UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
https://www.fisheries.noaa.gov/region/southeast

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Carmen G. Roman
Project Manager, Antilles Permits Section
Jacksonville District Corps of Engineers
Department of the Army
Fund. Angel Ramos Annex Building, Suite 202
383 F.D. Roosevelt Avenue
San Juan, Puerto Rico 00918

Ref: Puerto Rico Infrastructure Financing Authority, Humacao Fishing Pier Replacement, SAJ-1994-01597, Punta Santiago Ward, Municipality of Humacao, Puerto Rico

Dear Carmen G. Roman,

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. The Opinion considers the effects of a proposal by the United States Army Corps of Engineers (USACE) to authorize the removal and replacement of an existing fishing pier. We base this Opinion on project-specific information provided in the consultation package, NMFS's review of published literature, and the best available data. This Opinion analyzes the potential for the project to affect the following: green sea turtle (North Atlantic and South Atlantic distinct population segments [DPSs]), hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), scalloped hammerhead (Central and Southwest Atlantic DPS), Nassau grouper, giant manta ray, and Acropora (elkhorn and staghorn coral) designated critical habitat (Puerto Rico Area).

We look forward to further cooperation with the USACE on other projects to ensure the conservation and recovery of our threatened and endangered marine species. This project has been assigned the tracking number SERO-2021-01132 in our NMFS Environmental Consultation Organizer (ECO). Please refer to the ECO number in all future inquiries regarding this consultation. If you have any questions regarding this consultation, please contact Dana M. Bethea, Consultation Biologist, by email at Dana.Bethea@noaa.gov.

Sincerely,

BERNHART.DAVID.M.1066125889
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for Andrew J. Strelcheck
Regional Administrator

Enclosure: Biological Opinion
File: 1514-22.f.9

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency: United States Army Corps of Engineers

Applicant: Jose Basora, Puerto Rico Infrastructure Financing Authority

Activity: Humacao Fishing Pier Replacement

SAJ-1994-01597

Consulting Agency: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida

Tracking Number: SERO-2021-01132
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Approved by:

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for Andrew J. Strelcheck, Regional Administrator
NMFS, Southeast Regional Office
St. Petersburg, Florida

Date Issued: 10/26/2021

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Acronyms and Abbreviations

ADA	Americans with Disabilities Act
BIRNM	Buck Island Reef National Monument
CCL	Curved Carapace Length
CFR	Code of Federal Regulations
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPUE	Catch per unit effort
CRs	Conservation Recommendations
cSEL	Cumulative Sound Exposure Level
DDT	Dichlorodiphenyltrichloroethane
DO	Dissolved Oxygen
DPS	Distinct Population Segment
DWH	*Deepwater Horizon*
DTRU	Dry Tortugas Recovery Unit
ECO	NOAA Fisheries Environmental Consultation Organizer
E	Listed as Endangered under the ESA
ESA	Endangered Species Act
FGBNMS	Flower Garden Banks National Marine Sanctuary
MSFP	Fibropapillomatosis disease
FR	Federal Register
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Fish and Wildlife Research Institute
GADNR	Georgia Department of Natural Resources
GCRU	Greater Caribbean Recovery Unit
IPCC	Intergovernmental Panel on Climate Change
ITS	Incidental Take Statement
LAA	Likely to Adversely Affect
LED	Light Emitting Diode
MHW	Mean High Water
MMF	Marine Megafauna Foundation
MRIP	NMFS Marine Recreational Information Program
NA DPS	North Atlantic DPS of the green sea turtle
NCWRC	North Carolina Wildlife Resources Commission
NE	No Effect
NGMRU	Northern Gulf of Mexico Recovery Unit
NLAA	Not Likely to Adversely Affect
NMFS	National Marine Fisheries Service

NOAA	National Oceanic and Atmospheric Administration
NRU	Northern Recovery Unit
NWA DPS	Northwest Atlantic DPS of the loggerhead sea turtle
Opinion	Biological Opinion
PCB	Polychlorinated Biphenyls
PFC	Perfluorinated Chemicals
PFRU	Peninsular Florida Recovery Unit
PLL	Pelagic Longline Fishery
PRD	NMFS Protected Resources Division
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PRM	Post-release mortality
RPMs	Reasonable and Prudent Measures
SA DPS	South Atlantic DPS of the green sea turtle
SCDNR	South Carolina Department of Natural Resources
SCL	Straight Carapace length
SERO	NMFS Southeast Regional Office
SSRIT	Smalltooth Sawfish Recovery Implementation Team
STSSN	Sea Turtle Stranding and Salvage Network
T	Listed as Threatened under the ESA
T&Cs	Terms and Conditions
TED	Turtle Exclusion Device
TEWG	Turtle Expert Working Group
TL	Total Length
UPR	University of Puerto Rico
U.S.	United States of America
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

Units of Measure

ac	Acres
°C	Degrees Celsius
cm	Centimeter(s)
°F	Degrees Fahrenheit
ft	Foot/feet
ft^2	Square foot/feet
g	Gram(s)
in	Inch(es)
kg	Kilogram(s)
lb	Pound(s)
m	Meter(s)
mi	Miles(s)
mm	Millimeter(s)
mt	Metric Ton(s)
oz	Ounce(s)

Introduction

Section 7(a)(2) of the 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 NMFS or the USFWS, depending upon the protected species or critical habitat 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 measures that the action agency must take to reduce the effects of the anticipated 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 document represents NMFS's Opinion based on our review of effects associated with the USACE's proposed action to permit the removal and replacement of the Humacao Fishing Pier in Punta Santiago Ward, Municipality of Humacao, Puerto Rico. This Opinion analyzes the proposed actions' effects on threatened and endangered species and designated critical habitat in accordance with Section 7 of the ESA. We based our Opinion on information provided by the USACE, the STSSN, the SSRIT encounter database, the MMF, the PRDNER and MRIP datasets, and the published literature cited herein.

1. CONSULTATION HISTORY

The following is the consultation history for NMFS ECO tracking number SERO-2021-01132 Humacao Fishing Pier Replacement.

On April 5, 2021, NMFS received a request for consultation under Section 7 of the ESA from USACE in a letter dated April 5, 2020.

On May 13, 2021, NMFS requested additional information from the USACE. NMFS received response on May 14, 2020.

On June 1, 2021, NMFS sought information from the PRDNER related to ESA-listed fish species in the project area. We received final response on June 2, 2021.

On June 2, 2021, NMFS sought information from the PRDNER related to nesting sea turtles in the project area.

On July 8, 2021, NMFS conferred internally on which ESA-listed species may be included in the Opinion given the lack of available data.

On August 4, 2021, NMFS conferred internally on the largest radius of behavioral noise effects to ESA-listed species based on the proposed action. On August 4, 2021, NMFS also followed-up to our June 2, 2021, request for information related to nesting sea turtles in the project area.

On August 5, 2021, NMFS provided the USACE with a draft of Section 2. USACE supplied edits to the draft on August 6, 2021.

On August 18, 2021, NMFS conferred internally on potential effects to Nassau grouper.

On August 17, 2021, NMFS followed-up to our June 2, 2021, request for information related to nesting sea turtles in the project area.

On August 25, 2021, NMFS received response from the PRDNER regarding nesting sea turtles in the project area.

On August 25 and 26, 2021, NMFS conferred with the PRDNER on construction conditions related to minimizing potential effects to nesting sea turtles and emerging hatchlings.

On August 26, 2021, NMFS requested additional information from the USACE related to additional construction conditions to minimize effects to nesting sea turtles and emerging hatchlings. We received response September 1, 2021, and initiated consultation that day.

On October 12-14, 2021, NMFS conferred internally on potential effects to scalloped hammerhead shark given the lack of available data.

2. DESCRIPTION OF THE PROPOSED ACTION

2.1 Proposed Action

The USACE seeks to authorize the Puerto Rico Infrastructure Financing Authority (the applicant) to remove and replace the Humacao Fishing Pier within the same footprint.

The applicant proposes to:

1. Demolish the 534-ft-long by 28-ft-wide existing pier (including the whole pier, access ramp, pilasters and pilings, which accounts to an area of approximately 0.3 ac), and
2. Construct a new pier 447-ft-long with widths of 21-ft and 38-ft.

Demolition will be conducted from barges. One barge will carry a crane with a demolition ball, a clamshell bucket and a backhoe loader (to assist the crane and extract the demolished material). A second barge will be used to carry the demolished material to disposal site near the project site. The existing pilings will be pulled by the crane. If any existing piles cannot be removed completely, then they will be cut 18-in from the sea bottom surface and left in place.

The new pier will be built in the same footprint of the existing pier. The construction method for the pier will be from shore-to-ocean in a top-down manner. All structural members will be installed from the top of the constructed section, minimizing the impacts that could result from the use of barges in this phase. The platform from where the heavy machinery (mostly cranes) will be working will be made of wood panels over the prefabricated concrete pilasters. With this methodology, the crane and other machinery will be supported by the pier structure that is under construction. The new pier will require 68 new 24-in metal piles to be installed via impact hammer, using a wooden cushion block. A maximum of 4 piles will be installed per day.

The project is expected to take 265 days to complete, during daylight hours only. Upon reopening to the public, the new pier will not have fishing cleaning stations or an attendant on site.

2.1.1 Construction Conditions

The applicant will comply with the NMFS's *Protected Species Construction Conditions* (NMFS 2021).

The applicant shall install floating turbidity barriers with weighted skirts that extend to the bottom around all work areas that are in, or adjacent to, surface waters. The turbidity barriers shall remain in place and be maintained until the authorized work has been completed and all suspended and erodible materials have been stabilized.

To minimize potential impacts to ESA-listed species, USACE will add the following conditions to the permit to be followed during construction (adapted from the Biological Opinion on the Authorization of Minor In-Water Activities throughout the Geographic Area of Jurisdiction of the U.S. Army Corps of Engineers Jacksonville District, including Florida and the U.S. Caribbean [JAXBO, SER-2015-17616], issued November 20, 2017.):

- The existing parking lot will be used for delivery and storage of the majority of construction material and equipment; construction equipment will be kept off the beaches as much as possible.

- Construction will be conducted in a shore-to-ocean, top-down manner.

- Pile driving will not occur September 1 – October 31 to avoid potential noise impacts to nesting sea turtles.

- The applicant will coordinate with the with PRDNER to perform early morning (i.e., sunrise to 9 am) monitoring for sea turtle nesting evidence before any pile-driving, regardless of time of year.
    - If a sea turtle nest is found within 0.5 mi of the pier (based on the closest nest recorded by PDNER and the extent of in-water noise effects [see Section 3.1]), work will not begin until the proper mitigation measures have been put in place.
    - Prior to construction resuming, the turtle nest will be properly marked and fenced off. Based on the nest location, PRDNER will make a determination of whether construction can safely resume or if restrictions and/or alterations to the pile-driving activities need to be made.
    - Once the mitigating measures have been finalized, the engineer and contractor will meet with the PRDNER to discuss the new construction procedures.

- Prior to the onset of construction activities, the applicant, or designated agent, will conduct a meeting with all construction staff to discuss field identification of sea turtles, marine mammals, and sturgeon, their protected status, what to do if any are observed within the project area, and applicable penalties that may be imposed if State or Federal regulations are violated. All personnel shall be made aware that there are civil and criminal penalties for harming, harassing, or killing ESA-listed species or marine mammals.

- All construction personnel must watch for and avoid collision with ESA-listed species. Vessel operators must avoid potential interactions with protected species and operate in accordance with the following protective measures:
    - All vessels associated with the construction project shall operate at "Idle Speed/ No Wake" at all times while operating in water depths where the draft of the vessel provides less than a 4-ft-clearance from the bottom, and in all depths after a protected species has been observed in and has departed the area.
    - All vessels will follow marked channels and routes using the maximum water depth whenever possible.
    - Operation of any mechanical construction equipment, including vessels, shall cease immediately if a listed species is observed within a 50-ft radius of construction equipment and shall not resume until the species has departed the area of its own volition.

  - If the detection of species is not possible during certain weather conditions (e.g., fog, rain, wind), then in-water operations will cease until weather conditions improve and detection is again feasible.

- Any collision(s) with or injury to any ESA-listed species occurring during the construction shall be reported immediately to NMFS PRD at (1-727-824-5312) or by email to takereport.nmfsser@noaa.gov. Reports must reference the ECO tracking number: SERO-2021-01132.

2.1.2 Best Management Practices

To minimize potential impacts to ESA-listed species upon completion of the project, USACE will add the following best management practices to the permit to be followed by the applicant post-construction:

- Coordinate an agreement with the PRDNER, as needed, for the rehabilitation of recreational hook-and-line sea turtle captures. Contact information for the PRDNER is: Mr. Nelson Velázquez; 787-999-2200, nvelazquez@drna.pr.gov.

- Fishing line recycling receptacles and trash receptacles with lids will be maintained in order to prevent fishing lines from being disposed of in the ocean or on the beaches. Receptacles will be clearly marked and will be emptied regularly to ensure they do not overfill and that fishing lines are disposed of properly.

- If the pier will be lit, all associated lighting will be sea turtle-friendly (i.e., long wavelength amber, orange, or red LED lighting, mounted as low to the ground as possible with shielding structures).

- Upon completion of the renovations, educational sign(s) will be posted in visible location(s), alerting users of listed species in the area. The applicant will place the "Save Dolphins, Sea Turtles, Sawfish, and Manta Rays" sign available for download at the following website: https://www.fisheries.noaa.gov/southeast/consultations/protected-species-educational-signs. This sign is available in English and Spanish.

- The applicant will conduct in-water cleanup around the fishing pier on an as-needed basis.

2.2 Proposed Action Area

The Humacao Fishing Pier is located at state road PR-3, km 75.1, at the end of Aduana Street, Playa de Humacao Sector, Punta Santiago, Municipality of Humacao on the eastern shore of Puerto Rico in the Caribbean Sea (Latitude 18.1636, Longitude -65.7432). There is an existing, derelict 534-ft-long by 28-ft-wide fishing pier on site (**Figure 1**). It provides a platform for recreational fishing. There are no fishing cleaning stations associated with the pier.

A maritime transportation dock for sugar and other goods has existed at the site since 1870. The original dock was rebuilt, improved, and eventually replaced in 1915 by a railway dock. In 1977, 3 ruins of docks existed on site. In 2014, a total remodeling of the fishing pier was carried out. In 2017, the fishing pier sustained damages in from Hurricanes Irma and Maria and has not been operational since.

Figure 1. Image showing the existing Humacao Fishing Pier at Latitude 18.1636, Longitude -65.7432 (©2021 Google Earth)

The applicant estimates that 25 anglers per day, on average, used the fishing pier, depending on weather, tide, and fishing conditions, with an average of 5 to 10 anglers fishing at the same time. Although the main purpose of the pier will be a platform for recreational fishing, the pier also will be used for temporary docking for vessels that transport personal and food/general cargo to and from the adjacent Cayo Santiago Primates Research Facility. After personnel finish daily operation at the research facility, the vessel(s) will be removed from the area. No overnight storage of vessels will be allowed.

The Humacao Fishing Pier will be open to the public 24 hours per day, 7 days a week without schedule restrictions. The fishing pier has never had an attendant and no attendant is proposed upon the completion of renovations. According to the PRDNER database for the years 2000-2019, and confirmed by the NMFS MRIP database, the only ESA-listed fish species under NMFS jurisdiction reported captured at the Humacao Fishing Pier was 1 juvenile scalloped hammerhead shark harvested on May 16, 2003 (G.R. Ferrer, PRDNER, pers. comm. to Consultation Biologist on June 1, 2021). We are not aware of any other encounters of ESA-listed species under our jurisdiction at the Humacao Fishing Pier.

The action area is defined by regulation as all areas to be affected by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for the Humacao Fishing Pier replacement project includes the old pier's physical footprint, the new pier's footprint, the surrounding water accessible to recreational anglers upon completion of the proposed action (i.e., casting distance or approximately 200-ft), and extends to the radius of anticipated effects. The radius of anticipated effects is equivalent to the largest radius of behavioral noise effects on ESA-listed species based on the proposed installation of 24-in-diameter metal piles by impact hammer using a wooden cushion block for noise abatement, which is 2,413 ft (0.46 mi) from the proposed action (**Figure 2**; see noise analysis in Section 3.1).

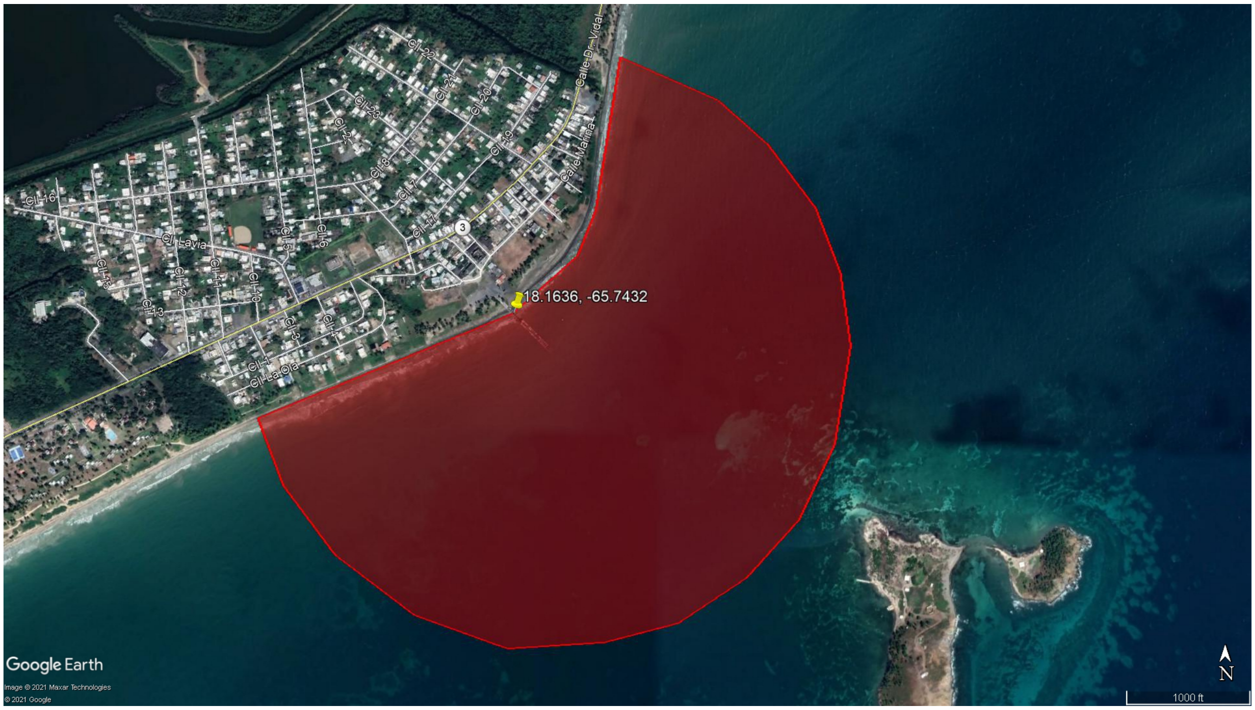

Figure 2. Image showing the extent of the action area based on the largest radius of behavioral noise effects to ESA-listed species due to the proposed action (©2021 Google Earth)

Based on the September 2019 benthic survey report provided by the USACE, unconsolidated sand completely covers the area under the fishing pier and adjacent beachfront areas. Water depth along the pier varies from 1 to 10-ft-deep. There are no seagrasses, ESA-listed corals, hard bottom, or red mangroves within the action area.

On August 25, 2021, the PRDNER provided a report related to sea turtle standings and nesting in the action area (S. Sànchez, PRDNER, pers. comm. to consulting biologist). The action area is located on a known hawksbill and leatherback sea turtle nesting beach; the closest known nest was located 909 m (0.56 mi) from the pier.

The action area is located within the boundary of Acropora (elkhorn and staghorn coral) designated critical habitat (Puerto Rico Area).

3. STATUS OF THE SPECIES AND CRITICAL HABITAT

Table 1 provides the effect determinations for species the USACE and NMFS believe may be affected by the proposed action. Please note abbreviations used in the table below: E = endangered; T = threatened; NLAA = may affect, not likely to adversely affect; LAA = likely to adversely affect; NE = no effect.

Table 1. Effects Determinations for ESA-Listed Species that May Be Affected by the Proposed Action

Species	ESA Listing Status	Action Agency Effect Determination	NMFS Effect Determination
Sea Turtles			
Green (NA DPS)	T	NLAA	LAA
Green (SA DPS)	T	NLAA	LAA
Kemp's ridley	E	NLAA	NE
Leatherback	E	NLAA	NLAA
Loggerhead (NWA DPS)	T	NLAA	LAA
Hawksbill	E	NLAA	LAA
Fish			
Scalloped hammerhead shark (Central and Southwest Atlantic DPS)	T	NLAA	LAA
Nassau grouper	T	NLAA	NE
Giant manta ray	T	NE	LAA

The Humacao Fishing Pier is located in the ocean-facing waters of eastern Puerto Rico. NMFS does not have STSSN data for Puerto Rico. Therefore, we believe it is prudent to use STSSN data from a similar habitat area (i.e., ocean-facing, sandy bottom) for which we have adequate data to help determine which sea turtle species area likely to occur within the action area and may be affected by the proposed action. Zone 26 extends from 27° to 26° North latitude (from Jupiter Island south to Hollywood) along the east coast of Florida (Atlantic Ocean) and meets the similar habitat and adequate data requirements. Therefore, we believe the ocean-facing STSSN data (i.e., all reporting data outside of protected waters) from Zone 26 is the best available data to be used as a proxy for the Humacao Pier in Puerto Rico. Based on this data (**Table 2**), we believe green sea turtle (NA and SA DPSs), hawksbill sea turtle, and loggerhead sea turtle (NWA DPS) may be affected by construction effects as well as recreational fishing that will occur at the pier upon completion of the proposed action (See Section 5.2).

Table 2. Summary of STSSN Offshore Data for Zone 26 (2007-2015)

Species	Number of Sea Known Turtles Stranded or Salvaged (All Activities)	Number of Known Gear Entanglements	Number of Known Recreational Hook-and-line Captures
Green sea turtle	716	73	36

Species	Number of Sea Known Turtles Stranded or Salvaged (All Activities)	Number of Known Gear Entanglements	Number of Known Recreational Hook-and-line Captures
Hawksbill sea turtle	85	9	1
Kemp’s ridley sea turtle	24	3	1
Leatherback sea turtle	17	0	0
Loggerhead sea turtle	376	10	10
Olive ridley sea turtle	1	0	0
Unidentified	17	0	0
Total	**1,236**	**95**	**48**

While Kemp’s ridley sea turtle is represented in the STSSN offshore data for Zone 26, the Humacao Fishing Pier is located outside the primary range and distribution of this species; Kemp’s ridley sea turtles are generally only located in the Gulf of Mexico, with an increasing number of nests located along the U.S. South Atlantic. Therefore, we do not believe this species will be in the action area and will not be affected by any aspect of the proposed action.

The PRDNER provided a report related to sea turtle standings and nesting in the action area (S. Sànchez, PRDNER, pers. comm. to consulting biologist, August 25, 2021). Based on the report, NMFS believes that leatherback sea turtles may be in the action area for nesting and may be affected by construction activities. We do not believe this species will be caught on or entangled in recreational hook and line gear used at the pier; leatherback sea turtles have a pelagic, deepwater life history, where they forage primarily on jellyfish and not baits typically fishing at recreational fishing structures.

NMFS is aware that all life stages of Nassau grouper may be present throughout Puerto Rico; however, we must consider habitat associations for the various life stages when determining whether Nassau grouper may be present in the area affected by the proposed action. Habitats used by small Nassau grouper include a variety of microhabitats (*Laurencia* spp. mats, queen conch shells, tilefish mounds) and more traditional habitats (coral, mangroves, and hard bottom) (Hill and Sadovy de Mitcheson 2013). Habitats used by larger juvenile and adult Nassau grouper include hard bottom, coral, mangroves, and seagrass. We believe the project will have no effect on Nassau grouper because the action area does not contain suitable habitat for this species at any life stage; habitat type in the action area is described as unconsolidated sand.

Scalloped hammerhead shark (Central and Southwest Atlantic DPS) inhabit tropical, subtropical, and temperate bodies of water and are commonly found near productive coastlines. We believe it is prudent to assume that this species would be in or near the action area and may be affected by construction effects as well as recreational fishing that will occur at the pier upon completion of the proposed action. Further, as stated above, we are aware of 1 juvenile scalloped hammerhead harvested (i.e., caught and kept) using recreational fishing gear at the Humacao Fishing Pier. Herein, we use the PRDNER and NMFS MRIP data to determine future recreational hook and line interactions of scalloped hammerhead (Central and Southwest Atlantic DPS) that may occur at the consultation pier (See Section 5.3).

We do not have sightings or encounter data for giant manta ray in Puerto Rico. Given this species inhabits tropical, subtropical, and temperate bodies of water and is commonly found near productive coastlines, we believe it is prudent to assume that this species would be in or near the action area and may be affected by construction effects as well as recreational fishing that will occur at the pier upon completion of the proposed action. In general, NMFS considers potential hook and line capture due to recreational fishing at public fishing structures that are ocean-facing or located in or near inlets/passes likely to adversely affect giant manta ray. Herein, we use the best available MMF data from comparable locations in Florida to determine future recreational hook and line interactions of giant manta ray that may occur at the consultation pier (See Section 5.4).

The project is located within the boundary of Acropora (elkhorn and staghorn coral) designated critical habitat (Puerto Rico Area). The physical feature essential to the conservation of elkhorn and staghorn corals is: substrate of suitable quality and availability to support larval settlement and recruitment, and reattachment and recruitment of asexual fragments. "Substrate of suitable quality and availability" is defined as natural consolidated hard substrate or dead coral skeleton that is free from fleshy or turf macroalgae cover and sediment cover. We do not believe the essential feature may be affected by the proposed action because there is no natural consolidated hard substrate or dead coral skeleton located within the existing or replacement pier's footprint, where adverse effects from construction activities could result. Based on the benthic survey report provided by the USACE, unconsolidated sand completely covers the area under the fishing pier and adjacent beachfront areas.

3.1 Potential Routes of Effect Not Likely To Adversely Affect ESA-Listed Species

Green (NA and SA DPS), hawksbill, leatherback, and loggerhead (NWA DPS) sea turtles, scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray may be injured if struck by equipment or materials during construction activities. However, we believe that such route of effect is extremely unlikely to occur. These species are expected to exhibit avoidance behavior by moving away from physical disturbances. In addition, the applicant will implement NMFS's *Protected Species Construction Conditions*. This will further reduce the risk of injury to these species during construction activities. If at any point, an ESA-listed species is observed within 50 ft of the work site, all construction or operation of any mechanical equipment will cease until the animal has departed the project area on its own volition.

Green (NA and SA DPS), hawksbill, leatherback, and loggerhead (NWA DPS) sea turtles, scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray may also be injured due to entanglement in improperly discarded fishing gear upon completion of the proposed action. We believe this route of effect is extremely unlikely to occur. The applicant will maintain fishing line recycling receptacles and trash cans to keep debris out of the water when the public fishing structure is open for use by the public, and we expect that anglers will appropriately dispose of fishing gear using these bins in the future. The receptacles will be clearly marked and will be emptied regularly to ensure they are not overfilled and that fishing lines are disposed of properly. The applicant will also posted signage that instructs anglers not to dispose of fishing line or debris in the water. Further, to the best of our knowledge, there has never been a reported entanglement with any of these species at the Humacao Fishing Pier.

The action area contains habitat that may be used by green (NA and SA DPS), hawksbill, leatherback, and loggerhead (NWA DPS) sea turtles, scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray. These species may be affected by their inability to access the action area due to their avoidance of construction activities and physical exclusion from the project area due to blockage by turbidity curtains. We believe the effect of temporary loss of habitat access will be insignificant, given the availability of similar habitat nearby, the abundance of habitat outside of the action area, and the temporary nature of the project (i.e., 265 days, during daylight hours only).

Hawksbill and leatherback sea turtles may be affected by their temporary inability to access the in-water or nearshore portion of the project area for nesting habitat due to their avoidance of construction activities and related noise. Due to the construction conditions outlined in Section 2.1.1 above, we anticipate any nesting habitat exclusion effects to these species will be so small as to be unmeasurable and, therefore, insignificant.

The NMFS educational sign “Save the Dolphins, Sea Turtles, Sawfish, and Manta Ray” will be installed in a visible location prior to opening the pier for public use. We believe the placement of educational signs is a beneficial effect to green (NA and SA DPS), hawksbill, leatherback, and loggerhead (NWA DPS) sea turtles, and giant manta ray. The sign will provide information to the public on how to avoid and minimize encounters with these species as well as proper handling techniques. The signs will also encourage anglers to report sightings and interactions, thus providing valuable distribution and abundance data to researchers and resource managers. Accurate distribution and abundance data allows management to evaluate the status of the species and refine conservation and recovery measures.

Finally, noise created by pile driving activities can physically injure animals 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 interfere with animals migrating, feeding, resting, or reproducing, for example. Our evaluation of effects to ESA-listed fish and sea turtles (identified by NMFS as potentially affected in the table above) as a result of noise created by construction activities is based on the analysis prepared in support of the Opinion for SAJ-82 (NMFS. Biological Opinion on Regional General Permit SAJ-82 [SAJ-2007-01590], Florida Keys, Monroe County, Florida. June 10, 2014.). While we have no information regarding noise effects specific to scalloped hammerhead shark or giant manta ray, we believe that effects to these species from pile driving noise would be very similar to effects on smalltooth sawfish (which are considered in SAJ-82), because all are elasmobranchs and lack swim bladders.

Based on our noise calculations, the installation of 24-in metal piles by impact hammer, using a wooden cushion block, will cause single-strike or peak-pressure injury to sea turtles or ESA-listed fish at a radius of 3.8 ft. Because this radius is well within the 50-ft "stop work" radius that will be monitored for all ESA-listed species, we believe that an animal's suffering physical injury from single-strike or peak-pressure is extremely unlikely to occur.

Based on our noise calculations, the cSEL of multiple pile strikes over the course of a day may cause injury to ESA-listed fishes and sea turtles at a radius of up to 172 ft. Due to the mobility of sea turtles and ESA-listed fish species, 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 cumulative noise is extremely unlikely to occur. Thus, we believe the likelihood of any injurious cSEL effects is extremely unlikely to occur. An animal's movement away from the injurious impact zone is a behavioral response, with the same effects discussed below.

Based on our noise calculations, the installation of 24-in metal piles by impact hammer, using a wooden cushion block, could also result in behavioral effects at radii 2,413 ft for ESA-listed fishes and 520 ft for sea turtles. Due to the mobility of sea turtles and ESA-listed fish species, 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.

3.2 Potential Route of Effect Likely To Adversely Affect ESA-Listed Species

NMFS determined that recreational hook-and-line interactions from the completed pier are likely to adversely affect green sea turtle (NA and SA DPS), hawksbill sea turtle, loggerhead sea turtle (NWA DPS), scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray. We provide greater detail on the potential effects of entanglement, hooking, and trailing line to these species in the Effects of the Action below (Section 5.1).

3.3 Status of Sea Turtles

Section 3.3.1 addresses the general threats that confront all sea turtle species. Sections 3.3.2 – 3.3.5 address information on the distribution, life history, population structure, abundance, population trends, and unique threats to each species of sea turtle likely to be adversely affected by the proposed action.

3.3.1 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 ESA-listed sea turtle species. The threats identified in this section are discussed in a general sense for all sea turtles. Threat information specific to a particular species are then discussed in the corresponding Status of the Species where appropriate.

3.3.1.1 Fisheries

Incidental bycatch in commercial fisheries is identified as a major contributor to past declines, and threat to future recovery, for all of the sea turtle species (NMFS and USFWS 1991a; NMFS and USFWS 1992; NMFS and USFWS 1993; NMFS and USFWS 2008; NMFS et al. 2011). 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 U.S. 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 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 U.S., and continue to interact with and kill large numbers of sea turtles each year.

In addition to domestic fisheries, sea turtles are subject to direct as well as incidental capture in numerous foreign fisheries, further impeding the ability of sea turtles to survive and recover on a global scale. For example, pelagic stage sea turtles, especially loggerheads and leatherbacks, circumnavigating the Atlantic are susceptible to international longline fisheries including the Azorean, Spanish, and various other fleets (Aguilar et al. 1994; Bolten et al. 1994). Bottom longlines and gillnet fishing is known to occur in many foreign waters, including (but not limited to) the northwest Atlantic, western Mediterranean, South America, West Africa, Central America, and the Caribbean. Shrimp trawl fisheries are also occurring off the shores of numerous foreign countries and pose a significant threat to sea turtles similar to the impacts seen in U.S. waters. Many unreported takes or incomplete records by foreign fleets make it difficult to characterize the total impact that international fishing pressure is having on listed sea turtles. Nevertheless, international fisheries represent a continuing threat to sea turtle survival and recovery throughout their respective ranges.

3.3.1.2 Non-Fishery In-Water Activities

There are also many non-fishery impacts affecting the status of sea turtle species, both in the ocean and on land. In nearshore waters of the U.S., 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.

3.3.1.3 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 (Witherington 1992) and is often fatal to emerging hatchlings that are drawn away from the water (Witherington and Bjorndal 1991). In-water erosion control structures such as breakwaters, groins, and jetties can impact nesting females and hatchling as they approach and leave the surf zone or head out to sea by creating physical blockage, concentrating predators, creating longshore currents, and disrupting of wave patterns.

3.3.1.4 Environmental Contamination

Multiple municipal, industrial, and household sources, as well as atmospheric transport, introduce various pollutants such as pesticides, hydrocarbons, organochlorides (e.g., DDT, PCBs, and PFCs), 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 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 2015a). Following the spill, juvenile Kemp's ridley, green, and loggerhead sea turtles were found in *Sargassum* algae mats in the convergence zones, where currents meet and oil collected. Sea turtles found in these areas were often coated in oil and/or had ingested oil. The spill resulted in the direct mortality of many sea turtles and may have had sublethal effects or caused environmental damage that will impact other sea turtles into the future. Information on the spill impacts to individual sea turtle species is presented in the Status of the Species sections for each species.

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

3.3.1.5 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 2007c). 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 2007c).

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 2007d). 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, DO levels, nutrient distribution, etc.) could influence the distribution and abundance of lower trophic levels (e.g., phytoplankton, zooplankton, submerged aquatic vegetation, crustaceans, mollusks, forage fish, etc.) which could ultimately affect the primary foraging areas of sea turtles.

3.3.1.6 Other Threats

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

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

3.3.2 Status of Green Sea Turtle – NA and SA DPSs

The green sea turtle was originally listed as threatened under the ESA on July 28, 1978, except for the Florida and Pacific coast of Mexico breeding populations, which were listed as endangered. On April 6, 2016, the original listing was replaced with the listing of 11 DPSs (81 FR 20057 2016) (**Figure 3**). 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 DPSs were listed as threatened. For the purposes of this consultation, only the SA DPS and 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.

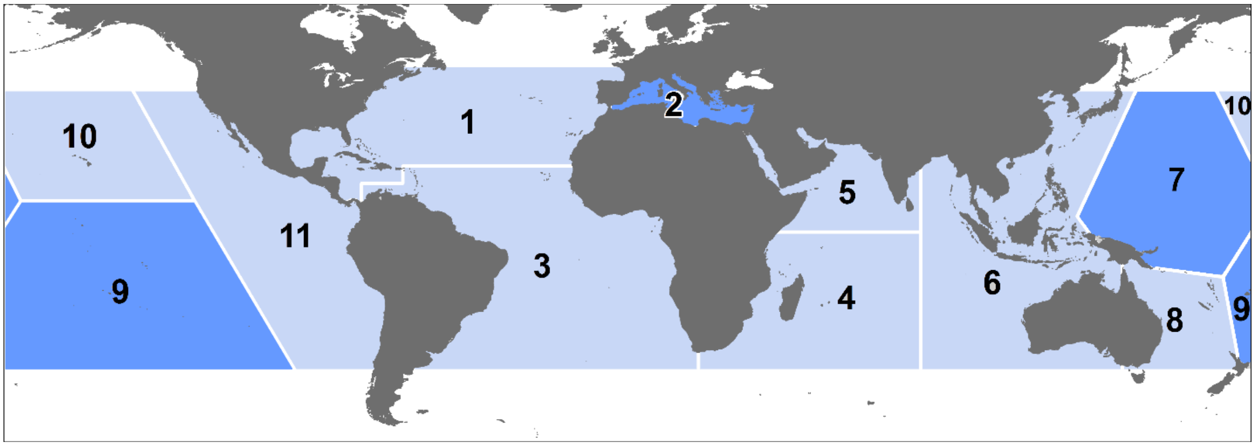

Figure 3. Threatened (light) and endangered (dark) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11.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

3.3.2.1 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 SCL 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

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. 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 1991a). 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

The SA DPS boundary is shown in Figure 2, 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).

3.3.2.2 Life History Information

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

After emerging from the nest, hatchlings swim to offshore areas and go through a post-hatchling pelagic stage where they are believed to live for several years. During this life stage, green sea turtles feed close to the surface on a variety of marine algae and other life associated with drift lines and debris. This early oceanic phase remains one of the most poorly understood aspects of green sea turtle life history (NMFS and USFWS 2007a). Green sea turtles exhibit particularly slow growth rates of about 0.4-2 in (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 in (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 (i.e., a technique used to determine the individual, chronological ages of vertebrates by counting lines of annual growth, within skeletal tissues) 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 1997; 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).

3.3.2.3 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.

North Atlantic DPS

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).

Quintana Roo, Mexico, accounts for approximately 11% of nesting for the DPS (Seminoff et al. 2015). In the early 1980s, approximately 875 nests/year were deposited, but by 2000 this increased to over 1,500 nests/year (NMFS and USFWS 2007e). By 2012, more than 26,000 nests were counted in Quintana Roo (J. Zurita, CIQROO, unpublished data, 2013, in 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 U.S., green sea turtle nesting occurs along the Atlantic coast, primarily along the central and southeast coast of Florida (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 (up to tens of nests) (nesting databases maintained on www.seaturtle.org).

Florida accounts for approximately 5% of nesting for this DPS (Seminoff et al. 2015). 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 3). According to data collected from Florida's index nesting beach survey from 1989-2019, green sea turtle nest counts across Florida have increased dramatically, from a low of 267 in the early 1990s to a high of 40,911 in 2019. 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 resulted in an estimate of the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9% at that time. Increases have been even more rapid in recent years.

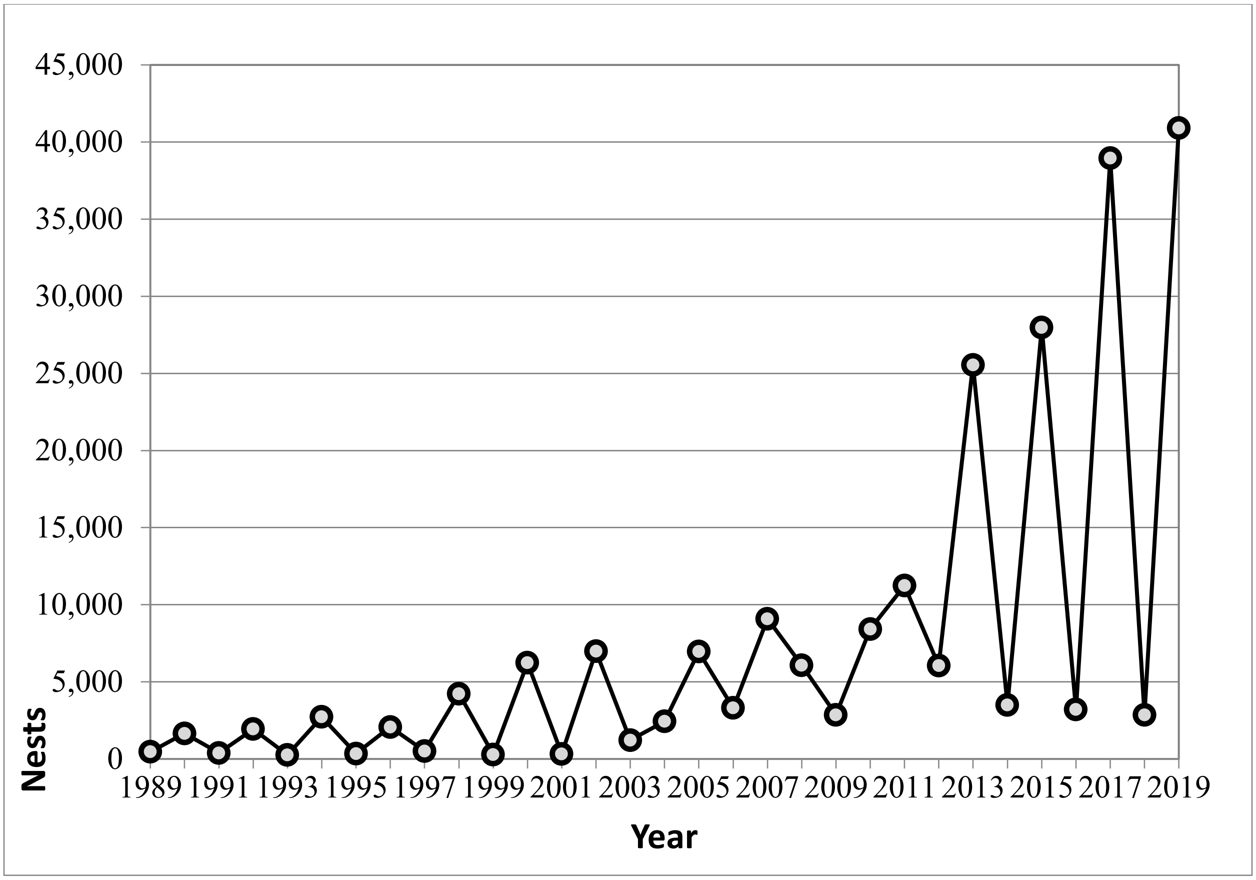

Figure 4. Green sea turtle nesting at Florida index beaches since 1989

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. 2007), and the St Lucie Power Plant site, with a significant increase in the annual rate of capture of immature green turtles (SCL<90 cm) from 1977 to 2002 or 26 years (3,557 green turtles total; M. Bressette, Inwater Research Group, unpublished data; (Witherington et al. 2006).

South Atlantic DPS

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

3.3.2.4 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 U.S., green sea turtles that nest and forage in the region may spend large portions of their life history outside the region and outside U.S. jurisdiction, where exploitation is still a threat. Green sea turtles also face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (e.g., plastics, petroleum products, petrochemicals), ecosystem alterations (e.g., nesting beach development, beach nourishment and shoreline stabilization, vegetation changes), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 3.3.1.

In addition to general threats, green sea turtles are susceptible to natural mortality from FP. 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 in (0.1 cm) to greater than 11.81 in (30 cm) in diameter and may affect swimming, vision, feeding, and organ function (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). Presently, scientists are unsure of the exact mechanism causing this disease, though it is believed to be related to both an infectious agent, such as a virus (Herbst et al. 1995), and environmental conditions (e.g., habitat degradation, pollution, low wave energy, and shallow water (Foley et al. 2005). FP is cosmopolitan, but it has been found to affect large numbers of animals in specific areas, including Hawaii and Florida (Herbst 1994; Jacobson 1990; Jacobson et al. 1991).

Cold-stunning is another natural threat to green sea turtles. Although it is not considered a major source of mortality in most cases, as temperatures fall below 46.4-50 °F (8-10°C) turtles may lose their ability to swim and dive, often floating to the surface. The rate of cooling that precipitates cold-stunning appears to be the primary threat, rather than the water temperature itself (Milton and Lutz 2003). Sea turtles that overwinter in inshore waters are most susceptible to cold-stunning because temperature changes are most rapid in shallow water (Witherington and Ehrhart 1989a). During January 2010, an unusually large cold-stunning event in the southeastern United States resulted in around 4,600 sea turtles, mostly greens, found cold-stunned, and hundreds found dead or dying. A large cold-stunning event occurred in the western Gulf of Mexico in February 2011, resulting in approximately 1,650 green sea turtles found cold-stunned in Texas. Of these, approximately 620 were found dead or died after stranding, while approximately 1,030 turtles were rehabilitated and released. During this same time frame, approximately 340 green sea turtles were found cold-stunned in Mexico, though approximately 300 of those were subsequently rehabilitated and released.

Whereas oil spill impacts are discussed generally for all species in Section 3.3.1, 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 2015b). 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 DWH oil spill, 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 2015b).

3.3.3 Status of Hawksbill Sea Turtle

The hawksbill sea turtle was listed as endangered throughout its entire range on June 2, 1970 (35 FR 8491), under the Endangered Species Conservation Act of 1969, a precursor to the ESA. Critical habitat was designated on June 2, 1998, in coastal waters surrounding Mona and Monito Islands in Puerto Rico (63 FR 46693).

3.3.3.1 Species Description and Distribution

Hawksbill sea turtles are small- to medium-sized (99-150 lb on average [45-68 kg]) although females nesting in the Caribbean are known to weigh up to 176 lb (80 kg) (Pritchard et al. 1983). The carapace is usually serrated and has a “tortoise-shell” coloring, ranging from dark to golden brown, with streaks of orange, red, and/or black. The plastron of a hawksbill turtle is typically yellow. The head is elongated and tapers to a point, with a beak-like mouth that gives the species its name. The shape of the mouth allows the hawksbill turtle to reach into holes and crevices of coral reefs to find sponges, their primary adult food source, and other invertebrates. The shells of hatchlings are 1.7 in (42 mm) long, are mostly brown, and are somewhat heart-shaped (Eckert 1995; Hillis and Mackay 1989; van Dam and Sarti 1989).

Hawksbill sea turtles have a circumtropical distribution and usually occur between latitudes 30°N and 30°S in the Atlantic, Pacific, and Indian Oceans. In the western Atlantic, hawksbills are widely distributed throughout the Caribbean Sea, off the coasts of Florida and Texas in the continental United States, in the Greater and Lesser Antilles, and along the mainland of Central America south to Brazil (Amos 1989; Groombridge and Luxmoore 1989; Lund 1985; Meylan and Donnelly 1999; NMFS and USFWS 1998; Plotkin and Amos 1990; Plotkin and Amos 1988). They are highly migratory and use a wide range of habitats during their lifetimes (Musick and Limpus 1997; Plotkin 2003). Adult hawksbill sea turtles are capable of migrating long distances between nesting beaches and foraging areas. For instance, a female hawksbill sea turtle tagged at BIRNM in St. Croix was later identified 1,160 mi (1,866 km) away in the Miskito Cays in Nicaragua (Spotila 2004).

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

Mitochondrial DNA studies show that reproductive populations are effectively isolated over ecological time scales (Bass et al. 1996). Substantial efforts have been made to determine the nesting population origins of hawksbill sea turtles assembled in foraging grounds, and genetic research has shown that hawksbills of multiple nesting origins commonly mix in foraging areas (Bowen and Witzell 1996). Since hawksbill sea turtles nest primarily on the beaches where they were born, if a nesting population is decimated, it might not be replenished by sea turtles from other nesting rookeries (Bass et al. 1996).

3.3.3.2 Life History Information

Hawksbill sea turtles exhibit slow growth rates although they are known to vary within and among populations from a low of 0.4-1.2 in (1-3 cm) per year, measured in the Indo-Pacific (Chaloupka and Limpus 1997; Mortimer et al. 2003; Mortimer et al. 2002; Whiting 2000), to a high of 2 in (5 cm) or more per year, measured at some sites in the Caribbean (Diez and Van Dam 2002; León and Diez 1999). Differences in growth rates are likely due to differences in diet and/or density of sea turtles at foraging sites and overall time spent foraging (Bjorndal and Bolten 2002; Chaloupka et al. 2004). Consistent with slow growth, age to maturity for the species is also long, taking between 20 and 40 years, depending on the region (Chaloupka and Musick 1997; Limpus and Miller 2000). Hawksbills in the western Atlantic are known to mature faster (i.e., 20 or more years) than sea turtles found in the Indo-Pacific (i.e., 30-40 years) (Boulan 1983; Boulon Jr. 1994; Diez and Van Dam 2002; Limpus and Miller 2000). Males are typically mature when their length reaches 27 in (69 cm), while females are typically mature at 30 in (75 cm) (Eckert et al. 1992; Limpus 1992).

Female hawksbills return to the beaches where they were born (natal beaches) every 2-3 years to nest (Van Dam et al. 1991; Witzell 1983) and generally lay 3-5 nests per season (Richardson et al. 1999). Compared with other sea turtles, the number of eggs per nest (clutch) for hawksbills can be quite high. The largest clutches recorded for any sea turtle belong to hawksbills (approximately 250 eggs per nest) ((Hirth and Latif 1980), though nests in the U.S. Caribbean and Florida more typically contain approximately 140 eggs (USFWS hawksbill fact sheet, http://www.fws.gov/northflorida/SeaTurtles/Turtle%20Factsheets/hawksbill-sea-turtle.htm). Eggs incubate for approximately 60 days before hatching (USFWS hawksbill fact sheet). Hatchling hawksbill sea turtles typically measure 1-2 in (2.5-5 cm) in length and weigh approximately 0.5 oz (15 g).

Hawksbills may undertake developmental migrations (migrations as immatures) and reproductive migrations that involve travel over many tens to thousands of miles (Meylan 1999a). Post-hatchlings (oceanic stage juveniles) are believed to live in the open ocean, taking shelter in floating algal mats and drift lines of flotsam and jetsam in the Atlantic and Pacific oceans (Musick and Limpus 1997) before returning to more coastal foraging grounds. In the Caribbean, hawksbills are known to almost exclusively feed on sponges (Meylan 1988; Van Dam and Diez 1997), although at times they have been seen foraging on other food items, notably corallimorphs and zooanthids (León and Diez 2000; Mayor et al. 1998; Van Dam and Diez 1997).

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

3.3.3.3 Status and Population Dynamics

There are currently no reliable estimates of population abundance and trends for non-nesting hawksbills at the time of this consultation; therefore, nesting beach data is currently the primary information source for evaluating trends in global abundance. Most hawksbill populations around the globe are either declining, depleted, and/or remnants of larger aggregations (NMFS and USFWS 2007b). The largest nesting population of hawksbills occurs in Australia where approximately 2,000 hawksbills nest off the northwest coast and about 6,000-8,000 nest off the Great Barrier Reef each year (Spotila 2004). Additionally, about 2,000 hawksbills nest each year in Indonesia and 1,000 nest in the Republic of Seychelles (Spotila 2004). In the United States, hawksbills typically laid about 500-1,000 nests on Mona Island, Puerto Rico in the past (Diez and Van Dam 2007), but the numbers appear to be increasing, as the Puerto Rico Department of Natural and Environmental Resources counted nearly 1,600 nests in 2010 (PRDNER nesting data). Another 56-150 nests are typically laid on Buck Island off St. Croix (Meylan 1999b; Mortimer and Donnelly 2008). Nesting also occurs to a lesser extent on beaches on Culebra Island and Vieques Island in Puerto Rico, the mainland of Puerto Rico, and additional beaches on St. Croix, St. John, and St. Thomas, U.S. Virgin Islands.

Mortimer and Donnelly (2008) reviewed nesting data for 83 nesting concentrations organized among 10 different ocean regions (i.e., Insular Caribbean, Western Caribbean Mainland, Southwestern Atlantic Ocean, Eastern Atlantic Ocean, Southwestern Indian Ocean, Northwestern Indian Ocean, Central Indian Ocean, Eastern Indian Ocean, Western Pacific Ocean, Central Pacific Ocean, and Eastern Pacific Ocean). They determined historic trends (i.e., 20-100 years ago) for 58 of the 83 sites, and also determined recent abundance trends (i.e., within the past 20 years) for 42 of the 83 sites. Among the 58 sites where historic trends could be determined, all showed a declining trend during the long-term period. Among the 42 sites where recent (past 20 years) trend data were available, 10 appeared to be increasing, 3 appeared to be stable, and 29 appeared to be decreasing. With respect to regional trends, nesting populations in the Atlantic (especially in the Insular Caribbean and Western Caribbean Mainland) are generally doing better than those in the Indo-Pacific regions. For instance, 9 of the 10 sites that showed recent increases are located in the Caribbean. Buck Island and St. Croix’s East End beaches support 2 remnant populations of between 17-30 nesting females per season (Hillis and Mackay 1989; Mackay 2006). While the proportion of hawksbills nesting on Buck Island represents a small proportion of the total hawksbill nesting occurring in the greater Caribbean region, Mortimer and Donnelly (2008) report an increasing trend in nesting at that site based on data collected from 2001-2006. The conservation measures implemented when BIRNM was expanded in 2001 most likely explains this increase.

Nesting concentrations in the Pacific Ocean appear to be performing the worst of all regions despite the fact that the region currently supports more nesting hawksbills than either the Atlantic or Indian Oceans (Mortimer and Donnelly 2008). While still critically low in numbers, sightings of hawksbills in the eastern Pacific appear to have been increasing since 2007, though some of that increase may be attributable to better observations (Gaos et al. 2010). More information about site-specific trends can be found in the most recent 5-year status review for the species (NMFS and USFWS 2007b).

3.3.3.4 Threats

Hawksbills are currently subjected to the same suite of threats on both nesting beaches and in the marine environment that affect other sea turtles (e.g., interaction with federal and state fisheries, coastal construction, oil spills, climate change affecting sex ratios) as discussed in Section 3.3.1.

There are also specific threats that are of special emphasis, or are unique, for hawksbill sea turtles discussed in further detail below.

While oil spill impacts are discussed generally for all species in Section 3.3.1, specific impacts of the DWH spill on hawksbill turtles have been estimated. Hawksbills made up 2.2% (8,850) of small juvenile sea turtle (of those that could be identified to species) exposures to oil in offshore areas, with an estimate of 615 to 3,090 individuals dying as a result of the direct exposure (DWH Trustees 2015b). No quantification of large benthic juveniles or adults was made. 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. Although adverse impacts occurred to hawksbills, the relative proportion of the population that is expected to have been exposed to and directly impacted by the DWH event is relatively low, and thus a population-level impact is not believed to have occurred due to the widespread distribution and nesting location outside of the Gulf of Mexico for this species.

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

The continuing demand for the hawksbills’ shells as well as other products derived from the species (e.g., leather, oil, perfume, and cosmetics) represents an ongoing threat to its recovery. The British Virgin Islands, Cayman Islands, Cuba, Haiti, and the Turks and Caicos Islands (United Kingdom) all permit some form of legal take of hawksbill sea turtles. In the northern Caribbean, hawksbills continue to be harvested for their shells, which are often carved into hair clips, combs, jewelry, and other trinkets (Márquez M. 1990; Stapleton and Stapleton 2006). Additionally, hawksbills are harvested for their eggs and meat, while whole, stuffed sea turtles are sold as curios in the tourist trade. Hawksbill sea turtle products are openly available in the Dominican Republic and Jamaica, despite a prohibition on harvesting hawksbills and their eggs (Fleming 2001). Up to 500 hawksbills per year from 2 harvest sites within Cuba were legally captured each year until 2008 when the Cuban government placed a voluntary moratorium on the sea-turtle fishery (Carillo et al. 1999; Mortimer and Donnelly 2008). While current nesting trends are unknown, the number of nesting females is suspected to be declining in some areas (Carillo et al. 1999; Moncada et al. 1999). International trade in the shell of this species is prohibited between countries that have signed the CITES, but illegal trade still occurs and remains an ongoing threat to hawksbill survival and recovery throughout its range.

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

3.3.4 Status of Loggerhead Sea Turtle – 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 which designated 9 DPSs for loggerhead sea turtles (76 FR 58868, September 22, 2011, and effective October 24, 2011). This rule listed the following DPSs: (1) Northwest Atlantic Ocean (threatened), (2) Northeast Atlantic Ocean (endangered), (3) South Atlantic Ocean (threatened), (4) Mediterranean Sea (endangered), (5) North Pacific Ocean (endangered), (6) South Pacific Ocean (endangered), (7) North Indian Ocean (endangered), (8) Southeast Indo-Pacific Ocean (endangered), and (9) Southwest Indian Ocean (threatened). The NWA DPS is the only one that occurs within the action area, and therefore it is the only one considered in this Opinion.

3.3.4.1 Species Description and Distribution

Loggerheads are large sea turtles. Adults in the southeast United States average about 3 ft (92 cm) long, measured as a SCL, and weigh approximately 255 lb (116 kg) (Ehrhart and Yoder 1978). Adult and subadult loggerhead sea turtles typically have a light yellow plastron and a reddish brown carapace covered by non-overlapping scutes that meet along seam lines. They typically have 11 or 12 pairs of marginal scutes, 5 pairs of costals, 5 vertebrals, and a nuchal (precentral) scute that is in contact with the first pair of costal scutes (Dodd Jr. 1988).

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

The majority of loggerhead nesting occurs at the western rims of the Atlantic and Indian Oceans concentrated in the north and south temperate zones and subtropics (NRC 1990). For the NWA DPS, most nesting occurs along the coast of the United States, from southern Virginia to Alabama. Additional nesting beaches for this DPS are found along the northern and western Gulf of Mexico, eastern Yucatán Peninsula, at Cay Sal Bank in the eastern Bahamas (Addison 1997; Addison and Morford 1996), off the southwestern coast of Cuba (Moncada Gavilan 2001), and along the coasts of Central America, Colombia, Venezuela, and the eastern Caribbean Islands.

Non-nesting, adult female loggerheads are reported throughout the U.S. Atlantic, Gulf of Mexico, and Caribbean Sea. Little is known about the distribution of adult males who are seasonally abundant near nesting beaches. Aerial surveys suggest that loggerheads as a whole are distributed in U.S. waters as follows: 54% off the southeast U.S. coast, 29% off the northeast U.S. coast, 12% in the eastern Gulf of Mexico, and 5% in the western Gulf of Mexico (TEWG 1998).

Within the NWA DPS, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf Coast of Florida. Previous Section 7 analyses have recognized at least 5 western Atlantic subpopulations, divided geographically as follows: (1) a Northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29ºN; (2) a South Florida nesting subpopulation, occurring from 29°N on the east coast of the state to Sarasota on the west coast; (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (Márquez M. 1990; TEWG 2000); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (NMFS 2001).

The recovery plan for the Northwest Atlantic population of loggerhead sea turtles concluded that there is no genetic distinction between loggerheads nesting on adjacent beaches along the Florida Peninsula. It also concluded that specific boundaries for subpopulations could not be designated based on genetic differences alone. Thus, the recovery plan uses a combination of geographic distribution of nesting densities, geographic separation, and geopolitical boundaries, in addition to genetic differences, to identify recovery units. The recovery units are as follows: (1) the NRU (Florida/Georgia border north through southern Virginia), (2) the PFRU (Florida/Georgia border through Pinellas County, Florida), (3) the DTRU (islands located west of Key West, Florida), (4) the NGMRU (Franklin County, Florida, through Texas), and (5) the GCRU (Mexico through French Guiana, the Bahamas, Lesser Antilles, and Greater Antilles) (NMFS and USFWS 2008). The recovery plan concluded that all recovery units are essential to the recovery of the species. Although the recovery plan was written prior to the listing of the NWA DPS, the recovery units for what was then termed the Northwest Atlantic population apply to the NWA DPS.

3.3.4.2 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[1]), (4) juvenile stage (oceanic zone), (5) juvenile stage (neritic zone), (6) adult stage (oceanic zone), (7) adult stage (neritic zone), and (8) nesting female (terrestrial zone) (NMFS and USFWS 2008). Loggerheads are long-lived animals. They reach sexual maturity between 20-38 years of age, although age of maturity varies widely among populations (Frazer and Ehrhart 1985; NMFS 2001). The annual mating season occurs from late March to early June, and female turtles lay eggs throughout the summer months. Females deposit an average of 4.1 nests within a nesting season (Murphy and Hopkins 1984), but an individual female only nests

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

every 3.7 years on average (Tucker 2010). Each nest contains an average of 100-126 eggs (Dodd Jr. 1988) which incubate for 42-75 days before hatching (NMFS and USFWS 2008). Loggerhead hatchlings are 1.5-2-in-long and weigh about 0.7 oz (20 g).

As post-hatchlings, loggerheads hatched on U.S. beaches enter the "oceanic juvenile" life stage, migrating offshore and becoming associated with *Sargassum* habitats, driftlines, and other convergence zones (Carr 1986; Conant et al. 2009; 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, as well as numerous embayments fringing the Gulf of Mexico, comprise important inshore habitat. Along the Atlantic and Gulf of Mexico shoreline, essentially all shelf waters are inhabited by loggerheads (Conant et al. 2009).

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. 2009).

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); GADNR, unpublished data; SCDNR, 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 U.S., and along the north coast of Cuba

(A. Bolten and K. Bjorndal, University of Florida, unpublished data). Moncada et al. (2010) report the recapture of 5 adult female loggerheads in Cuban waters originally flipper-tagged in Quintana Roo, Mexico, which indicates that Cuban shelf waters likely also provide foraging habitat for adult females that nest in Mexico.

3.3.4.3 Status and Population Dynamics

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

Numbers of nests and nesting females can vary widely from year to year. Nesting beach surveys, though, can provide a reliable assessment of trends in the adult female population, due to the strong nest site fidelity of female loggerhead sea turtles, as long as such studies are sufficiently long and survey effort and methods are standardized (e.g., (NMFS and USFWS 2008). NMFS and USFWS (2008) concluded that the lack of change in 2 important demographic parameters of loggerheads, remigration interval and clutch frequency, indicate that time series on numbers of nests can provide reliable information on trends in the female population.

Peninsular Florida Recovery Unit

The PFRU is the largest loggerhead nesting assemblage in the Northwest Atlantic. A near-complete nest census (all beaches including index nesting beaches) undertaken from 1989 to 2007 showed an average of 64,513 loggerhead nests per year, representing approximately 15,735 nesting females per year (NMFS and USFWS 2008). The statewide estimated total for 2017 was 96,912 nests (FWRI nesting database).

In addition to the total nest count estimates, the FWRI uses an index nesting beach survey method. The index survey uses standardized data-collection criteria to measure seasonal nesting and allow accurate comparisons between beaches and between years. This provides a better tool for understanding the nesting trends (**Figure 5**). FWRI performed a detailed analysis of the long-term loggerhead index nesting data (1989-2017; http://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trend/). Over that time period, 3 distinct trends were identified. From 1989-1998, there was a 24% increase that was followed by a sharp decline over the subsequent 9 years. A large increase in loggerhead nesting has occurred since, as indicated by the 71% increase in nesting over the 10-year period from 2007 and 2016. Nesting in 2016 also represented a new record for loggerheads on the core index beaches. FWRI examined the trend from the 1998 nesting high through 2016 and found that the decade-long post-1998 decline was replaced with a slight but nonsignificant increasing trend. Looking at the data from 1989 through 2016, FWRI concluded that there was an overall positive change in the nest counts although it was not statistically significant due to the wide variability between 2012 and 2016, resulting in widening confidence intervals. Nesting at the core index beaches declined in 2017 to 48,033, and rose slightly again to 48,983 in 2018, and then to 53,507 in 2019, which is the 3rd highest total since 2001. However, it is important to note that with the wide confidence intervals and uncertainty around the variability in nesting parameters (changes and variability in nests/female, nesting intervals, etc.) it is unclear whether the nesting trend equates to an increase in the population or nesting females over that time frame (Ceriani, et al. 2019; https://esajournals.onlinelibrary.wiley.com/doi/pdf/10.1002/ecs2.2936).

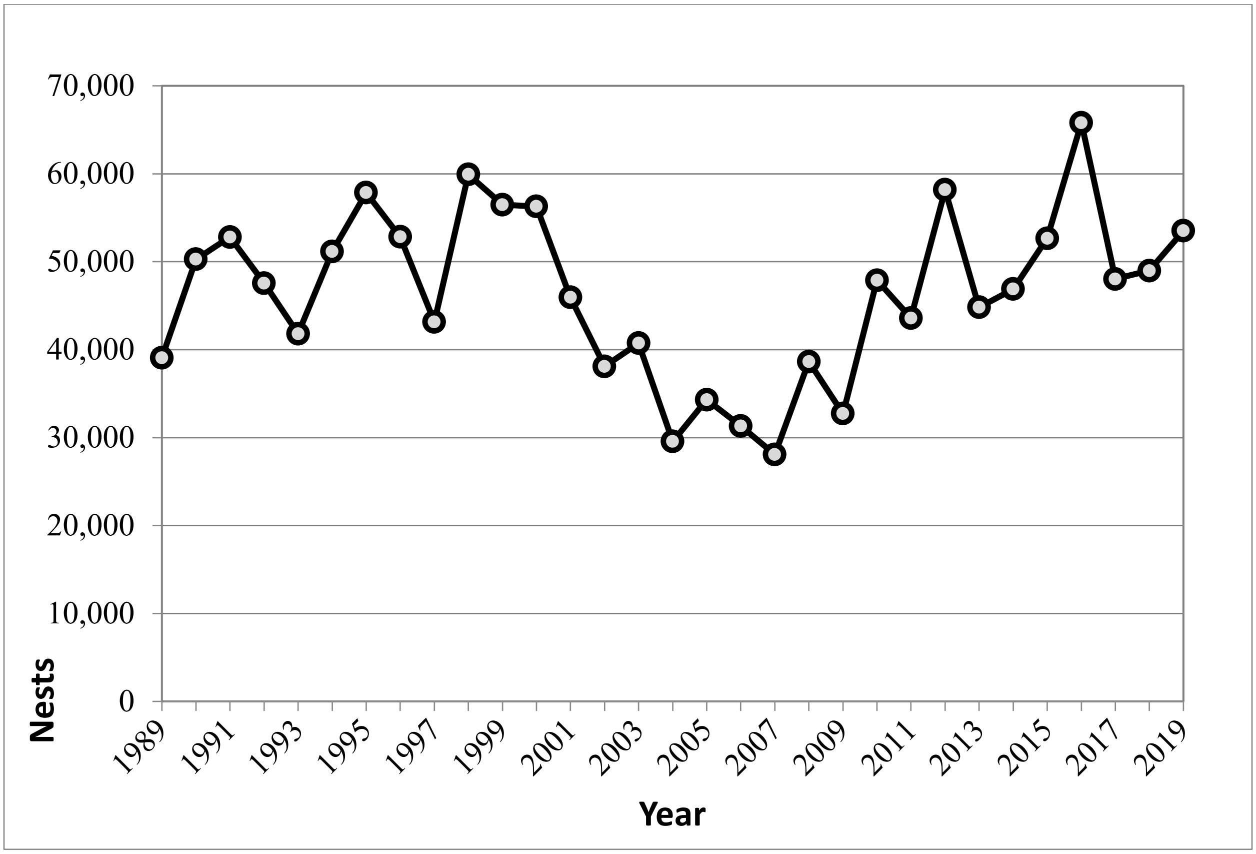

Figure 5. Loggerhead sea turtle nesting at Florida index beaches since 1989

Northern Recovery Unit

Annual nest totals from beaches within the NRU averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (GADNR unpublished data, NCWRC unpublished data, 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 3**) are showing improved nesting numbers and a departure from the declining trend. Georgia nesting has rebounded to show the first statistically significant increasing trend since comprehensive nesting surveys began in 1989 (Mark Dodd, GADNR press release, http://www.georgiawildlife.com/node/3139). South Carolina and North Carolina nesting have also begun to shift away from the past declining trend. Loggerhead nesting in Georgia, South Carolina, and North Carolina all broke records in 2015 and then topped those records again in 2016. Nesting in 2017 and 2018 declined relative to 2016, back to levels seen in 2013 and 2015, but then bounced back in 2019, breaking records for each of the three states and the overall Recovery Unit.

Table 3. Total Number of NRU Loggerhead Nests (GADNR, SCDNR, and NCWRC nesting datasets compiled at Seaturtle.org)

Year	**Georgia**	**South Carolina**	**North Carolina**	**Totals**
2008	1,649	4,500	841	**6,990**
2009	998	2,182	302	**3,472**
2010	1,760	3,141	856	**5,757**
2011	1,992	4,015	950	**6,957**
2012	2,241	4,615	1,074	**7,930**
2013	2,289	5,193	1,260	**8,742**
2014	1,196	2,083	542	**3,821**
2015	2,319	5,104	1,254	**8,677**
2016	3,265	6,443	1,612	**11,320**
2017	2,155	5,232	1,195	**8,582**
2018	1,735	2,762	765	**5,262**
2019	3,945	8,774	2,291	**15,010**

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 2009-2013, with a subsequent steep drop in 2014. Nesting then rebounded in 2015 and 2016, setting new highs each of those years. Nesting in 2017 dropped back down from the 2016 high, but was still the second highest on record (**Figure 6**).

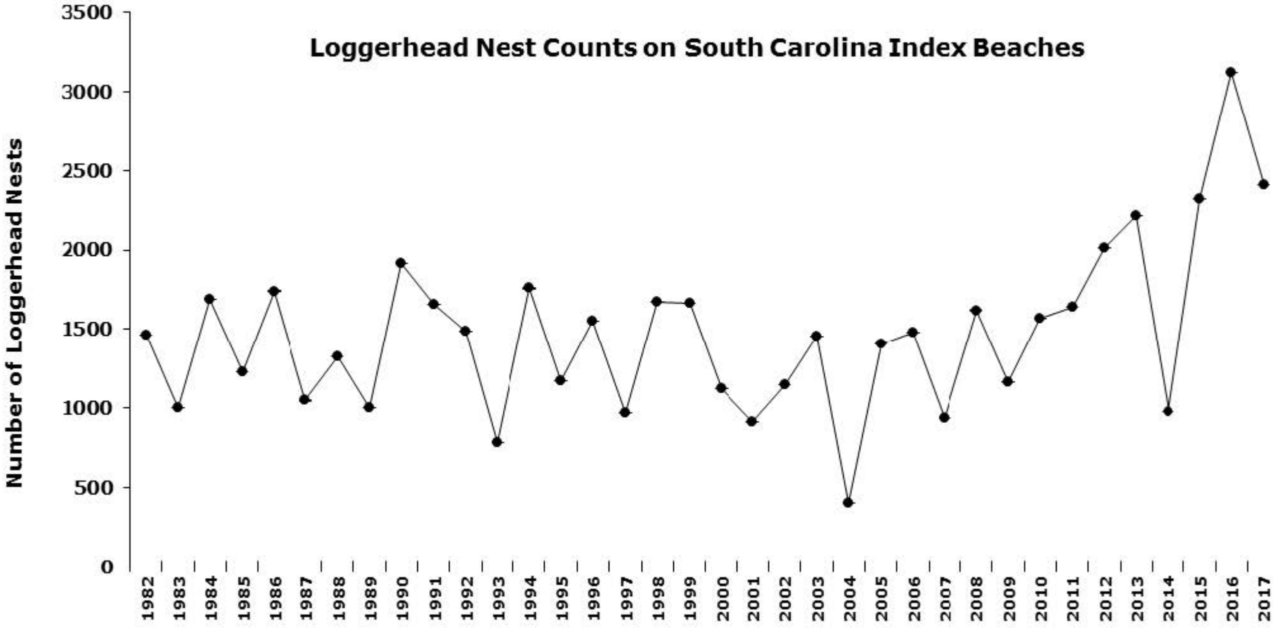

Figure 6. South Carolina index nesting beach counts for loggerhead sea turtles (from the SCDNR website: http://www.dnr.sc.gov/seaturtle/nest.htm)

Other Northwest Atlantic DPS Recovery Units

The remaining 3 recovery units—DTRU, NGMRU, and GCRU—are much smaller nesting assemblages, but they are still considered essential to the continued existence of the species. Nesting surveys for the DTRU are conducted as part of Florida's statewide survey program. Survey effort was relatively stable during the 9-year period from 1995-2004, although the 2002 year was missed. Nest counts ranged from 168-270, with a mean of 246, but there was no detectable trend during this period (NMFS and USFWS 2008). Nest counts for the NGMRU are focused on index beaches rather than all beaches where nesting occurs. Analysis of the 12-year dataset (1997-2008) of index nesting beaches in the area shows a statistically significant declining trend of 4.7% annually. Nesting on the Florida Panhandle index beaches, which represents the majority of NGMRU nesting, had shown a large increase in 2008, but then declined again in 2009 and 2010 before rising back to a level similar to the 2003-2007 average in 2011. Nesting survey effort has been inconsistent among the GCRU nesting beaches, and no trend can be determined for this subpopulation (NMFS and USFWS 2008). Zurita et al. (2003) found a statistically significant increase in the number of nests on 7 of the beaches on Quintana Roo, Mexico, from 1987-2001, where survey effort was consistent during the period. Nonetheless, nesting has declined since 2001, and the previously reported increasing trend appears to not have been sustained (NMFS and USFWS 2008).

3.3.4.4 In-water Trends

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

3.3.4.5 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 20,000-40,000 individuals, with a low likelihood of females' numbering 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).

3.3.4.6 Threats

The threats faced by loggerhead sea turtles are well summarized in the general discussion of threats in Section 3.3.1. 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. 2009).

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. 1991).

While oil spill impacts are discussed generally for all species in Section 4.2.1, specific impacts of the DWH oil spill event on loggerhead sea turtles are considered here. Impacts to loggerhead sea turtles occurred to offshore small juveniles as well as large juveniles and adults. A total of 30,800 small juvenile loggerheads (7.3% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. Of those exposed, 10,700 small juveniles are estimated to have died as a result of the exposure. In contrast to small juveniles, loggerheads represented a large proportion of the adults and large juveniles exposed to and killed by the oil. There were 30,000 exposures (almost 52% of all exposures for those age/size classes) and 3,600 estimated mortalities. A total of 265 nests (27,618 eggs) were also translocated during response efforts, with 14,216 hatchlings released, the fate of which is unknown (DWH Trustees 2015b). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

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

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

3.4 Status of Scalloped Hammerhead Shark – Central and Southwest Atlantic DPS

Four of six identified DPSs of scalloped hammerhead shark (*Sphyrna lewini*) were listed under the ESA by NMFS effective September 2, 2014 (79 FR 38213, July 3, 2014) (**Figure 7**). The Central and Southwest Atlantic and the Indo-West Pacific DPSs were listed as threatened, while the Eastern Atlantic and Eastern Pacific DPSs were listed as endangered. The Central and Southwest Atlantic DPS is bounded to the north by 28°N latitude, to the east by 30°W longitude, and to the south by 36°S latitude. All waters of the Caribbean Sea are within this DPS boundary, including the Bahamas' EEZ off the coast of Florida, the U.S. EEZ off Puerto Rico and the U.S. Virgin Islands, and Cuba's EEZ.

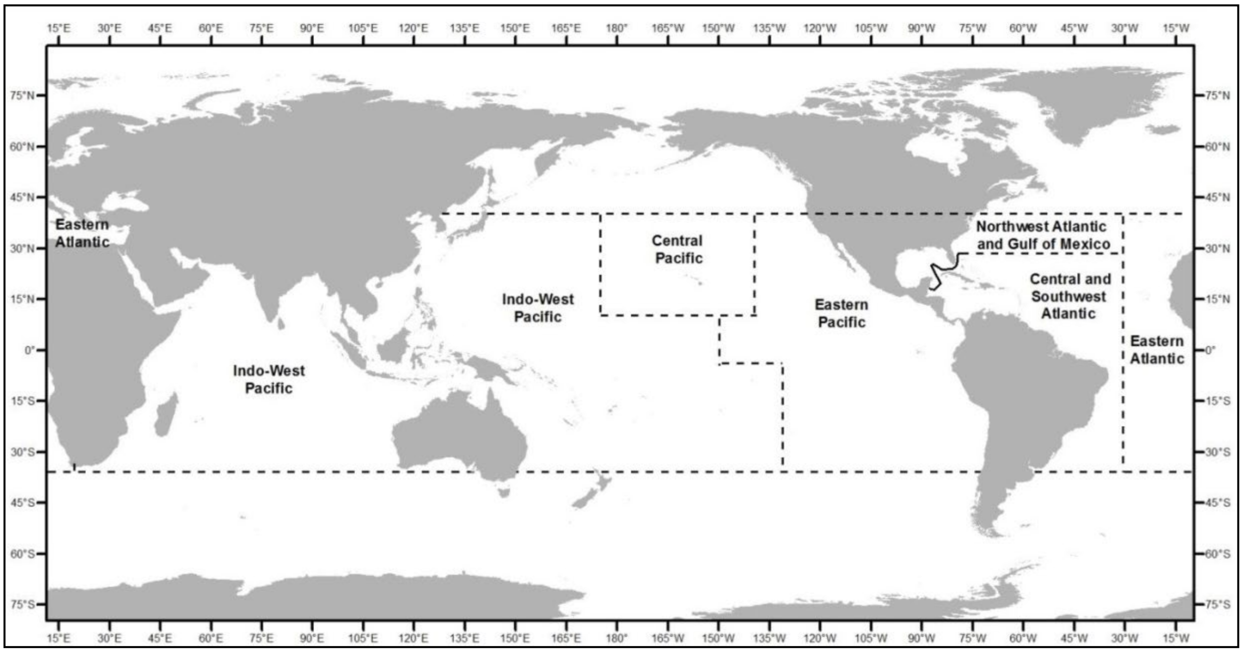

Figure 7. Scalloped hammerhead shark DPS boundaries (Source: 78 FR 20717; April 5, 2013). Note: The Northwest Atlantic/Gulf of Mexico and Central Pacific DPSs are not listed under the ESA.

3.4.1 Species Description and Distribution

All hammerhead sharks belong to the family *Sphyrnidae* and are classified as requiem sharks (order Carcharhiniformes). Hammerhead sharks are recognized by their laterally expanded head that resembles a hammer, hence the common name "hammerhead." The scalloped hammerhead shark is distinguished from other hammerheads by a noticeable indentation on the center and front portion of the head, along with 2 more indentations on each side of this central indentation, giving the head a "scalloped" appearance. It has a broadly arched mouth, and the back of the head is slightly swept backward.

The scalloped hammerhead shark is found throughout the world and lives in coastal warm temperate and tropical seas. It occurs over continental shelves and the shelves surrounding islands, as well as adjacent deep waters, but it is seldom found in waters cooler than 22°C (Compagno 1984; Rhode Island Sea Grant and NMFS 2003). It ranges from the intertidal and surface waters to depths of up to approximately 1,475-1,675 ft (450-512 m) (Klimley 1993; Sanches 1991), with occasional dives even deeper (Jorgensen et al. 2009). It has also been documented entering enclosed bays and estuaries (Compagno 1984). In the western Atlantic Ocean, the scalloped hammerhead's range extends from the northeast coast of the U.S. (New Jersey) to Florida and on to Brazil, including the Gulf of Mexico and Caribbean Sea.

Scalloped hammerhead sharks are highly mobile and partly migratory, and are likely the most abundant of the hammerhead species (Maguire et al. 2006). These sharks have been observed making migrations along the edges of continents as well as between oceanic islands in tropical waters (Bessudo et al. 2011; Diemer et al. 2011; Duncan and Holland 2006; Kohler and Turner 2001). Although scalloped hammerhead sharks are highly mobile, this species rarely crosses entire oceans (Diemer et al. 2011; Duncan and Holland 2006; Kohler and Turner 2001). The median distance between mark and recapture of 3,278 tagged adult sharks along the eastern U.S. was less than 65 miles (100 km) (Kohler and Turner 2001). Tagging studies reveal the tendency for scalloped hammerhead sharks to aggregate around and travel to and from core areas or "hot spots" within locations (Duncan and Holland 2006; Hearn et al. 2010; Holland et al. 1993) (Bessudo et al. 2011). However, other studies indicate they are also capable of traveling long distances (e.g., 1,206 mi [1,941 km] (Bessudo et al. 2011); 1,038 mi [1,671 km] (Kohler and Turner 2001); 390 mi [629 km] (Diemer et al. 2011).

Both juveniles and adult scalloped hammerhead sharks occur as solitary individuals, pairs, or in schools (Compagno 1984). Adult aggregations are most common offshore over seamounts and near islands, especially near the Galapagos, Malpelo, Cocos and Revillagigedo Islands, and within the Gulf of California (Bessudo et al. 2011; CITES 2010; Compagno 1984; Hearn et al. 2010). Neonate and juvenile aggregations are more common in nearshore nursery habitats (Bejarano-Álvarez et al. 2011; Diemer et al. 2011; Duncan and Holland 2006). It has been suggested that juveniles inhabit these nursery areas for up to or more than 1 year as they provide valuable refuges from predation (Duncan and Holland 2006).

The scalloped hammerhead shark is a high trophic level predator (Cortés 1999) and an opportunistic feeder with a diet that includes a wide variety of bony fish, octopi/cuttlefish/squid, crabs/lobsters, and rays (Bush 2003; Compagno 1984; Júnior et al. 2009; Noriega et al. 2011).

3.4.2 Life History Information

The scalloped hammerhead shark gives birth to live young (i.e., "viviparous"), with a gestation period of 9-12 months (Branstetter 1987; Stevens and Lyle 1989), which may be followed by a 1-year resting period (Liu and Chen 1999). Generally, females attain maturity around 6.5-8 ft (2.0-2.5 m) TL, while males reach maturity at smaller sizes (range 4-6.5 ft [1.3-2.0 m] TL). The available information specific to the Central and Southwest Atlantic DPS indicates females attain maturity when they reach around 7.5 ft (greater than 240 cm) TL, while males reach maturity at 6-6.5 ft (1.8-2.0 m) TL (Hazin et al. 2001).

The age at maturity differs by region. In Brazil (part of the Central and Southwest Atlantic DPS), males reach sexual maturity between 6.3 and 8.1 years, females at 15.2 years (Hazin et al. 2001). However, when pupping occurs does not appear to vary by region and may be partially seasonal (Harry et al. 2011a; Harry et al. 2011b), with neonates present year round, but with abundance peaking during the spring and summer months (Adams and Paperno 2007; Bejarano-Álvarez et al. 2011; Duncan and Holland 2006; Harry et al. 2011a; Harry et al. 2011b; Noriega et al. 2011). Females move inshore to birth, with litter sizes anywhere between 1 and 41 live pups. No relationship between litter size and female shark length was identified by Hazin et al. (2001) for animals off the northeastern coast of Brazil. The DPS-specific information indicates pups are generally greater than 1.2 ft (0.38 m) at birth (Hazin et al. 2001).

While it appears that maturity, age, and growth estimates vary by region, it is unclear whether these differences are truly biological or the result of differences in the interpretations of aging methodology (Piercy et al. 2007). Scalloped hammerhead sharks develop opaque bands on their vertebrae which are used to estimate age. Assuming annual band formation for animals in the Atlantic, and adjusting age maturity estimates from the Pacific accordingly, the average age at maturity for female scalloped hammerheads is around 12.8 years and 8.1 years for males. Based on analysis of the available data, the scalloped hammerhead shark can be characterized as a long-lived (i.e., at least 20-30 years) (Dudley and Simpfendorfer 2006), late-maturing, and relatively slow-growing species (Branstetter 1990). Within the DPS, Kotas et al. (2011) estimate the maximum age of females as 31.5 years and 29.5 years for males.

3.4.3 Status and Population Dynamics

Data from multiple sources indicate that the Atlantic population (including both the Northwest Atlantic and Gulf of Mexico DPS, and the Central and Southwest Atlantic DPS) of scalloped hammerheads has experienced severe declines over the past few decades. It is likely that scalloped hammerheads in the Northwest Atlantic and Gulf of Mexico were overfished beginning in the early 1980s and experienced periodic overfishing from 1983-2005 (Jiao et al. 2011). Other studies have also observed similar decreases in scalloped hammerhead shark populations along the Atlantic coast. For example, Baum et al. (2003) calculated that the northwest Atlantic population of scalloped hammerhead shark has declined by 89% since 1986; however, this study is controversial due to its sole reliance on HMS PLL logbook data. Off the southeastern U.S. coast, Beerkircher et al. (2002) found significant declines in nominal CPUE for scalloped hammerhead shark between 1981-1983 (CPUE = 13.37) and 1992-2000 (CPUE = 0.48).

For the northwest Atlantic and Gulf of Mexico DPS, models estimated the virgin population size to be between 142,000 and 169,000 individuals (range 116,000-260,000) (Hayes et al. 2009). Those models also estimated populations of 24,850-27,900 individuals in 2005 (most recent year estimated) (Hayes et al. 2009).

A stock assessment for the scalloped hammerhead shark, (Hayes et al. 2009) concluded that the northwestern Atlantic and Gulf of Mexico scalloped hammerhead shark stock has been depleted by approximately 83% since 1981. Miller et al. (2014) concluded that though abundance numbers for the Central and Southwest Atlantic DPS are unavailable, they are likely similar to, and probably worse than, those found in the Northwest Atlantic and Gulf of Mexico DPS. It is likely that scalloped hammerheads in the Central and Southwest Atlantic DPS have experienced at least the same level of decline as observed in the Northwest Atlantic and Gulf of Mexico DPS since the early 1980s (i.e., 83%). However, unlike the Northwest Atlantic and Gulf of Mexico DPS, the Central and Southwest Atlantic DPS continues to see heavy fishing pressure by commercial fisheries off the coast of Brazil and by artisanal fisheries in Central America, the Caribbean, and Brazil.

3.4.4 Threats

Scalloped hammerhead sharks are both targeted and taken as bycatch in many global fisheries. They are targeted by semi-industrial, artisanal, and recreational fisheries, and caught as bycatch in PLL tuna and swordfish fisheries and purse seine fisheries. There is a lack of information on the fisheries prior to the early 1970s, with only occasional mentions in historical records. Significant catches of scalloped hammerheads have gone, and continue to be, unrecorded in many countries outside the U.S. Brazil, the country that reports one of the highest scalloped hammerhead landings in South America, maintains heavy industrial fishing of this species off its coastal waters. In the late 1990s, Amorim et al. (1998) remarked that heavy fishing by longliners led to a decrease in this population off the coast of Brazil. According to the FAO global capture production database, Brazil reported a significant increase in catch of scalloped hammerhead during this period, from 30 mt in 1999 to 508 mt by 2002, before decreasing to a low of 87 mt in 2009. Information from PLL and bottom gillnet fisheries targeting several species of hammerhead sharks off southern Brazil indicates declines of more than 80% in CPUE from 2000 to 2008, with the targeted hammerhead fishery abandoned after 2008 due to the rarity of the species (FAO 2010). Scalloped hammerhead is also commonly landed by artisanal fishers in the Central and Southwest Atlantic, with concentrated fishing effort in nearshore and inshore waters, areas likely to be used as nursery grounds. In the Caribbean, specific catch and landings data are unavailable; however, scalloped hammerhead shark is often a target of artisanal fisheries off Trinidad and Tobago and Guyana, and anecdotal reports of declines in abundance, size, and distribution shifts of sharks suggest significant fishing pressure on overall shark populations in this region (Kyne et al. 2012).

The exploitation of this DPS continues to go largely unregulated. In Brazilian waters, there are very few fishery regulations that help protect hammerhead populations. For example, the minimum legal size for a scalloped hammerhead caught in Brazilian waters is approximately 24 in (60 cm) TL; however, scalloped hammerhead shark pups may range from 15-23 in (38 - 55 cm). As the pup sizes are very close to this minimum limit, the legislation is essentially ineffective, and as such, large catches of both juveniles and neonates have been documented from this region (CITES 2010; Kotas et al. 2008). Lack of enforcement of existing regulations in some countries outside the United States also hamper regulatory effectiveness.

In addition, scalloped hammerheads are likely underreported in catch records as many records do not account for discards (e.g., where the fins are kept, but the carcass is discarded) or reflect dressed weights instead of live weights. Also, many catch records do not differentiate between the hammerhead species, or shark species in general, and thus species-specific population trends for scalloped hammerheads are not readily available.

Although scalloped hammerhead meat is considered essentially unpalatable (due to its high urea concentration), some countries still consume the meat domestically or trade it internationally, including Colombia, Mexico, and Uruguay (CITES 2010; Vannuccini 1999). However, it is thought that the current volume of scalloped hammerhead shark traded meat and products is insignificant when compared to the volume of its fins in international trade (CITES 2010).

3.5 Status of Giant Manta Ray

NMFS listed the giant manta ray (*Manta birostris*) as threatened under the ESA (83 FR 2916, Publication Date January 22, 2018) and determined that the designation of critical habitat is not prudent on (84 FR 66652, Publication Date December 5, 2019). On December 4, 2019, NMFS published a recovery outline for the giant manta ray (NMFS 2019), which serves as an interim guidance to direct recovery efforts for giant manta ray.

3.5.1 Species Description and Distribution

The giant manta ray is the largest living ray, with a wingspan reaching a width of up to 7 m (23 ft), and an average size between 4-5 m (15-16.5 ft). The giant manta ray is recognized by its large diamond-shaped body with elongated wing-like pectoral fins, ventrally placed gill slits, laterally placed eyes, and wide terminal mouth. In front of the mouth, it has 2 structures called cephalic lobes that extend and help to introduce water into the mouth for feeding activities (making them the only vertebrate animals with 3 paired appendages). Giant manta rays have 2 distinct color types: chevron (mostly black back dorsal side and white ventral side) and black (almost completely black on both ventral and dorsal sides). Most of the chevron variants have a black dorsal surface and a white ventral surface with distinct patterns on the underside that can be used to identify individuals (Miller and Klimovich 2017). There are bright white shoulder markings on the dorsal side that form 2 mirror image right-angle triangles, creating a T-shape on the upper shoulders.

The giant manta ray is found worldwide in tropical and subtropical oceans and in productive coastal areas. They also occasionally occur within estuaries (e.g., lagoons and bays) and intracostal waterways. In terms of range, within the Northern hemisphere, the species has been documented as far north as southern California and New Jersey on the United States west and east coasts, respectively, and Mutsu Bay, Aomori, Japan, the Sinai Peninsula and Arabian Sea, Egypt, and the Azores Islands (CITES 2013; Gudger 1922; Kashiwagi et al. 2010; Moore 2012). In the Southern Hemisphere, the species occurs as far south as Peru, Uruguay, South Africa, New Zealand and French Polynesia (CITES 2013; Mourier 2012). Within its range, the giant manta ray inhabits tropical, subtropical, and temperate bodies of water and is commonly found offshore, in oceanic waters, and near productive coastlines (**Figure 8**) (Kashiwagi et al. 2011; Marshall et al. 2009).

Figure 8. The Extent of Occurrence (dark blue) and Area of Occupancy (light blue) based on species distribution (Lawson et al. 2017).

3.5.2 Life History Information

Giant manta rays make seasonal long-distance migrations, aggregate in certain areas and remain resident, or aggregate seasonally (Dewar et al. 2008; Girondot et al. 2015; Graham et al. 2012; Stewart et al. 2016). The giant manta ray is a seasonal visitor along productive coastlines with regular upwelling, in oceanic island groups, and at offshore pinnacles and seamounts. The timing of these visits varies by region and seems to correspond with the movement of zooplankton, current circulation and tidal patterns, seasonal upwelling, seawater temperature, and possibly mating behavior. They have also been observed in estuarine waters inlets, with use of these waters as potential nursery grounds (Adams and Amesbury 1998; Medeiros et al. 2015; Milessi and Oddone 2003).

Giant manta rays are known to aggregate in various locations around the world in groups usually ranging from 100-1,000 (Graham et al. 2012; Notarbartolo di Sciara and Hillyer 1989; Venables 2013). These sites function as feeding sites, cleaning stations, or sites where courtship interactions take place (Graham et al. 2012; Heinrichs et al. 2011; Venables 2013). The appearance of giant manta rays in these locations is generally predictable. For example, food availability due to high productivity events tends to play a significant role in feeding site aggregations (Heinrichs et al. 2011; Notarbartolo di Sciara and Hillyer 1989). Giant manta rays have also been shown to return to a preferred site of feeding or cleaning over extended periods of time (Dewar et al. 2008; Graham et al. 2012; Medeiros et al. 2015). In addition, giant and reef manta rays in Keauhou and Ho'ona Bays in Hawaii, appear to exhibit learned behavior. These manta rays learned to associate artificially lighting with high plankton concertation (primary food source) and shifted foraging strategies to include sites that had artificially lighting at night (Clark 2010). While little is known about giant manta ray aggregation sites, the FGBNMS and the surrounding region might represent the first documented nursery habitat for giant manta ray (Stewart et al. 2018). Stewart et al. (2018) found that the FGBNMS provides nursery habitat for juvenile giant manta rays because small age classes have been observed consistently across years at both the population and individual level. The FGBNMS may be an optimal nursery ground because of its location near the edge of the continental shelf and proximity to abundant pelagic food resources. In addition, small juveniles are frequently observed along a portion of Florida's east coast, indicating that this area may also function as a nursery ground for juvenile giant manta rays. Since directed visual surveys began in 2016, juvenile giant manta rays are regularly observed in the shallow waters (less than 5 m depth) from Jupiter Inlet to Boynton Beach Inlet (J Pate, Florida Manta Project, unpublished data). However, the extent of this purported nursery ground is unknown as the survey area is limited to a relatively narrow geographic area along Florida's southeast coast.

The giant manta ray appears to exhibit a high degree of plasticity in terms of its use of depths within its habitat. Tagging studies have shown that the giant manta rays conduct night descents from 200-450 m depths (Rubin et al. 2008; Stewart et al. 2016) and are capable of diving to depths exceeding 1,000 m (A. Marshall et al. unpublished data 2011, cited in Marshall et al. (2011)). Stewart et al. (2016) found diving behavior may be influenced by season, and more specifically, shifts in prey location associated with the thermocline, with tagged giant manta rays (n=4) observed spending a greater proportion of time at the surface from April to June and in deeper waters from August to September. Overall, studies indicate that giant manta rays have a more complex depth profile of their foraging habitat than previously thought, and may actually be supplementing their diet with the observed opportunistic feeding in near-surface waters (Burgess et al. 2016; Couturier et al. 2013).

Giant manta rays primarily feed on planktonic organisms such as euphausiids, copepods, mysids, decapod larvae and shrimp, but some studies have noted their consumption of small and moderately sized fishes (Miller and Klimovich 2017). While it was previously assumed, based on field observations, that giant manta rays feed predominantly during the day on surface zooplankton, results from recent studies (Burgess et al. 2016; Couturier et al. 2013) indicate that these feeding events are not an important source of the dietary intake. When feeding, giant manta rays hold their cephalic lobes in an "O" shape and open their mouth wide, which creates a funnel that pushes water and prey through their mouth and over their gill rakers. They use many different types of feeding strategies, such as barrel rolling (doing somersaults repeatedly) and creating feeding chains with other mantas to maximize prey intake.

The giant manta ray is viviparous (i.e., gives birth to live young). They are slow to mature and have very low fecundity and typically give birth to only one pup every 2 to 3 years. Gestation lasts approximately 10-14 months. Females are only able to produce between 5 and 15 pups in a lifetime (CITES 2013; Miller and Klimovich 2017). The giant manta ray has one of the lowest maximum population growth rates of all elasmobranchs (Dulvy et al. 2014; Miller and Klimovich 2017). The giant manta rays generation time (based on *M. alfredi* life history parameters) is estimated to be 25 years (Miller and Klimovich 2017).

Although giant manta rays have been reported to live at least 40 years, not much is known about their growth and development. Maturity is thought to occur between 8-10 years of age (Miller and Klimovich 2017). Males are estimated to mature at around 3.8 m disc width (slightly smaller than females) and females at 4.5 m disc width (Rambahiniarison et al. 2018).

3.5.3 Status and Population Dynamics

There are no current or historical estimates of global abundance of giant manta rays, with most estimates of subpopulations based on anecdotal observations. The CITES (CITES 2013) found that only ten populations of giant manta rays had been actively studied, 25 other aggregations have been anecdotally identified, all other sightings are rare, and the total global population may be small. Subpopulation abundance estimates range between 42 and 1,500 individuals, but are anecdotal and subject to bias (Miller and Klimovich 2017). The largest subpopulations and records of individuals come from the Indo-Pacific and eastern Pacific. Ecuador is thought to be home to the largest identified population (n=1,500) of giant manta rays in the world, with large aggregation sites within the waters of the Machalilla National Park and the Galapagos Marine Reserve (Hearn et al. 2014). Within the Indian Ocean, numbers of giant manta rays identified through citizen science in Thailand's waters (primarily on the west coast, off Khao Lak and Koh Lanta) was 288 in 2016. These numbers reportedly surpass the estimate of identified giant mantas in Mozambique (n=254), possibly indicating that Thailand may be home to the largest aggregation of giant manta rays within the Indian Ocean (MantaMatcher 2016). Miller and Klimovich (2017) concluded that giant manta rays are at risk throughout a significant portion of their range, due in large part to the observed declines in the Indo-Pacific. There have been decreases in landings of up to 95% in the Indo-Pacific, although similar declines have not been observed in areas with other subpopulations, such as Mozambique and Ecuador. In the U.S. Atlantic and Caribbean, giant manta ray sightings are concentrated along the east coast as far north as New Jersey, within the Gulf of Mexico, and off the coasts of the U.S. Virgin Islands and Puerto Rico. Because most sightings of the species have been opportunistic during other surveys, researchers are still unsure what attracts giant manta rays to certain areas and not others and where they go for the remainder of the time (84 FR 66652; Publication Date December 5, 2019).

The available sightings data indicate that giant manta rays occur regularly along Florida's east coast. In 2010, Georgia Aquarium began conducting aerial surveys for giant manta rays. The surveys are conducted in spring and summer and run from the beach parallel to the shoreline (0 to 2.5 nautical miles), from St. Augustine Beach Pier to Flagler Beach Pier, Florida. The numbers, location, and peak timing of the manta rays to this area varies by year (H. Webb unpublished data). In addition, juvenile giant manta rays have also been regularly observed inshore off the southeast Florida. Since 2016, researchers with the Marine Megafauna Foundation have been conducting annual surveys along a small transect off Palm Beach, Florida, between Jupiter Inlet and Boynton Beach Inlet (~44 km, 24 nautical miles) (J. Pate, MMF, pers. comm. to M. Miller, NMFS OPR, 2018). Results from these surveys indicate that juvenile manta rays are present in these waters for the majority of the year (observations span from May to December), with re-sightings data that suggest some manta rays may remain in the area for extended periods of time or return in subsequent years (J. Pate unpublished data). In the Gulf of Mexico, within the Flower Garden Banks National Marine Sanctuary, 95 unique individuals have been recorded between 1982 and 2017 (Stewart et al. 2018).

3.5.4 Threats

The giant manta ray faces many threats, including fisheries interactions, environmental contaminants (microplastics, marine debris, petroleum products, etc.), vessel strikes, entanglement, and global climate change. Overall, the predictable nature of their appearances, combined with slow swimming speed, large size, and lack of fear towards humans, may increase their vulnerability to threats (Convention on Migratory Species 2014; O'Malley et al. 2013). The ESA status review determined that the greatest threat to the species results from fisheries related mortality (Miller and Klimovich 2017); (83 FR 2916, Publication Date January 22, 2018).

3.5.4.1 Commercial Harvest and Fisheries Bycatch

Commercial harvest and incidental bycatch in fisheries is cited as the primary cause for the decline in the giant manta ray and threat to future recovery (Miller and Klimovich 2017). We anticipate that these threats will continue to affect the rate of recovery of the giant manta ray. Worldwide giant manta ray catches have been recorded in at least 30 large and small-scale fisheries covering 25 countries (Lawson et al. 2016). Demand for the gills of giant manta rays and other mobula rays has risen dramatically in Asian markets. With this expansion of the international gill raker market and increasing demand for manta ray products, estimated harvest of giant manta rays, particularly in many portions of the Indo-Pacific, frequently exceeds numbers of identified individuals in those areas and are accompanied by observed declines in sightings and landings of the species of up to 95% (Miller and Klimovich 2017). In the Indian Ocean, manta rays (primarily giant manta rays) are mainly caught as bycatch in purse seine and gillnet fisheries (Oliver et al. 2015). In the western Indian Ocean, data from the pelagic tuna purse seine fishery suggests that giant manta and mobula rays, together, are an insignificant portion of the bycatch, comprising less than 1% of the total non-tuna bycatch per year (Chassot et al. 2008; Romanov 2002). In the U.S., bycatch of giant manta rays has been recorded in the coastal migratory pelagic gillnet, gulf reef fish bottom longline, Atlantic shark gillnet, pelagic longline, pelagic bottom longline, and trawl fisheries. Incidental capture of giant manta ray is also a rare occurrence in the elasmobranch catch within U.S. Atlantic and Gulf of Mexico, with the majority that are caught released alive. In addition to directed harvest and bycatch in commercial fisheries, the giant manta ray is incidentally captured by recreational fishers using vertical line (i.e., handline, bandit gear, and rod-and-reel). Researchers frequently report giant manta rays having evidence of recreational gear interactions along the east coast of Florida (i.e., manta rays have embedded fishing hooks with attached trailing monofilament line) (J. Pate, Florida Manta Project, unpublished data). Internet searches also document recreational interactions with giant manta rays. For example, recreational fishers will search for giant manta rays while targeting cobia, as cobia often accompany giant manta rays (anglers will cast at manta rays in an effort to hook cobia). In addition, giant manta rays are commonly observed swimming near or underneath public fishing piers where they may become foul-hooked. The current threat of mortality associated with recreational fisheries is expected to be low, given that we have no reports of recreational fishers retaining giant manta ray. However, bycatch in recreational fisheries remains a potential threat to the species.

3.5.4.2 Vessel Strike

Vessel strikes can injure or kill giant manta rays, decreasing fitness or contributing to non-natural mortality (Couturier et al. 2012; Deakos et al. 2011). Giant manta rays do not surface to breathe, but they can spend considerable time in surface waters, while basking and feeding, where they are more susceptible to vessel strikes (McGregor et al., 2019). They show little fear toward vessels which can also make them extremely vulnerable to vessel strikes (Deakos 2010). Five giant manta rays were reported to have been struck by vessels from 2016 through 2018; individuals had injuries (i.e., fresh or healed dorsal surface propeller scars) consistent with a vessel strike. These interactions were observed by researchers conducting surveys from Boynton Beach to Jupiter, Florida (J. Pate, Florida Manta Project, unpublished data). The giant manta ray is frequently observed in nearshore coastal waters and feeding within and around inlets. As vessel traffic is concentrated in and around inlets and nearshore waters, this overlap exposes the giant manta ray in these locations to an increased likelihood of potential vessel strike. Yet, few instances of confirmed or suspected mortalities of giant manta ray attributed to vessel strike injury (e.g., via strandings) have been documented. This lack of documented mortalities could also be the result of other factors that influence carcass detection (i.e., wind, currents, scavenging, decomposition etc.). In addition, manta rays appear to be able to heal from wounds very quickly, while high wound healing capacity is likely to be beneficial for their long-term survival, the fitness cost of injuries and number vessel strikes occurring may be masked (McGregory et al., 2019).

3.5.4.3 Microplastics

Filter-feeding megafauna are particularly susceptible to high levels of microplastic ingestion and exposure to associated toxins due to their feeding strategies, target prey, and, for most, habitat overlap with microplastic pollution hotspots (Germanov et al. 2019). Giant manta rays are filter feeders, and, therefore can ingest microplastics directly from polluted water or indirectly through-contaminated planktonic prey (Miller and Klimovich 2017). The effects of ingesting indigestible particles include blocking adequate nutrient absorption and causing mechanical damage to the digestive tract. Microplastics can also harbor high levels of toxins and persistent organic pollutants, and introduce these toxins to organisms via ingestion. These toxins can bioaccumulate over decades in long-lived filter feeders, leading to a disruption of biological processes (e.g., endocrine disruption), and potentially altering reproductive fitness (Germanov et al. 2019). Jambeck et al. (2015) found that the Western and Indo- Pacific regions are responsible for the majority of plastic waste. These areas also happen to overlap with some of the largest known aggregations of giant manta rays. For example, in Thailand, where recent sightings data have identified over 288 giant manta rays (MantaMatcher 2016), mismanaged plastic waste is estimated to be on the order of 1.03 million tonnes annually, with up to 40% of this entering the marine environment (Jambeck et al. 2015). Approximately 1.6 million tonnes of mismanaged plastic waste is being disposed of in Sri Lanka, again with up to 40% entering the marine environment (Jambeck et al. 2015), potentially polluting the habitat used by the nearby Maldives aggregation of manta rays. While the ingestion of plastics is likely to negatively affect the health of the species, the levels of microplastics in manta ray feeding grounds and frequency of ingestion are presently being studied to evaluate the impact on these species (Germanov et al. 2019).

3.5.4.4 Mooring and Anchor Lines

Mooring and boat anchor line entanglement may also wound giant manta rays or cause them to drown (Deakos et al. 2011; Heinrichs et al. 2011). There are numerous anecdotal reports of giant manta rays becoming entangled in mooring and anchor lines (C. Horn, NMFS, unpublished data), as well as documented interactions encountered by other species of manta rays (C. Horn, NMFS, unpublished data). For example, although a rare occurrence, reef manta rays on occasion entangle themselves in anchor and mooring lines. Deakos (2010) suggested that manta rays become entangled when the line makes contact with the front of the head between the cephalic lobes, the animal's reflex response is to close the cephalic lobes, thereby trapping the rope between the cephalic lobes, entangling the manta ray as the animal begins to roll in an attempt to free itself. In Hawaii, on at least 2 occasions, a reef manta ray was reported to have died after entangling in a mooring line (A. Cummins, pers. comm. 2007, K. Osada, pers. comm. 2009; cited in Deakos (2011). In Maui, Hawaii, Deakos et al. (2011) observed that 1 out of 10 reef manta rays had an amputated or disfigured non-functioning cephalic lobe, likely a result of line entanglement. Mobulid researchers indicate that entanglements may significantly affect the manta rays fitness (Braun et al. 2015; Convention on Migratory Species 2014; Couturier et al. 2012; Deakos et al. 2011; Germanov and Marshall 2014; Heinrichs et al. 2011). However, there is very little quantitative information on the frequency of these occurrences and no information on the impact of these injuries on the overall health of the species.

3.5.4.5 Climate Change Effects

Because giant manta rays are migratory and considered ecologically flexible (e.g., low habitat specificity), they may be less vulnerable to the impacts of climate change compared to other sharks and rays (Chin et al. 2010). However, as giant manta rays frequently rely on coral reef habitat for important life history functions (e.g., feeding, cleaning) and depend on planktonic food resources for nourishment, both of which are highly sensitive to environmental changes (Brainard et al. 2011; Guinder and Molinero 2013), climate change is likely to have an impact on their distribution and behavior. Coral reef degradation from anthropogenic causes, particularly climate change, is projected to increase through the future. Specifically, annual, globally averaged surface ocean temperatures are projected to increase by approximately 0.7 °C by 2030 and 1.4 °C by 2060 compared to the 1986-2005 average (Intergovernmental Panel on Climate Change 2013), with the latest climate models predicting annual coral bleaching for almost all reefs by 2050 (Heron et al. 2016). Declines in coral cover have been shown to result in changes in coral reef fish communities (Jones et al. 2004) (Graham et al. 2008). Therefore, the projected increase in coral habitat degradation may potentially lead to a decrease in the abundance of fish that clean giant manta rays (e.g., *Labroides* spp., *Thalassoma* spp., and *Chaetodon* spp.) and an overall reduction in the number of cleaning stations available to manta rays within these habitats. Decreased access to cleaning stations may negatively affect the fitness of giant manta rays by hindering their ability to reduce parasitic loads and dead tissue, which could lead to increases in diseases and declines in reproductive fitness and survival rates.

Changes in climate and oceanographic conditions, such as acidification, are also known to affect zooplankton structure (size, composition, and diversity), phenology, and distribution (Guinder and Molinero 2013). As such, the migration paths and locations of both resident and seasonal aggregations of giant manta rays, which depend on these animals for food, may similarly be altered (Couturier et al. 2012). As research to understand the exact impacts of climate change on marine phytoplankton and zooplankton communities is still ongoing, the severity of this threat has yet to be fully determined (Miller and Klimovich 2017).

4. ENVIRONMENTAL BASELINE

By regulation (50 CFR 402.02), the environmental baseline for an Opinion refers to the condition of the listed species in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to the listed species from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

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.

4.1 Status of Species Likely to Be Adversely Affected within the Action Area

4.1.1 Sea Turtles

Based on the best available species life history, and range and distribution data, and the STSSN recreational hook-and-line capture and entanglement data (**Table 2**), we believe green sea turtle (NA and SA DPSs), hawksbill sea turtle, loggerhead sea turtle (NWA DPS) may be in the action area and adversely affected by recreational hook-and-line fishing that will occur at the pier upon completion of the proposed action. All of these sea turtle species are migratory, traveling to forage grounds or for reproduction purposes. The Puerto Rican waters within the action area are likely used by these species of sea turtle for nearshore reproductive, developmental, and foraging habitat. NMFS believes that no individual sea turtle is likely to be a permanent resident of the action area, although some individuals may be present at any given time. These same individuals will migrate into offshore waters of the Gulf of Mexico, Atlantic Ocean, and other areas of the Caribbean Sea at certain times of the year, and thus may be affected by activities occurring there. Therefore, the status of the sea turtles species in the action area are considered the same as those discussed in Sections 3.3.1-3.3.4. NMFS is not aware of any reported sea turtle interactions (recreational fishing or otherwise) at the Humacao Fishing Pier.

4.1.2 Scalloped Hammerhead Shark – Central and Southwest Atlantic Ocean

Scalloped hammerhead shark (Central and Southwest Atlantic DPS) may be in the action area and adversely affected by recreational hook-and-line fishing that will occur at the pier upon completion of the proposed action. The Puerto Rican waters within the action area are likely used by this species for nearshore reproductive, developmental, and foraging habitat. NMFS believes that no individual shark is likely to be a permanent resident of the action area, although some individuals may be present at any given time. These same individuals will migrate to the inshore and offshore waters of other areas of the Caribbean Sea at certain times of the year, and thus may be affected by activities occurring there. Therefore, the status of the scalloped hammerhead in the action area are considered the same as those discussed in Sections 3.4. NMFS is aware of the harvest (i.e., captured and kept) of 1 juvenile scalloped hammerhead shark at the Humacoa Fishing Pier.

4.1.3 Giant Manta Ray

NMFS does not have any data for giant manta ray in Puerto Rico so we will use what we know about the species in the continental U.S. as a proxy. Giant manta ray have been observed in estuarine waters of Florida (Gulf of Mexico and South Atlantic Ocean) near oceanic inlets, with use of these waters as potential nursery grounds. They are also commonly observed swimming near or underneath public fishing piers where they may become foul-hooked. Due to the pier's proximity to an inlet/pass, we believe giant manta ray may be adversely affected by recreational fishing that will occur at the pier upon completion of the proposed action. NMFS believes that no individual giant manta ray is likely to be a permanent resident of the action area, although some individuals may be present at any given time. These same individuals will migrate into coastal and offshore waters of the Gulf of Mexico and the North Atlantic Ocean, and thus may be affected by activities occurring there. Therefore, the status of giant manta ray in the action area, including the threats, are the same as those discussed in Section 3.5. NMFS is not aware of any reported recreational hook-and-line captures of a giant manta ray at the Humacao Fishing Pier.

4.2 Factors Affecting Species within the Action Area

4.2.1 Federal Actions

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

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

In August of 2007, NMFS issued a regulation (72 FR 43176, August 3, 2007) to require any fishing vessels subject to the jurisdiction of the U.S. to take observers upon NMFS's request. The purpose of this measure is to learn more about ESA-listed species interactions with fishing operations, to evaluate existing measures to reduce take, and to determine whether additional measures to address prohibited takes may be necessary. Fishing vessels subject to the jurisdiction of the U.S. could operate in the action area, and therefore, could be required to take a NMFS observer.

Other than the proposed action, no other federally permitted projects are known to have occurred within the action area, as per a review of the NMFS SERO PRD's completed ESA Section 7 consultation database by the consulting biologist on October 14, 2021.

4.2.2 State or Private Actions

4.2.2.1 Recreational Fishing

Recreational fishing as regulated by Puerto Rico can affect green sea turtle (NA and SA DPS), hawksbill sea turtle, loggerhead sea turtle (NWA DPS), scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray within the action area. Pressure from recreational fishing in and adjacent to the action area is likely to continue.

A maritime transportation dock for sugar and other goods has existed at the site of the Humacao Fishing Pier since 1870. The original dock was later rebuilt, improved, and eventually replaced in 1915 by a railway dock. In 1977, 3 ruins of docks existed on site. In 2014, a total remodeling of the fishing pier was carried out. In 2017, the fishing pier sustained damages from Hurricanes Irma and Maria and has not been operational since. The applicant estimates that 25 anglers per day, on average, use the fishing pier, depending on weather, tide, and fishing conditions, with an average of 5 to 10 anglers fishing at the same time.

As stated above, the STSSN database does not contain data for Puerto Rico; however, we know that sea turtle species are prone to capture and entanglement in recreational fishing gear used at public fishing piers. Observations of state recreational fisheries have shown that loggerhead sea turtles are known to bite baited hooks and frequently ingest the hooks. Overall, hooked sea turtles have been reported to the STSSN 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 Kemp's ridley and loggerhead sea turtles can be found in the TEWG reports.

Scalloped hammerhead shark are targeted and taken as bycatch in recreational fisheries. It is likely that scalloped hammerhead sharks are underreported in catch records as many records do not account for discards (e.g., where the fins are kept, but the carcass is discarded) or reflect dressed weights instead of live weights. In addition, many catch records do not differentiate between the hammerhead shark species, or shark species in general, and thus species-specific population trends for scalloped hammerheads are not readily available.

Giant manta ray is incidentally captured by recreational fishers. Researchers frequently report giant manta rays having evidence of recreational gear interactions along the east coast of Florida (i.e., manta rays have embedded fishing hooks with attached trailing fishing line) (J. Pate, Florida Manta Project, unpublished data). Internet searches also document recreational interactions with giant manta rays. For example, recreational fishers will search for giant manta rays while targeting cobia, as cobia often accompany giant manta rays. Giant manta rays are commonly observed swimming near or underneath public fishing piers where they may become foul-hooked.

NMFS is not aware of any sea turtle or giant manta ray captures at the Humacao Fishing Pier. We are aware of 1 reported capture of a juvenile scalloped hammerhead shark at the Humacao Fishing Pier. We have no way of knowing how many unreported captures of these species may have occurred at the pier in the past. However, because the proposed action is a repair of an existing fishing pier, recreational fishing and any associated take (reported or unreported) of green sea turtle (NA and SA DPS), hawksbill sea turtle, loggerhead sea turtle (NWA DPS), scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray is part of the baseline. That is, accidental captures of these species due to recreational fishing has likely been occurring in the past while the abundance trends of these species have also been increasing.

4.2.3 Marine Debris and Acoustic Impacts

A number of activities that may affect green sea turtle (NA and SA DPS), hawksbill sea turtle, loggerhead sea turtle (NWA DPS), scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray in the action area include anthropogenic marine debris and acoustic effects. The effects from these activities are difficult to measure. Where possible, conservation actions are being implemented to monitor or study the effects to these species from these sources.

4.2.4 Marine Pollution and Environmental Contamination

Sources of pollutants along the coast that may affect green sea turtle (NA and SA DPS), hawksbill sea turtle, loggerhead sea turtle (NWA DPS), scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray include PCB loading, stormwater runoff from coastal towns and cities into rivers and canals emptying into bays and the ocean, and groundwater and other discharges (Vargo et al. 1986). Although pathological effects of oil spills have been documented in laboratory studies of marine mammals and sea turtles (Vargo et al. 1986), the impacts of those and many other anthropogenic toxins have not been investigated in giant manta ray. In addition, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, and boat traffic can degrade marine habitats used by these species.

4.2.5 Stochastic Events

Stochastic (i.e., random) events, such as hurricanes or cold snaps, occur in Puerto Rico and can affect green sea turtle (NA and SA DPS), hawksbill sea turtle, loggerhead sea turtle (NWA DPS), scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray.

These events are unpredictable and their effect on the recovery of these ESA-listed 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. In 2017, Hurricanes Irma and Maria likely damaged important habitat in and around the action area.

4.3 Conservation Actions Benefitting Species in the Action Area

4.3.1 Sea Turtles

PRDNER monitors beaches around Puerto Rico, including those on Humacao. The Sea Turtle Program of Puerto Rico is a multi-agency collaboration between PRDNER, several nongovernmental organizations, and other agencies (e.g., Sea Grant-UPR, Rio Piedras-UPR, Mayaguez-UPR, Chelonia, WIDECAST, United States Fish and Wildlife Service). The main goal is to educate the public, and to investigate, recuperate and protect the species. Nesting beach surveys are conducted on several sites along the coast of Puerto Rico and adjacent islands. These surveys monitor leatherback sea turtle (April-July) and hawksbill sea turtle (August-December). In addition, since 1992, in-water surveys have been conducted for hawksbill sea turtles at Mona Island and Desecheo and for green sea turtle at Culebra.

4.3.2 Scalloped Hammerhead Shark – Central and Southwest Atlantic DPS

The increasing number of shark fin bans are one effort to conserve sharks. The concern regarding the practice of finning and its effect on global shark populations has been growing both domestically and internationally. The push to stop shark finning and curb the trade of shark fins is evident overseas, including in Asian countries, where the demand for shark fins is highest.

CITES listings are an effort to conserve the DPS. Member nations of CITES, referred to as "Parties," voted in support of listing scalloped hammerhead sharks in Appendix II—an action that means increased protection, but still allows legal and sustainable trade.

There are also national and international organizations with shark-focused goals that include advocating the conservation of sharks through education and campaign programs and conducting shark research to fill data gaps regarding the status of shark species. Some of these organizations include: The Pew Environment Group, Oceana, Ocean Conservancy, Shark Trust, Bite-Back, Shark Project, Pelagic Shark Research Foundation, Shark Research Institute, and Shark Savers.

When the Central and Southwest Atlantic scalloped hammerhead DPS was listed as threatened, NMFS evaluated the needs of and threats to the DPS and determined that protective regulations were not currently necessary and appropriate for the conservation of the DPS. Therefore, there are no prohibitions to take (e.g., capture) this species. For example, no permits to conduct research are required.

4.3.3 Giant Manta Ray

Manta rays were included on Appendix II of CITES at the 16 Conference of the CITES Parties in March 2013, with the listing going into effect on September 14, 2014. Export of manta rays and manta ray products, such as gill plates, require CITES permits that ensure the products are legally acquired and that the Scientific Authority of the State of export has advised that such export will not be detrimental to the survival of that species, after taking into account factors such as its population status and trends, distribution, harvest, and other biological and ecological elements. Although this CITES protection was not considered to be an action that decreased the current listing status of the threatened giant manta ray, it may help address the threat of foreign overutilization for the gill plate trade by ensuring that international trade of this threatened species is sustainable. Regardless, because the U.S. does not have a significant (or potentially any) presence in the international gill plate trade, we have concluded that any restrictions on U.S. trade of the giant manta ray that are in addition to the CITES requirements are not necessary and advisable for the conservation of the species.

5. EFFECTS OF THE ACTION ON ESA-LISTED SPECIES

Effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CFR 402.02).

As discussed above in Section 3, we believe hook-and-line gear commonly used by recreational anglers fishing from the Humacao Fishing Pier may adversely affect green sea turtle (NA and SA DPS), hawksbill sea turtle, loggerhead sea turtle (NWA DPS), scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray. In Sections 5.1.1-5.1.3 below, we provide more detail on the potential effects of entanglement, hooking, and trailing line to these species from hook-and-line gear. Section 5.2 addresses how we estimate future captures of sea turtles. Section 5.3 addresses how we estimate future captures of scalloped hammerhead shark. Section 5.4 addresses how we estimate future captures of giant manta ray.

5.1 Effects of the Action on the Species

5.1.1 Entanglement

Sea turtles are particularly prone to entanglement as a result of their body configuration and behavior. Records of stranded or entangled sea turtles reveal that hook-and-line gear can wrap around the neck, flipper, or body of a sea turtle and severely restrict swimming or feeding. If the sea turtle is entangled when young, the fishing line becomes tighter and more constricting as the sea turtle grows, cutting off blood flow and causing deep gashes, some severe enough to remove an appendage. Sea turtles have been found entangled in many different types of hook-and-line gear. Entangling gear can interfere with a sea turtle's ability to swim or impair its feeding, breeding, or migration. Entanglement may even prevent surfacing and cause drowning.

Due to the hammer-like shape of their head, scalloped hammerhead shark can become entangled in recreational fishing gear such as vertical lines, gill nets, cast nets, and seines that are directed at other species. Gear entanglement can cause injury, ranging from sub-lethal to lethal.

Fishing line entanglement can cause sub-lethal effects to giant manta ray, including injury to cephalic fins, stress, deep lacerations to the body, and impaired feeding or swimming.

5.1.2 Hooking

Sea turtles are also injured and killed by being hooked. Hooking can occur as a result of a variety of scenarios, some depending 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 the greatest threat. 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 an ingested 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.

Hook-and-line gear commonly used by recreational anglers fishing from fishing piers can adversely affect scalloped hammerhead shark via hooking or foul-hooking (i.e., a method that catches a fish using hooks without having the fish take the bait in its mouth). Hooking may cause lethal effects, especially if this hook is swallowed. While foul-hooking will cause injury, it is considered sub-lethal to scalloped hammerhead at this time. Further, hammerhead sharks tend to be particularly vulnerable to capture stress and mortality associated with hook-and-line interactions (Gallagher et al. 2014; Morgan and Burgess 2007).

Hook-and-line gear commonly used by recreational anglers fishing from fishing piers can adversely affect giant manta ray via foul-hooking. While foul-hooking will cause injury, it is considered sub-lethal to giant manta ray at this time.

5.1.3 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, or may cause a part of the intestine to slide into another part of intestine like a telescopic rod 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 more likely to entangle the sea turtle, eventually leading to impaired movement, constriction wounds, and potentially death.

The effects to scalloped hammerhead shark and giant manta ray from trailing line are the same as those discussed above under Entanglements.

5.2 Sea Turtles

5.2.1 Estimating Captures of Sea Turtles

5.2.1.1 Estimating Reported Captures of Sea Turtles

We believe the best available data to estimate future reported recreational hook-and-line captures of sea turtles at public fishing structures comes from the historic reported captures at similar structures in similar habitat obtained from STSSN data, and any additional information regarding captures at the structure under consultation. We believe that using this dataset is a more accurate representation of the likely range of future recreational hook and line interactions in the action area given the rarity of expected interactions and variability in species presence and angler behavior.

The STSSN data contains number and location of sea turtle recreational hook-and-line captures that were reported to the STSSN; it does not provide the total number of potential public fishing structures available in a particular zone, and NMFS does not have that information. Below, we provide additional discussion regarding why this is the best available information to estimate the expected annual number of reported recreational hook-and-line captures of sea turtles at the Humacao Fishing Pier in the future.

The Humacao Fishing Pier is located in the ocean-facing waters of eastern Puerto Rico. NMFS does not have STSSN data for this region. As stated above, due to the absence of available data in Puerto Rico, we believe it is prudent to use STSSN data from an area with similar habitat (i.e., ocean-facing, sandy bottom) for which we have adequate data to help determine which sea turtle species area likely to occur within the action area and may be adversely affected by recreational hook-and-line fishing that will occur at the pier upon completion of the proposed action. In the following analysis, we use recreational hook and line capture data from ocean-facing fishing structures in Zone 26. As previously stated, Zone 26 extends from 27° to 26° North latitude (from Jupiter Island south to Hollywood, Florida) along the east coast of Florida (Atlantic Ocean).

The STSSN database (2007-2015) contains 44 reported recreational hook-and-line capture of a sea turtle at 6 ocean-facing public fishing structure in Zone 26. Because these fishing structure are in a similar habitat (sandy bottom) and location (ocean-facing) as the Humacao Fishing Pier, we assume sea turtle behavior, density, and species composition are comparable at both locations. Because all of these ocean-facing fishing structures are of a similar size, they likely have comparable angler effort. Further, we assume anglers fishing from these structures use similar baits, equipment, and fishing techniques. Therefore, even though the historic reported hook-and-line captures are different between these structures, the potential for interactions with sea turtles is likely comparable at both locations.

Whether interactions with sea turtles are reported varies depending on a number of factors, including whether there are educational signs encouraging reporting and angler behavior; sometimes anglers do not report encounters with ESA-listed species due to concerns over their personal liability or public perception at the time of the capture even if there are posted signs. Given this variability, it is difficult to estimate reporting behavior. However, we assume that similar fishing structures within the same statistical fishing zone (in this case, Zone 26) would have similar reporting rates. Because piers in the same reporting zone are in similar geographic locations, we assume public perception about reporting and angler reporting behavior is likely the same. Therefore, even though the historic reported hook-and-line captures are different between these structures, the potential for reported captures is the same at both locations.

Thus, we believe the best available data to estimate the number of future reported recreational hook-and-line captures of sea turtles at the Humacao Fishing Pier is the average of the historic reported recreational hook-and-line captures at the comparable, ocean-facing fishing structures in the Zone 26 STSSN dataset. Averaging the Zone 26 ocean-facing data helps smooth variability in both the potential for interactions (i.e., number and species composition) and in reporting behavior among the locations and over time, providing for a more accurate overall estimate of future reported captures at the consultation pier. There is no additional information that can be used to estimate potential reported interactions.

To calculate the average number of reported hook-and-line captures at these similar public, ocean-facing fishing structures in Zone 26, we use available STSSN data and the following equation:

$$\begin{aligned}
&Average\ Reported\ Captures\ Per\ Structure\ in\ 9\ years\ (2007-2015)\\
&= Sum\ of\ Reported\ Captures\ in\ 9\ years \div 6\ Locations\\
&= 44 \div 6\\
&= 7.3333\ per\ structure\ in\ 9\ years
\end{aligned}$$

To calculate the estimated expected annual number of reported recreational hook-and-line captures of sea turtles at the Humacao Fishing Pier, we refer to the information above and use the following equation:

$$\begin{aligned}
&Expected\ Annual\ Reported\ Captures\\
&= Average\ Reported\ Captures\ Per\ Structure\ in\ 9\ years \div 9\ years\\
&= 7.3333 \div 9\\
&= 0.8148\ per\ year\ \text{(Table 4,}\ Line\ \text{1)}
\end{aligned}$$

5.2.1.2 Estimating Unreported Captures of Sea Turtles

While we believe the best available information for estimating expected reported captures at the consultation pier is the reported captures at similar public, ocean-facing fishing structures in Zone 26, we also recognize the need to account for unreported captures. In the following section, we use the best available data to estimate the number of unreported recreational hook-and-line-captures that may occur. To the best of our knowledge, only 2 fishing pier surveys aimed at collecting data regarding unreported recreational hook-and-line captures of ESA-listed species have been conducted in the Southeast Region. One is from Charlotte Harbor, 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 the fishing pier survey in Mississippi that interviewed 382 anglers. This survey indicated that approximately 60% of anglers who incidentally caught a sea turtle on hook-and-line reported it (i.e., 40% of anglers who incidentally caught a sea turtle did not report it) (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 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 (M. Cook, STSSN, pers. comm. to N. Bonine, NMFS SERO PRD, April 17, 2015). Anglers often do not admit the incidental capture for fear of liability.

Because we lack reporting data in the action area, we believe the higher unreported rate in the Hill (2013) study is the most appropriate to use to estimate the future unreported captures at the Humacao Fishing Pier. In addition, in the absence of additional information on factors that might affect angler reporting behavior, such as similarity of outreach and education, signage, or culture, we will err on the side of the species and assume fewer interactions were reported, as this will result in a higher total expected interactions. Therefore, we will address unreported captures by assuming that the expected annual reported captures of 0.8148 sea turtles per year at the Humacao Fishing Pier represents 8% of the actual captures and 92% of sea turtle captures will be unreported. Reinitiation may be required if information reveals changes in reporting behavior.

$$
\begin{aligned}
&\mathit{Expected\ Annual\ Unreported\ Captures}\\
&= (\mathit{Expected\ Annual\ Reported\ Captures} \div 92\%) \times 8\%\\
&= (0.8148\ \div 0.08) \times 0.92\\
&=\ 9.3702\ \mathit{per\ year}\ (\text{Table 4}, \mathit{Line}\ 2)
\end{aligned}
$$

5.2.1.3 Calculating Total Captures of Sea Turtles

The number of captures in any given year can be influenced by sea temperatures, species abundances, 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 capture is largely impractical. Using our experience monitoring other fisheries, a 3-year time period is appropriate for meaningful evaluation of future impacts and monitoring. The triennial takes are set as 3-year running sums (i.e., i.e., 2022-2024, 2023-2025, 2024-2026, and so on) and not for static 3-year periods (i.e., i.e., 2022-2024, 2025-2027, 2028-2029, and so on). This approach reduces the likelihood of reinitiation of the formal consultation process because of inherent variability in captures, while still allowing for an accurate assessment of how the proposed action is performing versus our expectations. **Table 4** shows the projected total sea turtle captures at the consultation pier for any 3-year consecutive period based on the expected annual reported and unreported captures.

Table 4. Summary of Expected Captures of Sea Turtles for Any 3-year Consecutive Period

Captures	Total
1. Expected Annual Reported	0.8148
2. Expected Annual Unreported	9.3702
Annual Total	10.1850
Triennial (3-year) Total	30.5550

5.2.2 Estimating Total Post Release Mortality of Sea Turtles

5.2.2.1 Estimating Post Release Mortality for Reported Captures of Sea Turtles

Almost all sea turtles that are captured, landed, and reported to the STSSN are evaluated by a trained veterinarian to determine if they can be immediately released alive or require a rehabilitation facility; exceptions may happen if the sea turtle breaks free before help can arrive. Sea turtles that are captured and reported to the STSSN may die onsite, may be evaluated, released alive, and subsequently suffer PRM later, or may be evaluated and taken to a rehabilitation facility. Those taken to a rehabilitation facility may be released alive at later date or be kept in rehabilitation indefinitely (either due to serious injury or death). We consider those that are never returned to the wild population to have suffered PRM because they will never again contribute to the population. The risk of PRM to sea turtles from reported 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.

We believe the 9-year STSSN dataset for offshore recreational hook and line captures and entanglements in Zone 26 is the most accurate representation of PRM for reported captures of sea turtles in the action area. As stated above, we believe it is prudent and best to use the STSSN data from Zone 26. **Table 5** provides a breakdown of final disposition of the 143 sea turtles caught or entangled in recreational hook-and-line gear in the STSSN dataset for offshore Zone 26.

Table 5. Final Disposition of Sea Turtles from Reported Recreational Hook-and-Line Captures and Gear Entanglements in Offshore Zone 26, 2007-2015 (n=143)

	Dead or Died Onsite	Released Alive Immediately (Not Evaluated)	Released Alive, Immediately (Evaluated)	Taken to Rehab, Released Alive Later	Taken to Rehab, Kept or Died in Rehab
Number of Records	54	1	4	28	56
Percentage	37.8	0.7	2.8	29.6	39.2

Of the 143 sea turtles reported captured on recreational hook-and-line or entangled in gear in Zone 26, 57.3% were removed from the wild population either through death or being unable to be released from the rehabilitation facility (i.e., lethal captures, 37.8 + 19.6) and 42.7% were released alive back into the wild population (i.e., non-lethal captures, 0.07 + 2.8 + 39.2).

To calculate the annual estimated lethal captures of reported sea turtles at the consultation pier, we use the following equation:

$$\begin{aligned}
&\mathit{Annual\ Lethal\ Reported\ Captures}\\
&= \mathit{Expected\ Annual\ Reported\ Captures}\ [\text{Table 4}, \mathit{Line}\ 1]\\
&\qquad\qquad \times \mathit{Lethal\ Captures}\ [\mathit{calculated\ from}\ \text{Table 5}]\\
&= 0.8148 \times 57.3\%\\
&= 0.4672\ \mathit{per\ year}\ (\text{Table 9}, \mathit{Line}\ 1A)
\end{aligned}$$

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

$$\begin{aligned}
&\mathit{Annual\ Non-lethal\ Reported\ Captures}\\
&= \mathit{Expected\ Annual\ Reported\ Captures}\ [\text{Table 4}, \mathit{Line}\ 1] \times \mathit{Non}\\
&\qquad\qquad - \mathit{lethal\ Captures}\ [\mathit{calculated\ from}\ \text{Table 5}]\\
&= 0.8148 \times 42.7\%\\
&= 0.3476\ \mathit{per\ year}\ (\text{Table 9}, \mathit{Line}\ 1B)
\end{aligned}$$

5.2.2.2 Estimating Post-Release Mortality for Unreported Captures of Sea Turtles

Sea turtles that are captured and not reported to the STSSN may be released alive and subsequently suffer PRM. The risk of PRM 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 a hooked captured sea turtle, some will not be able to be de-hooked, 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 fishing line, which may cause post-release injury or death.

In January 2004, NMFS convened a workshop of experts to develop criteria for estimating PRM of sea turtles caught in the pelagic longline fishery 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 updated the criteria again by adding 3 additional hooking scenarios, bringing the total to 6 categories of injury. **Table 6** describes injury categories for hardshell sea turtles captured on hook-and-line gear and the associated PRM estimates for sea turtles released with hook and trailing line greater than or equal to half the length of the carapace (i.e., Release Condition B as defined in (NMFS 2012). We use these criteria when estimating the PRM for unreported captures of sea turtles because it accounts for the expected differences in handling and care of reported versus unreported sea turtles. Please note the following as it relates to Table 6, there is no PRM estimate of Release Condition B for Injury Category V. For Injury Category V, we believe it is prudent to use the PRM 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 6, we believe it is prudent to use the PRM 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 disentangle the animal completely before releasing it back into the wild.

Table 6. Estimated Post Release Mortality Based on Injury Category for Hardshell Sea Turtles Captured via Commercial Pelagic Longline and Released in Release Condition B (NMFS 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%

PRM 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 dataset we used in **Table 5** because this data includes on what part of the body the sea turtle was hooked for 135 of the 143 interactions (**Table 7**). Please note the following for Table 7, SERO PRD assigned an Injury Category of 0 to all records with unknown hooking and entanglement locations. We exclude Injury Category 0 from the calculation because we are unsure of the location and therefore cannot assign a corresponding PRM. In this case, there are 8 interactions with an unknown hooking/entanglement location in the dataset.

Table 7. Category of Injury of Sea Turtles from Reported Recreational Hook-and-Line Captures and Gear Entanglements in Zone 26, 2007-2015 (n=135)

Injury Category*	I	II	III	IV	V	VI
Number	35	0	33	14	53	0
Percentage	25.9	0	24.4	10.4	39.3	0

As above, we assume that 8% of the sea turtles captured at the pier will be reported, and that reported turtles will be sent to rehabilitation if needed. To estimate the fate of the 92% of sea turtles expected to go unreported at the consultation pier, and therefore un-evaluated or rehabilitated, we use the estimated PRM for the injury categories in **Table 6** along with the percentage of captures in each injury category in **Table 7** to calculate the weighted PRM for each injury category. We then sum the weighted PRMs across all injury categories to determine the overall PRM for sea turtles (**Table 8**). This overall rate helps us account for the varying severity of future injuries and varying PRM 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 hooking location, and the amount of fishing gear likely to remain on an animal released immediately at the pier, we estimate a total weighted PRM of 42.0% for the 92% of sea turtles captured, unreported, and released immediately at the consultation pier. Please note the following for Table 8, % Weighted PRM = % PRM × % Captures for each category

Table 8. Estimated Weighted and Overall Post Release Mortality for Sea Turtles Captured, Unreported, and Released Immediately

Injury Category	PRM (%) [from Table 6]	Percentage [from Table 7]	% Weighted PRM
I	20	25.9	5.2
II	30	0	0
III	45	24.4	11.0
IV	60	10.4	6.2
V	50	39.3	19.6
VI	60	0	0
		Total % Weighted PRM	42.0

To calculate the estimated annual lethal captures of unreported sea turtles at the consultation pier, we use the following equation:

$Annual\ Unreported\ Lethal\ Captures$

$= Annual\ Unreported\ Captures$ [Table 4, $Line$ 2] $\times Total\ Weighted\ PRM$ [Table 8]
$= 9.3702 \times 42.0\%$
$= 3.9390\ per\ year$ (Table 9, $Line\ 2A$)

If the equation for calculating annual lethal captures of unreported sea turtles multiplies the annual unreported captures by the total weighted PRM of 42.0%, then the equation for calculating annual non-lethal captures of unreported sea turtles would multiply the annual unreported captures by 51.3% (100% – 42.0%). Therefore, to calculate the estimated annual non-lethal captures of unreported sea turtles at the consultation pier, we use the following equation:

$Annual\ Unreported\ Non-lethal\ Captures$
$= Annual\ Unreported\ Captures$ [Table 4, $Line$ 2] $\times 51.3\%$
$= 9.3702 \times 51.3\%$
$= 4.8069\ per\ year$ (Table 9, $Line\ 2B$)

5.2.2.3 Calculating Total Post Release Mortality of Sea Turtles

As we discussed above, we use a 3-year running total to evaluate future impacts to sea turtles due to PRM. **Table 9** shows the total sea turtle captures at the consultation pier for any 3-year consecutive period based on the expected annual lethal and non-lethal reported and unreported captures.

Table 9. Summary of Post Release Mortality of Sea Turtles for Any 3-year Consecutive Period

Captures	A. Lethal	B. Non-lethal
1. Annual Reported Captures	0.4672	0.3476
2. Annual Unreported Captures	3.9390	4.8069
Annual Total	4.4062	5.1545
Triennial (3-year) Total	13.2186	15.4635

5.2.3 Estimating Captures of Sea Turtles by Species

Of the sea turtles in the STSSN Zone 26 offshore data identifiable to species and which may be located in the action area and adversely affected by recreational fishing upon completion of the proposed action (n=139), 78.4% were green (n=109), 7.2% were hawksbill sea turtle (n=10), and 14.4% were loggerhead sea turtles (n=20) (**Table 2**). We will assume the same potential species composition for future captures at the consultation because, for reasons previously stated, we believe the data from Zone 26 are the best available proxy for the captures expected to occur at the Humacao Pier.

Table 10 estimates the number of lethal and non-lethal captures by sea turtles species for any consecutive 3-year period based on our calculations from Sections 5.2.1 and 5.3.2. To be conservative to the individual species, numbers of captures are rounded up to the nearest whole number. While this results in an increase in the total number of sea turtles, compared to what is presented in the non-species-specific total estimates in **Table 4** and **Table 9**, this approach is most conservative to the species, ensures that we are adequately analyzing the effects of the proposed action on whole animals, and that impacts from the proposed action can be more easily tracked. The impacts of future captures to the individual green sea turtle DPSs are discussed in the Jeopardy Analysis (Section 7) and presented in the ITS (Section 9).

Table 10. Estimated Captures of Sea Turtle Species for Any Consecutive 3-Year Period

Species	Lethal Captures	Non-lethal Captures	Total Captures
Green sea turtle (NA or SA DPS)	11 (13.2186 × 0.784 = 10.3657)	13 (15.4635 × 0.784 = 12.1261)	24
Hawksbill sea turtle	1 (13.2186 × 0.072 = 0.9510)	2 (15.4635 × 0.072 = 1.1125)	3
Loggerhead sea turtle (NWA DPS)	2 (13.2186 × 0.144 = 1.9020)	3 (15.4635 × 0.144 = 2.2250)	5

5.3 Scalloped Hammerhead Shark – Central and Southwest Atlantic DPS

5.3.1 Estimating Reported Captures of Scalloped Hammerhead Shark

NMFS considers potential hook and line capture due to recreational fishing at public fishing structures in the Caribbean Sea likely to adversely affect the Central and Southwest Atlantic DPS of scalloped hammerhead. We believe the best available data to estimate future reported recreational captures of scalloped hammerhead shark at the Humacao Fishing Pier comes from the PRDNER and NMFS MRIP data for Puerto Rico (2000-2019). Below, we discuss why this is the best available information to estimate the expected annual number of reported recreational hook-and-line captures of scalloped hammerhead shark at the Humacao Fishing Pier in the future.

As previously stated, the PRDNER and MRIP datasets contains 1 observed harvested juvenile scalloped hammerhead shark. PRDNER confirmed this reported harvest occurred at the Humacao Fishing Pier. Therefore, to calculate the estimated expected annual number of reported recreational hook-and-line captures of scalloped hammerhead shark at the Humacao Fishing Pier, we use the following equation:

$$
\begin{aligned}
&\mathit{Expected\ Annual\ Reported\ Captures}\\
&= \mathit{Reported\ Captures\ in}\ 20\ \mathit{years} \div 20\ \mathit{years}\\
&= 1 \div 20\\
&= 0.05\ \mathit{per\ year}\ (\boldsymbol{Table\ 11}, \mathit{Line}\ 1)
\end{aligned}
$$

5.3.2 Estimating Unreported Captures of Scalloped Hammerhead Shark

Like above in Section 5.2.1.2, we recognize the need to account for unreported captures. As previously discussed, only 2 fishing pier surveys aimed at collecting data regarding unreported recreational hook-and-line captures of ESA-listed species have been conducted in the Southeast Region. Like above, we will also use the unreported rate from Hill (2013) because this is the only available data we have for unreported rates of ESA-listed fish species captured from recreational fishing structures. Hill (2013) found that only 12% of anglers would have reported a smalltooth sawfish hook-and-line capture (i.e., 88% of anglers would not have reported a smalltooth sawfish capture). Herein, we use the percentage of anglers that would have not reported a smalltooth sawfish as a proxy for the percentage of anglers that would have not reported a scalloped hammerhead. In addition, in the absence of additional information on factors that might affect angler reporting behavior, such as similarity of outreach and education, signage, or culture, we will err on the side of the species and assume fewer interactions were reported, as this will result in a higher total expected interactions. Reinitiation may be required if information reveals changes in reporting behavior.

Below, we will address unreported captures by assuming that the expected annual reported captures of 0.05 scalloped hammerhead per year represents 12% of the actual captures and 88% of captures will be unreported. Therefore, to calculate the expected annual number of unreported recreational hook-and-line captures of scalloped hammerhead shark, we use the equation:

$$\begin{aligned}
&\mathit{Expected\ Annual\ Unreported\ Captures}\\
&= (\mathit{Expected\ Annual\ Reported\ Captures} \div 12\%) \times 88\%\\
&= (0.05 \div 0.12) \times 0.88\\
&= \ 0.36\ \mathit{per\ year}\ (\boldsymbol{Table}\ \mathbf{11}, \mathit{Line}\ 2)
\end{aligned}$$

5.3.3 Calculating Total Captures of Scalloped Hammerhead Shark

As previously discussed, we believe using a 3-year period is appropriate for meaningful monitoring. Table 11 presents the estimated scalloped hammerhead shark (Central and Southwest DPS) captures at the Humacao Fishing Pier for any 3-year consecutive period based on the expected annual reported and unreported captures calculated above.

Table 11. Summary of Expected Captures of Scalloped Hammerhead Shark

Captures	Total
1. Expected Annual Reported	0.05
2. Expected Annual Unreported	0.36
Annual Total	0.41
Triennial (3-year) Total	1.23

We round 1.23 up to 2 to account for the capture of whole animals in our Jeopardy analysis. Therefore, we estimate that up to 2 scalloped hammerhead sharks could be caught at the Humacao Fishing Pier during any consecutive 3-year period. Although scalloped hammerhead meat is considered essentially unpalatable (due to its high urea concentration), some countries still consume the meat domestically or trade it internationally, including Colombia, Mexico, and Uruguay (CITES 2010; Vannuccini 1999) and the 1 reported capture of a scalloped hammerhead at the Humacao Fishing Pier was recorded as a harvest (i.e., caught and kept). Further, as stated above, hammerhead sharks tend to be particularly vulnerable to capture stress and mortality associated with hook-and-line interactions (Gallagher et al. 2014; Morgan and Burgess 2007). Therefore, we will assume that all captures of scalloped hammerhead sharks at the Humacao Fishing Pier will be lethal or that all animals will suffer PRM.

5.4 Giant Manta Ray

As previously stated, NMFS does not have giant manta ray sightings or encounter data for Puerto Rico. NMFS considers potential hook and line capture due to recreational fishing at public fishing structures that are ocean-facing or located in or near inlets/passes likely to adversely affect giant manta ray. Therefore, we use the best available data from comparable locations to determine future recreational hook and line interactions of this species that may occur at the consultation pier.

The MMF conducts annual visual surveys between Jupiter Inlet and Boynton Beach Inlet, Florida. This is a known area of high abundance for juvenile giant manta ray. From 2016-2019, MMF documented 59 unique giant manta ray in the survey area, of which 16 were entangled in fishing line or foul-hooked (J. Pate, MMF, unpublished data). In the absence of better data, we assume that all giant manta ray observed entangled or foul-hooked were due to recreational fishing interactions from fishing piers. We recognize that this analysis is likely an overestimation of giant manta ray interactions that may occur at the Humacao Fishing Pier because the MMF survey occurred in a known area of high abundance; however, it is the best available data we have and most conservative to the species.

There are 4 public fishing piers between Jupiter Inlet and Boynton Beach Inlet, Florida. Because these piers are similar in size and location (i.e., relatively large, public beach-facing or inlet piers), they likely have comparable angler effort. We also assume anglers fishing from these piers use similar baits, equipment, and fishing techniques. Therefore, if we believe that the potential for interactions with giant manta ray is likely the same at all 4 piers in the survey area, then approximately 4 animals were entangled or foul-hooked per pier (16 unique animals observed entangled or foul-hooked in 4 years ÷ 4 piers in survey area). This equates to 1 recreational fishing interaction per pier per year in the survey area.

As discussed above, we believe using a 3-year period is appropriate for meaningful monitoring. Therefore, up to 3 interactions with giant manta ray at the consultation pier may occur in any consecutive 3-year period. As previously stated, we believe that all captures of giant manta ray will be non-lethal with no associated PRM.

6 CUMULATIVE EFFECTS

ESA Section 7 regulations require NMFS to consider cumulative effects in formulating its 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 (50 CFR 402.02).

At this time, we are not aware of any non-federal actions, beyond those discussed in the Environmental Baseline section, being planned or under development in the action area which would have effects to green sea turtle (NA and SA DPS), hawksbill sea turtle, loggerhead sea turtle (NWA DPS), scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray. Within the action area, major future changes are not anticipated in these ongoing human activities. The present, major human uses of the action area are expected to continue at the present levels of intensity in the near future.

Many threats to green sea turtle (NA and SA DPS), hawksbill sea turtle, loggerhead sea turtle (NWA DPS), scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray are expected to be exacerbated by the effects of global climate change. These threats are the same as those previously discussed in Sections 3.3-3.5.

7 JEOPARDY ANALYSIS

The analyses conducted in the previous sections of this Opinion serve to provide a basis to determine whether the proposed action is likely to jeopardize the continued existence of green sea turtle (NA and SA DPS), hawksbill sea turtle, loggerhead sea turtle (NWA DPS), scalloped hammerhead shark (Central and Southwest Atlantic DPS), and giant manta ray. In the Effects of the Action, we outlined how the proposed action would affect these species at the individual level and the extent of those effects in terms of the number of associated interactions, captures, and mortalities of each species to the extent possible based on the best available data. Now we assess each of these species' responses to this impact, in terms of overall population effects, and whether those effects of the proposed actions, when considered in the context of the Status of the Species, the Environmental Baseline, and the Cumulative Effects, are likely to jeopardize the continued existence of ESA-listed species in the wild. To "jeopardize the continued existence of" means to "engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and the recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Thus, in making this determination for each species, we must look at whether the proposed actions directly or indirectly reduce the reproduction, numbers, or distribution of a listed species. Then, if there is a reduction in 1 or more of these elements, we evaluate whether it would be expected to cause an appreciable reduction in the likelihood of both the survival and the recovery of the species.

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.

The status of each listed species likely to be adversely affected by the proposed action is reviewed in the Status of the Species. For any species listed globally, a jeopardy determination must find that the proposed actions will appreciably reduce the likelihood of survival and recovery at the global species range (i.e., in the wild). For any species listed as DPSs, a jeopardy determination must find that the proposed actions will appreciably reduce the likelihood of survival and recovery of that DPS.

7.1 Green Sea Turtles - NA and SA DPSs

Within U.S. waters, individuals from both the NA and SA DPS of green sea turtle 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, a study on the foraging grounds off Hutchinson Island (Atlantic coast of Florida) 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). This information suggests that the vast majority of the anticipated captures in the Atlantic Ocean 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 will act conservatively and conduct 2 jeopardy analyses (1 for each DPS). The NA DPS analysis will assume based on Bass and Witzel (2000) that 95% of green sea turtles adversely affected during the proposed action are from that DPS. The SA DPS analysis will assume that 5% of the green sea turtles adversely affected by the proposed action are from that DPS.

Applying the above percentages to our estimated 24 total captures of green sea turtles during any consecutive 3-year period (**Table 10**), we estimate the following:

- Up to 23 green sea turtles will come from the NA DPS (95% of 24 is 22.80, rounded up to 23), and
- Up to 2 green sea turtle will come from the SA DPS (5% of 24 is 1.20, rounded up to 2).

We note rounding, when splitting the take into the two DPSs, results in a slightly higher combined total than the 3-year total in **Table 10** (i.e., 25 instead of 24). This approach provides a conservative estimate for lethal and non-lethal captures at the consultation pier. While we use the higher numbers for purposes of analyzing the likelihood of jeopardy to the DPSs (Section 7.1.1 and 7.1.2), we do not expect more than 24 green sea turtle captures at the consultation pier during any consecutive 3-year period.

In Section 5.2.2.1, we presented the breakdown of the final disposition of sea turtles from reported recreational hook-and-line captures and gear entanglements in the ocean-facing waters of Zone 26. We then estimated that 57.3% of those sea turtles were lethal captures and 42.7% were non-lethal captures (**Table 5**). Applying that same percentage here to estimate lethal and non-lethal captures of green sea turtles from each of the DPSs during any 3-year consecutive period at the consultation pier, we estimate the following:

- Up to 23 green sea turtles will come from the NA DPS, of which 14 will be lethal captures (57.3% of 24 is 13.18, rounded up to 14) and 9 (23 – 14 = 9) will be non-lethal captures, and
- Up to 2 green sea turtles will come from the SA DPS, only one of which can be lethal (42.7% of 2 is 0.85, rounded up to 1).

We note that rounding, when splitting the take into lethal and non-lethal, captures results in a higher estimate of lethal take than the 3-year total in **Table 10** (i.e., 16 instead of 11). This approach provides a conservative estimate for lethal and non-lethal captures at the consultation pier. While we use the higher numbers for purposes of analyzing the likelihood of jeopardy to the DPSs (Section 7.1.1 and 7.1.2), we do not expect more than 11 lethal green sea turtle captures at the consultation pier during any consecutive 3-year period.

7.1.1 NA DPS of Green Sea Turtle

7.1.1.1 Survival

The proposed action is expected to result in capture of up to 23 green sea turtles (14 lethal, 9 non-lethal) from the NA DPS over any consecutive 3-year period. Any potential non-lethal capture during any consecutive 3-year period are not expected to have a measurable impact on the reproduction, numbers, or distribution of the species. The individual suffering non-lethal injuries or stresses is expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. The non-lethal captures will occur in the action area, which encompass a small portion of the overall range or distribution of green sea turtles within the NA DPS. Any incidentally caught animals would be released within the general area where caught and no change in the distribution of NA DPS green sea turtles would be anticipated. The potential lethal captures during any consecutive 3-year period would reduce the number of NA DPS green sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. A lethal capture would also result in a reduction in future reproduction, assuming the individual was female and would have survived otherwise to reproduce. For example, as discussed in this Opinion, an adult green sea turtle can lay up to 7 clutches (usually 3-4) of eggs every 2-4 years, with a mean clutch size of 110-115 eggs per nest, of which a small percentage is expected to survive to sexual maturity. The potential lethal captures are expected to occur in a small, discrete area and green sea turtles in the NA DPS generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals.

Whether the reductions in numbers and reproduction of this species would appreciably reduce the species likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species, we presented the status of the NA DPS, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline, we outlined the past and present impacts of all state, federal, or private actions and other human activities in or having effects in the action area that have affected and continue to affect the NA DPS. In the Cumulative Effects, we discussed the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In Section 3.3.2.1, we summarized the available information on number of green sea turtle nesters and nesting trends at NA DPS beaches; all major nesting populations demonstrate long-term increases in abundance (Seminoff et al. 2015). Therefore, nesting at the primary nesting beaches has been increasing over the course of the decades, against the background of the past and ongoing human and natural factors that have contributed to the Status of the Species. We believe these nesting trends are indicative of a species with a high number of sexually mature individuals. In the absence of any total population estimates, nesting trends are the best proxy for estimating population changes. Since the nesting abundance trend information for the NA DPS of green sea turtle is clearly increasing, we believe the combined potential lethal take of up to 14 green sea turtles from the NA DPS during any consecutive 3-year period attributed to the structures will not have any measurable effect on that trend. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe that recreational fishing from the consultation pier is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the green sea turtle NA DPS in the wild.

7.1.1.2 Recovery

The NA DPS of green sea turtles does not have a separate recovery plan at this time. 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 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.*

According to data collected from Florida's index nesting beach survey from 1989-2019, green sea turtle nest counts across Florida index beaches have increased substantially from a low of approximately 267 in the early 1990s to a high of almost 41,000 in 2019 (See Figure 3), and indicate that the first listed recovery objective is being met. 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 have increased, which is consistent with the criteria of the second listed recovery objective.

The potential lethal captures during any consecutive 3-year period will result in a reduction in numbers; however, it is unlikely to have any detectable influence on the recovery objectives and trends noted above, even when considered in the context of the of the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. Any non-lethal captures would not affect the adult female nesting population or number of nests per nesting season. Thus, the proposed action will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of NA DPS green sea turtles' recovery in the wild.

7.1.1.3 Conclusion

The combined potential lethal and non-lethal captures during any consecutive 3-year period of green sea turtles 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.

7.1.2 SA DPS of Green Sea Turtle

7.1.2.1 Survival

The proposed action is expected to result in the capture of up to 2 green sea turtle, only 1 of which can be lethal, from the SA DPS over any consecutive 3-year period. Any potential non-lethal captures during any consecutive 3-year period are not expected to have a measurable impact on the reproduction, numbers, or distribution of the species. The individual suffering non-lethal injuries or stresses is expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. All non-lethal captures will occur in the action area, which encompass a small portion of the overall range or distribution of green sea turtles within the SA DPS. Any incidentally caught animals would be released within the general area where caught and no change in the distribution of SA DPS green sea turtles would be anticipated. The potential lethal captures during any consecutive 3-year period would reduce the number of SA DPS green sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. A lethal capture would also result in a reduction in future reproduction, assuming the individual was female and would have survived otherwise to reproduce. For example, as discussed in this Opinion, an adult green sea turtle can lay up to 7 clutches (usually 3-4) of eggs every 2-4 years, with a mean clutch size of 110-115 eggs per nest, of which a small percentage is expected to survive to sexual maturity. All potential lethal captures are expected to occur in a small, discrete area and green sea turtles in the SA DPS generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals.

Whether the reductions in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species, we presented the status of the DPS, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline, we considered the past and present impacts of all state, federal, or private actions and other human activities in, or having effects in, the action area that have affected and continue to affect this DPS. In the Cumulative Effects, we considered the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In Section 3.3.2.1, we summarized available information on number of green sea turtle nesters and nesting trends at SA DPS beaches; some of the largest nesting beaches such as Ascension Island, Aves Island (Venezuela), and Galibi (Suriname) appear to be increasing. Therefore, it is likely that nesting at the primary nesting beaches has been increasing over the course of the decades, against the background of the past and ongoing human and natural factors that have contributed to the status of the species. We believe these nesting trends are indicative of a species with a high number of sexually mature individuals. Since the nesting abundance trend information for green sea turtles appears to be increasing, we believe a lethal capture during any consecutive 3-year period attributed to recreational fishing at the consultation pier will not have any measurable effect on that trend. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe that recreational fishing from the consultation pier is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the SA DPS of green sea turtle in the wild.

7.1.2.2 Recovery

Like the NA DPS, the SA DPS of green sea turtles does not have a separate recovery plan in place at this time. However, an Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991b) does exist. Since the animals within the SA 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 SA DPS, is developed. In our analysis for the NA DPS, we stated that 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.*

Because the first objective listed above is specific to nesting in Florida, it is specific to the NA DPS, but demonstrates the importance of increases in nesting to recovery. As previously stated, nesting at the primary SA DPS nesting beaches appears to have been increasing over the course of the decades. There are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the likely increases in nesting, and likely correlation between increased nesting and increased overall population, it is likely that numbers on foraging grounds also have increased.

The potential lethal capture of up to 1 green sea turtle from the SA DPS during any consecutive 3-year period will result in a reduction in numbers; however, it is unlikely to have any detectable influence on the trends noted above, even when considered in context with the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. Any non-lethal captures would not affect the adult female nesting population or number of nests per nesting season. Thus, the recreational fishing from the proposed pier will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of the SA DPS of green sea turtles' recovery in the wild.

7.1.2.3 Conclusion

The combined potential lethal and non-lethal captures during any consecutive 3-year period of green sea turtles associated with the proposed action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the SA DPS of green sea turtle in the wild.

7.2 Hawksbill Sea Turtle

7.2.1 Survival

The proposed action is expected to result in the capture of up to 3 hawksbill sea turtles (1 lethal, 2 non-lethal) over any consecutive 3-year period. The potential non-lethal capture of hawksbill sea turtles is not expected to have any measurable impact on the reproduction, numbers, or distribution of the species. The individuals suffering non-lethal injuries or stresses are expected to fully recover such that no reductions in reproduction or numbers of hawksbill sea turtles are anticipated. The captures may occur anywhere in the action area, which encompasses only a tiny portion of hawksbill sea turtles' overall range/distribution. Any incidentally caught animal would be released within the general area where caught and no change in the distribution of hawksbill sea turtles would be anticipated.

The lethal capture of 1 hawksbill sea turtle during any 3-year consecutive period would reduce the number of hawksbill sea turtles, compared to the number that would have been present in the absence of the proposed action, assuming all other variables remained the same. The potential lethal interaction could also result in a reduction in future reproduction, assuming the individual would be a female and would have survived to reproduce in the future. For example, an adult hawksbill sea turtle can lay 3-5 clutches of eggs every few years (Meylan and Donnelly 1999; Richardson et al. 1999) with up to 250 eggs/nest (Hirth and Latif 1980). Thus, the loss of a female could preclude the production of thousands of eggs and hatchlings, of which a fraction would otherwise survive to sexual maturity and contribute to future generations. Sea turtles generally have large ranges in which they disperse; thus, no reduction in the distribution of hawksbill sea turtles is expected from this take.

In the absence of any total population estimates for hawksbill sea turtles, nesting trends are the best proxy we have for estimating population changes. The 5-year status review estimated between 21,000 and 28,000 adult females existed in the Atlantic basin at the time of its writing in 2007 (NMFS and USFWS 2007b); this estimate does not include juveniles of either sex or mature males. Hawksbill nesting trends also indicate an increase over the last 20 years. A survey of historical nesting trends (i.e., 20-100 years ago) for the 33 nesting sites in the Caribbean found declines at 25 of those sites; data were not available for the remaining 8 sites. However, in the last 20 years, nesting trends have been increasing. Of those 33 sites, 9 sites now show an increase in nesting, 11 sites showed a decrease, and data for the remaining 13 were not available (NMFS and USFWS 2007b). Because of the small impact we believe the proposed action may have on the hawksbill population from the loss of 1 hawksbill sea turtle in any 3-year period and because we believe increases in nesting indicate improving population numbers against the background of the past and ongoing human and natural factors that have contributed to the current status of the species, including fishing at the Humacao Fishing Pier, we do not anticipate the potential loss will have any detectable effect on the total population of hawksbill sea turtles.

Additionally, we do not anticipate the proposed action will have any measurable effect on genetic diversity. Based on the sex ratio of hawksbill sea turtles, there is only a 50% chance that a female would be captured. Furthermore, we have no reason to believe that the proposed action would disproportionately affect females from one rookery over another. This is noteworthy because, regardless of the size of these rookeries, each contributes to species' genetic diversity. Because we believe only 1 lethal take may occur over any consecutive 3-year period, and that take could be from any 1 of these rookeries, we do not believe the proposed action will have a measurable effect on the species' overall genetic diversity. Nor do we believe the anticipated lethal take of 1 hawksbill sea turtle during any 3-year consecutive period will have any noticeable effect on the number of sexually mature individuals that produce viable offspring.

We do not anticipate the proposed action will have any noticeable impact of the population overall, and the action will not cause the population to lose genetic diversity, or the capacity to successfully reproduce. Therefore, we do not believe the proposed action will cause an appreciable reduction in the likelihood of survival of the hawksbill sea turtle in the wild.

7.2.2 Recovery

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

Objective: The adult female population is increasing, as evidenced by a statistically significant trend in the annual number of nests at 5 index beaches, including Mona Island and Buck Island Reef National Monument.

- Of the rookeries regularly monitored—Jumby Bay (Antigua/Barbuda), Barbados, Mona Island, and Buck Island Reef National Monument— all show increasing trends in the annual number of nests (NMFS and USFWS 2007b).

Objective: The numbers of adults, subadults, and juveniles are increasing, as evidenced by a statistically significant trend on at least 5 key foraging areas within Puerto Rico, USVI, and Florida.

- In-water research projects at Mona Island, Puerto Rico, and Marquesas, Florida, which involve the observation and capture of juvenile hawksbill turtles, are underway. Although there are 15 years of data for the Mona Island project, abundance indices have not yet been incorporated into a rigorous analysis or a published trend assessment. The time series for the Marquesas project is not long enough to detect a trend (NMFS and USFWS 2007b).

Objective: The recovery plan lists 6 major actions that are needed to achieve recovery, including:

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

- Ensure long-term protection of important foraging habitats

The proposed action could cause the loss of 1 hawksbill sea turtle over any consecutive 3-year period, and that animal may or may not be an adult and may or may not be a female. Compared to the adult female populations at index beaches, which are showing increasing trends in the annual number of nests, we do not believe the potential lethal take associated with the proposed action would have any detectable influence on the magnitude of the trends noted above. Similarly, we do not believe the potential lethal take of 1 hawksbill sea turtle over any consecutive 3-year period will have any detectable influence over the numbers of adults, subadults, and juveniles occurring at 5 key foraging areas. Unlike for other sea turtle species, none of the major actions specified for recovery are specific to fishery bycatch. While incidental capture in commercial and recreational fisheries is listed as one of the threats to the species, the only related action, "Monitor and reduce mortality from incidental capture in fisheries," is ranked as a Priority 3. The potential effects on hawksbill sea turtles from the proposed action are not likely to reduce overall population numbers over time due to current population sizes and expected recruitment. Thus, we believe the proposed action is not likely to impede the recovery objectives above and will not result in an appreciable reduction in the likelihood of hawksbill sea turtles' recovery in the wild.

7.2.3 Conclusion

The combined potential lethal and nonlethal capture of up to 3 hawksbill sea turtles associated with the proposed action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of hawksbill sea turtles in the wild.

7.3 Loggerhead Sea Turtle – NWA DPS

7.3.1 Survival

The proposed action is expected to result in the capture of up to 5 loggerhead sea turtles (2 lethal, 3 non-lethal) from the NWA DPS during any consecutive 3-year period. Any potential non-lethal captures during any consecutive 3-year period are not expected to have a measurable impact on the reproduction, numbers, or distribution of the species. The individual suffering non-lethal injuries or stresses is expected to fully recover such that no reductions in reproduction or numbers of green sea turtles are anticipated. All non-lethal captures will occur in the action area, which encompass a small portion of the overall range or distribution of loggerhead sea turtles within the NWA DPS. Any incidentally caught animals would be released within the general area where caught and no change in the distribution of NWA DPS of loggerhead sea turtles would be anticipated.

The potential lethal captures during any consecutive 3-year period would reduce the number of NWA loggerhead sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. Potential lethal captures would also result in a reduction in future reproduction, assuming the individual was female and would have survived otherwise to reproduce. For example, an adult female loggerhead sea turtle can lay approximately 4 clutches of eggs every 3-4 years, with 100-126 eggs per clutch. Thus, the loss of adult females could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity. However, the potential lethal take during any consecutive 3-year period is expected to occur in a small, discrete area and loggerhead sea turtle generally have large ranges; thus, no reduction in the distribution is expected from the take of these individuals.

Whether the reductions in numbers and reproduction of this species would appreciably reduce its likelihood of survival depends on the probable effect the changes in numbers and reproduction would have relative to current population sizes and trends. In the Status of Species, we presented the status of the DPS, outlined threats, and discussed information on estimates of the number of nesting females and nesting trends at primary nesting beaches. In the Environmental Baseline, we considered the past and present impacts of all state, federal, or private actions and other human activities in, or having effects in, the action area that have affected and continue to affect this DPS. In the Cumulative Effects, we considered the effects of future state, tribal, local, or private actions that are reasonably certain to occur within the action area.

In the absence of any total population estimates, nesting trends are the best proxy for estimating population changes. Abundance estimates in the western North Atlantic indicate the population is large (i.e., several hundred thousand individuals). In Section 3.3.4.3, we summarized available information on number of loggerhead sea turtle nesters and nesting trends. Nesting trends across all of the recovery units have been steady or increasing over several years against the background of the past and ongoing human and natural factors that have contributed to the current status of the species. Additionally, in-water research suggests the abundance of neritic juvenile loggerheads is steady or increasing.

While the potential lethal capture of 2 loggerhead sea turtles during any consecutive 3-year period will affect the population, in the context of the overall population’s size and current trend, we do not expect this loss to result in a detectable change to the population numbers or increasing trend. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to the DPS discussed in this Opinion, we believe the consultation pier is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the NWA DPS of loggerhead sea turtle in the wild.

7.3.2 Recovery

The recovery plan for the for the Northwest Atlantic population of loggerhead sea turtles (NMFS and USFWS 2009) was written prior to the loggerhead sea turtle DPS listings. However, this plan deals with the populations that comprise the current NWA DPS and is therefore, the best information on recovery criteria and goals for the DPS. It lists the following recovery objectives that are relevant to the effects of the proposed actions:

- Ensure that the number of nests in each recovery unit is increasing and that this increase corresponds to an increase in the number of nesting females
- 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 is the process of removing threats so self-sustaining populations persist in the wild. The proposed actions would not impede progress on carrying out any aspect of the recovery program or achieving the overall recovery strategy. The recovery plan estimates that the population will reach recovery in 50-150 years following implementation of recovery actions. The minimum end of the range assumes a rapid reversal of the current declining trends; the higher end assumes that additional time will be needed for recovery actions to bring about population growth.

Nesting trends have been significantly increasing over several years. The potential lethal capture of up to 2 loggerhead sea turtles during any consecutive 3-year period is so small in relation to the overall population, even when considered in the context of the Status of the Species, the Environmental Baseline, and Cumulative Effects discussed in this Opinion. We believe this is true for both nesting and juvenile in-water populations. The potential non-lethal from the NWA DPS would not affect the adult female nesting population, number of nests per nesting season, or juvenile in-water populations. Thus, recreational fishing at the proposed pier will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of NWA DPS of loggerhead sea turtles' recovery in the wild.

7.3.3 Conclusion

The combined lethal and non-lethal captures during any consecutive 3-year period of loggerhead sea turtles associated with the proposed action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the NWA DPS of the loggerhead sea turtle in the wild.

7.4 Scalloped Hammerhead Shark – Central and Southwest Atlantic DPS

The proposed action is expected to result in the capture of 2 scalloped hammerhead sharks over any consecutive 3-year period. Due to this species' stress physiology, typically longer fight times associated with recreational gear, and likelihood of juvenile capture, we expect all captures to be lethal or animals to suffer PRM (Gallagher et al. 2014; Macbeth et al. 2009; Morgan and Burgess 2007).

7.4.1 Survival

The lethal capture of 2 scalloped hammerhead over any consecutive 3-year period will reduce the number of scalloped hammerheads as compared to the number of scalloped hammerheads that would have been present in the absence of the proposed action assuming all other variables remained the same. These lethal takes could also result in the loss of reproduction value as compared to the reproductive value in the absence of the proposed actions, if a female is taken. The death of a female eliminates an individual's contribution to future generations, and the proposed action would result in a reduction in future scalloped hammerhead reproduction. While adult scalloped hammerhead sharks are less migratory than other sharks (i.e., this species rarely crosses oceans), they are still wide-ranging. Juveniles are known to inhabit protected, inshore or nearshore highly productive areas for the first year of their lives (Clark 1971). Since these lethal captures may occur in the small, discrete action area, no change in the distribution of scalloped hammerhead is anticipated.

There is currently no accurate population estimate for the Central and Southwest Atlantic DPS of scalloped hammerhead sharks. However, Miller et al. (2014) concluded that abundance numbers for this DPS are likely similar to, and probably worse than, those found in the Northwest Atlantic and Gulf of Mexico DPS. The virgin population estimates for the Northwest Atlantic and Gulf of Mexico DPS ranged from 142,000 and 169,000 individuals (range 116,000-260,000) (Hayes et al. 2009). The population estimates for the most recent time period (2005) estimate a much smaller population: 24,850-27,900 individuals (Hayes et al. 2009).

Since Miller et al. (2014) concluded that abundance numbers for this DPS are likely similar to, and probably worse than, those found in the Northwest Atlantic and Gulf of Mexico DPS, we will conservatively base our analysis on the 24,850 population number. The loss of 2 scalloped hammerhead over any consecutive 3-year period will not significantly decrease the populations within the Central and Southwest Atlantic DPS as this is a limited amount of loss relative to the estimated population size, nor will it change their distribution. Thus, we believe the lethal captures associated with the proposed action are not likely to appreciably reduce the likelihood of survival of the Central and Southwest Atlantic DPS of scalloped hammerhead sharks in the wild.

7.4.2 Recovery

Since scalloped hammerhead sharks have just recently been listed, a recovery plan for them is not yet available. However, recovery is the process by which the ecosystems of a species are restored and the threats to the species are removed. Restoring ecosystems and eliminating threats will help support self-populating and self-regulating populations so they can become persistent members of the native biological communities. Thus, the first step in recovering a species is to reduce identified threats; only by alleviating threats can lasting recovery be achieved. The Final Listing Rule (79 FR 38213, July 3, 2014) noted the following potential threats to the Central and Southwest Atlantic DPS of scalloped hammerhead sharks:

1. Overutilization in artisanal fisheries, north of Brazil, that operate in nearshore and inshore environments that are likely nursery areas, and overutilization in artisanal and commercial fisheries within Brazil that target scalloped hammerhead sharks.
2. Operation of domestic artisanal fisheries and foreign commercial fisheries in areas without adequate fisheries regulations and operation of domestic and foreign fisheries in areas without capacity to enforce existing fishery regulations.
3. Scalloped hammerhead sharks' physiology makes them very susceptible to mortality in fishing gear. They often suffer very high at-vessel fishing mortality (Macbeth et al. 2009; Morgan and Burgess 2007), and their schooling behavior increases their likelihood of being caught in large numbers.

The proposed action will not contribute to the overutilization of the species in Brazil. Additionally, as discussed previously, the lethal captures associated with the proposed action are not likely to impede the Central and Southwest Atlantic DPS of scalloped hammerhead sharks from continuing to survive. Therefore, we believe the proposed action is not likely to impede the recovery of the species, and will not result in an appreciable reduction in the likelihood of the Central and Southwest Atlantic DPS of scalloped hammerhead shark's recovery in the wild.

7.4.3 Conclusion

The potential lethal captures over any consecutive 3-year period associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the Central and Southwest Atlantic DPS of scalloped hammerhead shark in the wild.

7.5 Giant Manta Ray

The proposed action is expected to result in the capture of 3 giant manta rays over any consecutive 3-year period. We expect all captures to be non-lethal with no associated PRM.

7.5.1 Survival

The non-lethal capture of giant manta ray over any consecutive 3-year period is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. The individuals captured are expected to fully recover such that no reductions in reproduction or numbers of this species are anticipated. Since these captures may occur in the small, discrete action area and would be released within the general area where caught, no change in the distribution of giant manta ray is anticipated.

7.5.2 Recovery

A recovery plan for giant manta ray has not yet been developed; however, NMFS published a recovery outline for the giant manta ray (NMFS 2019). The recovery outline serves as an interim guidance to direct recovery efforts for giant manta ray. The recovery outline identifies two primary interim goals:

1) Stabilize population trends through reduction of threats, such that the species is no longer declining throughout a significant portion of its range; and
2) Gather additional information through research and monitoring on the species' current distribution and abundance, movement and habitat use of adult and juveniles, mortality rates in commercial fisheries (including at-vessel and PRM), and other potential threats that may contribute to the species' decline.

The major threats affecting the giant manta ray were summarized in the final listing rule (83 FR 2619, Publication Date January 22, 2018). The most significant threats to the giant manta ray are overutilization by foreign commercial and artisanal fisheries in the Indo-Pacific and Eastern Pacific and inadequate regulatory mechanisms in foreign nations to protect this species from the heavy fishing pressure and related mortality in these waters outside of U.S. jurisdiction. Other threats that potentially contribute to long-term risk of the species include: (micro) plastic ingestion rates, increased parasitic loads as a result of climate change effects, and potential disruption of important life history functions as a result of increased tourism. However, due to the significant data gaps, the likelihood and impact of these threats on the status of the species is highly uncertain. Recreational fishing interactions are not considered a major threat to this species and we do not believe the proposed action will appreciably reduce the recovery of giant manta ray, by significantly exacerbating effects of any of the major threats identified in the final listing rule.

The individuals suffering non-lethal capture are expected to fully recover such that no reductions in reproduction or numbers of giant manta rays are anticipated. The non-lethal capture will occur at in a discrete location and the action area encompasses only a portion of the overall range or distribution of giant manta rays. Any incidentally caught animal would be released within the general area where caught and no change in the distribution of giant manta rays would be anticipated. Therefore, the non-lethal capture of giant manta rays associated with the proposed action are not expected to cause an appreciable reduction in the likelihood of recovery of the giant manta rays in the wild.

7.5.3 Conclusion

The potential non-lethal capture over any consecutive 3-year period associated with the proposed action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of giant manta ray in the wild. Mortalities are not expected, and the proposed action furthers outreach efforts by ensuring signs are maintained at the pier to educate anglers about safe handling and reporting interactions with the species.

8 CONCLUSION

After reviewing the Status of the Species, the Environmental Baseline, the Effects of the Action, and the Cumulative Effects using the best available data, it is NMFS's Opinion that the proposed action are not likely to jeopardize the continued existence of the green sea turtle (NA and SA DPS), hawksbill sea turtle, loggerhead sea turtle (NWA DPS), scalloped hammerhead shark (Central and Southwest Atlantic DPS), or giant manta ray.

9 INCIDENTAL TAKE STATEMENT (ITS)

Section 9 of the ESA and protective regulations issued pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption.

Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. *Incidental take* is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that would otherwise be considered prohibited under Section 9 or Section 4(d), but which is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with the reasonable and prudent measures and the terms and conditions of the ITS of the Opinion.

9.1 Anticipated Amount or Extent of Incidental Take

The take limits prescribed in this Opinion that will trigger the requirement to reinitiate consultation are based on the amount of take that we expect *to be reported* as it is not possible to directly monitor the incidents that go unreported. The best available information for estimating the amount of future take of sea turtles, scalloped hammerhead shark, and giant manta ray that will be reported at the Humacao Fishing Pier is described in Sections 5.2-5.4.

In Section 5.2.1.1, we developed an estimate of the total number of sea turtle captures expected to be reported annually (0.8148; **Table 4**, Line 1). We take that number and multiply by 3 to get the 3-year total estimate of reported sea turtle captures (0.8148 × 3 = 2.4444). We then apply that number to the species breakdown reported in the STSSN inshore data for recreational hook-and-line captures and gear entanglement in the ocean-facing waters of Zone 26 (described in Section 5.3.2) to obtain the 3-year total estimate of reported take of each species of sea turtle. For those estimates that come out to be less than 1, we round up to 1 to reach a whole number that can be used as the take limit. The anticipated, unreported sea turtle takes are not directly monitored but can be estimated from reported takes using the process described in Section 5.2.1.2. Based on the data collected from the Hill (2013) fishing pier study, we anticipate 92% of sea turtle take will go unreported.

In Section 5.3, we developed an estimate of the total number of scalloped hammerhead captures expected to be reported annually (0.05; **Table 11**, Line 1). We take that number and multiply by 3 to get the 3-year total estimate of reported scallop hammerhead shark captures (0.05 × 3 = 0.15). We round 0.15 to 1 to reach a whole number that can be used as the take limit.

Section 5.4 describes how we calculate the take limit for giant manta ray in the absence of annual reporting data.

Therefore, the take limits shown in **Table 12** are our best estimates of the amount of sea turtle, scalloped hammerhead, and giant manta ray take expected to be reported over any consecutive 3-year period at the Humacao Fishing Pier. Please note, we do not expect, and do not authorize, more than 2 green sea turtle takes during any consecutive 3-year time period, which may come from either the NA or the SA DPS.

Table 12. Incidental Take Limits by Species for Any Consecutive 3-Year Period

Species	Total Estimated Reported Captures	Incidental Take Limits that will Trigger Reinitiation
Green sea turtle (NA or SA DPS)	2.4444 × 0.76 = 1.8577, rounded up to 2	No more than 2 reported captures
Hawksbill sea turtle	2.4444 × 0.07 = 0.1711, rounded up to 1	No more than 1 reported capture
Loggerhead sea turtle (NWA DPS)	2.4444 × 0.14 = 0.3422, rounded up to 1	No more than 1 reported capture

Species	Total Estimated Reported Captures	Incidental Take Limits that will Trigger Reinitiation
Scalloped hammerhead shark (Central and Southwest DPS)	0.05 × 5 = 0.15, rounded up to 1	No more than 1 reported capture
Giant manta ray	-	No more than 3 reported captures

It is important to note that the mortality rates estimated in Section 5.2.2 for sea turtles are not likely to be detected in the initial reporting of captures, as most sea turtles are expected to live for some period following capture. Some of these individuals may be sent to rehabilitation facilities and later die in those facilities, or may be released and die in the wild from undetected injuries, as discussed in our PRM analysis. While it is also possible that some sea turtles may die immediately from severe injuries related to hook and line capture or entanglement (which will be included in the annual reports discussed below in Section 9), we do not expect that result. At the time of the interaction, we expect sea turtle take in the above ITS to be non-lethal. As previously discussed in Section 5.2.2.1, up to 57.3% of the reported interactions could result in a mortality, and reports of such PRM are consistent with the analysis in this Opinion and this ITS. Likewise, we expect PRM of the unreported sea turtle interactions, as described in Section 5.2.2.2.

Again, we expect all interactions with scalloped hammerhead shark to be lethal (reported and unreported) and all interactions with giant manta ray (reported and unreported) to be non-lethal with no associated PRM.

9.2 Effect of Take

NMFS has determined that the anticipated incidental take is not likely to jeopardize the continued existence of the green sea turtle (NA and SA DPS), hawksbill sea turtle, loggerhead sea turtle (NWA DPS), scalloped hammerhead shark (Central and Southwest Atlantic DPS), or giant manta ray.

9.3 Reasonable and Prudent Measures (RPMs)

Section 7(b)(4) of the ESA requires NMFS to issue a statement specifying the impact of any incidental take on a ESA-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 T&Cs to implement those measures must be provided and must be followed to minimize those impacts. Only incidental taking by the federal action agency or applicant that complies with the specified T&Cs is authorized.

The RPMs and T&Cs 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 ESA-listed species. These RPMs and T&C must be implemented by the federal action agency in order for the protection of Section 7(o)(2) to apply. If the applicant fails to adhere to the T&Cs of this ITS through enforceable terms, and/or fails to retain oversight to ensure compliance with these

T&Cs, the protective coverage of Section 7(o)(2) may lapse. To monitor the impact of the incidental take, the applicant 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 T&Cs are necessary and appropriate to minimize impacts of the incidental take of ESA-listed species related to the proposed action:

1. The federal action agency must ensure that the applicant provides take reports regarding all interactions with ESA-listed species at the fishing pier(s).
2. The federal action agency must ensure that the applicant minimizes the likelihood of injury or mortality to ESA-listed species resulting from hook-and-line capture or entanglement by activities at the fishing pier(s).
3. The federal action agency must ensure that the applicant reduces the impacts to incidentally captured ESA-listed species.
4. The federal action agency must ensure that the applicant coordinates periodic fishing line removal (i.e., cleanup) events with non-governmental or other local organizations.

9.4 Terms and Conditions (T&Cs)

The following T&Cs implement the above RPMs:

1. To implement RPM 1, the federal action agency must ensure that the applicant reports all known angler-reported hook-and-line captures of ESA-listed species and any other takes of ESA-listed species to the NMFS SERO PRD.
    a. If and when the applicant becomes aware of any reported capture, entanglement, stranding, or other take, the applicant must notify NMFS SERO PRD by email: takereport.nmfsser@noaa.gov.
        i. Emails must reference this Opinion by the NMFS tracking number (SERO-2021-001132 Humacao Fishing Pier Replacement) and date of issuance.
        ii. The email must state the species, date and time of the incident, general location and activity resulting in capture (e.g., fishing from the pier by hook-and-line), condition of the species (i.e., alive, dead, sent to rehabilitation), size of the individual, behavior, identifying features (i.e., presence of tags, scars, or distinguishing marks), and any photos that may have been taken.
    b. Every year, the applicant must submit a summary report of capture, entanglement, stranding, or other take of ESA-listed species to NMFS SERO PRD by email: nmfs.ser.esa.consultations@noaa.gov.
        i. Emails and reports must reference this Opinion by the NMFS tracking number (SERO-2021-001132 Humacao Fishing Pier Replacement) and date of issuance.
        ii. The report will contain the following information: the total number of ESA-listed species captures, entanglements, strandings, or other take that was reported at or adjacent to the piers included in this Opinion.

        iii. The report will contain all information for any sea turtles taken to a rehabilitation facility holding an appropriate USFWS Native Endangered and Threatened Species Recovery permit. This information can be obtained from the appropriate State Coordinator for the STSSN (https://www.fisheries.noaa.gov/state-coordinators-sea-turtle-stranding-and-salvage-network)
        iv. The first report will be submitted by January 31, 2022, and will cover the time period from pier opening until December 31, 2022. The second report will be submitted by January 31, 2023, and will cover calendar year 2022 and the information in the first report. The third report will be submitted by January 31, 2024, and will cover the prior two calendar years (calendar years 2023 and 2022) and the information from the first report. The next report will be submitted by January 31, 2025, and will cover the prior three calendar years (calendar years 2024, 2023, and 2022). Thereafter, reports will be prepared every year, covering the prior rolling three-year time period, and emailed no later than January 31 of any year.
        v. Reports will include current photographs of signs and bins required in T&Cs 2, below, and records of the clean-ups required in T&C 3 below.

2. To implement RPMs 2 and 3, the federal action agency must ensure that the applicant must:
    a. Install and maintain the following NMFS Protected Species Educational Sign: 'Save Dolphins, Sea Turtles, Sawfish, and Manta Ray.'
        i. Signs will be posted at least at the entrance to and terminal end of the pier.
        ii. Signs will be installed prior to opening the pier for public use.
        iii. Photographs of the installed signs will be emailed to NMFS's Southeast Regional Office (nmfs.ser.esa.consultations@noaa.gov) with the NMFS tracking number (SERO-2021-001132 Humacao Fishing Pier Replacement) and date of issuance.
        iv. Sign designs and installation methods are provided at the following website: https://www.fisheries.noaa.gov/southeast/consultations/protected-species-educational-signs.
        v. Current photographs of the signs will be included in each report required by T&C 1, above.
    b. Install and maintain monofilament recycling bins and trash receptacles at the piers to reduce the probability of trash and debris entering the water.
        i. Monofilament recycling bins and trash receptacles will be installed prior to opening the pier for public use.
        ii. Photographs of the installed bins will be emailed to NMFS's Southeast Regional Office by email (nmfs.ser.esa.consultations@noaa.gov) with the NMFS tracking number for this Opinion (SERO-2021-001132 Humacao Fishing Pier Replacement) and date of issuance.
        iii. The applicant must regularly empty the bins and trash receptacles and make sure they are functional and upright.
        iv. Additionally, current photographs of the bins will be included in each report required by T&C 1, above.

3. To implement RPMs 2, 3, and 4, the federal action agency must ensure that the applicant must:
    a. Perform at least 1 annual underwater cleanup to remove derelict fishing line and associated gear from around the pier structure.
    b. Submit a record of each cleaning event in the report required by T&C 1 above.

10 CONSERVATION RECOMMENDATIONS (CRs)

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. CRs 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 CRs further the conservation of the listed species that will be affected by the proposed action. NMFS strongly recommends that these measures be considered and implemented by the federal action agency:

Sea turtles:

- Conduct or fund research that investigates ways to reduce and minimize mortality of sea turtles in the recreational hook-and-line fishery.
- Conduct or fund outreach designed to increase the public's knowledge and awareness of ESA-listed sea turtle species.

Scalloped hammerhead shark:

- Conduct or fund research that investigates ways to reduce and minimize mortality of scalloped hammerhead shark in the recreational hook-and-line fishery.
- Conduct or fund outreach designed to increase the public's knowledge and awareness of scalloped hammerhead.
- Develop safe handling and release guidance scalloped hammerhead sharks caught in the recreational fishery in the Caribbean.

Giant manta ray:

- Conduct or fund outreach designed to increase the public's knowledge and awareness of giant manta ray.
- Report giant manta ray sightings to the giant manta ray recovery coordinator at NMFS Southeast Region Protected Resources Division. Giant manta ray's observations should be photographed and include the latitude/longitude, date, and environmental conditions at the time of the sighting.

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 of these or additional conservation recommendations.

11 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 take 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 Opinion, or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

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