a search of NMFS records found no projects in the action area that have undergone Section 7 consultation.

State or Private Actions

Recreational Fishing

Recreational fishing as regulated by the state of Texas can affect protected species or their habitats within the action area. Pressure from recreational fishing in and adjacent to the action area is likely to continue and will increase with the restoration, extension, and operation of the proposed fishing pier. Recreational fishing from private vessels may occur in the action area. Observations of state recreational fisheries have shown that loggerhead sea turtles are known to bite baited hooks and frequently ingest the hooks. Hooked turtles have been reported by the public fishing from boats, piers, and beach, banks, and jetties and from commercial anglers fishing for reef fish and for sharks with both single rigs and bottom longlines. Additionally, lost fishing gear such as line cut after snagging on rocks, or discarded hooks and line, can also pose an entanglement threat to sea turtles in the area. A detailed summary of the known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the SEFSC Turtle Expert Working Group (TEWG) reports (TEWG 1998a; TEWG 2000a).

Coastal Development

Beachfront development, lighting, and beach erosion control all are ongoing activities along the Texas coastline, including near the action area. These activities potentially reduce or degrade sea turtle nesting habitats or interfere with hatchling movement to sea. Nocturnal human activities along nesting beaches may also discourage sea turtles from nesting sites. The extent to which these activities reduce sea turtle nesting and hatchling production is unknown. Still, more and more coastal counties are adopting stringent protective measures to protect hatchling sea turtles from the disorienting effects of beach lighting.

<u>Other Potential Sources of Impacts in the Environmental Baseline</u>

Stochastic events

Stochastic (i.e., random) events, such as hurricanes, occur in Texas and can affect the action area. These events are by nature unpredictable, and their effect on the recovery of the species is unknown; yet, they have the potential to directly impede recovery if animals die as a result or indirectly if important habitats are damaged. Other stochastic events, such as a cold snap, can injure or kill sea turtles. According to the Texas Coordinator of the STSSN, 309 turtles were adversely affected by cold snap this winter, with the vast majority of those occurring January 7-9, 2017 (D. Shaver, Division of Sea Turtle Science and Recovery NPS, pers comm. to D. Bethea, NOAA NMFS SERO PRD, on January 25, 2017).

Marine Pollution and Environmental Contamination

Coastal runoff, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased under water noise and boat traffic can degrade marine habitats used by sea turtles (Colburn et al. 1996) and negatively impact nearshore habitats, including the action area. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. Although these contaminant concentrations are unknown in the action area, the sea turtles analyzed in this Biological Opinion travel within near shore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

The Gulf of Mexico is an area of high-density offshore oil extraction with chronic, low-level spills and occasional massive spills (such as the current DWH oil spill, Ixtoc I oil well blowout and fire in the Bay of Campeche in 1979, and the explosion and destruction of a loaded supertanker, the Mega Borg, near Galveston in 1990). When large quantities of oil enter a body of water, chronic effects such as cancer, and direct mortality of wildlife becomes more likely (Lutcavage et al. 1997). Oil spills in the vicinity of nesting beaches just prior to or during the nesting season could place nesting females, incubating egg clutches, and hatchlings at significant risk (Fritts and McGehee 1982; Lutcavage et al. 1997; Witherington 1999).

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. 2008). 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. 1991b). No information on detrimental threshold concentrations is available, and little is known about the consequences of exposure of organochlorine compounds to sea turtles. Research is needed on the short- and long-term health and fecundity effects of chlorobiphenyl, organochlorine, and heavy metal accumulation in sea turtles.

Conservation and Recovery Actions Shaping the Environmental Baseline
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 any live stranded sea turtles. The network, which includes federal, state and private partners, encompasses the coastal areas of the eighteen-state region from Maine to Texas, and includes portions of the U.S. Caribbean. Data are compiled through the efforts of network participants who document marine turtle strandings in their respective areas and contribute those data to the centralized STSSN database.

In response to the growing awareness of recreational fishery impacts on sea turtles, in 2006 the Marine Recreational Fishery Statistics Survey added a survey question regarding sea turtle interactions within recreational fisheries. NMFS is exploring potential revisions to Marine Recreational Information Program to quantify recreational encounters with sea turtles on a permanent basis.

6. 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). First, we will discuss general effects of the action and types of injuries that can occur to sea turtles via hook-and-line capture. Then we will estimate the number of sea turtles anticipated to be captured at the proposed fishing pier, based on the available data regarding the number of sea turtles that have been reported captured via recreational hook-and-line in the surrounding area and the estimated number of un-reported recreational hook-and-line captures in the surrounding area. We will then estimate survival rate of sea turtles post capture (i.e., post-release mortality) based on data from rehabilitation facilities and the severity of the injury during capture.

6.1 Effects of Hook-and-Line Captures to Sea Turtles

Hook-and-line gear commonly used by recreational anglers fishing from fishing piers can adversely affect sea turtles via entanglement, hooking, and trailing line. 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, the types of effects that sea turtles are likely to experience as a result of interactions with commercial fisheries (i.e., entanglement, hooking, and trailing line) are expected to be the same as those that might occur in recreational hook-and-line gear. 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.

<u>Entanglement</u>

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.

<u>Hooking</u>

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 when the animal has swallowed the bait (Balazs et al. 1995). 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) 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 snagged on a floating or fixed object, further entangling a turtle and potentially slicing its appendages and affecting its ability to swim, feed, avoid predators, or reproduce. Sea turtles have been found trailing gear that has been snagged on the 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.

6.2 Captures of Sea Turtles at Quintana Pier

6.2.1 Estimating Reported Captures

There are no reported captures of sea turtles at Quintana Pier. Based on similarity of pier location and habitat type (i.e., Gulf of Mexico-facing beach with sandy substrate), we believe the best available data to estimate the number of expected reported captures of sea turtles at Quintana Pier is an average of the reported sea turtle captures at the four closest fishing pier structures along the Upper Texas Coast (within a 50-mi radius). We use the 14-year STSSN dataset of reported recreational hook-and-line sea turtles captures along the Upper Texas Coast to obtain those numbers: Matagora Bay Jetty (n=0), Surfside County Park Jetty (n=7), Galveston Fishing Pier (n=30), and Galveston 61st Street Fishing Pier (n=14). To calculate the expected number of reported hook-and-line captures at Quintana Pier in 14 years, we use the following equation:

$$Expected\ Captures\ (Reported) for\ Qunitana\ Pier\ in\ 14\ years$$
$$= Sum\ of\ the\ \ Captures\ (Reported) in\ 14\ Years from\ 4\ Closest\ Piers \div 4$$
$$Expected\ Captures\ (Reported) for\ Qunitana\ Pier\ in\ 14\ years\ = (0 + 7 + 30 + 14) \div 4$$
$$Expected\ Captures\ (Reported) for\ Qunitana\ Pier\ in\ 14\ years\ = 51\ \div 4$$
$$Expected\ Captures\ (Reported) for\ Qunitana\ Pier\ in\ 14\ years\ = 12.75$$

To calculate the estimated expected annual number of reported recreational hook-and-line captures of sea turtles at Quintana Pier, we use the following equation:

$$Expected\ Annual\ Captures\ (Reported) at\ the\ Quintana\ Pier$$
$$= Average\ Annual\ Reported\ Captures \div 14\ years$$

$$Expected\ Annual\ Captures\ (Reported) at\ the\ Quintana\ Pier = 12.75\ captures\ per\ year \div 14\ years$$

$$Expected\ Annual\ Captures\ (Reported) at\ the\ Quintana\ Pier = 0.9107\ (Table\ 3, Line\ 1)$$

6.2.2 Estimating Un-reported Captures

While we believe the best available information for estimating future captures at fishing piers are the reported captures at public piers in the surrounding area, we also recognize the need to account for un-reported captures. In the following section, we use the best available data to estimate the number of un-reported recreational hook-and-line-captures from the same four fishing pier structures as in Section 6.2.1. To the best of our knowledge, only two fishing pier surveys aimed at collecting data regarding un-reported recreational hook-and-line captures of ESA-listed species have been conducted in the Southeast. One is from Charlotte Harbor, Florida (Gulf of Mexico-side of Florida), and the other is from Mississippi.

The fishing pier survey in Charlotte Harbor, Florida, was conducted at 26 fishing piers in smalltooth sawfish critical habitat (Hill 2013). During the survey, 93 anglers were asked a series of open-ended 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 encounters. The interviewer also noted conditions about the pier including if educational signs regarding reporting of hook-and-line captures were present at the pier. Hill (2013) found that only 8% of anglers would have reported a sea turtle hook-and-line capture (i.e., 92% of anglers would not have reported a sea turtle capture).

NMFS conducted a fishing pier survey in Mississippi that interviewed 382 anglers (Cook et al. 2014). This survey indicated that approximately 60% of anglers who incidentally captured a sea turtle on hook-and-line reported it (i.e., 40% of anglers would not have reported a sea turtle capture) (Cook et al. 2014). It is important to note that in 2012 educational signs were installed at all fishing piers in Mississippi, alerting anglers to report accidental hook-and-line captures of sea turtles. After the signs were installed, there was a dramatic increase in the number of reported sea turtle hook-and-line captures. Though this increase in reported captures may not solely be related to outreach efforts, it does highlight the importance of educational signs on fishing piers. The STSSN in Mississippi (M. Cook, STSSN, per comm. to N. Bonine, NMFS Protected Resources Division, April 17, 2015) indicated that inconsistency in reporting of captures may also be due to anglers' concerns over their personal liability, public perception at the time of the capture, or other consequences from turtle captures. Since it is illegal to harm an endangered species, anglers are often afraid to admit the incidental capture. Similarly, a study of smalltooth sawfish noted that some anglers were apprehensive to continue to report smalltooth sawfish encounters once the species was listed on the ESA, fearing their favorite fishing hole would be closed or restricted due to the known presence of an endangered species (Wiley and Simpfendorfer 2010).

No studies have been conducted near the action area to determine the rate of underreporting. While all fishing piers in Texas have educational signs instructing the public on how to handle encounters with ESA-listed species, anecdotal reports to the STSSN from recreational anglers along the Upper Texas Coast indicate sea turtles are caught much more frequently than are reported; often anglers will only report a sea turtle when it has an injury or a flipper tag (L. Howell, NOAA NMFS Galveston, pers comm. to D. Bethea, NOAA NMFS SERO PRD, on

January 27, 2017). Also, Mississippi has a small coast line and a very active STSSN that is a common presence at fishing piers along the Mississippi coast. The same cannot be said for the Texas coast. Due to this anecdotal evidence, we believe it is reasonable (and conservative to the species) to use the higher un-reported rate in the Hill (2013) fishing pier study to estimate the un-reported captures at the Quintana Pier. We will address un-reported captures by assuming that the expected annual reported captures of 0.9107 sea turtles per year at Quintana Pier represent only 8% of the actual captures and 92% of sea turtle captures will be un-reported. To calculate the annual number of un-reported recreational hook-and-line captures of sea turtles at Quintana Pier, we use the equation:

$$Expected\ Annual\ Captures\ at\ Quintana\ Pier\ (Un - Reported) \div 92\%$$
$$= \ Expected\ Annual\ Captures\ (Reported) at\ the\ Quintana\ Pier\ [From\ Section\ 6.2.1] \div 8\%$$
$$Expected\ Annual\ Captures\ at\ Quintana\ Pier\ (Un - Reported) \div 0.92 = 0.9107 \ \div 0.08$$
$$Expected\ Annual\ Captures\ at\ Quintana\ Pier\ (Un - Reported) = (0.9107 \div 0.08) \times 0.92$$
$$Expected\ Annual\ Captures\ at\ Quintana\ Pier\ (Un - Reported) = \\ = 10.4731\ (Table\ 3, Line\ 2)$$

6.2.3 Calculating Total Captures

The number of captures in any given year can be influenced by sea temperatures, species abundances in a given year, fluctuating salinity levels in estuarine habitats where piers may be located, and other factors that cannot be predicted. For these reasons, we believe basing our future capture estimate on a 1-year estimated captures is largely impractical. Based on our experience monitoring other fisheries, a 3-year time period is appropriate for meaningful monitoring. The triennial takes are set as 3-year running sums (total for any consecutive 3-year period i.e., 2017-2019, 2018-2020, 2019-2021 and so on) and not for static 3-year periods (i.e., 2017-2019, 2020-2022, 2023-2025 and so on). This approach reduces the likelihood of re-initiation of ESA consultation process because of inherent variability captures, while still allowing for an accurate assessment of how the proposed action is performing versus our expectations. Table 3 calculates the total sea turtle captures for any 3-year period based on the annual reported and un-reported captures at Quintana Pier.

Table 3. Summary of Captures at Quintana Pier

		Total
1.	Reported Captures	0.9107
2.	Un-reported Captures	10.4731
	Annual Total	11.3838
	Triennial (3-year) Total	34.1513

6.3 Post Release Mortality

6.3.1 Estimating Post Release Mortality for Reported Captures

All sea turtles that are captured, landed, and reported to the STSSN in Texas are evaluated by a trained veterinarian to determine if they can be immediately released alive or require a rehabilitation facility (L. Howell, NOAA NMFS Galveston, pers comm. to D. Bethea, NOAA NMFS SERO PRD, on February 9, 2017). We believe the 14-year Texas STSSN dataset of reported recreational hook-and-line sea turtles captures along the Upper Texas Coast is a more accurate representation of post-release mortality for sea turtles than a smaller subset of data from a specific pier (e.g., Galveston Pier) or a larger set of data from another gulf-coast state (e.g., Mississippi), because this dataset is large enough to account for inter-annual variability while also pertaining specifically to the Texas coastline where the proposed action is occurring. Table 4 provides a breakdown of final disposition of the 294 sea turtles in the STSSN Upper Texas Coast dataset.

Table 4. Final Disposition of Sea Turtles from Reported Recreational Hook-and-Line Captures along the Upper Texas Coast, 2003-2016 (n=294)

	Died Onsite	Released Alive	Rehab, Released Alive	Rehab, Kept	Rehab, Died
Number of Records	1	42	242	1	8
Percentage	0.34	14.29	82.31	0.34	2.72

Of the sea turtles reported captured on recreational hook-and-line along the Upper Texas Coast, 3.4% were removed from the wild population either through death or being unable to be released from the rehabilitation facility (i.e., lethal capture, 3.40 = 0.34 + 0.34 + 2.72) and 96.6% were released alive back into the wild population either immediately or after rehabilitation (i.e. non-lethal capture, 96.60 = 14.29 + 82.31). We assume the 14.29% of sea turtles released alive into the wild population immediately do not suffer any post release mortality due to on-site evaluation by a trained veterinarian prior to release. To calculate the annual estimated lethal captures of reported sea turtles at Quintana Pier, we use the following equation:

$$Annual\ Lethal\ Captures\ (Reported)\ at\ Quintana\ Pier$$
$$= Expected\ Annual\ Reported\ Captures\ at\ Qunitana\ Pier\ [Section\ 6.2.1] \times 3.4\%\ [calculated\ from\ Table\ 3]$$
$$Annual\ Lethal\ Captures\ (Reported)\ at\ Quintana\ Pier = 0.9107\ \times 0.0340$$
$$Annual\ Lethal\ Captures\ (Reported)\ at\ Quintana\ Pier = 0.0310\ (Table\ 8, Line\ 1A)$$

To calculate the estimated annual non-lethal captures of reported sea turtles at Quintana Pier, we use the following equation:

$$Annual\ Non-lethal\ Captures\ (Reported) at\ Quintana\ Pier$$
$$= Expected\ Annual\ Reported\ Captures\ at\ Quintana\ Pier\ [Section\ 6.2.1] \times 96.6\%\ [calculated\ from\ Table\ 3]$$
$$Annual\ Non-lethal\ Captures\ (Reported) at\ Quintana\ Pier = 0.9107\ \times 0.9660$$
$$Annual\ Non-lethal\ Captures\ (Reported) at\ Quintana\ Pier = 0.8797\ (Table\ 8, Line\ 1B)$$

6.3.2 Estimating Post Release Mortality for Un-reported Captures

Sea turtles that are captured and not reported to the STSSN may be released alive and subsequently suffer post-release mortality. The risk of post-release mortality to sea turtles from hook-and-line captures will depend on numerous factors including how deeply the hook is embedded, whether or not the hook was swallowed, 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. While the preferred method to release a hooked sea turtle safely is to bring it ashore and de-hook/disentangle it there and release it immediately, that cannot always 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. Because of considerations such as the tide, weather, and the weight and size of the captured sea turtle, some will not be able to be de-hooked (when applicable), and will be cut free by anglers and intentionally released. These sea turtles will escape with embedded or swallowed hooks, or trailing varying amounts of monofilament fishing line which may cause post-release injury or death.

In January 2004, NMFS convened a workshop of experts to develop criteria for estimating post-release mortality (PRM) of sea turtles caught in the pelagic longline fishery based on the severity of injury. In 2006, those criteria were revised and finalized (Ryder et al. 2006). In February 2012, the Southeast Fisheries Science Center (SEFSC) updated the criteria again by adding 3 additional hooking scenarios, bringing the total to 6 categories of injury (NMFS and SEFSC 2012). Table 5 describes injury categories for hardshell sea turtles captured on hook-and-line and the associated post-released mortality estimates for sea turtles released with hook and tailing line greater than or equal to half the length of the carapace (i.e., Release Condition B as defined in (NMFS and SEFSC 2012).

Table 5. Estimated Post Release Mortality Based on Injury Category for Hardshell Sea Turtles Captured via Hook-and-Line and Released in Release Condition B (NMFS and SEFSC 2012).

Injury Category	Description	Post-release Mortality
I	Hooked externally with or without entanglement	20%
II	Hooked in upper or lower jaw with or without entanglement—includes ramphotheca (i.e., beak), but not any other jaw/mouth tissue parts	30%
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.	45%
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	60%
V	Entangled only, no hook involved	50%*
VI	Comatose/resuscitated	60%*

*There is no post-release mortality estimate of Release Condition B for Injury Category V or VI. For Injury Category V we believe it is prudent to use the post-release mortality for Release Condition A (Released Entangled) because we know the sea turtle was released entangled without a hook, but we do not know how much line was remaining. For Injury Category VI we believe it is prudent to use the post-release mortality Release Condition D (Released with All Gear Removed) because we believe that if a fisher took the time to resuscitate the sea turtle, then it is likely the fisher also took the time to completely disentangle the animal before releasing it back into the wild.

Post-release mortality varies based on the initial injury the animal sustained and the amount of gear left on the animal at the time of release. Again, we will rely on the STSSN 14-year dataset from the Upper Texas Coast because this data includes the location of where on the animal the sea turtle was hooked (Table 6).

Table 6. Category of Injury of Sea Turtles from Reported Recreational Hook-and-Line Captures along the Upper Texas Coast, 2003-2016 (n=294)

Injury Category	**I**	**II**	**III**	**IV**	**V**	**VI**
Number	94	30	122	38	9	1
Percentage	32.0	10.2	41.5	12.9	3.1	0.3

To estimate the fate of the 92% of sea turtles expected to go un-reported, and therefore un-rehabilitated, we use the injury category totals in Table 6 along with the post-release mortality estimates in Table 5 to calculate the weighted mortality rate expected for each injury category. We then sum the weighted mortality rates across all injury categories to determine the overall post-release mortality for these turtles. This overall rate helps us account for the varying severity of future injuries and varying post-release mortality associated with these injuries. Based on the assumptions we have made about the percentage of sea turtles that will be released alive without rehabilitation, the likely hooking location, and the amount of fishing gear likely to remain on an animal released immediately at the pier, we estimate an total weighted post-release mortality of 37.61% for 92% of the sea turtles captured, un-reported, and released immediately at Quintana Pier (Table 7).

Table 7. Estimated Weighted and Overall Post Release Mortality for Turtles Released Immediately from Quintana Pier

Injury Category	**Captures [from Table 4]**	**Post-release Mortality [from Table 3]**	**Weighted Post-release Mortality***
I	32.0%	20%	6.40%
II	10.2%	30%	3.06%
III	41.5%	45%	18.68%
IV	12.9%	60%	7.74%
V	3.1%	50%	1.55%
VI	0.3%	60%	0.18%
**Total Weighted Post-release Mortality			37.61%

*Weighted Mortality Rate = Percent of Total Captures in Each Injury Category x PRM Rate per Category
**Overall Weighted Post-Release Mortality Rate = Sum of Weighted Mortality Rates

To calculate the estimated lethal captures of un-reported sea turtles, we use the following equation:

$$\begin{aligned} &Annual\ Lethal\ Captures\ (Un-reported) at\ Quintana\ Pier \\ &\quad = Annual\ Captures\ at\ Quintana\ Pier\ (Un-Reported)[Section\ 6.2.2] \\ &\quad \times Total\ Weighted\ Post-release\ Mortality\ [Table\ 6] \end{aligned}$$

$$Annual\ Lethal\ Captures\ (Un-reported) at\ Quintana\ Pier = 10.4731\ \times 37.61\%$$

$$Annual\ Lethal\ Captures\ (Un-reported) at\ Quintana\ Pier = 10.4731\ \times 0.3761$$

$$Annual\ Lethal\ Captures\ (Un - reported) at\ Quintana\ Pier = 3.9389\ (Table\ 8, Line\ 2A)$$

To calculate the estimated non-lethal captures of reported sea turtles, we use the following equation:

$$\begin{aligned} &Annual\ Non - lethal\ Captures\ (Un - reported)\ at\ Quintana\ Pier \\ &\quad = Annual\ Captures\ at\ Quintana\ Pier\ (Un - Reported)[Section\ 6.2.2] \\ &\quad - Lethal\ Captures\ (Un - reported) at\ Quintana\ Pier \end{aligned}$$

$$Annual\ Non - lethal\ Captures\ (Un - reported)\ at\ Quintana\ Pier = 10.4732 - 3.9385$$

$$\begin{aligned} &Annual\ Non - lethal\ Captures\ (Un - reported)\ at\ Quintana\ Pier \\ &\quad = 6.5341\ (Table\ 8, Line\ 2B) \end{aligned}$$

Table 8. Summary of Post Release Mortality at Quintana Pier

		A. Lethal	B. Non-lethal
1.	Reported Captures	0.0310	0.8797
2.	Un-reported Captures	3.9389	6.5341
	Annual Total	3.9699	7.4139
	Triennial (3-year) Total	11.9096	22.2416

6.4 Estimating Captures at Quintana Pier by Species

Of the 294 sea turtles in the STSSN 14-year dataset from the Upper Texas Coast, 6.8% were green sea turtles, 88.4% were Kemp's ridley sea turtles, and 4.8% were loggerhead sea turtles. We assume approximately the same species composition for future captures at Quintana Pier: 7% for green sea turtles (inclusive of the North Atlantic and South Atlantic DPSs), 88% for Kemp's ridley sea turtles, and 5% for loggerhead sea turtles. Table 9 estimates the number of lethal and non-lethal captures by species for any 3-year period at Quintana Pier.

Table 9. Estimated Captures at Quintana Pier by Species for Any 3-Year Period (Rounded to Whole Numbers)

Sea Turtle Species	Captures	Lethal*	Non-lethal*	Total*
Green**	7%	1 (11.9096 x 0.07 = 0.8337)	2 (22.2416 x 0.07 = 1.5569)	3
Kemp's ridley	88%	11 (11.9096 x 0.88 = 10.4805)	20 (22.2416 x 0.88 = 19.5726)	31
Loggerhead	5%	1 (11.9096 x 0.05 = 0.5955)	2 (22.2416 x 0.05 = 1.1121)	3
**To be conservative to the species, numbers of captures are rounded up to the nearest whole number.* ***Both the North Atlantic and South Atlantic DPSs.*				

The impacts of future captures to green sea turtle DPSs is discussed in the Jeopardy Analysis (Section 8) and presented in the Incidental Take Statement (Section 10; Table 10).

7. 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. At this time, we are not aware of any other non-federal actions being planned or under development in the action area. 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.

8. 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 Kemp's ridley, green (North Atlantic and South Atlantic DPSs), or 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 Listed Species (Section 4), the Environmental Baseline (Section 5), and Cumulative Effects (Section 7).

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. Sub-lethal 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.

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

The proposed action is anticipated to result in the capture of up to 3 green sea turtles during any consecutive 3-year period (Table 9). Of the anticipated 3 captures, 2 are expected to be non-lethal, meaning the animal may be captured and released immediately alive with no anticipated mortality or be taken to a rehabilitation center and released later in time after recovery with no anticipated mortality. Injuries resulting from non-lethal captures are unlikely to affect the reproductive potential, fitness, or growth of the captured animal because (1) it will be released immediately unharmed in the same general area shortly after capture, (2) it will be rehabilitated and released alive later, or (3) it will strand alive later as a result of injuries, subjecting it to rescue, rehabilitation, and eventual release as a viable member of its population. For these reasons, non-lethal captures are not expected to have any measurable impact on the numbers, reproduction, or distribution of green sea turtle populations in the wild. The 1 lethal capture of a green sea turtle may occur 4 ways. The animal may be (1) captured at the pier and die from its injuries before it can be released alive, (2) captured at the pier, released alive, and expected to die from its injuries at a later time (i.e., suffer post-release mortality), (3) captured at the pier and transported to a rehabilitation center only to die in captivity at a later time due to its injuries, or (4) captured at the pier and transported to a rehabilitation center but is unable to be released back into the wild population due to its injuries. For lethal captures we need to determine the proportion that will affect the NA and SA DPSs of green sea turtle.

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 nesting 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).

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. 2003a; 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, 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 boundaries.

However, as discussed in Section 4.4, 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, 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 was from the NA DPS. 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 during the proposed action. For these reasons, we act conservatively and conduct jeopardy analyses on the assumption that both the NA DPS and the SA DPS will be captured by the proposed action. In order to conservatively assume the SA DPS may be represented in the take, we will divide the total take (i.e., 3) between the NA and SA DPSs as such: 2 for the NA DPS and 1 for the SA DPS. However, because of the much lower probability that green sea turtle captures will be from the SA DPS coupled with the higher probability of non-lethal captures, we further anticipate that the 1 take from the SA DPS will be non-lethal. The 2 takes from the NA DPS will be equally split between lethal and non-lethal take.

8.1.1 NA DPS of Green Sea Turtle

The proposed action may result in the take of 2 green sea turtles (1 lethal, 1 non-lethal) from the NA DPS over any consecutive 3-year period (Table 9). For the reasons discussed above (Section 8.1), the potential non-lethal take of green sea turtle from the NA DPS is not expected to have any measurable impact on the numbers, reproduction, or distribution of this DPS.

The potential lethal take of 1 green sea turtle from the NA DPS over any 3-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. A lethal interaction would also result in a potential reduction in future reproduction, assuming the individual would be a female and would have survived otherwise to reproduce. For example, an adult green sea turtle 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. The anticipated lethal interaction is expected to occur in a small, discrete action area which is a tiny portion of the large range of the NA DPS of green sea turtles in which they disperse; thus, no reduction in the distribution of the NA DPS of green sea turtles is expected from this take.[4]

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).

There are no known green sea turtle nesting beaches along the Upper Texas Coast; majority of the juvenile green turtles inhabiting Texas waters likely hatched from nests in Mexico (D. Shaver, NPS Padre Island National Seashore Division of Sea Turtle Science and Recovery, pers comm. to D. Bethea, NOAA NMFS SERO PRD, on May 26, 2017). 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 Quintana Roo (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 3.4, 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. 2007b). Similar in-water work at the St. Lucie Power

[4] NA DPS green takes are anticipated from the action area at the Quintana Fishing Pier but we expand outward within Texas in the Gulf of Mexico because post-release mortalities may occur somewhere further away from the action area from the time of release until the time of death. Usually, the time between release and mortality occurs over a period of hours to days, so we would not expect a sea turtle to range too far outside the action area before dying.

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).[5] 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).[6] 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).

Nesting at the primary nesting beaches has been increasing over the course of the decades. Additionally, the population viability analysis for the Florida and Tortuguero, Costa Rica, nesting beaches indicate no more than a 0.7% probability those populations will reach the 50% decline threshold at the end of 100 years, and a 0% probability these populations will fall below the absolute abundance threshold of 100 nesting females per year at the end of 100 years (Seminoff et al. 2015). We believe these nesting trends are indicative of a species with a high number of sexually mature individuals. Since the abundance trend information for green sea turtles is clearly increasing, we believe the potential lethal take of 1 green sea turtle from the NA DPS over consecutive 3 year periods attributed to 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 1991b) does exist. Since the animals within the NA DPS all occur in the Atlantic Ocean and would have been 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

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

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

DPS is developed. The Atlantic Recovery Plan lists the following relevant recovery objectives over a period of 25 continuous years:

- The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years.
- A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.

Green sea turtle nesting in Florida between 2001-2006 was documented as follows: 2001 – 581 nests, 2002 – 9,201 nests, 2003 – 2,622, 2004 – 3,577 nests, 2005 – 9,644 nests, 2006 – 4,970 nests. This averages 5,039 nests annually over those 6 years (2001-2006) (NMFS and USFWS 2007a). Subsequent nesting has shown even higher numbers (i.e., 2007 – 12,751 nests, 2008 – 9,228, 2009 – 4,462, 2010 – 13,225 nests, 2011 – 15,352, 2012 – 9,617, 2013 – 25, 553, 2014 – 3,502; 2015 – 27,975 (http://myfwc.com/research/wildlife/sea-turtles/nesting/2015-nesting-trends/). There are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the clear increases in nesting, however, it is likely that numbers on foraging grounds will also have increased.

The potential lethal take of 1 green sea turtle from the NA DPS over any consecutive 3-year period will result in a reduction in numbers when takes occur, but it is unlikely to have any detectable influence on the recovery objective and trends noted above. In addition, because of the relatively small number of lethal takes as compared to the overall NA DPS population size, we would not anticipate any impact on the species' reproduction described above to have a detectable difference in the first recovery objective for this DPS noted above. Thus, 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.

Therefore, we conclude that the lethal take of 1 green sea turtle from the NA DPS associated with the proposed action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the NA DPS of green sea turtle in the wild.

8.1.2 SA DPS of Green Sea Turtle

The proposed action may result in the non-lethal take of 1 green sea turtle from the SA DPS over consecutive 3-year periods (Table 9). For the reasons discussed above (Section 8.1), non-lethal take is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. Therefore, we do not expect the proposed action will impede likelihood of survival or recovery of the SA DPS of green sea turtle.

8.2 Kemp's Ridley Sea Turtle

The proposed action is anticipated to result in the capture of up to 31 Kemp's ridley sea turtles during any consecutive 3-year period (Table 8). Of the anticipated 30 captures, 20 will be non-lethal, meaning the animal may be captured and released immediately alive with no anticipated post-release mortality or be taken to a rehabilitation center and released later in time after recovery with no anticipated mortality. Injuries resulting from non-lethal captures are unlikely to affect the reproductive potential, fitness, or growth of the captured animal because (1) it will be released immediately unharmed in the same general area shortly after capture, (2) it will be rehabilitated and released alive later, or (3) it will strand alive later as a result of injuries, subjecting it to rescue, rehabilitation, and eventual release as a viable member of its population. For these reasons, non-lethal captures are not expected to have any measurable impact on the numbers, reproduction, or distribution of Kemp's ridley sea turtle populations in the wild. The 11 lethal captures of Kemp's ridley sea turtle may occur 4 ways. The animal may be (1) captured at the pier and die from its injuries before it can be released alive, (2) captured at the pier, released alive, and expected to die from its injuries at a later time (i.e., suffer post-release mortality), (3) captured at the pier and transported to a rehabilitation center only to die in captivity at a later time due to its injuries, or (4) captured at the pier and transported to a rehabilitation center but is unable to be released back into the wild population due to its injuries.

The potential lethal take of 11 Kemp's ridley sea turtle during any consecutive 3-year period would reduce the species' population compared to the number that 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 from 7-15 years. Females return to their nesting beach about every 2 years (TEWG 1998b). The mean clutch size for Kemp's ridley sea turtle is 100 eggs/nest, with an average of 2.5 nests/female/season. Lethal takes could also result in a potential reduction in future reproduction, assuming at least one of these individuals would be female and would have survived to reproduce in the future. The loss of 1 Kemp's ridley sea turtle 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 reduction in sea turtle reproduction. The anticipated lethal takes are expected to occur in a small, discrete action area and Kemp's ridley sea turtle generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals.

In the absence of any total population estimates for Kemp's ridley sea turtle, nesting trends are the best proxy for estimating population changes (Figure 5). Following a significant, unexplained 1-year decline in 2010, Kemp's ridley sea turtle 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 in Mexico improved to 14,006 recorded nests (J. Pena, Gladys Porter Zoo, pers. comm. to M. Barnette, NMFS, October 19, 2015). 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 209 nests in 2012 (National Park Service data, http://www.nps.gov/pais/naturescience/strp.htm, http://www.nps.gov/pais/naturescience/current-season.htm). Nesting numbers from 2013 indicate they decreased in 2013 to 153 nests in Texas (Gladys Porter Zoo nesting database 2013). Nesting rebounded somewhat in 2015, with 159 nests documented along the Texas coast (D. Shaver, NPS Padre Island National Seashore Division of Sea Turtle Science and Recovery, pers. comm. to M. Barnette, NMFS, October 28, 2015). It is important to remember that with significant inter-annual variation in nesting data, sea turtle population trends necessarily are measured over decades and the long-term trend line better reflects the population increase in Kemp's ridleys. With the recent increase in nesting data (14,006 nests in 2015[7]) and recent declining numbers of nesting females (2013-14), it is too early

[7] 2015 Report - MEXICO / UNITED STATES OF AMERICA POPULATION RESTORATION PROJECT FOR THE KEMP´S RIDLEY SEA TURTLE, *Lepidochelys kempii*, ON THE COASTS OF TAMAULIPAS, MEXICO

to tell whether the long-term trend line is affected. Nonetheless, long-term data from 1990 to present continue to support that Kemp's ridley sea turtle is increasing in population size.

We believe this long-term increasing trend in nesting 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 large number of sexually mature individuals. We do not believe the anticipated takes of Kemp's ridley sea turtle associated with the proposed action will have a measurable effect on the long term increasing nesting trends, particularly given the thousands of nests observed over the last several years. We also do not believe the proposed action will have a measurable effect on the species' overall genetic diversity, particularly in light of the increasing population trends. In general, increasing population size equates to increasing genetic diversity over successive generations. The anticipated increases in population numbers associated with increasing nesting trends are expected to replace the anticipated loss of 10 Kemp's ridley sea turtle during any consecutive 3-year period. Further, we believe the anticipated lethal takes will not cause a change in the number of sexually mature individuals producing viable offspring to an extent that changes in nesting trends will occur. Therefore, we do not believe the proposed action will cause an appreciable reduction in the likelihood of survival.

As to whether the proposed action will appreciably reduce the species' likelihood of recovery, 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. Yet, in 2013 through 2014, there was a second significant decline, with only 16,385 and 11,279 nests recorded, respectively, which would equate to 6,554 nesting females in 2013 (16,385 / 2.5) and 4,512 in 2014 (11,279 / 2.5). Nest counts increased in the last two years, but they did not reach 25,000 by 2016; however, it is clear that the population has increased over the last 2 decades (Figure 5). The increase in Kemp's ridley sea turtle nesting 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).

The lethal take of up to 10 Kemp's ridley sea turtle during any consecutive 3-year period by the proposed action will result in a reduction in numbers and reproduction, but it is unlikely to have any detectable influence on the nesting trends noted above. Given a nesting population in the thousands, the projected loss is not expected to have any discernable impact to the species. Non-lethal takes of sea turtles would not affect the adult female nesting population or number of nests per nesting season. Thus, we believe the proposed action will not result in an appreciable reduction in the likelihood of Kemp's ridley sea turtles' recovery in the wild.

8.2.1 Jeopardy Analysis Conclusion for Kemp's ridley Sea Turtle

Based on the analysis above, we conclude that the lethal take of up to 10 and the non-lethal take of up to 20 Kemp's ridley sea turtles associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of this species in the wild.

8.3 NWA DPS of Loggerhead Sea Turtle

The proposed action is anticipated to result in the capture of up to 3 loggerhead sea turtles during any consecutive 3-year period (Table 8). Of the anticipated 3 captures, 2 will be non-lethal, meaning the animal may be captured and released immediately alive with no anticipated mortality or be taken to a rehabilitation center and released later in time after recovery with no anticipated mortality. Injuries resulting from non-lethal captures are unlikely to affect the reproductive potential, fitness, or growth of the captured animal because (1) it will be released immediately unharmed in the same general area shortly after capture, (2) it will be rehabilitated and released alive later, or (3) it will strand alive later as a result of injuries, subjecting it to rescue, rehabilitation, and eventual release as a viable member of its population. For these reasons, non-lethal captures are not expected to have any measurable impact on the numbers, reproduction, or distribution of loggerhead sea turtle populations in the wild. The 1 lethal capture of loggerhead sea turtle may occur The animal may be (1) captured at the pier and die from its injuries before it can be released alive, (2) captured at the pier, released alive, and expected to die from its injuries at a later time (i.e., suffer post-release mortality), (3) captured at the pier and transported to a rehabilitation center only to die in captivity at a later time due to its injuries, or (4) captured at the pier and transported to a rehabilitation center but is unable to be released back into the wild population due to its injuries.

The lethal take of 1 loggerhead sea turtle from the NWA DPS will result in a reduction in both numbers (the individual lethally taken) and reproduction as a result of lost reproductive potential, as the individual could be a female who could have survived other threats and reproduced in the future, thus eliminating the female's contribution to future generations. 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. Because the potential fishing capture and lethal take would occur in a small, discrete action area, and the NWA DPS of loggerhead sea turtle have large ranges in which they disperse, including along the coast of the United States, from southern Virginia to Alabama, where nesting may occur, the distribution of loggerhead sea turtle is expected to be unaffected by the lethal take.

Whether the reduction of 1 loggerhead sea turtle per 3-year period would appreciably reduce the likelihood of survival for loggerheads depends on what effect this reduction in numbers and reproduction would have on overall population sizes and trends. In other words, we consider whether the reduction would be of such magnitude that adverse effects on population dynamics would be appreciable when viewed within the context of the environmental baseline and status of the species. In Section 4.6, 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 2009). 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 turtle is a slow growing, late-maturing species. Because of its longevity, the loggerhead sea turtle requires high survival rates throughout its 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 natural growth rates are low for loggerhead sea turtle, 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 (Chaloupka and Musick 1997b; Crouse et al. 1987; Crowder et al. 1994; Heppell et al. 1995).

NMFS-SEFSC (2009b) estimated the minimum adult female population size for the NW Atlantic DPS in the 2004-2008 timeframe to likely be between approximately 20,000-40,000 individuals (median 30,050), with a low likelihood of being as many as 70,000 individuals. Another 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 less than 1 million.

NMFS-NEFSC (2011) preliminarily estimated the loggerhead population in the Northwestern Atlantic Ocean along the continental shelf of the Eastern Seaboard during the summer of 2010 at 588,439 individuals (estimate ranged from 381,941 to 817,023) based on positively identified individuals. The NMFS-NEFSC’s point estimate increased to approximately 801,000 individuals when including data on unidentified sea turtles that were likely loggerheads. The NMFS-NEFSC (2011) underestimates the total population of loggerheads since it did not include Florida’s east coast south of Cape Canaveral or the Gulf of Mexico, which are areas where large numbers of loggerheads are also expected. In other words, it provides an estimate of a subset of the entire population.

Florida accounts for more than 90% of U.S. loggerhead nesting. The Florida Fish and Wildlife Conservation Commission conducted a detailed analysis of Florida's long-term loggerhead nesting data (1989-2016). They indicated that following a 24% increase in nesting between 1989 and 1998, nest counts declined sharply from 1999 to 2007. However, annual nest counts showed a strong increase (71%) from 2008 to 2016. Examining only the period between the high-count nesting season in 1998 and the most recent nesting season (2016), researchers found a slight but nonsignificant increase, indicating a reversal of the post-1998 decline. The overall change in counts from 1989 to 2016 was significantly positive; however, it should be noted that wide confidence intervals are associated with this complex data set (http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/).

Abundance estimates accounting for only a subset of the entire loggerhead sea turtle population in the western North Atlantic indicate the population is large (i.e., several hundred thousand individuals). Nesting trends have been significantly increasing over several years against the background of the past and ongoing human and natural factors (environmental baseline) that have contributed to the current status of the species. Additionally, our estimate of future captures is not a new source of impacts on the species. The same or a similar level of captures has occurred in the past, yet we have still seen positive trends in the status of this species.

With respect to whether the proposed action would appreciably reduce the likelihood of the species' recovery, we evaluated the Services' recovery plan for the Northwest Atlantic population of the loggerhead sea turtle (NMFS and USFWS 2008b), which is the same population of sea turtles as the NWA DPS. The recovery plan 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 objectives of the recovery plan most pertinent to the threats posed by the proposed actions are Recovery Objectives Nos. 1 and 2:

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 No. 1, 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. Although any continuing mortality in what might be an already declining population can affect the potential for population growth, we believe 1 loggerhead mortality during any consecutive 3-year period from the proposed action will not impede or prevent achieving Recovery Objective No. 1.

Currently, there are not enough data to determine if Recovery Objective No. 2 is being met. In particular, data specific to loggerhead juvenile abundance is sparse. Therefore, research focusing on adults and nesting trends provides some alternative data to assess the status of juveniles. The nesting trends of the NWA DPS of loggerhead sea turtles remains slightly negative, although as mentioned above the trend has likely stabilized. Overall, loggerhead populations still have to make significant gains before the population decline is reversed and numerical increases in population meet the goals of the recovery plan. Because of high inter-annual variation in nesting and stranding data, and due to the relatively long-term lens needed to discern species recovery for the NWA population of loggerheads, recovery trends are assessed over decades. As with Recovery Objective No. 1, continuing mortality in what might still be a declining population combined with the 1 mortality from the proposed action would not impede or prevent achieving Recovery Objective No. 1 over the anticipated 50- to 150-year time frame. Thus, we believe the lethal take of 1 NWA sea turtle as a result of the proposed action will not impede recovery or significantly add to any negative recovery trend for this DPS.

8.3.2 Jeopardy Analysis Conclusion for Loggerhead Sea Turtle
Based on the analysis above, we conclude that, the loss of 2 NWA DPS (1 lethal, 1 non-lethal) loggerhead sea turtles over any consecutive 3-year period from the proposed action would not be expected to cause an appreciable reduction in the likelihood of either the survival or recovery of this species in the wild.

9. 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 likely to adversely affect, but not likely to jeopardize the continued existence of the NA DPS of green sea turtle, the SA DPS of green sea turtle, Kemp's ridley sea turtle, or the NWA DPS of loggerhead sea turtle.

10. 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.

10.1 Anticipated Amount or Extent of Incidental Take

Based on the above information and analyses, NMFS believes that the proposed action will adversely affect NA DPS green sea turtles, SA DPS green sea turtles, Kemp's ridley sea turtles, and loggerhead sea turtles. These effects will result from capture on hook-and-line and entanglement in fishing line or debris. NMFS anticipates the following incidental takes may occur in the future as a result of the proposed action. We anticipate these levels of take will occur over any consecutive 3-calendar-year periods (i.e., 2017-2019, 2018-2020, 2019-2021, etc.). The take estimates by species and DPS are shown in Table 9 below.

Table 10. Estimated Take at Quintana Pier by Species and Distinct Population Segment (DPS) for Any 3-Year Period

Sea Turtle Species (DPS)	Estimated Total Take	Estimated Lethal Take	Estimated Non-lethal Take
Green (NA DPS)	2	1	1
Green (SA DPS)	1	0	1
Kemp's ridley	31	11	20
Loggerhead (NWA DPS)	3	1	2

10.2 Effect of Take

NMFS has determined the anticipated incidental take is not likely to jeopardize the continued existence of the NA DPS of green sea turtle, the SA DPS of green sea turtle, Kemp's ridley, and the NWA DPS of loggerhead sea turtle.

10.3 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 applicants (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 RPMs and associated terms and conditions are necessary and appropriate to minimize impacts of the incidental take of sea turtles related to the proposed action.

1. The USACE must ensure that the applicant provides take reports regarding all interactions with protected species at this fishing pier. Reports shall be forwarded to NMFS.
2. The USACE must ensure that the applicant minimizes the likelihood of injury or mortality resulting from hook-and-line capture or entanglement by activities at this fishing pier.
3. The USACE must ensure that the applicant reduces the impacts to incidentally captured sea turtles.
4. The USACE must ensure that the applicant coordinates periodic fishing line removal (cleanup) events with a local non-governmental or other organization.

10.4 Terms and Conditions (T&Cs)

The following T&Cs implement the above RPMs:

1. To implement RPM No. 1, USACE must make it a condition of their permit that the applicant reports all hook-and-line captures of sea turtles at Quintana Pier to the NMFS's Southeast Regional Office.
    a. Within 24 hours, the applicant must notify NMFS by email (takereport.nmfsser@noaa.gov) that the capture has occurred. Emails must reference

this Opinion by the respective identifier number SER-2017-18384 (Quintana Pier Restoration and Extension) and date of issuance. The email shall also state the type of species captured, date and time of capture, general location and activity resulting in capture (i.e., fishing from the pier by hook-and-line), condition of the sea turtle (i.e., alive, dead, sent to rehabilitation), size of the individual, behavior (i.e., carapace length), identifying features (i.e., presence of tags, scars, or distinguishing marks), and any photos that may have been taken.

   b. Reports must also be provided on an annual basis. These reports shall be emailed to NMFS's Southeast Regional Office (takereport.nmfsser@noaa.gov) with the following information: the total number of sea turtle captures, entanglements, and strandings that occurred at or adjacent to the pier included in this Opinion. The report must include the same details listed in T&C No. 1, above.

2. To implement RPM No. 2, USACE must make it a condition of their permit that the applicant installs the NMFS Protected Species Educational Signs "Save the Sea Turtles, Sawfish, and Dolphins" sign at the entrance to and terminal end of each side of the T-head. The applicant stated that informational signs will be displayed on the pier, educating the public on safe fishing practices that will reduce or prevent sea turtle injuries and who to notify in the event a dead, injured, or entangled sea turtle is located (see Description of the Proposed Action [Section 3.1]). 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. The applicant shall email photographs of installed signs to USACE and NMFS. Signs shall be installed during or post-construction, but prior to opening the pier for operation to the public.
3. To implement RPM No. 2, USACE must make it a condition of their permit that the applicant install and maintain monofilament recycling bins and trash receptacles at the piers to reduce the probability of trash and debris entering the water. This means periodically emptying the bins and trash receptacles and making sure they are functional and upright. The applicant has agreed to place monofilament recycling bins on the fishing where fishing is permitted (Description of the Proposed Action [Section 3.1]). The applicant shall email photographs of the installed bins and receptacles to the USACE and NMFS.
4. To implement RPM No. 3, USACE must make it a condition of their permit that the applicant report incidentally captured sea turtles and that are taken to a rehabilitation facility holding an appropriate U.S. Fish and Wildlife Native Endangered and Threatened Species Recovery permit. The applicant shall submit reports on turtles taken to rehabilitation facilities to the USACE and to NMFS every 3 years.
5. To implement RPM No. 4, USACE shall make it a condition of their permit that the applicant contact volunteer groups to aid with in-water and out-of-water pier cleanup on an annual/biennial basis around the Quintana Pier. The applicant will allow, and aid as needed, volunteer annual/biennial fishing debris cleanups the pier (Description of the Proposed Action [Section 3.1]). Project Aware (http://www.projectaware.org/action/diving-against-debris-port-aransas-texas) and Sea Grant Texas (https://mrrp.tamu.edu/) offer such volunteer groups. Reports of the each cleaning event should be submitted to the USACE and to NMFS with the NMFS PRD number for this Opinion and the respective identifier number SER-2017-18384 (Quintana Pier Restoration and Extension).

11. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are designed to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

NMFS believes the following conservation recommendations further the conservation of the listed species that will be affected by the USACE's proposed action. NMFS strongly recommends that these measures be considered and implemented by USACE:

1. USACE encourages the Texas sea turtle rehabilitation centers to work with other southeastern U.S. sea turtle rehabilitation facilities on the best handling techniques, data collection and reporting, and public outreach.
2. USACE encourages 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.

12. REINITIATION OF CONSULTATION

As provided in 50 CFR Section 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if (1) the amount or extent of taking specified in the ITS is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the identified action is subsequently modified in a manner that causes an effect to 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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