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

F/SER31:SG
SERO-2023-01541

03/21/2024

Patricia Clune
Project Manager, Palm Beach Gardens Section
Jacksonville District Corps of Engineers
Department of the Army
4400 PGA Boulevard, Suite 500
Palm Beach Gardens, Florida 33410

Ref.: SAJ-2023-00139, City of West Palm Beach, Fishing Pier Removal and Replacement, West Palm Beach, Palm Beach County, Florida

Dear Patricia Clune,

The enclosed Biological Opinion responds to your request for consultation with us, the National Marine Fisheries Service (NMFS), pursuant to Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. § 1531 et seq.) for the above referenced action. The Opinion has been given the NMFS tracking number SERO-2023-01541. Please use the NMFS tracking number in all future correspondence related to this action.

The Opinion considers the effects of the U.S. Army Corps of Engineer's (USACE) proposal to authorize the demolition and replacement of an existing public recreational fishing pier by the City of Palm Beach (the applicant) in West Palm Beach, Palm Beach County, Florida, on the following listed species and critical habitat: green sea turtle (North and South Atlantic DPS), Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), hawksbill sea turtle, smalltooth sawfish (U.S. DPS), and giant manta ray. The Opinion is based on information provided by the USACE, the applicant, and the published literature cited within. NMFS concludes that the proposed action will have no effect on green sea turtle (South Atlantic DPS) and leatherback sea turtle. NMFS concludes that the proposed action is not likely to adversely affect Kemp's ridley sea turtle. NMFS concludes that the proposed action is likely to adversely affect, but is not likely to jeopardize the continued existence of, green sea turtle (North Atlantic DPS), hawksbill sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish (U.S. DPS), and giant manta ray.

NMFS is providing an Incidental Take Statement with this Opinion. The Incidental Take Statement describes Reasonable and Prudent Measures that NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The Incidental Take Statement also specifies Terms and Conditions, including monitoring and reporting requirements with which the USACE and applicant must comply, to carry out the Reasonable and Prudent Measures.

We look forward to further cooperation with you on other projects to ensure the conservation of our threatened and endangered marine species and critical habitat. If you have any questions regarding this consultation, please contact Sarah Garvin, Consultation Biologist, by phone at (727) 342-0249, or by email at Sarah.Garvin@noaa.gov.

Sincerely,

AMENDOLA.KIMBERLY.BARBARA.1365830769
Digitally signed by AMENDOLA.KIMBERLY.BARBARA.1365830769
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for Andrew J. Strelcheck
Regional Administrator

Enclosure (s):
NMFS Biological Opinion SERO-2023-01541
cc: Patricia.R.Clune@usace.army.mil
nmfs.ser.esa.consultations@noaa.gov
File: 1514-22.f.4

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency:	U.S. Army Corps of Engineers – Jacksonville District Permit number: SAJ-2023-00139
Applicant:	City of Palm Beach
Activity:	Demolition and Replacement of an Existing Fishing Pier
Location:	West Palm Beach, Palm Beach County, Florida
Consulting Agency:	National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida NMFS Tracking Number: SERO-2023-01541
Approved by:	for AMENDOLA.KIMBERLY.BARBARA.1365830769 Digitally signed by AMENDOLA.KIMBERLY.BARBARA.1365830769 Date: 2024.03.21 09:53:12 -04'00' Andrew J. Strelcheck, Regional Administrator NMFS, Southeast Regional Office St. Petersburg, Florida
Date Issued:	03/21/2024

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ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASURE

ac	acre(s)
°C	degrees Celsius
CFR	Code of Federal Regulations
cm	centimeter(s)
dB	Decibel
DDT	dichlorodiphenyltrichloroethane
DPS	Distinct Population Segment
DW	disc width
ECO	Environmental Consultation Organizer
EFH	Essential Fish Habitat
ESA	Endangered Species Act of 1973, as amended (16 U.S.C. § 1531 et seq.)
°F	degrees Fahrenheit
ft	foot/feet
FR	Federal Register
ft^2	square foot/feet
FWC	Florida Fish and Wildlife Conservation Commission
FWRI	Florida Fish and Wildlife Research Institute
GADNR	Georgia Department of Natural Resources
in	inch(es)
IPCC	Intergovernmental Panel on Climate Change
km	kilometer(s)
lin ft	linear foot/feet
m	meter(s)
MHW	Mean High Water
mi	mile(s)
mi^2	square mile(s)
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
MMF	Marine Megafauna Foundation
MSA	Magnuson-Stevens Fishery Conservation and Management Act
N/A	not applicable
NAD 83	North American Datum of 1983
NCWRC	North Carolina Wildlife Resources Commission
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
Opinion	Biological Opinion, Conference Biological Opinion, or Draft Biological Opinion
PCB	polychlorinated biphenyls
PFC	perfluorinated chemicals
PFRU	Peninsular Florida Recovery Unit
PK	Peak Sound Pressure Level
POPs	persistent organic pollutants
PTS	Permanent Threshold Shift
RMS	Root Mean Square
SEL	Sound Exposure Level
SELcum	Cumulative Sound Exposure Level

SERO PRD	NMFS Southeast Regional Office, Protected Resources Division
SAV	Submerged Aquatic Vegetation
SCDNR	South Carolina Department of Natural Resources
SCL	straight carapace length
SEFSC	Southeast Fisheries Science Center
SSRIT	Smalltooth Sawfish Recovery Implementation Team
STSSN	Sea Turtle Stranding and Salvage Network
U.S.	United States of America
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

1 INTRODUCTION

1.1 Overview

Section 7(a)(2) of the ESA, requires that each federal agency ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. Section 7(a)(2) requires federal agencies to consult with the appropriate Secretary in carrying out these responsibilities. The NMFS and the USFWS share responsibilities for administering the ESA. Consultations on most ESA-listed marine species and their critical habitat are conducted between the federal action agency and NMFS (hereafter, may also be referred to as we, us, or our).

Consultation is required when a federal action agency determines that a proposed action "may affect" ESA-listed species or critical habitat and can be conducted informally or formally. Informal consultation is concluded after NMFS issues a Letter of Concurrence that concludes that the action is "not likely to adversely affect" ESA-listed species or critical habitat. Formal consultation is concluded after we issue a Biological Opinion (hereafter, referred to as an/the Opinion) that identifies whether a proposed action is "likely to jeopardize the continued existence of an ESA-listed species" or "destroy or adversely modify critical habitat," in which case Reasonable and Prudent Alternatives to the action as proposed must be identified to avoid these outcomes. An Opinion often states the amount or extent of anticipated incidental take of ESA-listed species that may occur, develops Reasonable and Prudent Measures necessary to minimize the impacts, i.e., amount or extent, of the anticipated incidental take, and lists the Terms and Conditions to implement those measures. An Opinion may also develop Conservation Recommendations that help benefit ESA-listed species.

This document represents NMFS's Opinion based on our review of potential effects of the USACE's proposal to authorize the demolition and replacement of an existing public recreational fishing pier by the City of Palm Beach (the applicant) in West Palm Beach, Palm Beach County, Florida, on the following listed species and critical habitat: green sea turtle (North and South Atlantic DPS), Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), hawksbill sea turtle, smalltooth sawfish (U.S. DPS), and giant manta ray. Our Opinion is based on information provided by the USACE, the applicant, and the published literature cited within.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the Opinion and

Incidental Take Statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

1.2 Consultation History

The following is the consultation history for the NMFS ECO tracking number SERO-2023-01541 Brian H Chappell City Park.

On July 17, 2023, we received a request for consultation under Section 7 of the ESA from the USACE to authorize the demolition and replacement of an existing public recreational fishing pier by the City of Palm Beach (the applicant) in West Palm Beach, Palm Beach County, Florida.

On November 6, 2023, we requested additional information related to the project description and action area.

We received a final response from USACE on January 6, 2024, and initiated formal consultation that day.

2 PROPOSED ACTION

2.1 Project Details

2.1.1 Project Description

USACE proposes to authorize the demolition and replacement of an existing public recreational fishing pier by the City of Palm Beach in West Palm Beach, Palm Beach County, Florida. Demolition of the existing 1,560-ft^2 fishing pier will consist of pulling the existing support piles and removing the existing decking using a crane and a floating work platform. All construction debris will be disposed of at an upland facility.

The new 1,576-ft^2 replacement pier will be constructed using the existing footprint, and will consist of a 101.37-ft by 10.33-ft walkway connecting to a 43.17-ft by 12.25-ft terminal platform. The decking will have spacing measuring 0.25-in.

A total of 30 new 14-in square concrete pilings will be installed via a barge-mounted impact hammer. No more than 5 piles will be installed per day. Work will be conducted from both the uplands and a barge. In-water work will take approximately 120 days to complete.

The new pier will not include any fish cleaning stations or lighting. The pier will be accessible to the public 24 hours a day, 7 days a week, with no pier attendant. The average fishing use of the completed pier is expected to range between 0 and 4 fishers per day. No mooring will be authorized along the pier and there are no wet or dry slips proposed for this project.

The proposed work also includes the replacement of 129 lin ft of existing seawall and of an existing 60-in diameter stormwater outfall. The replacement seawall will be constructed by installing 86 new 18-in wide steel sheet piles placed 18-in waterward of the existing seawall. A vibratory hammer will be used to install the steel sheet piles from land, and a maximum of 12 sheet piles per day will be installed. The replacement seawall will have a 2.25-ft-wide concrete cap. A manatee protection grate will be installed on the outfall.

2.1.2 Mitigation Measures

To minimize potential impacts to ESA-listed species, USACE will add the following conditions to the permit, which will be implemented during construction and following the completion of the proposed work.

- The applicant shall comply with NMFS *SERO's Protected Species Construction Conditions,* dated May 2021.
    - All construction personnel will be responsible for observing water-related activities to detect the presence of Threatened and/or Endangered Species as described in the *Protected Species Construction Conditions*.
    - Any interaction with a protected species during construction shall be reported immediately to NOAA Fisheries SERO PRD and Florida State STSSN.
    - The applicant shall report to NMFS SERO PRD via the NMFS SERO Endangered Species Take Report Form (https://forms.gle/85fP2da4Ds9jEL829). This form shall be completed for each individual known reported capture, entanglement, stranding, or other take incident. Information provided via this form shall include the title, the issuance date, and NMFS SERO ECO tracking number from this Opinion (SERO-2023-01541 Brian H Chappell City Park); the species name; the date and time of the incident; the general location and activity resulting in capture; 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.
    - The applicant shall also report the interaction to the Florida State STSSN Coordinator, whose contact information is provided at the following website: https://www.fisheries.noaa.gov/state-coordinators-sea-turtle-stranding-and-salvage-network.
- All work will occur during daylight hours.
- No more than 5 concrete piles and 12 steel sheet piles per day shall be installed.
- Turbidity barriers will be used, and will be placed in the water by hand. The area around the perimeter of the existing and replacement pier footprints will be encompassed by the turbidity barriers. The turbidity barriers will remain in the water for the duration of the project.
- The Permittee shall comply with the "Vessel Strike Avoidance Measures and Reporting for Mariners", revised May 2021, for marine turtles and marine mammals.
    - Vessel speeds will be reduced while maintaining sufficient maneuverability and navigation.
    - Vessel travel routes will be restricted to existing navigation channels of the Lake Worth Lagoon.

2.1.3 Best Practices

To minimize the impacts to ESA-listed species primarily from fishing bycatch and marine debris, USACE will add the following best practices to the permit to be followed by the applicant or their designated agent, post-construction.

- The applicant will coordinate an agreement with the Florida State Sea Turtle Stranding Coordinator to assist, as needed, with the handling and rehabilitation of any sea turtle standings due to incidental bycatch and other in-water activities in the area. The State Sea Turtle Stranding Coordinators are provided at the following website: https://www.fisheries.noaa.gov/state-coordinators-sea-turtle-stranding-and-salvage-network.
- The applicant will place trash receptacles with lids along each fishing structure. Trash receptacles will be clearly marked and will be emptied regularly to ensure they do not overfill and that fish carcasses are disposed of properly.
- Upon completion of the replacement pier, NMFS-approved educational signs must be posted in a visible location at least at the entrance to and terminal end of the fishing structure, alerting users of listed species in the area. The applicant will post at the Brian H Chappell City Park Fishing Pier the following signs, which are available for download at the following website: https://www.fisheries.noaa.gov/southeast/consultations/protected-species-educational-signs. It is suggested that both English and Spanish versions of the signs are posted.
    - *"Save Dolphins, Sea Turtles, Smalltooth Sawfish, and Manta Rays"*
    - *"Do Not Catch or Harass Sea Turtles"*
- Fishing line-recycling bins will be placed along the Brian H Chappell City Park Fishing Pier in order to prevent fishing line and debris from being disposed of in the water or on the shore. Receptacles will be clearly marked and will be emptied regularly to ensure they do not overfill and that fishing lines are disposed of properly.
- The applicant will conduct out-of-water structure cleanup on a regular basis, and will hold a minimum of two in-water cleanups annually to remove any derelict tackle or fishing line attached to the structure.

2.2 Action Area

The project site is an existing public recreational fishing pier located at Brian H Chappell City Park (26.759412°, -80.050837°] (NAD 83) in Lake Worth Lagoon, West Palm Beach, Palm Beach County, Florida. The project site is located at a 1.0-ac city park with 80 lin ft of hardened shoreline with an existing stormwater outfall. The existing pier was constructed originally sometime during the 1970s. The existing pier is not open to the public because of the deteriorated condition of the structure. There is no lighting and or fishing cleaning stations on the existing pier. Prior to the pier's closure in 2023, a maximum of 5 fishers per day utilized the pier.

The project site is located 1.6 mi from the Atlantic Ocean. The water depths in the action area range between 4 to 10 ft deep. According to the USACE, the substrate consists of sand/silt. Beneath the existing pier, the benthic substrates are mostly sandy bottoms with sparse algae visible. An aquatic resource survey was conducted on August 15, 2022. Three species of seagrass – shoal grass (*Halodule wrightii*), paddle grass (*Halophila decipiens*), and Johnson's seagrass (*H. johnsonii*) – were found within the action area. Densities varied from abundant (51-75%) to dense (76-100%) beginning at the approximate midpoint of the existing fishing pier and extending to and beyond the existing terminal platform. No seagrass was observed growing underneath the existing pier. No corals or mangroves are present at the project site.

Figure 1. Location of the project site in Lake Worth Lagoon, West Palm Beach, Palm Beach County, Florida.

The action area is defined by regulation as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the purposes of this federal action, the action area includes the existing pier's physical footprint, the new replacement 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. Therefore, the action area is equivalent to the largest radius of effects on ESA-listed species based on the proposed installation of 14-in-square concrete piles by impact hammer, which is 1,775.5-ft from the proposed action.

3 EFFECTS DETERMINATIONS

Please note the following abbreviations are only used in **Table 1** and **Table 2** and are not, therefore, included in the list of acronyms: E = endangered; T = threatened; LAA = likely to adversely affect; NLAA = may affect, not likely to adversely affect; NE = no effect.

3.1 Effects Determinations for ESA-Listed Species

3.1.1 Agency Effects Determinations

Please note the following abbreviations are only used in Table 1 and are not, therefore, included in the list of acronyms: E = endangered; T = threatened; LAA = likely to adversely affect; NLAA = may affect, not likely to adversely affect; NE = no effect.

We have assessed the ESA-listed species that may be present in the action area and our determination of the project's potential effects is shown in **Table 1** below.

Table 1. ESA-listed Species in the Action Area and Effect Determinations

Species (DPS)	ESA Listing Status	Listing Rule/Date	Most Recent Recovery Plan (or Outline) Date	USACE Effect Determination	NMFS Effect Determination
Sea Turtles					
Green sea turtle (North Atlantic DPS)	T	81 FR 20057/ April 6, 2016	October 1991	NLAA	LAA
Green sea turtle (South Atlantic DPS)	T	81 FR 20057/ April 6, 2016	October 1991	NLAA	NE
Hawksbill sea turtle	E	35 FR 8491/ June 2, 1970	December 1993	NE	LAA
Kemp's ridley sea turtle	E	35 FR 18319/ December 2, 1970	September 2011	NE	NLAA
Leatherback sea turtle	E	35 FR 8491/ June 2, 1970	April 1992	NE	NE
Loggerhead sea turtle (Northwest Atlantic DPS)	T	76 FR 58868/ September 22, 2011	December 2008	NLAA	LAA
Fishes					
Giant manta ray	T	83 FR 2916/ January 22, 2018	2019 (Outline)	NLAA	LAA
Smalltooth sawfish (U.S. DPS)	E	68 FR 15674/ April 1, 2003	January 2009	NLAA	LAA

The Brian H. Chappell City Park recreational fishing pier is located in Lake Worth Lagoon, which is within Zone 26, a statistical subarea used when reporting commercial fishing data. Zone

26 extends along the east coast of Florida from 26º to 28º North latitude (from approximately Fort Lauderdale north to Palm Bay, Florida) (Atlantic Ocean).

Sea Turtles
To help determine which sea turtle species are likely to occur within the project site, we reviewed all the available years of STSSN inshore stranding data for Zone 26 (i.e., stranding data for all offshore waters for the years 2007-2016; Table 3). Based on these data, we believe green sea turtle (North Atlantic DPS), hawksbill sea turtle, and loggerhead sea turtle (Northwest Atlantic DPS) may be adversely affected by the proposed action.

We believe the proposed action will have No Effect on the South Atlantic DPS of green sea turtles. Limited information previously indicated that benthic juveniles from both the North Atlantic and South Atlantic DPSs may be found in waters off the mainland United States. However, additional research has determined that juveniles from the South Atlantic DPS are not likely to occur in the mainland United States waters, including the action area for this project.

We believe Kemp's ridley sea turtle may be affected by the proposed construction activities, but are not likely to be adversely affected. The available STSSN data for inshore Zone 26 does not show any Kemp's ridley sea turtles stranded or salvaged within or adjacent to the action area. As a result, NMFS believes it is likely that the presence of this species in the action area is rare. We discuss the effects of the proposed construction activities on Kemp's ridley sea turtle in our analysis in Section 3.1.2.

While leatherback sea turtle is represented in the data, we do not believe this species will be in the action area or caught on or entangled in recreational hook and line gear used at Brian H. Chappell Park fishing pier. The 3 available STSSN records for leatherback sea turtles are due to research (n=1) and vessel strike (n=2) and are not the result of recreational fishing interactions (i.e., gear entanglement or hook-and-line captures). Leatherback sea turtles also tend to be pelagic feeders, feeding on jellyfish and not baits typically fished from piers. The location of the proposed pier within Lake Worth Lagoon also makes it very unlikely that leatherback sea turtles will be in the action area.

Table 2. Summary of Available STSSN Inshore Data for Zone 26 (2007-2016)

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	308	36	2
Hawksbill sea turtle	12	3	0
Leatherback sea turtle	3	0	0
Loggerhead sea turtle	159	7	0
Unidentified	8	0	0
Total	**490**	**46**	**2**

Smalltooth Sawfish
Smalltooth sawfish are documented throughout the state of Florida. According to the U.S. Sawfish Recovery Database, there have been 94 documented reports of smalltooth sawfish in Palm Beach County, Florida, between 2003-2023. Of those reports, 4 are captures due to recreational fishing from ocean-facing fishing piers. There have been no reported recreational hook-and-line capture of a smalltooth sawfish at Brian H. Chappell City Park fishing pier or other inshore recreational fishing piers within Lake Worth Lagoon. Based on the best available data, we believe that smalltooth sawfish may be found in the action area, may be affected by construction effects, and are likely to be adversely affected by recreational hook-and-line interactions upon the completion of this public, inshore recreational fishing pier in Florida.

Giant Manta Ray
Giant manta ray are prone to foul-hooking (i.e., when an animal is hooked anywhere on the body without having taken the bait in its mouth) by recreational fishing gear used at fishing structures that are ocean-facing or located in or near inlet/passes. Based on the best available data, we believe that giant manta may be found in the action area, may be affected by construction effects, and are likely to be adversely affected by recreational hook-and-line interactions upon the completion of this public, inshore recreational fishing pier in Florida.

3.1.2 Effects Analysis for ESA-Listed Species Not Likely to be Adversely Affected by the Proposed Action

Kemp's ridley sea turtle may be physically injured if struck by equipment or materials during construction activities. However, we believe that such route of effect is extremely unlikely to occur. This species is expected to exhibit avoidance behavior by moving away from physical disturbances. In addition, the implementation of NMFS Southeast Region's *Protected Species Construction Conditions* (NMFS 2021) will require all construction workers to observe in-water activities for the presence of this species. Operation of any mechanical construction equipment shall cease immediately if a protected species is seen within 150 ft of operations. Activities may not resume until the protected species has departed the project area of its own volition. Further, construction would be limited to daylight hours so construction workers would be more likely to see listed species, if present, and avoid interactions with them.

Kemp's ridley sea turtle may be injured due to entanglement in improperly discarded fishing gear resulting from future use of the replacement pier after completion of the proposed action. We believe this route of effect is extremely unlikely to occur. To the best of our knowledge, there has never been a reported entanglement with Kemp's ridley sea turtle at Brian H. Chappell City Park fishing pier or within inshore waters of Zone 26, as reported in the available years of STSSN data. To help further reduce the risk of entanglement in improperly discarded fishing gear, the applicant will install and maintain fishing line recycling receptacles and trashcans with lids at the pier to keep debris out of the water, and we expect that anglers will appropriately dispose of fishing gear when disposal bins are available. 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 perform annual in-water and out-of-water fishing debris cleanups, minimizing the accumulation of fishing line over time.

Noise created by pile driving activities can physically injure animals or change animal behavior in the affected areas. Animals can be physically injured in 2 ways. First, immediate adverse effects can occur if a single noise event exceeds the threshold for direct physical injury. Second, adverse physical effects can result from prolonged exposure to noise levels that exceed the daily cumulative sound exposure level for the animals. Noise can also interfere with an animal's behavior, such as migrating, feeding, resting, or reproducing and such disturbances could constitute adverse behavioral effects.

When an impact hammer strikes a pile, a pulse is created that propagates through the pile and radiates sound into the water, the ground substrate, and the air. Pulsed sounds underwater are typically high volume events that have the potential to cause hearing injury. Vibratory pile driving produces continuous, non-pulsed sounds that can be tonal or broadband. In terms of acoustics, the sound pressure wave is described by the peak sound pressure level (PK, which is the greatest value of the sound signal), the root-mean-square pressure level (RMS, which is the average intensity of the sound signal over time), and the sound exposure level (SEL, which is a measure of the energy that takes into account both received level and duration of exposure). Further, the cumulative sound exposure level (SELcum) is a measure of the energy that takes into account the received sound pressure level over a 24-hour period. Please see the following website for more information related to measuring underwater sound and the NMFS-accepted pile driving sound measurement thresholds for species in the NMFS Southeast Region: https://www.fisheries.noaa.gov/southeast/consultations/section-7-consultation-guidance. Please note that for vibratory pile driving, only behavioral sound measurement thresholds exist for fishes; NMFS does not recognize any injurious sound thresholds for fishes when vibratory pile driving is used.

We use the NMFS Multi-species Pile Driving Tool (dated May 2022) to calculate the radii of physical injury and behavioral effects on ESA-listed species that may be located in the action area based on the above measurements of underwater sound. The applicant proposes to install up to 5 new 14-in concrete piles per day per day and 12 new 18-in steel piles per day using a vibratory hammer. Each pile will require varying strikes or seconds to install. The noise analysis in this consultation evaluates the potential for physical injury and behavioral effects to the ESA-listed fish and sea turtles that NMFS believes may be affected by the proposed action. The proposed action occurs in an open water environment. We define an open water environment as any area where an animal would be able to move away from the noise source without being forced to pass through the radius of noise effects. Because multiple pile types are proposed for installation by either vibratory or impact hammer and the scope and scale of the project is relatively small, the noise analysis in this consultation evaluates the pile type and installation method with the greatest potential effects and largest potential effect radius. Any potential effects of pile driving noise from other proposed pile types would not exceed those as described below.

The installation of up to 5 new 14-in square concrete piles per day by impact hammer not using noise abatement measures may cause PK injurious noise effects to Kemp's ridley sea turtle at a radius of up to 0.1-ft (0-m) away from the pile driving operations. Additionally, the SELcum may cause injury to Kemp's ridley sea turtles at a radius of up to 13.0-ft (4.0-m) away from the pile driving operations over a 24-hour period. We believe both PK and SELcum injurious noise effects are extremely unlikely to occur. These distances are within the 150-ft "stop-work" radius defined in SERO's *Protected Species Construction Conditions* (2021) and we expect this species to move away from the noise disturbances before the exposure to the noise causes physical injury. Movement away from the injurious sound radius is a behavioral response, which is discussed below.

The installation of up to 5 new 14-in square concrete piles per day by impact hammer not using noise abatement measures could result in behavioral effects to Kemp's ridley sea turtles at a radius of up to 82.4-ft (25.1-m) away from the impact pile driving operations. Due to the mobility of this species and the open-water environment, we expect the animal to move away from noise disturbances. Because there is similar habitat nearby, we believe behavioral effects will be insignificant. If an animal chooses to remain within the behavioral response zone, it could be exposed to behavioral noise effects during pile installations. Because pile installations will occur intermittently during daylight hours only and no more than 5 piles per day will be installed, this species will be able to resume normal activities during quiet periods between pile installations and at night.

Finally, the NMFS educational signs *"Save Dolphins, Sea Turtles, Smalltooth Sawfish, and Manta Rays"* and *"Do Not Catch or Harass Sea Turtles"* will be installed in a visible location upon completion of the proposed action. We believe the placement of educational signs will further reduce the likelihood of recreational hook-and-line interactions with Kemp's ridley sea turtles. The signs will provide information to the public on how to avoid and minimize encounters with this 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 this species and refine conservation and recovery measures.

3.1.3 ESA-Listed Species Likely to be Adversely Affected by the Proposed Action

We have determined that green sea turtle (North Atlantic DPS), hawksbill sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish, and giant manta ray are likely to be adversely affected by the proposed action and thus require further analysis. We provide greater detail on the potential effects to these species from the proposed action in the Effects of the Action (Section 6.1) and whether those effects, when considered in the context of the Status of the Species (Section 4.1), the Environmental Baseline (Section 5), and the Cumulative Effects (Section 7), are likely to likely to jeopardize the continued existence of these ESA-listed species in the wild.

3.2 Effects Determinations for Critical Habitat

3.2.1 Agency Effects Determination

The project is not located in critical habitat, and there are no potential routes of effect to any critical habitat.

4 STATUS OF ESA-LISTED SPECIES CONSIDERED FOR FURTHER ANALYSIS

4.1 Overview of Status of Sea Turtles

The 3 species of sea turtles (green, hawksbill, and loggerhead) that may be adversely affected by the proposed action travel widely throughout the North Atlantic, Gulf of Mexico and the Caribbean. These species are highly migratory and therefore could occur within the action area. Section 4.1.1 will address the general threats that confront all sea turtle species. The remainder of Section 4.1 (Sections 4.1.2-4.1.6) will address information on the distribution, life history, population structure, abundance, population trends, and unique threats to each species of sea turtle.

4.1.1 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 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 sections where appropriate.

Fisheries
Incidental bycatch in commercial fisheries is identified as a major contributor to past declines, and threat to future recovery, for all of the sea turtle species (NMFS and USFWS 1991; NMFS and USFWS 1992; NMFS and USFWS 1993; NMFS 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 United States are exposed to a suite of other fisheries in federal and state waters. These fishing methods include trawls, gillnets, purse seines, hook-and-line gear (including bottom longlines and vertical lines [e.g., bandit gear, handlines, and rod-reel]), pound nets, and trap fisheries. Refer to the Environmental Baseline section of this opinion for more specific information regarding federal and state managed fisheries affecting sea turtles within the action area). The Southeast U.S. shrimp fisheries have historically been the largest fishery threat to benthic sea turtles in the southeastern United States, and continue to interact with and kill large numbers of sea turtles each year.

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

Nevertheless, international fisheries represent a continuing threat to sea turtle survival and recovery throughout their respective ranges.

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

Coastal Development and Erosion Control
Coastal development can deter or interfere with nesting, affect nesting success, and degrade nesting habitats for sea turtles. Structural impacts to nesting habitat include the construction of buildings and pilings, beach armoring and renourishment, and sand extraction (Bouchard et al. 1998; Lutcavage et al. 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 hatchlings as they approach and leave the surf zone or head out to sea by creating physical blockage, concentrating predators, creating longshore currents, and disrupting of wave patterns.

Environmental Contamination
Multiple municipal, industrial, and household sources, as well as atmospheric transport, introduce various pollutants such as pesticides, hydrocarbons, organochlorides (e.g., dichlorodiphenyltrichloroethane [DDT], polychlorinated biphenyls [PCB], and perfluorinated chemicals [PFC]), and others that may cause adverse health effects to sea turtles (Garrett 2004; Grant and Ross 2002; Hartwell 2004; Iwata et al. 1993). Acute exposure to hydrocarbons from petroleum products released into the environment via oil spills and other discharges may directly injure individuals through skin contact with oils (Geraci 1990), inhalation at the water’s surface and ingesting compounds while feeding (Matkin and Saulitis 1997). Hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability in the action area.

The April 20, 2010, explosion of the Deepwater Horizon oil rig affected sea turtles in the Gulf of Mexico. An assessment has been completed on the injury to Gulf of Mexico marine life, including sea turtles, resulting from the spill (DWH Trustees 2015). Following the spill, juvenile Kemp’s ridley, green, and loggerhead sea turtles were found in Sargassum algae mats in the convergence zones, where currents meet and oil collected. Sea turtles found in these areas were often coated in oil and/or had ingested oil. The spill resulted in the direct mortality of many sea turtles and may have had sublethal effects or caused environmental damage that will impact other sea turtles into the future. Information on the spill impacts to individual sea turtle species is presented in the Status of the Species sections for each species.

Marine debris is a continuing problem for sea turtles. Sea turtles living in the pelagic environment commonly eat or become entangled in marine debris (e.g., tar balls, plastic bags/pellets, balloons, and lost, abandoned or discarded fishing gear) as they feed along oceanographic fronts where debris and their natural food items converge. Marine debris can cause significant habitat destruction from derelict vessels, further exacerbated by tropical storms moving debris and scouring and destroying corals and seagrass beds, for instance. Sea turtles that spend significant portions of their lives in the pelagic environment (i.e., juvenile loggerheads, and juvenile green turtles) are especially susceptible to threats from entanglement in marine debris when they return to coastal waters to breed and nest.

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 2007a). 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 2007a).

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 2007b). Sea level rise from global climate change is also a potential problem for areas with low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting sites and decrease available nesting habitat (Baker et al. 2006; Daniels et al. 1993; Fish et al. 2005). The loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as an increase in the frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006; Baker et al. 2006).

Other changes in the marine ecosystem caused by global climate change (e.g., ocean acidification, salinity, oceanic currents, dissolved oxygen levels, nutrient distribution, 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.

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.

4.1.2 Green Sea Turtle – North Atlantic DPS

The green sea turtle was originally listed as threatened under the ESA on July 28, 1978, except for the Florida and Pacific coast of Mexico breeding populations, which were listed as endangered. On April 6, 2016, the original listing was replaced with the listing of 11 distinct population segments (DPSs) (81 FR 20057 2016) (Figure 2). 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. Only individuals from the South Atlantic DPS and North Atlantic DPS may occur in waters under the purview of the NMFS SE Region, with South Atlantic DPS individuals only expected to occur in the U.S. Caribbean.

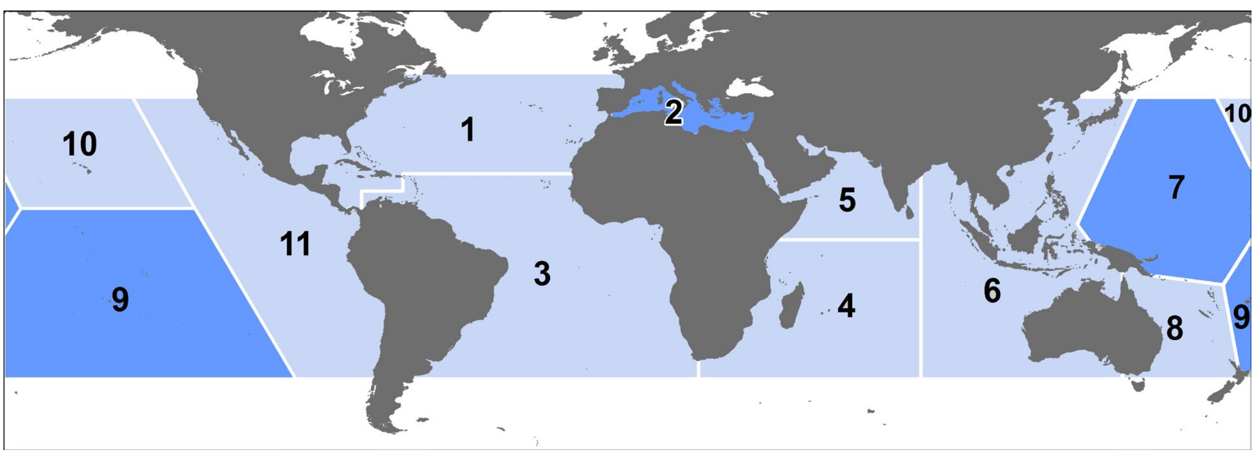

Figure 2. Threatened (light) and endangered (dark) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11.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

Species Description and Distribution

The green sea turtle is the largest of the hardshell marine turtles, growing to a weight of 350 lb (159 kg) with a straight carapace length of greater than 3.3 ft (1 m). Green sea turtles have a smooth carapace with 4 pairs of lateral (or costal) scutes and a single pair of elongated prefrontal scales between the eyes. They typically have a black dorsal surface and a white ventral surface, although the carapace of green sea turtles in the Atlantic Ocean has been known to change in color from solid black to a variety of shades of grey, green, or brown and black in starburst or irregular patterns (Lagueux 2001).

With the exception of post-hatchlings, green sea turtles live in nearshore tropical and subtropical waters where they generally feed on marine algae and seagrasses. They have specific foraging grounds and may make large migrations between these forage sites and natal beaches for nesting (Hays et al. 2001). Green sea turtles nest on sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands in more than 80 countries worldwide (Hirth 1997). The two largest nesting populations are found at Tortuguero, on the Caribbean coast of Costa Rica (part of the North Atlantic 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. Limited early information indicated that within U.S. waters benthic juveniles from both the North Atlantic and South Atlantic DPSs may be found on foraging grounds. Two small-scale studies provided an insight into the possible 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 South Atlantic 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 South Atlantic DPS (Bass and Witzell 2000). 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). However, with additional research it has been determined that South Atlantic juveniles are not likely to be occurring in U.S. mainland coastal waters in anything more than negligible numbers. Jensen et al. (2013) indicated that the earlier studies might represent a statistical artifact as they lack sufficient precision, with error intervals that span zero. More recent studies with better rookery baseline representation found negligible (<1%) contributions from the South Atlantic DPS among Texas and Florida GoM juvenile green turtle assemblages (Shamblin et al. 2016, 2018). Finally, an as-yet published genetic analysis of samples from various coastal areas in the Gulf of Mexico and Atlantic has now solidified the conclusion that South Atlantic juveniles represent at best a negligible number of individuals in mainland United States waters (Peter Dutton, SWFSC, pers. comm. April 2022). Therefore, we will not consider South Atlantic DPS individuals when conducting consultations for projects in the waters off the mainland United States.

The North Atlantic DPS boundary is illustrated in Figure 2. Four regions support nesting concentrations of particular interest in the North Atlantic DPS: Costa Rica (Tortuguero), Mexico (Campeche, Yucatan, and Quintana Roo), U.S. (Florida), and Cuba. By far the most important nesting concentration for green turtles in this DPS is Tortuguero, Costa Rica. Nesting also occurs in the Bahamas, Belize, Cayman Islands, Dominican Republic, Haiti, Honduras, Jamaica, Nicaragua, Panama, Puerto Rico, Turks and Caicos Islands, and North Carolina, South Carolina, Georgia, and Texas, U.S.A. In the eastern North Atlantic, nesting has been reported in Mauritania (Fretey 2001).

The complete nesting range of North Atlantic DPS green sea turtles within the southeastern United States includes sandy beaches between Texas and North Carolina, as well as Puerto Rico (Dow et al. 2007; NMFS and USFWS 1991). The vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Johnson and Ehrhart 1994; Meylan et al. 1995). Principal U.S. nesting areas for green sea turtles are in eastern Florida, predominantly Brevard south through Broward counties.

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

Life History Information

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

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

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.

The North Atlantic 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 2007d). 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 2007). 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. However, a recent long-term study spanning over 50 years of nesting at Tortuguero found that while nest numbers increased steadily over 37 years from 1971-2008, the rate of increase slowed gradually from 2000-2008. After 2008 the nesting trend has been downwards, with current nesting levels having reverted to that of the mid 1990's and the overall long-term trend has now become negative (Restrepo, et al. 2023).

In the continental United States, 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). 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. 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 1989-2021, 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. The pattern departed from the low lows and high peaks in 2020 and 2021 as well, when 2020 nesting only dropped by half from the 2019 high, while 2021 nesting only increased by a small amount over the 2020 nesting, with another increase in 2022 still well below the 2019 high (Figure 3). While nesting in Florida has shown dramatic increases over the past decade, individuals from the Tortuguero, the Florida, and the other Caribbean and Gulf of Mexico populations in the North Atlantic DPS intermix and share developmental habitat. Therefore, threats that have affected the Tortuguero population as described previously, may ultimately influence the other population trajectories, including Florida. Given the large size of the Tortuguero nesting population, which is currently in decline, its status and trend largely drives the status of North Atlantic DPS.

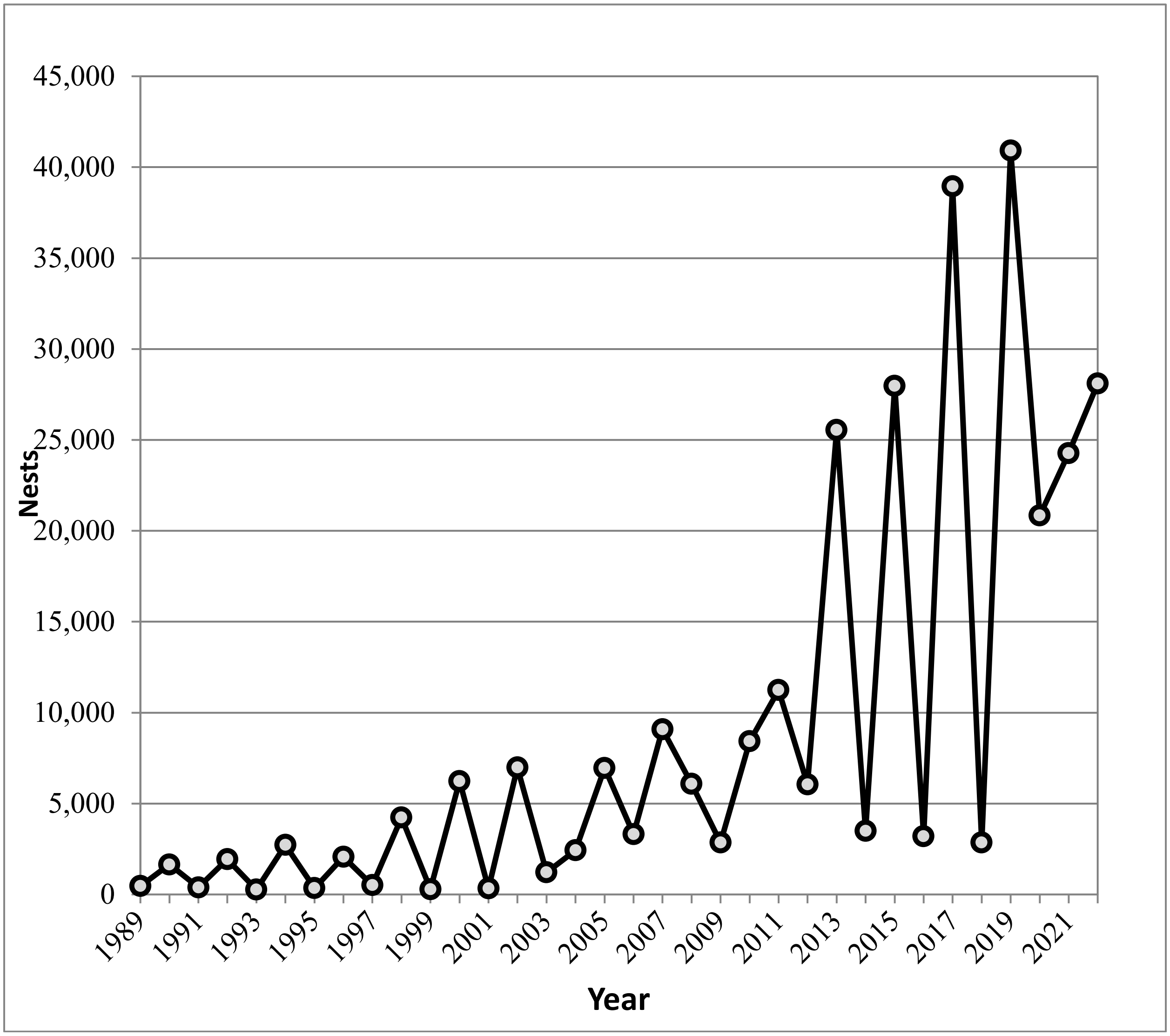

Figure 3. Green sea turtle nesting at Florida index beaches since 1989.

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

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the overexploitation of the species for food and other products. Although intentional take of green sea turtles and their eggs is not extensive within the southeastern United States, green sea turtles that nest and forage in the region may spend large portions of their life history outside the region and outside U.S. jurisdiction, where exploitation is still a threat. Green sea turtles also face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (e.g., plastics, petroleum products, petrochemicals), ecosystem alterations (e.g., nesting beach development, beach nourishment and shoreline stabilization, vegetation changes), poaching, global climate change, fisheries interactions, natural predation, and disease. A discussion on general sea turtle threats can be found in Section 4.1.1.

In addition to general threats, green sea turtles are susceptible to natural mortality from Fibropapillomatosis (FP) disease. FP results in the growth of tumors on soft external tissues (flippers, neck, tail, etc.), the carapace, the eyes, the mouth, and internal organs (gastrointestinal tract, heart, lungs, etc.) of turtles (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). These tumors range in size from 0.04 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) sea turtles may lose their ability to swim and dive, often floating to the surface. The rate of cooling that precipitates cold-stunning appears to be the primary threat, rather than the water temperature itself (Milton and Lutz 2003). Sea turtles that overwinter in inshore waters are most susceptible to cold-stunning because temperature changes are most rapid in shallow water (Witherington and Ehrhart 1989a). During January 2010, an unusually large cold-stunning event in the southeastern United States resulted in around 4,600 sea turtles, mostly greens, found cold-stunned, and hundreds found dead or dying. A large cold-stunning event occurred in the western Gulf of Mexico in February 2011, resulting in approximately 1,650 green sea turtles found cold-stunned in Texas. Of these, approximately 620 were found dead or died after stranding, while approximately 1,030 turtles were rehabilitated and released. During this same time frame, approximately 340 green sea turtles were found cold-stunned in Mexico, though approximately 300 of those were subsequently rehabilitated and released.

Whereas oil spill impacts are discussed generally for all species in Section 4.1.1, 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 2015). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources, which could lead to compromised growth and/or reproductive potential.

There is no information currently available to determine the extent of those impacts, if they occurred.

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

4.1.3 Hawksbill Sea Turtle

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

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 Buck Island Reef National Monument (BIRNM) in St. Croix was later identified 1,160 miles (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 2007).

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).

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, https://www.fws.gov/species/carey-eretmochelys-imbricata). 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).

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 2007). 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 2007).

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 4.1.1. 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 4.1.1, 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 2015). 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 Convention on International Trade in Endangered Species of Wild Flora and Fauna (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.

4.1.4 Loggerhead Sea Turtle – Northwest Atlantic DPS

The loggerhead sea turtle was listed as a threatened species throughout its global range on July 28, 1978. NMFS and USFWS published a final rule which designated 9 DPSs for loggerhead sea turtles (76 FR 58868, September 22, 2011, and effective October 24, 2011). This rule listed the following DPSs: (1) Northwest Atlantic Ocean (threatened), (2) Northeast Atlantic Ocean (endangered), (3) South Atlantic Ocean (threatened), (4) Mediterranean Sea (endangered), (5) North Pacific Ocean (endangered), (6) South Pacific Ocean (endangered), (7) North Indian

Ocean (endangered), (8) Southeast Indo-Pacific Ocean (endangered), and (9) Southwest Indian Ocean (threatened). The Northwest Atlantic DPS is the only one that occurs within the action area, and therefore it is the only one considered in this Opinion.

Species Description and Distribution

Loggerheads are large sea turtles. Adults in the southeast United States average about 3 ft (92 cm) long, measured as a 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 (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 Northwest Atlantic DPS, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf Coast of Florida. Previous Section 7 analyses have recognized at least 5 western Atlantic subpopulations, divided geographically as follows: (1) a Northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29ºN; (2) a South Florida nesting subpopulation, occurring from 29°N on the east coast of the state to Sarasota on the west coast; (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (Márquez M. 1990; TEWG 2000); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (NMFS 2001).

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

Life History Information

The Northwest Atlantic Loggerhead Recovery Team defined the following 8 life stages for the loggerhead life cycle, which include the ecosystems those stages generally use: (1) egg (terrestrial zone), (2) hatchling stage (terrestrial zone), (3) hatchling swim frenzy and transitional stage (neritic zone- nearshore marine environment from the surface to the sea floor where water depths do not exceed 200 meters), (4) juvenile stage (oceanic zone), (5) juvenile stage (neritic zone), (6) adult stage (oceanic zone), (7) adult stage (neritic zone), and (8) nesting female (terrestrial zone) (NMFS and USFWS 2008). Loggerheads are long-lived animals. They reach sexual maturity between 20-38 years of age, although age of maturity varies widely among populations (Frazer and Ehrhart 1985; NMFS 2001). The annual mating season occurs from late March to early June, and female turtles lay eggs throughout the summer months. Females deposit an average of 4.1 nests within a nesting season (Murphy and Hopkins 1984), but an individual female only nests every 3.7 years on average (Tucker 2010). Each nest contains an average of 100-126 eggs (Dodd Jr. 1988) which incubate for 42-75 days before hatching (NMFS and USFWS 2008). Loggerhead hatchlings are 1.5-2 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 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 United States, and along the north coast of Cuba (A. Bolten and K. Bjorndal, University of Florida, unpublished data). Moncada et al. (2010) report the recapture of 5 adult female loggerheads in Cuban waters originally flipper-tagged in Quintana Roo, Mexico, which indicates that Cuban shelf waters likely also provide foraging habitat for adult females that nest in Mexico.

Status and Population Dynamics

A number of stock assessments and similar reviews (Conant et al. 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 (PFRU)

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 2020 was 105,164 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. FWRI uses the standardized index survey data to analyze the nesting trends (Figure 4) (https://myfwc.com/research/wildlife/sea-turtles/nesting/beach-survey-totals/). Since the beginning of the index program in 1989, 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. While nest numbers subsequently declined from the 2016 high FWRI noted that the 2007-2021 period represents a period of increase. 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 non-significant increasing trend. Looking at the data from 1989 through 2016, FWRI concluded that there was an overall positive change in the nest counts although it was not statistically significant due to the wide variability between 2012-2016 resulting in widening confidence intervals. Nesting at the core index beaches declined in 2017 to 48,033, and rose again each year through 2020, reaching 53,443 nests, dipping back to 49,100 in 2021, and then in 2022 reaching the second-highest number since the survey began, with 62,396 nests. 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).

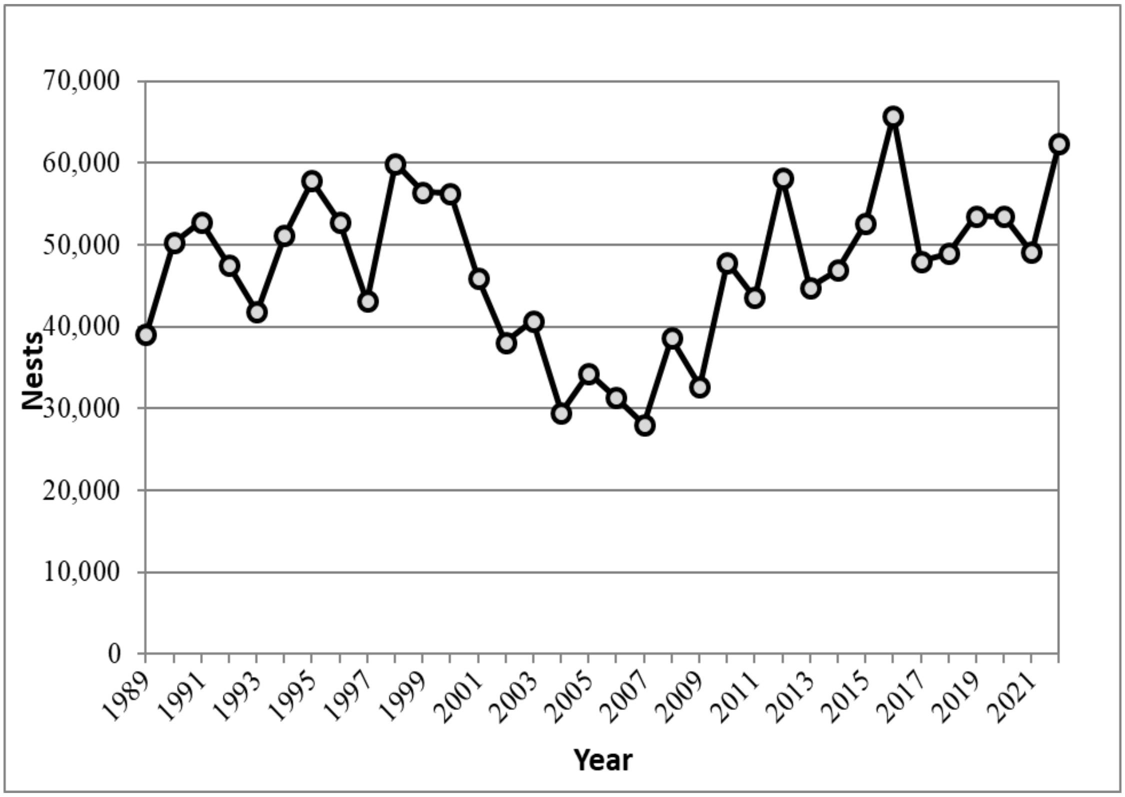

Figure 4. Loggerhead sea turtle nesting at Florida index beaches since 1989.

<u>Northern Recovery Unit (NRU)</u>
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, https://georgiawildlife.com/loggerhead-nest-season-begins-where-monitoring-began). 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 to 2015, but then bounced back in 2019, breaking records for each of the three states and the overall recovery unit. Nesting in 2020 and 2021 declined from the 2019 records, but still remained high, representing the third and fourth highest total numbers for the NRU since 2008. In 2022 Georgia loggerhead sea turtle nesting broke the record at 4,071, while South Carolina and North Carolina nesting were both at the second-highest level recorded.

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**
2020	2,786	5,551	1,335	**9,672**
2021	2,493	5,639	1,448	**9,580**
2022	4,071	7,970	1,906	**13,947**

In addition to the statewide nest counts, 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. After another drop in 2018, a new record was set for the 2019 season, with a return to 2016 levels in 2020 and 2021 and then a rebound to the second highest level on record in 2022 (Figure 5).

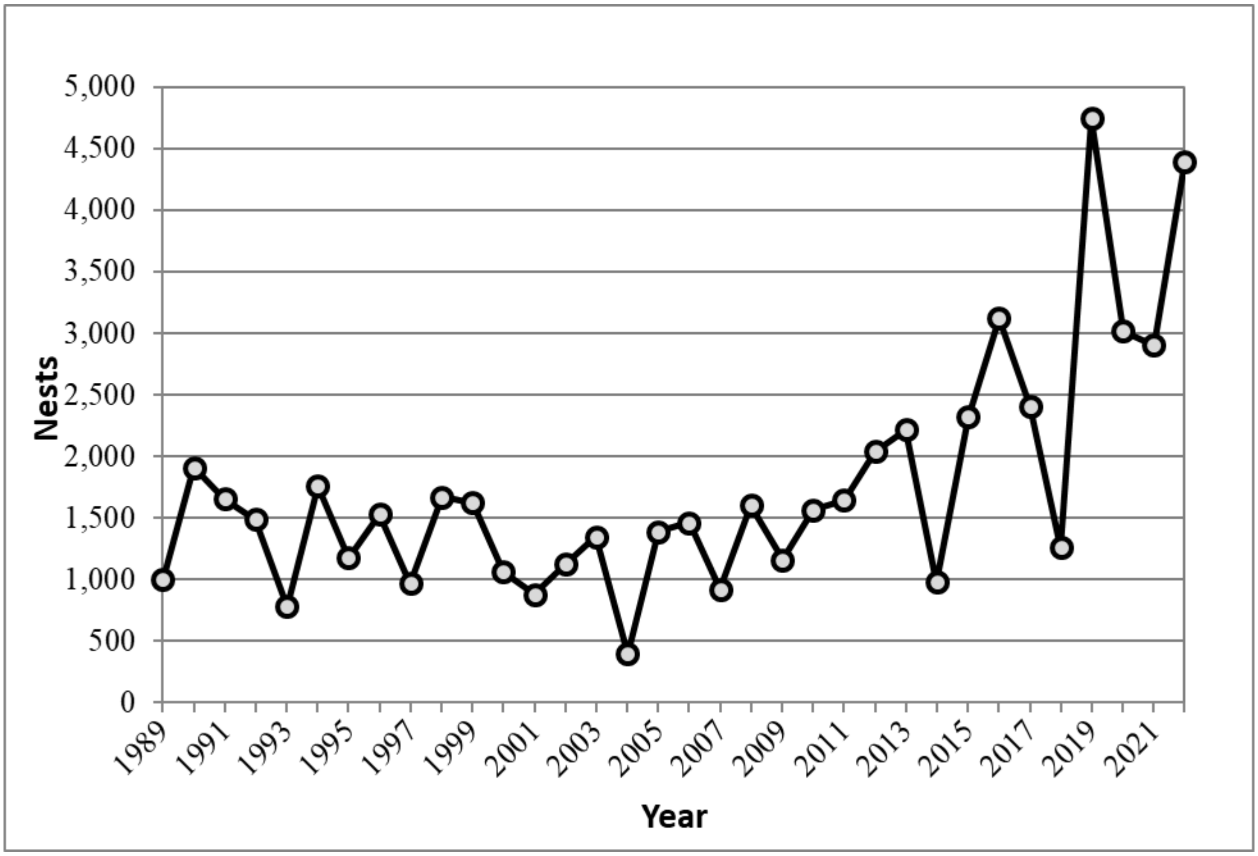

Figure 5. South Carolina index nesting beach counts for loggerhead sea turtles (data provided by SCDNR)

Other Northwest Atlantic DPS Recovery Units

The remaining 3 recovery units – Dry Tortugas (DTRU), Northern Gulf of Mexico (NGMRU), and Greater Caribbean (GCRU) – are much smaller nesting assemblages, but they are still considered essential to the continued existence of the species. Nesting surveys for the DTRU are conducted as part of Florida's statewide survey program. Survey effort was relatively stable during the 9-year period from 1995-2004, although the 2002 year was missed. Nest counts ranged from 168-270, with a mean of 246, but there was no detectable trend during this period (NMFS and USFWS 2008). Nest counts for the NGMRU are focused on index beaches rather than all beaches where nesting occurs. Analysis of the 12-year dataset (1997-2008) of index nesting beaches in the area shows a statistically significant declining trend of 4.7% annually. Nesting on the Florida Panhandle index beaches, which represents the majority of NGMRU nesting, had shown a large increase in 2008, but then declined again in 2009 and 2010 before rising back to a level similar to the 2003-2007 average in 2011. From 1989-2018 the average number of NGMRU nests annually on index beaches was 169 nests, with an average of 1100 counted in the statewide nesting counts (Ceriani et al. 2019). Nesting survey effort has been inconsistent among the GCRU nesting beaches, and no trend can be determined for this subpopulation (NMFS and USFWS 2008). Zurita et al. (2003) found a statistically significant increase in the number of nests on 7 of the beaches on Quintana Roo, Mexico, from 1987-2001, where survey effort was consistent during the period. Nonetheless, nesting has declined since

2001, and the previously reported increasing trend appears to not have been sustained (NMFS and USFWS 2008).

In-water Trends

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

Population Estimate

The NMFS SEFSC 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).

Threats (Specific to Loggerhead Sea Turtles)

The threats faced by loggerhead sea turtles are well summarized in the general discussion of threats in Section 4.1.1. 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 Northwest Atlantic 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 4.1.1, 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 2016). 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 ridley sea turtle, the majority of nesting for the Northwest Atlantic DPS occurs on the Atlantic coast and, thus, loggerhead sea turtles were impacted to a relatively lesser degree. However, it is likely that impacts to the NGMRU of the Northwest Atlantic 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 DWH Trustees (2016) 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 NGMRU 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).

4.2 Giant Manta Ray

The giant manta ray (*Mobula birostris*) is listed as a threatened species under the ESA (83 FR 2916, January 22, 2018). Critical habitat is not designated (84 FR 66652; December 5, 2019).

Species Description and Distribution
The giant manta ray is the largest living ray species, attaining a maximum size of 700 cm DW with anecdotal reports up to 910 cm DW (Compagno 1999; Alava et al. 2002). Males mature at 350-400 cm DW and females mature at 380-500 cm DW (White et al. 2006; Last et al. 2016; Stevens et al. 2018). The species 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 two structures called cephalic lobes that extend and help to introduce water into the mouth for feeding activities (making them the only vertebrate animals with three paired appendages). The giant manta ray has two 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. There are bright white shoulder markings on the dorsal side that form two mirror image right-angle triangles, creating a T-shape on the upper shoulders.

The giant manta ray primarily feds 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.

The giant manta ray's reproduction is aplacental viviparous with a single large pup of 122-200 cm DW (White et al. 2006; Rambahiniarison et al. 2018). Reproductive periodicity is unknown, but assumed to be 4-5 years, similar to the closely related reef manta ray. Female age-at-maturity is estimated as 8.6 years of age, but first pregnancy may be delayed by up to 4 years (making first age of pregnancy 12 years) depending upon food availability (Rambahiniarison et al. 2018). The maximum age is estimated as 45 years, based on the longevity of the reef manta ray; generation length is therefore estimated as 29 years. Based on this life history, the maximum intrinsic rate of population increase could range between 0.019 and 0.046 per year (median 0.032 per year) (J. Carlson unpubl. data 2019, following methods in Dulvy et al. 2014). The species is among the longest-living ray species and has an extremely conservative life history; the average giant manta ray may produce only 4 to 7 pups during its estimated lifespan, which would contribute to the species' slow recovery from population reductions due to over-exploitation or other threats.

The giant manta ray is circumglobal in tropical and temperate waters from the surface to 1,000 m depth (Last et al. 2016). Within the Northern hemisphere, the species has been documented as far north as southern California and New Jersey on the U.S. west and east coasts, respectively, and Mutsu Bay, Aomori, Japan, the Sinai Peninsula and Arabian Sea, Egypt, and the Azores Islands. Within the Southern Hemisphere, the species occurs as far south as Peru, Uruguay, South Africa, New Zealand and French Polynesia (Lawson et al. 2017; Figure 6).

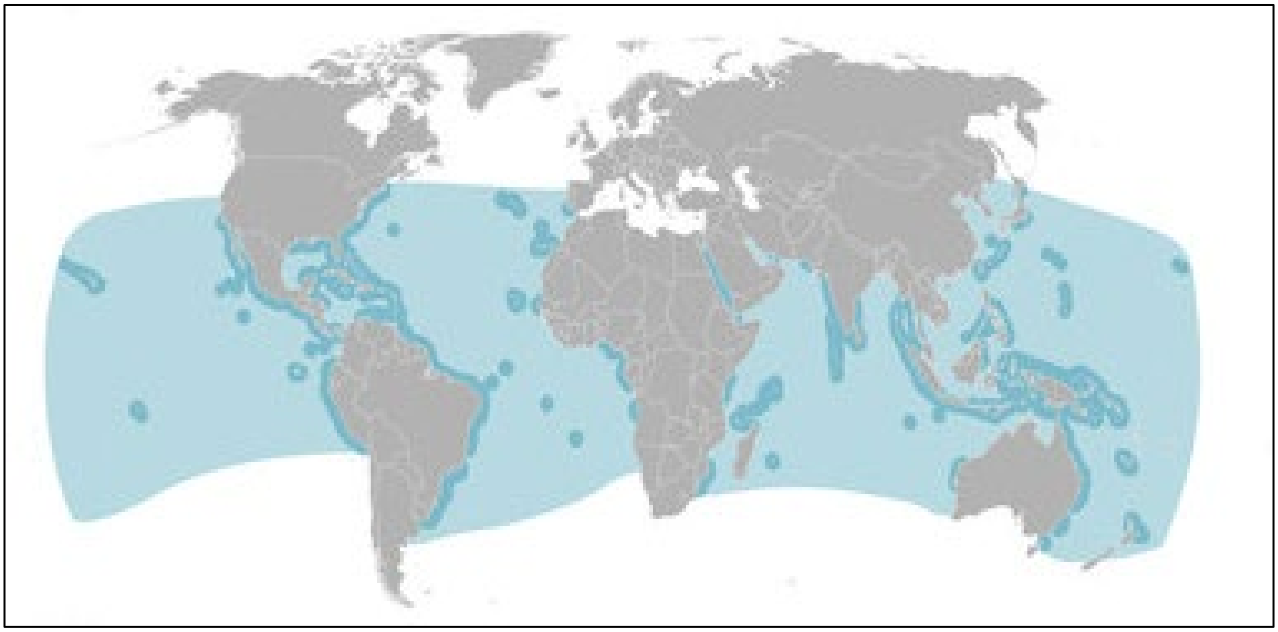

Figure 6. The Extent of Occurrence (dark blue) and Area of Occupancy (light blue) for giant manta ray, based on species distribution (Lawson et al. 2017).

The giant manta ray is a neritic and oceanic pelagic ray that occurs in places with regular upwelling along coastlines, oceanic islands, and offshore pinnacles and seamounts (Marshall et al. 2009). The giant manta ray can exhibit diel patterns in habitat use, moving inshore during the day to clean and socialize in shallow waters, and then moving offshore at night to feed to depths of 1,000 meters (Hearn et al. 2014; Burgess 2017). 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 (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.

Seasonal upwelling events concentrate zooplankton, creating patches of high productivity, which in turn may drive the seasonal occurrence and peaks in giant manta ray sightings. Small-scale movements also appear to be associated with exploiting local prey patches in addition to refuging and cleaning activities (O'Shea et al. 2010; Marshall et al. 2011; Graham et al. 2012; Rohner et al. 2013; Stewart et al. 2016a; Stewart et al. 2016b). 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). However, not all giant manta ray subpopulations are defined by seasonal sightings. Studied subpopulations that have more regular sightings include the Similan Islands (Thailand); Raja Ampat (Indonesia); northeast North Island (New Zealand); Kona, Hawaii (USA); Laje de Santos Marine Park (Brazil); Isla de la Plata (Ecuador); Ogasawara Islands (Japan); Isla Margarita and Puerto la Cruz (Venezuela); Isla Holbox, Revillagigedo Islands, and Bahia de Banderas, Mexico, southeast Florida; and in the Flower Garden Banks of the Gulf of Mexico (Notarbartolo di-Sciara and Hillyer 1989; Homma et al. 1999; Duffy and Abbott 2003; Luiz et al. 2009; Clark 2010; Kashiwagi et al. 2010; Marshall et al. 2011; Pate and Marshall 2021; Stewart et al. 2016ab.). Stewart et al. (2016a) suggest that habitats used by giant manta rays include both nearshore and offshore locations, and that the core spatial distribution of giant manta ray subpopulations encompass both types of habitats, leading to seasonal observations of giant manta rays in the nearshore habitats in many areas.

Within the northwestern Atlantic, the giant manta ray is distributed as far north as New Jersey, in the Gulf of Mexico, and in the U.S. Virgin Islands and Puerto Rico (Farmer et al., 2022; Figure 7). The giant manta ray are more commonly observed in productive nearshore environments, at shelf-edge upwelling zones, and at surface thermal frontal boundaries with temperatures ranging from approximately 20-30°C (Farmer et al. 2022). Species distribution models described in Farmer et al. (2022) indicate that giant manta rays occur more frequently in the nearshore waters of northeast Florida during the month of April, with their distribution extending northward along the shelf-edge as water temperatures warm, leading to higher occurrences north of Cape Hatteras, North Carolina, from June to October, and then south of Savannah, Georgia from November to March as water temperatures decrease (Farmer et al. 2022). Within the Gulf of Mexico, the highest nearshore occurrence was predicted to occur around the Mississippi River delta from April to June and again from October to November.

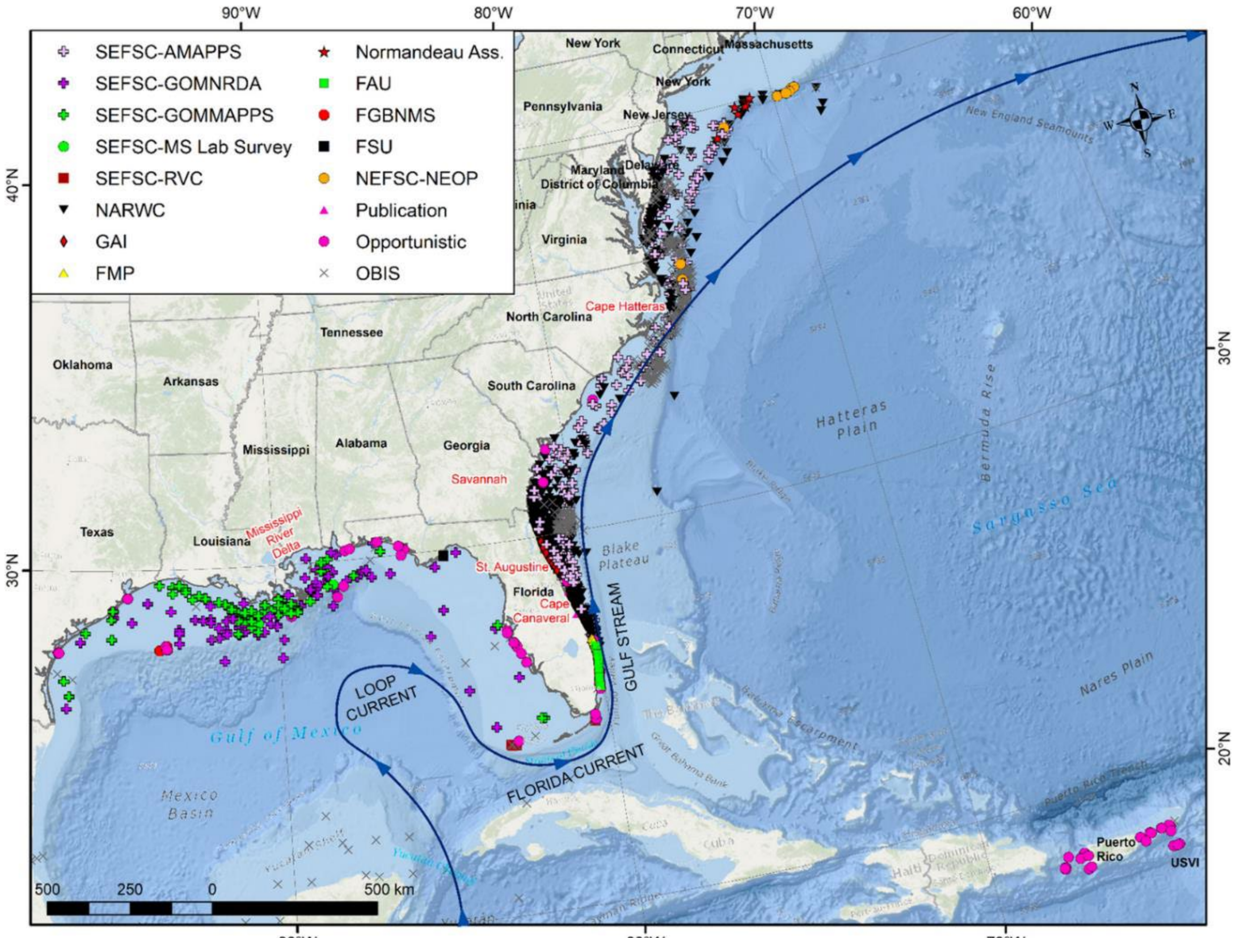

Figure 7. Reported sightings of manta rays (1925-2020) relative to regional landmarks and ocean currents, from Farmer et al. (2022).

Documenting nursery habitats is a priority in manta ray research and conservation (Stewart et al. 2018a), yet the juvenile life stages remain particularly understudied. To date, only three nursery areas for giant manta rays have been described worldwide, two of which occur within the Southeast (*M. birostris* and *M. cf. birostris:* Stewart et al. 2018a; Pate and Marshall 2020). Stewart et al. (2018a) described juvenile nursery habitat within the Flower Garden Banks National Marine Sanctuary (FGBNMS) in the Gulf of Mexico. Pate and Marshall (2020) identified a nursery habitat along miles of highly developed coastline in southeast Florida (i.e., between Jupiter Inlet and Palm Beach Inlet), but note it is likely that the surveyed area only encompasses a portion of this nursery habitat. These nursery habitats were described based on the frequent observations of juveniles, high site fidelity, and extended use (Heupel et al. 2017).

Population Structure and Status

Although capable of long-distance movements of 100s to >1000 km (Andrzejaczek et al. 2021), most populations appear to be philopatric (Stewart et al. 2016a), with few examples of long-distance dispersal (Andrzejaczek et al. 2021; Knochel et al. 2022). Several authors have reported that giant manta ray likely occur in small regional subpopulations (Lewis et al. 2015; Stewart et al. 2016a; Marshall et al. 2022; Beale et al. 2019) and may have distinct home ranges (Stewart et al. 2016a). The degree to which subpopulations are connected by migration is unclear but is assumed to be low (Stewart et al. 2016a; Marshall et al. 2022) so regional or local populations are not likely to be connected through immigration and emigration (Marshall et al. 2022), making them effectively demographically independent.

The population structure of giant manta rays – the number of populations and subpopulations that comprise the species, whether they are linked by immigration and emigration, and the strength of those links – is largely unknown. At a minimum, the evidence suggests that giant manta rays in the Atlantic and giant manta rays in the Indo-Pacific represent separate populations because this species does not appear to migrate to the Pacific through Drake Passage (or vice versa) and they do not appear to migrate around the Cape of Good Hope to the Indian Ocean (Figure 1; Lawson et al. 2017; Marshall et al. 2022).

While NMFS' concluded that the species is likely to become endangered within the foreseeable future throughout a significant portion of its range (the Indo Pacific and eastern Pacific), NMFS did not find the species met the criteria to list as a DPS (83 FR 2916, and 82 FR 3694). This decision is unique to the listing process, and does not mean that NMFS should not or would not consider the potential role that populations play in evaluating whether a proposed action is likely to result in appreciable reduction in numbers, distribution or reproduction, or whether such reductions may affect the viability of the putative populations that comprise the listed species.

The current evidence, combined with expert opinion, suggest the species likely has a complex population structure, and while it may occasionally be observed making long distance movements, the species likely occurs in small spatially separated populations, though to be viable the abundance of each subpopulation likely needs to be at least 1,000 individuals (Frankham et al. 2014). This structure is further supported by studies described by Beale et al. (2019) that have documented fisheries-induced declines in several isolated subpopulations (Lewis et al. 2015; Stewart et al. 2016; Moazzam 2018). Several studies have tracked individual giant manta rays and provide information on the spatial extent of giant manta ray populations. Stewart et al. (2016) studied four subpopulations of giant manta ray using genetics, stable isotopes, and satellite tags. They found that these subpopulations appeared to be discrete with little evidence of movement between them. The home ranges for three of these subpopulations, defined as the areas where tagged animals were expected to spend 95% of their time encompassed areas of 79,293 km^2 (Raja Ampat, Indonesia), 70,926 km^2 (Revillagigedo Islands, Mexico), and 66,680 km^2 (Bahia de Banderas, Mexico). These finding indicate that giant manta rays form discrete subpopulations that exhibit a high degree of residency. Stewart et al. (2016) state that this does not preclude occasional long-distance migrations, but that these migrations are likely rare and do not generate substantial gene flow or immigration of individuals into these subpopulations.

The Status Review (Miller and Klimovich 2016), notes only four instances of individual tagged giant manta rays making long-distance migrations. Of those, one animal was noted to travel a maximum distance of 1,151 km but that was a cumulative distance made up of shorter movements within a core area (Graham et al. 2012). No giant manta rays in that study moved further than 116 km from its tagging location and the results of Graham et al. (2012) support site fidelity leading to subpopulation structure. The remaining references to long distance migrations include Mozambique to South Africa (1,100 km), Ecuador to Peru (190 km), and the Yucatan into the Gulf of Mexico (448 km). The last two distances are well within core areas of subpopulation habitat use as specified in Stewart et al. (2016) and may only represent movements between coastal aggregation sites and offshore habitats as discussed in Stewart et al. (2016a). An additional instance of a long-distance migration is from Hearn et al. (2014) who tracked nine giant manta rays at Isla de la Plata, Ecuador. Eight of the nine tagged giant manta rays remained in an area of 162,500 km^2, while the ninth traveled a straight-line distance of 1,500 km to the Galapagos Islands; however, Stewart and Hearn later believed it may have been from a floating tag and not the result of a long distance migration (J. Stewart pers. comm. to J. Rudolph, NMFS, October 7, 2020).

In contrast with these few individuals making long-distance movements, most tracked individuals (Hearn et al. 2014 [8 out of 9 individuals]) or all tracked individuals (Graham et al. 2012 [6 individuals]; Stewart et al. 2016 [18 individuals]) from other studies remained within defined core areas, supporting subpopulation structure. Marshall et al. (2022) summarizes that current satellite tracking studies and international photo-identification matching projects suggest a low degree of interchange between subpopulations. To date there have been limited genetics studies on giant manta ray; however, Stewart et al. (2016) found genetic discreteness between giant manta ray populations in Mexico suggesting isolated subpopulations with distinct home ranges within 500 km of each other. In addition to genetics, differentiation was discovered through isotope analysis between those two Mexican populations (nearshore and offshore) and between two others (Indonesia and Sri Lanka). Using satellite tagging, stable isotopes and genetics, Stewart et al. (2016) concluded that, in combination, the data strongly suggest that giant manta rays in these regions are well-structured subpopulations that exhibit a high degree of residency. In the Gulf of Mexico, Hinojosa-Alvarez et al. (2016) propose a genetically distinct diverged group that may be a separate species and tentatively termed *M. cf. birostris.*

The global population size of the giant manta ray is difficult to assess, but abundance trajectories have been estimated based on longtime series of sightings at diving sites. Generally, divers encounter the giant manta ray less frequently than the reef manta ray and this is thought to be due to their oceanic habitat preference. Locally, abundance varies substantially and may be based on food availability and the degree that they were, or are currently, being fished. In most regions, giant manta ray population sizes appear to be small (less than 1,000 individuals). The current photo-identification databases for giant manta rays exist across multiple studied subpopulations, but rarely exceed 1,000 recorded individuals: 267 identified individuals in the Red Sea (Knochel et al. 2022); 588 in Raja Ampat, Indonesia (Beale et al. 2019); 101 in Mozambique (Marshall 2008); 1,141 in the Revillagigedo Archipelago, Mexico (K. Kumli pers. comm. Cited in Harty et al. 2022); 286 in coastal Mexico (J. D. Stewart unpubl. data, cited in Harty et al. 2022); 678 in the Maldives (Hilbourne and Stevens 2019); 59 in coastal Florida U.S. (Pate and Marshall 2020); 85 in the FGBNMS, U.S.(Stewart et al. 2018a); and 2,803 in Ecuador and Peru (Harty et al. 2022).

The global population size is not known, but three regional total abundance estimates are available. The total abundance estimates of giant manta rays populations are 600 in Mozambique (Marshall 2008), 1,875 from Raja Ampat (Beale et al. 2019), and 22,000 in coastal Ecuador and Peru (Harty et al. 2022). Preliminary (uncorrected for availability bias) relative abundance estimates for giant manta rays in the northwestern Atlantic and Gulf of Mexico, U.S., suggest an abundance ranging from approximately 5,000-14,000 individuals with a coefficient of variation between 14-20%, depending on the month (N. Farmer unpubl. data 2023). Preliminary satellite tagging returns from nine individuals suggest manta rays in the southeast spend a median of 14% of their time within depths visible to aerial observers; adjusted estimates for this availability bias suggest 47,802 ± 121,032 (mean ± SD; range 8,206-161,804) individuals in the western North Atlantic Ocean off the eastern United States (N. Farmer unpubl. data 2023).

Giant manta ray aggregation sites are widely separated, and the lack of genetic sub structuring indicates occasional large-scale movements have occurred. Cross-referencing of regional photo-identification databases has not detected inter-region individual movements (e.g. across ocean basins) (Holmberg and Marshall 2018), indicating a low degree of interchange between ocean basins. Unlike the reef manta ray, no significant genetic sub-structuring has been detected within the giant manta ray (Stewart et al. 2016, Hosegood et al. 2019). Long-term studies, including those that have incorporated telemetry, have shown low re-sighting rates but a degree of philopatry.

The trend of the number of individuals varies widely across the range of the giant manta ray, but trends appear stable where they are protected and declining rapidly where fishing pressure is greater. For example, sighting trends appear stable where they receive some level of protections, such as Hawaii (Ward-Paige et al. 2013) and Ecuador (Holmberg and Marshall 2018), although individuals sighted in Ecuador seasonally migrate to Peru (A. Marshall unpubl. data 2019) where directed fishing occurs (Heinrichs et al. 2011). Elsewhere, the number of individuals is likely to be declining in places where the species is targeted or caught regularly as bycatch. For example, in southern Mozambique, a 94% decline in diver sighting records occurred over a 15-year period in a well-studied population (Rohner et al. 2017). Similarly, at Cocos Island, Costa Rica, there has been an 89% decline in diver sighting records of giant manta rays over a 21-year period (White et al. 2015). These steep declines have occurred in less than one-generation length (29 years) (Marshall et al. 2022).

Along with these sightings data, it is suspected (based on historical sightings, distribution data, and habitat suitability), that giant manta ray populations may have been depleted in areas where significant fisheries or threats for manta rays exist, such as the west coast of mainland Mexico (Booda 1984, Rubin 2002), Madagascar, Tanzania (Bianchi 1985), Kenya, Somalia, Pakistan (Nawaz and Khan 2015, Moazzam 2018), India, Sri Lanka, Bangladesh, Myanmar, China, Indonesia, and the Philippines. In these densely populated and heavily fished countries, fishing pressure may have more swiftly depleted resident populations of giant manta ray.

There are narratives consistent with rapid local depletion, and disappearance of manta rays, particularly in Indonesia. In Lamakera, eastern Indonesia, increasing international trade demand for manta ray products in the 1990s resulted in increased fishing effort, with up to 2,400 manta and devil rays landed per year. Consequently, manta ray catches declined sharply in this region, forcing fishers to travel further afield to find manta rays (Dewar 2002). Furthermore, landings of manta species, including giant manta ray (which was the main target), continued to decline in Lamakera despite increased effort, with a reduction in landings of 75% over a 13-year period from 2001 to 2014, leading to possible local extinction of manta species from Lamakera (Lewis et al. 2015). Landings of manta species also declined significantly during the same 13-year period in two other regions in Indonesia where effort also increased: Tanjung Luar (Lombok) (95% declines) and Cilicap (Central Java) (71% declines) (Lewis et al. 2015). Aggregations of manta rays have entirely disappeared from three other locations within Indonesia (i.e., the Lembeh Strait, South Sulawesi and Northwest Alor) with the cause strongly suspected as targeted and bycatch fishing (Lewis et al. 2015). In East Flores and Lembata, Indonesia, mobulid rays (including the giant manta ray) had historically been fished by indigenous villagers since 1959, with up to 360 individuals caught in a single year (Barnes 2005). From 1996 to 2001, fewer than 10 manta rays were being caught a year (Lewis et al. 2015).

In the Bohol Sea, Philippines, manta rays were targeted for over a century with landings estimated to have declined since the 1960s by 50-90% despite increasing fishing effort (Alava et al. 2002). Concern for the species led to a ban on targeting of giant manta ray in the Philippines in 1998, yet other Mobula species could still be targeted, and giant manta rays continued to be caught (Acebes and Tull 2016, Rambahiniarison et al. 2018). In 2017, all targeted Mobula fisheries in the Bohol Seas were banned, yet Mobula species may still be taken as bycatch in tuna fisheries in the Bohol Sea (Rambahiniarison et al. 2018). Declining trends in the abundance and body size of mobulid fisheries landings occurred in both India and Sri Lanka (Fernando and Stevens 2011, Pillai 1998, Nair et al. 2013, Raje et al. 2007). In Papua New Guinea, local declines have been noted and are attributed to fishing pressure (Rose 2008). Unspecified manta rays (some of which, based on distribution records, were likely giant manta rays) were caught as non-target species in purse seine sets from 1995 to 2006 (Marshall et al. 2022). There was a distinct and significant rise in the number of manta rays caught in these fisheries in 2001, which steadily rose until 2005/2006 when sharp declines were noted in the catch (Rose 2008).

Although sparse, the available data suggest that target fisheries in some regions have rapidly depleted localized populations of the giant manta ray and that local extinction is suspected to have occurred in many parts of their historical range. Globally, the suspected population reduction is 50-79% over three generation lengths, with a further population reduction suspected over the next three generation lengths, based on current and ongoing threats and exploitation levels, steep declines in monitored populations, and a reduction in area of occupancy (Marshall et al. 2022). In the few places where manta rays are protected, the number of individuals are thought to be stable (Marshall et al. 2022).

Threats

The most significant threat to giant manta rays is from targeted fisheries and bycatch. While the overwhelming cause of species decline is fishing mortality, sub lethal effects and lower levels of mortality occur from numerous other threats like vessel strike, entanglement, oil spills, oil and gas activities, pollution and marine debris, and global climate change (Marshall and Bennett 2010; Essumang 2010; Deakos et al. 2011, Couturier et al. 2012; Ooi et al. 2014; Stewart et al. 2018).

<u>Fisheries</u>

The giant manta ray is reportedly targeted in at least 13 artisanal fisheries in 12 countries. Some of the largest documented fisheries have been in Indonesia, the Philippines, India, Sri Lanka, Mexico, Taiwan, Mozambique, Palestine (Gaza strip), and Peru (Couturier et al. 2012, Ward-Paige et al. 2013, Croll et al. 2016), where sometimes thousands of manta rays are landed per annum (Alava et al. 2002, Dewar 2002, White et al. 2006, Lewis et al. 2015). They are captured in a wide range of gear types including harpoons, drift nets, purse seine nets, gill nets, traps, trawls, and longlines. While many artisanal fisheries have grown to meet international trade demand for gill plates, some still target these rays mainly for food and local products (White et al. 2006, Essumang 2010, Rohner et al. 2017). The giant manta ray's coastal and offshore distribution and tendency to aggregate, makes them particularly susceptible to bycatch in purse seine and longline fisheries and targeted capture in artisanal fisheries (Croll et al. 2016, Duffy and Griffiths 2017). In particular, giant manta rays are easy to target because of their large size, slow swimming speed, tendency to aggregate, predictable habitat use, and lack of human avoidance (Couturier et al. 2012).

Bycatch

The giant manta ray is frequently caught as bycatch in a number of commercial and artisanal fisheries worldwide, particularly, purse-seine and gillnet fisheries and to a lesser extent commercial longline and trawl fisheries off Europe, western Africa, the Atlantic coast of the United States, Australia, and the Pacific and Indian Oceans (Marshall et al. 2022). Despite being unintentionally caught, they are typically retained because of their high trade value. Even when discarded alive, manta rays are often injured and have high post-release mortality (Tremblay-Boyer and Brouwer 2016, Francis and Jones 2017). Within the U.S. jurisdiction, the giant manta ray is caught as bycatch in fisheries that deploy the following gear types including: gillnet, longline, purse seine, trawl, vertical line, rod and reel, buoy, and pot gears. While most of the giant manta rays caught as bycatch in the Southeast U.S. are released alive, mortalities have been documented in the pelagic longline fishery and shrimp trawl fishery in the western Atlantic and Gulf of Mexico. Additionally, there may be substantial post release mortality for animals released alive, depending on the gear type deployed and handling practices.

Recreational anglers targeting sharks and cobia (*Rachycentron canadum*) using hook and line gear can foul-hook giant manta rays (C. Horn. unpubl. data 2022). Anglers targeting cobia will search for giant manta rays to capture the cobia that are frequently associated with manta rays (e.g., cobia are commonly observed traveling underneath manta rays). Cobia anglers commonly cast at giant manta rays in the hopes of catching the cobia (Roberts, 2022). This fishing practice is popular among cobia anglers in Florida and Georgia and regularly results in the foul hooking the giant manta ray - as evident in the numerous social media posts and videos online documenting the interactions (C. Horn, unpubl. data 2022). NMFS has also documented several manta ray captures by anglers targeting sharks form the shore and during tournaments (C. Horn unpubl. data 2022). Giant manta rays can also be foul-hooked by recreational anglers fishing from piers and jetties (C. Horn, unpubl. data 2022; Pate et al. 2020). A study conducted in southeast Florida documented that 27% of the giant manta rays (n=16) observed were foul-hooked or entangled in fishing line, of which 6 individuals interacted with fishing gear more than once (Pate et al. 2020). While there is little information available on the physical effect of recreational foul-hooking and entanglement on giant manta rays, however amputations and disfigurements, specifically those of the cephalic fin, that likely reduce feeding efficiency and the absence of this fin may negatively affect size, growth rate and reproductive success (Marshall and Bennett 2010, Deakos et al. 2011, Couturier et al. 2012, Stewart et al. 2018). As with other marine species, even if a hook is removed, a captured giant manta ray is still at risk of post-release mortality due to the physical injury and physiological stress associated with the capture.

However, due to their large size, giant manta rays are seldom boarded, so instead of removing the hook, fishermen tend to cut the branch line. Leaving the hook embedded and trailing line attached to the animal can result in serious injury (e.g., amputated or disfigured cephalic lobes and pectoral fins) and increase entanglement risk.

Entanglement

The giant manta ray is an obligate ram ventilator and mooring line entanglement can significantly restrict their ability to swim, rapidly leading to asphyxiation and death (Manta Trust 2019). Entanglement in mooring, anchor line, and buoy lines can also cause disfigurements and amputations (i.e., missing cephalic lobes) (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). Giant manta rays cannot swim backwards and often cannot see a thin mooring line directly in front of them as they swim forward. It is thought that giant 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, and entangling the animal as it begins to roll in an attempt to free itself (A. Marshall pers comm to C. Horn, NMFS, 2019). In 2017 a giant manta ray was documented as dead entangled in a vessel exclusion line (steel cable) near Pompano Beach, Florida. The female measured 2.48 m in disc width and had no other signs of injury or fishing line entanglement. It is likely that the manta ray became entangled in the line and drowned (Pate et al 2020). In Hawaii, numerous manta rays have been reported to have dead or have evidence (i.e., amputations or disfigurements) as a result of entanglement in mooring lines (Deakos 2011). The Manta Trust (Manta Trust 2019) has recorded dozens of manta ray mortalities due to mooring line entanglements and it is thought that the number is higher as many incidents are unreported. The known mortalities associated with mooring line entangles have been reported throughout the giant manta rays range, but mostly in the Maldives where researchers and scientist are actively studying manta ray species.

Vessel Strike

Giant manta rays spend considerable time basking, traveling, and feeding in surface waters, where they are susceptible to vessel strikes (McGregor et al. 2019). In addition, giant manta rays are at greater risk of vessel strike if they occur near areas of high human use (e.g., inlets, coastal areas, beaches). In French Polynesia, manta rays near highly populated islands are more likely to be observed with sub-lethal injuries caused by vessel strikes than manta rays near unpopulated islands (Carpentier et al. 2019). Pate et al. (2020) documented at least 10 manta rays with injuries consistent with vessel strikes (denoted by multiple parallel linear injuries from propellers) within a high human use area (i.e., Boynton Beach to Jupiter) in southeastern Florida. However, the rapid wound healing of manta rays likely masks the frequency of vessel strike injuries leading to an underestimation of vessel strikes (McGregor et al. 2019). There are few instances of confirmed mortalities attributed to vessel strike injury (i.e., via stranding). However, mortality may be cryptic as manta rays are negatively buoyant and will sink when they die (Pate et al. 2020); thereby significantly decreasing the likelihood of detection.

Climate Change

Warming in northern latitudes off the U.S. East Coast appears to have resulted in a significant northerly shift of manta ray distribution (Farmer et al. 2022). Similarly, climate change is expected to cause shifts in productivity of the Humboldt Current System (Bertrand et al. 2018), and increased ocean temperatures, deepening stratification, and changes in wind patterns may lead to variable effects on primary production and upwelling strength (Mogollón and Calil 2018, Oyarzún and Brierley 2018). Even though some protection measures are in place, changes to food web dynamics may impact foraging opportunities for manta rays, potentially causing shifts in their distribution and movement patterns that may influence their susceptibility to incidental capture, especially in regional fisheries (Harty et al. 2022; Stewart et al. 2018).

Pollution and Marine Debris

In locations with high densities of floating microplastics, giant manta rays may directly ingest microplastics (Stewart et al. 2018). Additionally, zooplankton can be contaminated with pollutants and toxins (Fossi et al., 2014) as well as ingest microplastics and nanoplastics (Cole et al., 2013; Setälä et al., 2014). This suggests that mobulids, like giant manta ray, may be secondary consumers of microplastics and associated pollutants even if they are foraging in locations (or at depths) that do not have high densities of floating microplastics. Previous studies found elevated levels of some heavy metals in mobulid tissues (Essumang, 2009, 2010; Ooi et al., 2015), but low levels of POPs (Germanov et al. 2019). Phthalates and/or POPs have been recorded in tissue samples of baleen whales, basking sharks and whale sharks in areas with high levels of microplastic pollution (Fossi et al., 2014, 2016, 2017), indicating that filter feeding organisms are likely bioaccumulating these pollutants as a result of plastic ingestion. In addition, a number of studies have demonstrated that microplastics, POPs and heavy metals impact regular cellular and system functioning, including endocrine disruption, leading to knock-on negative impacts on reproductive output with the potential to alter populations and ecological assemblages of marine species (Jakimska et al., 2011; Rochman, 2013; Rochman et al., 2014; Galloway and Lewis, 2016; Sussarellu et al., 2016; Germanov et al., 2018). Yet, the implications of exposure to pollution and contaminants on the giant manta ray, remain speculative, especially at the level of individual fitness and population viability (Stewart et al. 2018).

Oil and Gas Activities

Hydrocarbons from petroleum products released into the environment via oil spills and other discharges may directly injure marine animals through skin contact with oils (Geraci 1990). In addition, hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability in the impacted area. While impacts to the giant manta ray from DWH oil spill event are unquantified, they may have included direct exposure to oil, disruption of foraging or migratory movements due to subsurface or surface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources. Aerial photographs and reports from boaters placed at least some manta rays in the thick surface of the DWH oil spill (Handwerk 2010). However, there is little information available to determine the extent of those impacts, if they occurred. Manta rays would have been near peak abundance in the spill area during April and May 2010 (Farmer et al. 2022; N. Farmer unpubl. data 2023).

There have been several reported incidences of giant manta ray entanglements associated with Oil and Gas Program activities. Line entanglements are associated with diver downlines, acoustic buoy release lines, acoustic pinger lanyards, nodal tether cables, and nodal lanyards. Similar to mooring line entanglements discussed above, the giant manta ray cannot see a vertical line directly in front of them and they become entangled once the line makes contact with their head, between the cephalic lobes, causing the animal to roll in an effort to free itself, thereby further entangling itself. There have been several confirmed reports of giant manta rays becoming entangled in vertical lines that deployed by commercial oil and gas divers in the Gulf of Mexico in recent years (C. Horn and N. Famer unpubl. data 2022). For example, in 2013, 2021, and 2022, giant manta rays were reported and documented as entangled in a vertical downlines deployed by oil and gas divers. In addition, commercial oil and gas divers have reported numerous incidences of large rays, possibly giant manta rays in close proximity to underwater operations. It is thought that zooplankton is attracted to the underwater lights deployed by commercial divers. The amassing of zooplankton is likely attracting giant manta rays to underwater operation sites where vertical lines are deployed thereby increasing their entanglement risk (C. Horn personal observation).

Other Threats

While the overwhelming cause of species decline is fishing mortality, other sub lethal effects occur from numerous lesser threats, such as anthropogenic noise, toxic blooms from algae and other microorganisms, military detonations and training exercises, in-water construction activities, aquaculture, aquarium trade, and tourisms. While these threats are known, the extent to which these impacts may affect individual health and overall population fitness is unclear (Couturier et al. 2012; Croll et al. 2016; Stewart et al. 2018).

4.3 Smalltooth Sawfish (U.S. DPS)

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

Species Description and Distribution

The smalltooth sawfish is a tropical marine and estuarine elasmobranch. It is a batoid with a long, narrow, flattened, rostral blade (rostrum) lined with a series of transverse teeth along either edge. In general, smalltooth sawfish inhabit shallow coastal waters of the Atlantic Ocean (Dulvy et al. 2016) and feed on a variety of fish (e.g., mullet, jacks, and ladyfish) (Simpfendorfer 2001) (Poulakis et al. 2017).

Although this species is reported throughout the tropical Atlantic, NMFS identified smalltooth sawfish from the Southeast United States as a DPS, due to the physical isolation of this population from others, the differences in international management of the species, and the significance of the U.S. population in relation to the global range of the species (see 68 FR15674). Within the United States, smalltooth sawfish have historically been captured in estuarine and coastal waters from North Carolina southward through Texas, although peninsular Florida has been the region of the United States with the largest number of recorded captures (NMFS 2018). Recent records indicate there is a resident reproducing population of smalltooth sawfish in south and southwest Florida from Charlotte Harbor through the Florida Keys, which is also the last U.S. stronghold for the species (Poulakis and Seitz 2004; Seitz and Poulakis 2002; Simpfendorfer and Wiley 2005). Water temperatures (no lower than 8-12°C) and the availability of appropriate coastal habitat (shallow, euryhaline waters and red mangroves) are the major environmental constraints limiting the northern movements of smalltooth sawfish in the western North Atlantic. Most specimens captured along the Atlantic coast north of Florida are large juveniles or adults (over 10 ft) that likely represent seasonal migrants, wanderers, or colonizers from a historical Florida core population to the south, rather than being members of a continuous, even-density population (Bigelow and Schroeder 1953).

Life History Information

Smalltooth sawfish mate in the spring and early summer (Grubbs unpubl. data; Poulakis unpubl. data). Fertilization is internal and females give birth to live young. Evidence suggests a gestation period of approximately 12 months and females produce litters of 7-14 young (Gelsleichter unpubl. data; Feldheim et al. 2017; Smith et al. 2021). Females have a biennial reproductive cycle (Feldheim et al. 2017) and parturition (act of giving birth) occurs nearly year round though peaking in spring and early summer (March – July)(Poulakis et al. 2011, Carlson unpubl. data). Smalltooth sawfish appear to exhibit parturition site fidelity, returning to the same general nursery sites to give birth each cycle (Feldheim et al. 2017, Smith et al. 2021).

Smalltooth sawfish are approximately 26-31 in (64-80 cm) at birth (Poulakis et al. 2011; Bethea et al. 2012) and may grow to a maximum length of approximately 16 ft (500 cm) (Grubbs unpubl. data, Brame et al. 2019). Simpfendorfer et al. (2008) report rapid juvenile growth for smalltooth sawfish for the first 2 years after birth, with stretched total length increasing by an average of 25-33 in (65-85 cm) in the first year and an average of 19-27 in (48-68 cm) in the second year. Uncertainty remains in estimating post-juvenile growth rates and age at maturity; yet, recent advances indicate maturity at 7-11 years (Carlson and Simpfendorfer 2015) at lengths of approximately 11 ft (340 cm) for males and 11.5-12 ft (350-370 cm) for females (Gelsleichter unpub data).

There are distinct differences in habitat use based on life history stage as the species shifts use through ontogeny. Juvenile smalltooth sawfish less than 7.2 ft (220 cm), inhabit the shallow euryhaline waters (i.e., variable salinity) of estuaries and can be found in sheltered bays, dredged canals, along banks and sandbars, and in rivers (NMFS 2000). These juveniles are often closely associated with muddy or sandy substrates, and shorelines containing red mangroves, *Rhizophora mangle* (Simpfendorfer 2001; Simpfendorfer 2003; Simpfendorfer et al. 2010; Poulakis et al. 2011; Poulakis et al. 2013; Hollensead et al. 2016; Hollensead et al 2018). Simpfendorfer et al. (2010) indicated the smallest juveniles (young-of-the-year juveniles measuring < 100 cm in length) generally used the shallowest water (depths less than 0.5 m (1.64 ft)), had small home ranges (4,264-4,557 m^2), and exhibited high levels of site fidelity. Although small juveniles exhibit high levels of site fidelity for specific nursery habitats for periods of time lasting up to 3 months (Wiley and Simpfendorfer 2007), they do undergo small movements coinciding with changing tidal stages. These movements often involve moving from shallow sandbars at low tide to within red mangrove prop roots at higher tides (Simpfendorfer et al. 2010) – behavior likely to reduce the risk of predation (Simpfendorfer 2006). As juveniles increase in size, they begin to expand their home ranges (Simpfendorfer et al. 2010; Simpfendorfer et al. 2011), eventually moving to more offshore habitats where they likely feed on larger prey as they continue to mature.

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

The juvenile "hotspots" may be of further significance as NMFS expects parturition sites align closely with the juvenile "hotspots" given the high fidelity shown by the smallest size/age classes of sawfish to specific nursery areas. Therefore, disturbance within the high-use areas (hotspots) could have wide-ranging effects on the sawfish population if it were to disrupt future parturition or juvenile survival within the nursery.

While adult smalltooth sawfish may also use the estuarine habitats used by juveniles, they are commonly observed in deeper waters along the coasts. Poulakis and Seitz (2004) noted that nearly half of the encounters with adult-sized smalltooth sawfish in Florida Bay and the Florida Keys occurred in depths from 200-400 ft (70-122 m) of water. Similarly, Simpfendorfer and Wiley (2005) reported encounters in deeper waters off the Florida Keys, and observations from both commercial longline fishing vessels and fishery-independent sampling in the Florida Straits report large smalltooth sawfish in depths up to 130 ft (~40 m)(ISED 2014). Yet, current field studies show adult smalltooth sawfish also use shallow estuarine habitats within Florida Bay and the Everglades (Grubbs unpub. data). Further, NMFS expects that females return to shallow estuaries during parturition (when adult females return to shallow estuaries to give birth).

Status and Population Dynamics
Based on the contraction of the species' geographic range, we expect that the population to be a fraction of its historical size. However, few long-term abundance data exist for the smalltooth sawfish, making it very difficult to estimate the current population size. Despite the lack of scientific data, recent encounters with young-of-the-year, older juveniles, and sexually mature smalltooth sawfish indicate that the U.S. population is currently reproducing (Seitz and Poulakis 2002; Simpfendorfer 2003, Grubbs unpub. data, Feldheim et al. 2017). The abundance of juveniles publically encountered by anglers and boaters, including very small individuals, suggests that the population remains viable (Simpfendorfer and Wiley 2004), and data analyzed from Everglades National Park as part of an established fisheries-dependent monitoring program (angler interviews) indicated a slightly increasing trend in juvenile abundance within the park over the past decade (Carlson and Osborne 2012; Carlson et al. 2007). Similarly, preliminary results of juvenile smalltooth sawfish sampling programs in both ENP and Charlotte Harbor indicate the juvenile population is at least stable and possibly increasing (Poulakis unpubl. data, Carlson unpubl. data).

Using a demographic approach and life history data for smalltooth sawfish and similar species from the literature, Simpfendorfer (2000) estimated intrinsic rates of natural population increase for the species at 0.08-0.13 per year and population doubling times from 5.4-8.5 years. These low intrinsic rates[1] of population increase, suggest that the species is particularly vulnerable to excessive mortality and rapid population declines, after which recovery may take decades. Carlson and Simpfendorfer (2015) constructed an age-structured Leslie matrix model for the U.S. population of smalltooth sawfish, using updated life history information, to determine the species' ability to recover under scenarios of variable life history inputs and the effects of bycatch mortality and catastrophes. As expected, population growth was highest (λ=1.237 yr^{-1}) when age-at-maturity was 7 yr and decreased to 1.150 yr^{-1} when age-at-maturity was 11 yr. Despite a high level of variability throughout the model runs, in the absence of fishing mortality or catastrophic climate effects, the population grew at a relatively rapid rate approaching carrying capacity in 40 years when the initial population was set at 2250 females or 50 years with an initial population of 600 females. Carlson and Simpfendorfer (2015) concluded that smalltooth sawfish in U.S. waters appear to have the ability to recover within the foreseeable future based on a model relying upon optimistic estimates of population size, lower age-at-maturity and the lower level of fisheries-related mortality. Another analysis was less optimistic based on lower estimates of breeding females in the Caloosahatchee River nursery (Chapman unpubl. data). Assuming similar numbers of females among the 5 known nurseries, that study would suggest an initial breeding population of only 140-390 females, essentially half of the initial population considered by Carlson and Simpfendorfer (2015). A smaller initial breeding population would extend the time to reach carrying capacity.

Threats

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

<u>Bycatch Mortality</u>

Bycatch mortality is cited as the primary cause for the decline in smalltooth sawfish in the United States (NMFS 2010). While there has never been a large-scale directed fishery, smalltooth sawfish easily become entangled in fishing gears (gill nets, otter trawls, trammel nets, and seines) directed at other commercial species, often resulting in serious injury or death (NMFS 2009). This has historically been reported in Florida (Snelson and Williams 1981), Louisiana (Simpfendorfer 2002), and Texas (Baughman 1943). For instance, one fisherman interviewed by Evermann and Bean (1897) reported taking an estimated 300 smalltooth sawfish in just one netting season in the Indian River Lagoon, Florida. In another example, smalltooth sawfish landings data gathered by Louisiana shrimp trawlers from 1945-1978, which contained both landings data and crude information on effort (number of vessels, vessel tonnage, number of gear units), indicated declines in smalltooth sawfish landings from a high of 34,900 lbs in 1949 to less than 1,500 lbs in most years after 1967. The Florida net ban passed in 1995 has led to a reduction in the number of smalltooth sawfish incidentally captured, "…by prohibiting the use of gill and other entangling nets in all Florida waters, and prohibiting the use of other nets larger than 500 square feet in mesh area in nearshore and inshore Florida waters"[2] (FLA. CONST. art. X,

[1] The rate at which a population increases in size if there are no density-dependent forces regulating the population
[2] "nearshore and inshore Florida waters" means all Florida waters inside a line 3 mi seaward

§ 16). However, the threat of bycatch currently remains in commercial fisheries (e.g., Southeast U.S. shrimp fishery, federal shark fisheries of the South Atlantic, and the Gulf of Mexico reef fish fishery). A recent study assessed three federal fisheries and determined the southeastern U.S. shrimp fishery posed the greatest threat to sawfish given spatio-temporal overlap (Graham et al. 2022).

In addition to incidental bycatch in commercial fisheries, smalltooth sawfish have historically been and continue to be captured by recreational anglers. Encounter data (U.S. Sawfish Recovery Database) and past research (Caldwell 1990) document that rostra are sometimes removed from smalltooth sawfish caught by recreational anglers. Sawfish without rostra are expected to die due to starvation (Morgan et al. 2016). While the current threat of mortality associated with recreational fisheries is expected to be low given that possession of the species in Florida has been prohibited since 1992, bycatch in recreational fisheries remains a potential threat to the species.

Habitat Loss

Modification and loss of smalltooth sawfish habitat, especially nursery habitat, is another contributing factor in the decline of the species. Activities such as agricultural and urban development, commercial activities, dredge-and-fill operations, boating, erosion, and diversions of freshwater runoff contribute to these losses (SAFMC 1998). Large areas of coastal habitat were modified or lost between the mid-1970s and mid-1980s within the United States (Dahl and Johnson 1991). Since then, rates of loss have decreased, but habitat loss continues. From 1998-2004, approximately 64,560 ac of coastal wetlands were lost along the Atlantic and Gulf coasts of the United States, of which approximately 2,450 ac were intertidal wetlands consisting of mangroves or other estuarine shrubs (Stedman and Dahl 2008). Further, Orlando et al. (1994) analyzed 18 major southeastern estuaries and recorded over 703 mi of navigation channels and 9,844 mi of shoreline with modifications. In Florida, coastal development often involves the removal of mangroves and the armoring of shorelines through seawall construction. Changes to the natural freshwater flows into estuarine and marine waters through construction of canals and other water control devices have had other impacts: altered the temperature, salinity, and nutrient regimes; reduced both wetlands and submerged aquatic vegetation; and degraded vast areas of coastal habitat utilized by smalltooth sawfish (Gilmore 1995; Reddering 1988; Whitfield and Bruton 1989). While these modifications of habitat are not the primary reason for the decline of smalltooth sawfish abundance, it is likely a contributing factor and almost certainly hampers the recovery of the species. Juvenile sawfish and their nursery habitats are particularly likely to be affected by these kinds of habitat losses or alternations, due to their affinity for shallow, estuarine systems. Prohaska et al. (2018) showed that juvenile smalltooth sawfish within the anthropogenically altered Charlotte Harbor estuary have higher metabolic stress compared to those collected from more pristine nurseries in the Everglades. Although many forms of habitat modification are currently regulated, some permitted direct and/or indirect damage to habitat from increased urbanization still occurs and is expected to continue to threaten survival and recovery of the species in the future.

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of the coastline along the Gulf of Mexico and inside a line 1 mi seaward of the coastline along the Atlantic Ocean.

Life History Limitations

The smalltooth sawfish is limited also by its life history characteristics as a relatively slow-growing, late-maturing, and long-lived species. Animals using this life history strategy are usually successful in maintaining small, persistent population sizes in constant environments, but are particularly vulnerable to increases in mortality or rapid environmental change (NMFS 2000). The combined characteristics of this life history strategy result in a very low intrinsic rate of population increase (Musick 1999) that make it slow to recover from any significant population decline (Simpfendorfer 2000).

Stochastic Events

Although stochastic events such as aperiodic extreme weather and harmful algal blooms are expected to affect smalltooth, we are currently unsure of their impact. A strong and prolonged cold weather event in January 2010 resulted in the mortality of at least 15 juvenile and 1 adult sawfish (Poulakis et al. 2011; Scharer et al. 2012), and led to far fewer catches in directed research throughout the remainder of the year (Bethea et al. 2011). Another less severe cold front in 2011 did not result in any known mortality but did alter the typical habitat use patterns of juvenile sawfish within the Caloosahatchee River. Since surveys began, 3 hurricanes have made direct landfall within the core range of U.S. sawfish. While these storms denuded mangroves along the shoreline and created hypoxic water conditions, we are unaware of any direct effects to sawfish. Just prior to the passage of Hurricane Irma in 2017, acoustically tagged sawfish moved away from their normal shallow nurseries and then returned within a few days (Poulakis unpubl. data; Carlson unpubl. data). Harmful algal blooms have occurred within the core range of smalltooth sawfish and affected a variety of fauna including sea turtles, fish, and marine mammals, but to date no sawfish mortalities have been reported.

Current Threats

The 3 major factors that led to the current status of the U.S. DPS of smalltooth sawfish – bycatch mortality, habitat loss, and life history limitations – continue to be the greatest threats today. All the same, other threats such as the illegal commercial trade of smalltooth sawfish or their body parts, predation, and marine pollution and debris may also affect the population and recovery of smalltooth sawfish on smaller scales (NMFS 2010). A rising threat involves entanglement in small bungee cords used to secure boat house canopies, which can lead to disfigurement and may affect both feeding and respiration. We anticipate that all of these threats will continue to affect the rate of recovery for the U.S. DPS of smalltooth sawfish.

In addition to the anthropogenic effects mentioned previously, changes to the global climate are likely to be a threat to smalltooth sawfish and the habitats they use. The IPCC has stated that global climate change is unequivocal and its impacts to coastal resources may be significant (IPCC 2007; IPCC 2013). Some of the likely effects commonly mentioned are sea level rise, increased frequency of severe weather events, changes in the amount and timing of precipitation, and changes in air and water temperatures (EPA 2012; NOAA 2012). The impacts to smalltooth sawfish cannot, for the most part, currently be predicted with any degree of certainty, but we can project some effects to the coastal habitats where they reside. Red mangroves and shallow, euryhaline waters will be directly impacted by climate change through sea level rise, which is expected to increase 0.45 to 0.75 m by 2100 (IPCC 2013). Sea level rise will impact mangrove resources, as sediment surface elevations for mangroves will not keep pace with conservative projected rates of elevation in sea level (Gilman et al. 2008). Sea level increases will also affect the amount of shallow water available for juvenile smalltooth sawfish nursery habitat, especially in areas where there is shoreline armoring (e.g., seawalls). Further, the changes in precipitation coupled with sea level rise may also alter salinities of coastal habitats, reducing the amount of available smalltooth sawfish nursery habitat.

5 ENVIRONMENTAL BASELINE

5.1 Overview

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

By regulation, the environmental baseline for an Opinion refers to the condition of the listed species or its designated critical habitat 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 listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

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

5.2 Baseline Status of ESA-Listed Species Considered for Further Analysis

The status of this species in the action area, as well as the threats to this species, is supported by the species accounts in Section 4 (Status of the Species).

As stated in Section 2.2 (Action Area), the proposed action occurs a 1.0-ac city park located within Lake Worth Lagoon in West Palm Beach, Palm Beach County, Florida. The project site is on the western shore of the Intercoastal Waterway, approximately 1.6 mi from the Atlantic

Ocean. There are no coral present in the action area, and the action area is not located in designated critical habitat.

5.2.1 Sea turtles

There have been no reported recreational hook-and-line captures of ESA-listed sea turtles at the Brian H. Chappell City Park pier according to the available STSSN data for the years 2007-2016. Based on the best available species life history data and the STSSN recreational hook-and-line capture and entanglement data (Table 2), we believe green sea turtle (North Atlantic DPS), hawksbill sea turtle, and loggerhead sea turtle (Northwest Atlantic DPS) may be in the action area and adversely affected by recreational hook-and-line fishing that will occur at Brian H. Chappell City Park pier upon completion of the proposed action. All of these sea turtle species are migratory, traveling to forage grounds or for reproduction purposes. The Atlantic Ocean waters within the action area are likely used by these species of sea turtles 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, Caribbean Sea, and other areas of the North Atlantic Ocean 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 4.1.1-4.1.4.

5.2.2 Giant Manta Ray

NMFS is not aware of any reported recreational hook-and-line captures of a giant manta ray at the Brian H. Chappell City Park pier. Giant manta rays can occur in coastal bays, intracoastal waterways, tidal inlets, and in estuarine systems (e.g., sounds and lagoons). Giant manta rays are observed feeding in tidal outflows, inlets, and river mouths (feeding around outfall plumes) (Adams and Amesbury 1998; Milessi and Oddone 2003; Pate and Marshall 2020; Farmer et al. unpublished). They are also commonly observed swimming near or underneath public fishing piers where they may become foul-hooked. Due to the pier's position in an estuary system (i.e., Lake Worth Lagoon), 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 4.2.

5.2.3 Smalltooth Sawfish

Smalltooth sawfish have been documented throughout the state of Florida; however, the majority of encounters occur in Lee, Charlotte, and Monroe counties. According to a review of the U.S. Sawfish Recovery Database, there have been 94 documented reports of smalltooth sawfish in Palm Beach County, Florida, between 2003-2023. Of those reports, 4 are captures due to recreational fishing from ocean-facing fishing piers. There have been no reported recreational hook-and-line capture of a smalltooth sawfish at Brian H. Chappell City Park pier or other inshore recreational fishing piers within Lake Worth Lagoon. NMFS believes that no individual smalltooth sawfish is likely to be a permanent resident of the action area, although some individuals may be present at any given time and may be adversely affected by recreational fishing that will occur at the pier. These same individuals will migrate into coastal and offshore waters of the Gulf of Mexico, and thus may be affected by activities occurring there. Therefore, the status of smalltooth sawfish in the action area is considered to be the same as those discussed in Section 4.3.

5.3 Additional Factors Affecting the Baseline Status of ESA-Listed Species Considered for Further Analysis

5.3.1 Federal Actions

Other than the proposed action, no other federally permitted projects are known to have occurred within the action area or undergone Section 7 consultation, as per a review of the NMFS SERO PRD's completed ESA Section 7 consultation database by the consulting biologist on January 19, 2024.

5.3.2 State and Private Actions

Recreational fishing as regulated by the State of Florida can affect green sea turtle (North Atlantic DPS), loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish, and giant manta ray within the action area. Pressure from recreational fishing in and adjacent to the action area is likely to continue.

The available 10-year STSSN dataset (2007-2016) for inshore Zone 26 contains no reported recreational hook-and-line captures of sea turtles from Brian H. Chappell City Park pier. We have no way of knowing how many unreported captures of these species may have occurred at this pier in the past. 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 (NMFS 2001). Additionally, lost fishing gear such as line cut after snagging on rocks, or discarded hooks and line, can also pose an entanglement threat to sea turtles in the area. A detailed summary of the known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the TEWG reports (1998; 2000).

The U.S. Sawfish Recovery Database (2003-2023) contains no reported recreational hook-and-line captures of a smalltooth sawfish at Brian H. Chappell City Park fishing pier or other inshore recreational fishing piers within Lake Worth Lagoon. We have no way of knowing how many unreported captures of these species may have occurred at this pier in the past. Though anglers are not targeting smalltooth sawfish, but instead capturing them incidentally, recreational fishing is currently a major activity that directly interacts with smalltooth sawfish throughout most of its range. Smalltooth sawfish occur as bycatch in the recreational hook-and-line fishery, mostly by shark, red drum *(Sciaenops ocellatus)*, snook *(Centropomus undecimalis)*, and tarpon *(Megalops atlanticus)* fishers (Wiley & Simpfendorfer, 2010), which may operate within the action area.

NMFS is not aware of any giant manta ray captures at Brian H. Chappell City Park fishing pier. We have no way of knowing how many unreported captures of these species may have occurred at this pier in the past. 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 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.

5.3.3 Marine Debris, Pollution, and Environmental Contamination

Sources of pollutants along the coast that may affect green sea turtle (North Atlantic DPS), hawksbill sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish, 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 many other anthropogenic toxins have not been investigated. Additionally, anthropogenic marine debris is known to affect ESA-listed sea turtle species, smalltooth sawfish, and giant manta ray; however, the effects are difficult to measure. Where possible, conservation measures are being implemented to monitor or study the effects to sea turtles from these sources.

The development of marinas and docks in inshore waters can negatively affect nearshore habitats. An increase in the number of docks built increases boat and vessel traffic. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. Although these contaminant concentrations do not likely affect the more pelagic waters, the species analyzed in this Opinion travel between near shore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles within the action area.

5.3.4 Acoustic Impacts

Acoustic effects on green sea turtles (North Atlantic DPS), hawksbill sea turtles, loggerhead sea turtles (Northwest Atlantic DPS), smalltooth sawfish, and giant manta rays are known to affect these species and they are difficult to measure. Where possible, conservation actions are being implemented to monitor or study the effects to protected species from these sources.

5.3.5 Stochastic Events

Seasonal stochastic (i.e., random) events, such as hurricanes or cold snaps, occur in the action area and can affect green sea turtle (North Atlantic DPS), hawksbill sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish, and giant manta ray in the action area.

These events are unpredictable and their effect on the recovery of these ESA-listed sea turtles, smalltooth sawfish, and giant manta ray is unknown; yet, they have the potential to impede recovery if animals die as a result or indirectly if important habitats are damaged.

6 EFFECTS OF THE ACTION

6.1 Overview

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 the effect would not occur but for the proposed action and the effect 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).

In this section of our Opinion, we assess the effects of the action on listed species that are likely to be adversely affected. The analysis in this section forms the foundation for our jeopardy analysis in Section 8. The quantitative and qualitative analyses in this section are based upon the best available commercial and scientific data on species biology and the effects of the action. Data are limited, so we are often forced to make assumptions to overcome the limits in our knowledge. Sometimes, the best available information may include a range of values for a particular aspect under consideration, or different analytical approaches may be applied to the same data set. In those cases, the uncertainty is resolved in favor of the species. NMFS generally selects the value that would lead to conclusions of higher, rather than lower risk to endangered or threatened species.

6.2 Effects of the Proposed Action on ESA-Listed Species Considered for Further Analysis

6.2.1 Routes of Effect That Are Not Likely to Adversely Affect ESA-Listed Species

Green sea turtle (North Atlantic DPS), hawksbill sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish, and giant manta ray may be physically injured if struck by equipment or materials during construction activities. However, we believe that such route of effect is extremely unlikely to occur. This species is expected to exhibit avoidance behavior by moving away from physical disturbances. In addition, the implementation of NMFS Southeast Region's *Protected Species Construction Conditions* (NMFS 2021) will require all construction workers to observe in-water activities for the presence of this species. Operation of any mechanical construction equipment shall cease immediately if a protected species are seen within 150 ft of operations. Activities may not resume until the protected species has departed the project area of its own volition. Further, construction would be limited to daylight hours so construction workers would be more likely to see listed species, if present, and avoid interactions with them.

Green sea turtle (North Atlantic DPS), hawksbill sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish, and giant manta ray may be injured due to entanglement in improperly discarded fishing gear resulting from future use of the replacement pier after completion of the proposed action. We believe this route of effect is extremely unlikely to occur. To the best of our knowledge, there has never been a reported entanglement with any of these species at Brian H. Chappell City Park pier. To help further reduce the risk of entanglement in improperly discarded fishing gear, the applicant will install and maintain fishing line recycling receptacles and trashcans with lids at the pier to keep debris out of the water, and we expect that anglers will appropriately dispose of fishing gear when disposal bins are available. 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 perform annual in-water and out-of-water fishing debris cleanups, minimizing the accumulation of fishing line over time.

As discussed in Section 3.2, noise created by pile driving activities can physically injure animals or change animal behavior in the affected areas. The installation of up to 5 new 14-in square concrete piles per day by impact hammer not using noise abatement measures may cause PK injurious noise effects to ESA-listed sea turtles and ESA-listed fishes at radii of up to 0.1-ft (0-m) and 3.8-ft (1.2-m) away from the pile driving operations, respectively. Additionally, the SELcum may cause injury to ESA-listed sea turtles and ESA-listed fishes at radii of up to 13.0-ft (4.0-m) and 177.0-ft (53.9-m) away from the pile driving operations over a 24-hour period, respectively. We believe both PK and SELcum injurious noise effects to ESA-listed sea turtles and ESA-listed sea turtles are extremely unlikely to occur. The effects radii for ESA-listed sea turtles and the PK injurious noise effects for ESA-listed fish are within the 150-ft "stop-work" radius defined in SERO's *Protected Species Construction Conditions* (2021). The SELcum injurious noise effects for ESA-listed fishes are also extremely unlikely to occur because we expect these species to move away from the noise disturbances before the exposure to the noise causes physical injury. Movement away from the injurious sound radius is a behavioral response, which is discussed below.

The installation of up to 5 new 14-in square concrete piles per day by impact hammer not using noise abatement measures could result in behavioral effects to ESA-listed sea turtles and ESA-listed fishes at radii of up to 82.4-ft (25.1-m) and 3,825.2-ft (1,165.9 m) away from the impact pile driving operations, respectively. Due to the mobility of this species and the open-water environment, we expect the animal to move away from noise disturbances. Because there is similar habitat nearby, we believe behavioral effects will be insignificant. If an animal chooses to remain within the behavioral response zone, it could be exposed to behavioral noise effects during pile installations. Because pile installations will occur intermittently during daylight hours only and no more than 5 piles per day will be installed, these species will be able to resume normal activities during quiet periods between pile installations and at night.

Finally, the NMFS educational signs *"Save Dolphins, Sea Turtles, Smalltooth Sawfish, and Manta Rays"* and *"Do Not Catch or Harass Sea Turtles"* will be installed in a visible location upon completion of the proposed action. We believe the placement of educational signs will further reduce the likelihood of recreational hook-and-line interactions with ESA-listed sea turtles, smalltooth sawfish, and giant manta ray. The signs 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 these species and refine conservation and recovery measures.

6.2.2 Routes of Effect That Are Likely to Adversely Affect ESA-Listed Species

We believe hook-and-line gear commonly used by recreational anglers fishing from Brian H. Chappell City Park pier may adversely affect Green sea turtle (North Atlantic DPSs, hawksbill sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish, and giant manta ray. In the discussion below, we provide more detail on the potential effects of entanglement, hooking, and trailing line to these species from hook-and-line gear. Sections 6.3-6.4 address how we estimate future captures of sea turtles. Sections 6.5 and 6.6 address how we estimate future captures of giant manta ray and smalltooth sawfish, respectively.

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 their toothed rostra, smalltooth sawfish can become entangled in fishing gears such as gill nets, otter trawls, trammel nets, cast nets and seines that are directed at other species (NMFS, 2009). Entanglement in recreational fishing line can cause effects to smalltooth sawfish including injury to fins and rostra (FWC unpublished data).

Fishing line entanglement can cause effects to giant manta ray, including injury to cephalic fins (Deakos et al. 2011), stress, deep lacerations to the body (Gallagher et al. 2014), and impaired feeding or swimming (Marshal et al. 2008). The effects from entanglement are considered sub-lethal to giant manta ray because they do not immediately result in death, with documented evidence that manta rays can recover and survive post-injury (Pate and Marshall 2020).

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 (known as foul-hooking, when an animal is hooked anywhere on the body without having taken the bait in its 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.

The U.S. Sawfish Recovery Datavase contains several recreational hook-and-line captures of smalltooth sawfish from ocean-facing fishing structures (2003-2023). Based on this data, smalltooth sawfish do not appear to be actively attracted to recreational fishing structures or to habituate near recreational fishing structures as a forage source. We believe smalltooth sawfish captures are largely a function of co-occurrence in space and time rather than triggered by the presence of a recreational fishing structure. While hooking interactions within the recreational fishery are numerous, the level of mortality is likely low when smalltooth sawfish are handled and released properly. Further, the threat of mortality associated with recreational fisheries in Florida is expected to be low given that possession of the species in Florida has been prohibited since 1992. Longer fights on recreational hook-and-line gear as opposed to commercial bottom longlines may elevate lactate and HCO_3 levels (Prohaska et al. (2018)); however, smalltooth sawfish appear resilient and, when considered in conjunction with information from ongoing tagging and telemetry studies, post-release survival is expected to be high (Brame et al., 2019).

Hook-and-line gear commonly used by recreational anglers fishing from fishing piers can adversely affect giant manta ray via hooking or foul-hooking. The effects from hooking and foul-hooking are considered sub-lethal to giant manta ray because they do not immediately result in death, with documented evidence that manta rays can recover and survive post-injury (Pate and Marshall 2020).

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 smalltooth sawfish and giant manta ray from trailing line are the same as those discussed above under *Entanglements*.

6.3 Estimating Hook-and-Line Interactions with Sea Turtles

6.3.1 Estimating Future Reported Hook-and-Line-Captures with Sea Turtles

We believe the best available data to estimate future reported recreational hook-and-line captures with sea turtles at public fishing structures comes from the historic reported captures at similar structures obtained from available STSSN data for Zone 26, and any additional information regarding captures at the structure under consultation. 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 Brian H. Chappell City Park pier in the future.

As previously stated, Brian H. Chappell City Park pier is located in Lake Worth Lagoon and the inshore waters of Zone 26. The available STSSN dataset contains no reported captures of sea turtles at Brian H. Chappell City Park pier (recreational hook-and-line or otherwise; years 2007-2016). There are 3 reported recreational hook-and-line captures of sea turtles at 2 other similar inshore, public fishing structures in Zone 26 during this period (i.e., Currie Park Pier and Sunglow Pier, both in West Palm Beach). Because these 2 fishing structures are in a similar habitat and location (i.e., Zone 26), we assume sea turtle behavior, density, and species composition are comparable at both locations. Also, because the fishing structures are of a similar size, they likely have comparable angler effort. Further, we assume anglers fishing from both of these structures use similar baits, equipment, and fishing techniques. Therefore, even though the historic reported hook-and-line captures are different between these 3 structures, the potential for interactions with sea turtles is likely comparable at all 3 locations within inshore Zone 26.

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, inshore 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.

Thus, we believe the best available data to estimate the number of future reported recreational hook-and-line captures of sea turtles at Brian H. Chappell City Park pier is the average of the historic reported recreational hook-and-line captures at other similar fishing structures in the inshore Zone 26 STSSN. Averaging the inshore Zone 26 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 Brian H. Chappell City Park 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 3 similar fishing structures in the inshore, protected waters of Zone 26, we use available STSSN data and the following equation:

$$
\begin{aligned}
&\mathit{Average\ Reported\ Captures\ Per\ Structure\ in}\ 10\ \mathit{years} \\
&= \mathit{Sum\ of\ Reported\ Captures\ in}\ 10\ \mathit{years} \div 3\ \mathit{Locations} \\
&= (1 + 2 + 0) \div 3 \\
&= 1.000\ \mathit{per\ structure\ in}\ 10\ \mathit{years}
\end{aligned}
$$

To calculate the estimated expected annual number of reported recreational hook-and-line captures of sea turtles at Brian H. Chappell City Park pier, we refer to the information above and use the following equation:

$$
\begin{aligned}
&\mathit{Expected\ Annual\ Reported\ Captures} \\
&= \mathit{Average\ Reported\ Captures\ Per\ Structure\ in}\ 10\ \mathit{years} \div 10\ \mathit{years} \\
&= 1.000 \div 10 \\
&= 0.1000\ \mathit{per\ year}\ \text{(Table } \mathbf{4}, \mathit{Line}\ 1\text{)}
\end{aligned}
$$

6.3.2 Estimating Unreported Hook-and-Line Captures with Sea Turtles

While we believe the best available information for estimating expected reported captures at Brian H. Chappell City Park pier is the reported captures at similar inshore public fishing structures in the surrounding area, 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. 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. 2016). 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.

We believe it is most appropriate to use the unreported rate in the Hill (2013) fishing pier study to estimate the future unreported captures at Brian H. Chappell City Park pier. Because the study is in a similar location (i.e., inshore waters in Florida), it is a reasonable proxy for reporting behavior at Brian H. Chappell City Park 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 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 0.1000 sea turtles per year at Brian H. Chappell City Park 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.

$$\begin{aligned}&Expected\ Annual\ Unreported\ Captures\\&= (Expected\ Annual\ Reported\ Captures \div 8\%) \times 92\%\\&= (0.1000 \ \div 0.08) \times 0.92\\&= \ 1.1500\ per\ year\ (\text{Table } \mathbf{4}, Line\ 2)\end{aligned}$$

6.3.3 Calculating Total Hook-and-Line Captures with 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., 2024-2026, 2025-2027, and so on) and not for static 3-year periods (i.e., 2024-2026, 2026-2028, 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 Hook-and-Line Captures with Sea Turtles

Captures	Total
1. Expected Annual Reported	0.1000
2. Expected Annual Unreported	1.1500

Captures	Total
Annual Total	1.2500
Triennial (3-year) Total	**3.7500**

6.4 Estimating Post-Release Mortality of Sea Turtles

6.4.1 Estimating Post-Release Mortality for Hook-and-Line Interactions with 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 a 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 available 10-year STSSN dataset for inshore 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 because this dataset pertains specifically to Florida where future reported captures are anticipated to occur. **Table 5** provides a breakdown of final disposition of the 48 sea turtles caught or entangled in recreational hook-and-line gear in the available STSSN dataset for inshore Zone 26.

Table 5. Final Disposition of Sea Turtles from Reported Recreational Hook-and-Line Captures and Gear Entanglements in inshore Zone 26, 2007-2016 (n=48)

	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	21	0	0	9	18
Percentage	43.8	0	0	18.8	37.5

Of the 48 sea turtles reported captured on recreational hook-and-line or entangled in gear in inshore Zone 26, 81.3% were removed from the wild population either through death or being unable to be released from the rehabilitation facility (i.e., lethal captures, 43.8% + 37.5%) and 18.8% were released alive back into the wild population (i.e., non-lethal captures).

To calculate the annual estimated lethal captures of reported sea turtles at Brian H. Chappell City Park pier, we use the following equation:

$$
\begin{aligned}
&Annual\ Lethal\ Reported\ Captures \\
&= Expected\ Annual\ Reported\ Captures\ [\text{Table } \mathbf{4}, Line\ 1] \\
&\qquad\qquad \times Lethal\ Captures\ [calculated\ from\ \text{Table } \mathbf{5}] \\
&= 0.1000 \times 81.3\% \\
&= 0.0813\ per\ year\ (\text{Table } \mathbf{9}, Line\ 1A)
\end{aligned}
$$

To calculate the estimated annual non-lethal captures of reported sea turtles at Brian H. Chappell City Park pier, we use the following equation:

$$
\begin{aligned}
&Annual\ Non-lethal\ Reported\ Captures \\
&= Expected\ Annual\ Reported\ Captures\ [\text{Table } \mathbf{4}, Line\ 1] \times Non \\
&\qquad\qquad - lethal\ Captures\ [calculated\ from\ \text{Table } \mathbf{5}] \\
&= 0.1000 \times 18.8\% \\
&= 0.0188\ per\ year\ (\text{Table } \mathbf{9}, Line\ 1B)
\end{aligned}
$$

6.4.2 Estimating Post-Release Mortality for Unreported Hook-and-Line Interactions with 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, NMFS SEFSC updated the criteria again by adding 3 additional hooking scenarios, bringing the total to 6 categories of injury (NMFS 2012a). **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, 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 48 interactions (**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 was 1 interaction 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, 2007-2016 (n=47)

Injury Category	I	II	III	IV	V	VI
Number	4	0	6	2	35	0
Percentage	8.5	0.0	12.8	4.3	74.5	0

As above, we assume that 8% of the sea turtles captured at Brian H. Chappell City Park 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 Brian H. Chappell City Park 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 Brian H. Chappell City Park pier, we estimate a total weighted PRM of 47.3% for the 40% of sea turtles captured, unreported, and released immediately at Brian H. Chappell City Park pier.

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

Injury Category	PRM (%) [from Table 5]	Percentage [from Table 6]	% Weighted PRM (% PRM × % Captures for each Injury Category)
I	20	8.5	1.7
II	30	0.0	0.0
III	45	12.8	5.8
IV	60	4.3	2.6
V	50	74.5	37.3
VI	60	0	0
		Total % Weighted PRM	47.3

To calculate the estimated annual lethal captures of unreported sea turtles at Brian H. Chappell City Park pier, we use the following equation:

$$\begin{aligned}&\mathit{Annual\ Unreported\ Lethal\ Captures}\\&= \mathit{Annual\ Unreported\ Captures}\ [\text{Table } 4, \mathit{Line}\ 2] \times \mathit{Total\ Weighted\ PRM}\ [\mathit{Table}\ 8]\\&= 1.1500 \times 47.3\%\\&= 0.5438\ \mathit{per\ year}\ (\text{Table } \mathbf{9}, \mathit{Line}\ 2A)\end{aligned}$$

If the equation for calculating annual lethal captures of unreported sea turtles multiplies the annual unreported captures by the total weighted PRM of 47.3%, then the equation for calculating annual non-lethal captures of unreported sea turtles would multiply the annual unreported captures by 52.7% (100% – 47.3%). Therefore, to calculate the estimated annual non-lethal captures of unreported sea turtles at Brian H. Chappell City Park pier, we use the following equation:

$$\begin{aligned}&\mathit{Annual\ Unreported\ Non-lethal\ Captures}\\&= \mathit{Annual\ Unreported\ Captures}\ [\text{Table } \mathbf{4}, \mathit{Line}\ 2] \times 52.7\%\\&= 1.1500 \times 52.7\%\\&= 0.6062\ \mathit{per\ year}\ (\text{Table } \mathbf{9}, \mathit{Line}\ 2B)\end{aligned}$$

6.4.3 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 Brian H. Chappell City Park 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

Captures	A. Lethal	B. Non-lethal
1. Annual Reported Captures	0.0813	0.0188
2. Annual Unreported Captures	0.5438	0.6062
Annual Total	0.6251	0.6249
Triennial (3-year) Total	1.8753	1.8747

6.4.4 Estimating Hook-and-Line Interactions of Sea Turtles by Species

Of the sea turtles in the STSSN inshore Zone 26 data identifiable to species and which may be adversely affected by the proposed action (n=48), 79.2% were green (n=38), 6.3% were hawksbill (n=3), and 14.6% were loggerhead sea turtles (n=7) (**Table 2**). We will assume the same potential species composition for future captures at Brian H. Chappell City Park pier because these are the best available data regarding the relative abundance of sea turtle species that may be affected by hook and line gear in the action area. **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 6.4.1 and 6.4.2. 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 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.

Table 10. Estimated Captures of Sea Turtle Species at Brian H. Chappell City Park pier for Any Consecutive 3-Year Period

Species	Lethal Captures	Non-lethal Captures	Total Captures
Green sea turtle (North Atlantic DPS)	2 (1.8753 × 0.792 = 1.4852)	2 (1.8747 × 0.792 = 1.4847)	4
Hawksbill sea turtle	1 (1.8753 × 0.063 = 0.1181)	1 (1.8747 × 0.063 = 0.1181)	2
Loggerhead sea turtle (Northwest Atlantic DPS)	1 (1.8753 × 0.146 = 0.2737)	1 (1.8747 × 0.146 = 0.2737)	2

6.5 Estimating Hook-and-Line Captures with Giant Manta Ray

We believe the best available data to estimate future observed fishing interactions with giant manta ray at public fishing structures come from the surveys conducted by MMF. In 2016, the MMF began conducting aerial and boat-based surveys between St. Lucie Inlet and Boynton Beach Inlet on the east coast of Florida in Palm Beach County, a known area of high abundance for juvenile giant manta ray (Pate and Marshall 2020). During survey efforts researchers documented high occurrences of recreational fishing interactions with giant manta ray (i.e., foul hooked or entangled) (Pate and Marshall 2020; Pate et al. 2022). According to the information provided by USACE and the applicant, there have been no reported captures of or interactions with giant manta ray at Brian H. Chappell City Park pier. In the absence of data specific to areas adjacent to or within the action area, we believe the MMF survey data is the best available for calculating the estimated number of future observed fishing gear interactions with giant manta ray at Brian H. Chappell City Park pier.

Between 2016 and 2022, MMF documented 58 interactions between fishing gear and giant manta ray within the survey area (J. Pate, MMF, unpublished data). Entangled or foul-hooked giant manta rays typically were observed within an average of 1.2 mi (2.0 km) from a fishing pier or inlet (J. Pate, MMF, unpublished data). We assume that all giant manta rays observed entangled or foul-hooked during these surveys occurred from fishing piers due to their close proximity to fishing piers and the fact that individuals had multiple fishing gear interactions within the survey area.

In the MMF survey area (i.e., between St. Lucie Inlet and Boynton Beach Inlet, Palm Beach County, Florida), there are 4 public ocean-facing fishing structures – Jupiter Inlet, Juno Beach Pier, Lake Worth Pier, and Boynton Beach Inlet. These piers are similar in size and location (i.e., relatively large, public ocean facing or inlet fishing structures), and have similar angler effort. Pate et. al. (2020) conducted semi-structured surveys to assess recreational anglers' knowledge of and attitudes toward giant manta ray. These surveys revealed anglers fishing from these locations use similar baits, equipment, and fishing techniques. Therefore, we believe that the potential for interactions with giant manta ray is likely the same at all 4 piers in the MMF survey area.

To calculate the average number of observed interactions with fishing gear within the MMF survey area, we use the available MMF data and the following equation:

Average Interactions Per Structure in 7 years
= Sum of Reported Interactions in 7 years ÷ 4 locations
= 58 ÷ 4
= 14.5 per structure in 7 years

To calculate the estimated expected annual number of observed fishing gear interactions with giant manta ray at Brian H. Chappell City Park pier, we refer to the MMF data above and use the following equation:

Expected Annual Interactions
= Average Reported Interactions Per Structure in 7 years ÷ 7 years
= 14.5 ÷ 7
= 2.07 interactions per structure per year

This analysis is likely an overestimation of giant manta ray interactions that may occur at the consultation pier because the survey occurred in a known area of high juvenile abundance; however, it is the best available data we have that is reflective of the potential for interactions that could occur from this project.. Because the calculated estimate is a fraction, we round the number of interactions per structure per year up to the nearest whole number to get a total of 3 observed fishing gear interactions per structure per year. As discussed above, we believe using a 3-year period is appropriate for meaningful monitoring. Therefore, up to 9 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.

6.6 Estimating Hook-and-Line Captures with Smalltooth Sawfish

6.6.1 Estimating Reported Captures of Smalltooth Sawfish

We believe the best available data to estimate future reported recreational hook-and-line captures of smalltooth sawfish at public fishing structures comes from the historic reported captures at similar structures obtained from the U.S. Sawfish Recovery Database, and any additional information regarding captures at the structure under consultation. The U.S. Sawfish Recovery Database contains number and location of smalltooth sawfish recreational hook-and-line captures that were reported; 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 discuss why this is the best available information to estimate the expected annual number of reported recreational hook-and-line captures of smalltooth sawfish at Brian H. Chappell City Park pier in the future.

As previously stated, Brian H. Chappell City Park pier is located in Palm Beach County, Florida. The U.S. Sawfish Recovery Database contains 94 records of sightings or captures of smalltooth sawfish in Palm Beach County for years 2003-2023. The database does not show any reported captures of smalltooth sawfish at Brian H. Chappell City Park pier or any other piers within Lake Worth Lagoos. There have been a total of 4 reported recreational hook-and-line captures of smalltooth sawfish at 3 ocean-facing, public fishing structures in Palm Beach County during this period. Because of the number of smalltooth sawfish sightings throughout inshore and offshore Palm Beach County, and in the absence of reported hook-and-line captures of smalltooth sawfish at inshore public fishing structures, we believe the reported captures at ocean-facing structures is the best available data to estimate the number of future reported recreational hook-and-line captures of smalltooth sawfish at Brian H. Chappell City Park pier. Subsequently, we assume smalltooth sawfish behavior and density is the same at both Brian H. Chappell City Park pier and at the 3 other ocean-facing public fishing structures. Because the fishing structures are of a similar size, they likely have similar angler effort. Further, we assume anglers fishing at these structures use similar baits, equipment, and fishing techniques. Therefore, the potential for interactions with smalltooth sawfish is likely the same at both Brian H. Chappell City Park pier and at the 3 other ocean-facing public fishing structures.

Whether those interactions with smalltooth sawfish 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 area (in this case, inshore Palm Beach County) would have similar reporting rates. Because they 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, we assume the potential for reported captures is the same at Brian H. Chappell City Park pier as it is at the 3 other ocean-facing public fishing structures.

Thus, we believe the best available data to estimate the number of future reported recreational hook-and-line captures of smalltooth sawfish at Brian H. Chappell City Park pier can be determined by taking the average of the historic reported recreational hook-and-line captures at the 3 other ocean-facing public fishing structures in the Palm Beach County. Averaging the data in this way helps smooth variability in both the potential for interactions 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 3 other ocean-facing public fishing structures in Palm Beach County, we use available data from the U.S. Sawfish Recovery Database and the following equation:

$$
\begin{aligned}
&\mathit{Average\ Reported\ Captures\ Per\ Structure\ in\ } 20 \mathit{\ years} \\
&= \mathit{Sum\ of\ Reported\ Captures\ in\ } 20 \mathit{\ years} \div 3 \mathit{\ Locations} \\
&= 4 \div 3 \\
&= 1.33 \mathit{\ per\ structure\ in\ } 20 \mathit{\ years}
\end{aligned}
$$

To calculate the estimated expected annual number of reported recreational hook-and-line captures of smalltooth sawfish at Brian H. Chappell City Park pier, we refer to the information on the similar structures above and use the following equation:

$$
\begin{aligned}
&\mathit{Expected\ Annual\ Reported\ Captures} \\
&= \mathit{Average\ Reported\ Captures\ Per\ Structure\ in\ } 20 \mathit{\ years} \div 20 \mathit{\ years} \\
&= 1.33 \div 20 \\
&= 0.0665 \mathit{\ per\ structure\ per\ year\ } (\text{Table } 11, \mathit{Line\ } 1)
\end{aligned}
$$

6.6.2 Estimating Unreported Captures of Smalltooth Sawfish

While we believe the best available information for estimating expected reported captures at Brian H. Chappell City Park pier is the average of the historic reported recreational hook-and-line captures at the similar fishing structures within inshore Palm Beach County, we also 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. Like above, we will use the unreported rate from Hill (2013). 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).

Below, we will address unreported captures by assuming that the expected annual reported captures of 0.0667 smalltooth sawfish per year represents 12% of the actual captures and 88% of captures will be unreported. We believe it is appropriate to use the unreported rate in the Hill (2013) fishing pier study to estimate the future unreported captures. The study was located in Florida, and is a reasonable proxy for reporting behavior at Brian H. Chappell City Park 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 assume fewer interactions were reported, which will result in a higher total expected interactions. Reinitiation may be required if information reveals changes in reporting behavior.

Therefore, to calculate the expected annual number of unreported recreational hook-and-line captures of smalltooth sawfish at Brian H. Chappell City Park pier, we use the equation:

$$
\begin{aligned}
&Expected\ Annual\ Unreported\ Captures \\
&= (Expected\ Annual\ Reported\ Captures \div 12\%) \times 88\% \\
&= (0.0667 \div 0.12) \times 0.88 \\
&= \ 0.4891\ per\ structure\ per\ year\ (\text{Table } 11, Line\ 2)
\end{aligned}
$$

6.6.3 Calculating Total Captures of Smalltooth Sawfish

As previously discussed, we believe using a 3-year period is appropriate for meaningful monitoring. Table 11 presents the estimated smalltooth sawfish captures at Brian H. Chappell City Park 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 Smalltooth Sawfish

Captures	Total
1. Expected Annual Reported	0.0665
2. Expected Annual Unreported	0.4891
Annual Total	0.5556
Triennial (3-year) Total	1.667

We round 1.667 up to 2 to account for the capture of whole animals in our Jeopardy analysis. Therefore, we estimate that up to 2 smalltooth sawfish could be caught at Brian H. Chappell City Park pier during any consecutive 3-year period. As previously stated, we believe that all captures of smalltooth sawfish will be non-lethal with no associated PRM.

7 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 or private actions, not involving federal activities, that are reasonably certain to occur within the action area considered in this Opinion (50 CFR 402.02). NMFS is not aware of any future projects that may contribute to cumulative effects. Within the action area, the ongoing activities and processes described in the environmental baseline are expected to continue and NMFS did not identify any additional sources of potential cumulative effect. Although the present human uses of the action area are expected to continue, some may occur at increased levels, frequency, or intensity in the near future as described in the environmental baseline.

8 JEOPARDY ANALYSIS

To "jeopardize the continued existence of" a species 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 action directly or indirectly reduces the reproduction, numbers, or distribution of a listed species. If there is a reduction in 1 or more of these elements, we evaluate whether the action 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 these terms 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." The Handbook further explains that 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. Per the Handbook and the ESA regulations at 50 CFR 402.02, recovery means "improvement in the status of 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 or threats to the species are removed or both so that self-sustaining and self-regulating populations of listed species can be supported as persistent members of native biotic communities.

The analyses conducted in the previous sections of this Opinion serve to provide a basis to determine whether the proposed action would be likely to jeopardize the continued existence of green sea turtle (North Atlantic DPS), hawksbill sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish, and giant manta ray. In Section 6.0, we outlined how the proposed action can adversely affect these species. Now we turn to an assessment of the species response to these impacts, in terms of overall population effects, and whether those effects of the proposed action, when considered in the context of the Status of the Species (Section 4.0), the

Environmental Baseline (Section 5.0), and the Cumulative Effects (Section 7.0), will jeopardize the continued existence of the affected species. For any species listed globally, our jeopardy determination must evaluate whether the proposed action will appreciably reduce the likelihood of survival and recovery at the species' global range. For any species listed as DPSs, a jeopardy determination must evaluate whether the proposed action will appreciably reduce the likelihood of survival and recovery of that DPS.

8.1 Green Sea Turtle (North Atlantic DPS)

The proposed action is expected to result in capture of up to 4 green sea turtles (2 lethal, 2 non-lethal) from the North Atlantic 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 North Atlantic DPS. Any incidentally caught animals would be released within the general area where caught and no change in the distribution of North Atlantic DPS green sea turtles would be anticipated. The potential lethal captures during any consecutive 3-year period would reduce the number of North Atlantic 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 North Atlantic 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. The North Atlantic 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 (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). A recent long-term study spanning over 50 years of nesting at Tortuguero found that while nest numbers increased steadily over 37 years from 1971-2008, the rate of increase slowed gradually from 2000-2008. After 2008, the nesting trend has been downwards, with current nesting levels having reverted to that of the mid-1990's, and the overall long-term trend has now become negative (Restrepo, et al. 2023).

Florida accounts for approximately 5% of nesting for this DPS (Seminoff et al. 2015). According to data collected from Florida's index nesting beach survey from 1989-2021, 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. The pattern departed from the low lows and high peaks in 2020 and 2021 as well, when 2020 nesting only dropped by half from the 2019 high, while 2021 nesting only increased by a small amount over the 2020 nesting, with another increase in 2022 still well below the 2019 high. While nesting in Florida has shown dramatic increases over the past decade, individuals from the Tortuguero, the Florida, and the other Caribbean and Gulf of Mexico populations in the North Atlantic DPS intermix and share developmental habitat. Therefore, threats that have affected the Tortuguero population as described previously, may ultimately influence the other population trajectories, including Florida. Given the large size of the Tortuguero nesting population, which is currently in decline, its status and trend largely drives the status of North Atlantic DPS.

Aside from the long-term increasing nesting trend observed in Florida, the declining trend in nesting observed in Toruguero indicates a species in decline. However, the potential lethal take of up to 2 green sea turtles from the North Atlantic DPS during any consecutive 3-year period attributed to the structure is not expected to have any measurable effect on current nesting trends. 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 North Atlantic DPS in the wild.

8.1.1 Recovery

The North Atlantic 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 1991) does exist. Since the animals within the North Atlantic 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 North Atlantic 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 1989-2021, 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. The pattern departed from the low lows and high peaks in 2020 and 2021 as well, when 2020 nesting only dropped by half from the 2019 high, while 2021 nesting increased over the 2020 nesting, indicating that the first recovery objective is currently 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 also increased, 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 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 North Atlantic DPS green sea turtles' recovery in the wild.

8.1.2 Conclusion

The combined potential lethal and non-lethal captures during any consecutive 3-year period of green sea turtles from the North Atlantic 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 North Atlantic DPS of green sea turtle in the wild.

8.2 Hawksbill Sea Turtle

8.2.1 Survival

The proposed action is expected to result in the capture of up to 2 hawksbill sea turtles (1 lethal, 1 non-lethal) at Brian H. Chappell City Park pier during any consecutive 3-year period. Any potential non-lethal capture is not expected to have any measurable impact on the reproduction, numbers, or distribution of the species. The individual suffering non-lethal injuries or stresses are expected to fully recover such that no reductions in reproduction or numbers of hawksbill sea turtle are anticipated. A non-lethal capture will occur in the action area, which encompasses a small portion of this species' 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 turtle would be anticipated.

The potential lethal capture at Brian H. Chappell City Park pier during any consecutive 3-year period would reduce the species' population compared to the number that would have been present in the absence of the proposed action, assuming all other variables remained the same. 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. Age to maturity for this species takes between 20 and 40 years. 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 per nest (Hirth and Latif 1980). A lethal capture could also result in a potential reduction in future reproduction, assuming at least one of these individuals would be female and would have survived to reproduce in the future. The loss could preclude the production of thousands of eggs and hatchlings, of which a fractional percentage would be expected to survive to sexual maturity. Thus, the death of any females would eliminate their contribution to future generations, and result in a reduction in hawksbill sea turtle reproduction. However, the potential lethal take at Brian H. Chappell City Park pier during any consecutive 3-

year period is expected to occur in a small, discrete area and hawksbill 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 hawksbill sea turtle, 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 species. 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. It is important to remember that with significant inter-annual variation in nesting data, sea turtle population trends necessarily are measured over decades and the long-term trend line better reflects the population trend. In Section 4.1.3, we summarized available information on number of hawksbill sea turtle nesters and nesting trends. Hawksbill nesting trends 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). We believe the recent observed 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. Subsequently, we believe the potential lethal capture at Brian H. Chappell City Park pier during any consecutive 3-year period will not have any measurable effect on that increasing nesting trend. After analyzing the magnitude of the effects, in combination with the past, present, and future expected impacts to hawksbill sea turtle discussed in this Opinion, we believe that recreational fishing from Brian H. Chappell City Park pier is not reasonably expected to cause an appreciable reduction in the likelihood of survival of hawksbill sea turtle in the wild.

8.2.2 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.*
- *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.*

- *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 result in the lethal capture 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 capture 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 capture 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 turtle 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 turtle's recovery in the wild.

8.2.3 Conclusion

The combined potential lethal and non-lethal captures of hawksbill sea turtle at Brian H. Chappell City Park pier during 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 hawksbill sea turtle in the wild.

8.3 Loggerhead Sea Turtle (Northwest Atlantic DPS)

8.3.1 Survival

The proposed action is expected to result in the capture of up to 2 loggerhead sea turtles (1 lethal, 1 non-lethal) from the Northwest Atlantic 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 Northwest Atlantic DPS. Any incidentally caught animals would be released within the general area where caught and no change in the distribution of Northwest Atlantic DPS of loggerhead sea turtles would be anticipated.

The potential lethal captures during any consecutive 3-year period would reduce the number of Northwest Atlantic 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 4.1.4, 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 a loggerhead sea turtle 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 Northwest Atlantic DPS of loggerhead sea turtle in the wild.

8.3.2 Recovery

The recovery plan for the for the Northwest Atlantic population of loggerhead sea turtles (NMFS and USFWS 2008) was written prior to the loggerhead sea turtle DPS listings. However, this plan deals with the populations that comprise the current Northwest Atlantic 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.

In Section 4.1.4, 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. Looking at the data from 1989 through 2016, FWRI concluded that there was an overall positive change in the nest counts although it was not statistically significant due to the wide variability between 2012-2016 resulting in widening confidence intervals. Nesting at the core index beaches declined in 2017 to 48,033, and rose again each year through 2020, reaching 53,443 nests, dipping back to 49,100 in 2021, and then in 2022 reaching the second-highest number since the survey began, with 62,396 nests. 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). In-water research suggests the abundance of neritic juvenile loggerheads is also steady or increasing.

The potential lethal capture of up to 1 loggerhead sea turtle 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 Northwest Atlantic 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 Northwest Atlantic DPS of loggerhead sea turtles' recovery in the wild.

8.3.3 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 Northwest Atlantic DPS of the loggerhead sea turtle in the wild.

8.4 Giant Manta Ray

The proposed action is expected to result in the capture of 9 giant manta rays over any consecutive 3-year period. We expect all captures to be non-lethal with no associated PRM.

8.4.1 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.

8.4.2 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.

8.4.3 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. Thus, the recreational fishing effects from the proposed pier will not result in an appreciable reduction in the likelihood of giant manta ray recovery in the wild.

8.5 Smalltooth Sawfish (U.S. DPS)

8.5.1 Survival

The potential non-lethal capture of up to 2 smalltooth sawfish 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 smalltooth sawfish is anticipated.

8.5.2 Recovery

The following analysis considers the effects of non-lethal capture on the likelihood of recovery in the wild. The recovery plan for the smalltooth sawfish (NMFS, 2009) lists 3 main objectives as recovery criteria for the species. The 2 objectives and the associated sub-objectives relevant to the proposed action are:

Objective - Minimize Human Interactions and Associated Injury and Mortality
<u>Sub-objective:</u>

- Minimize human interactions and resulting injury and mortality of smalltooth sawfish through public education and outreach targeted at groups that are most likely to interact with sawfish (e.g., fishermen, divers, boaters).
- Develop and seek adoption of guidelines for safe handling and release of smalltooth sawfish to reduce injury and mortality associated with fishing.
- Minimize injury and mortality in all commercial and recreational fisheries.

Objective - Ensure Smalltooth Sawfish Abundance Increases Substantially and the Species Reoccupies Areas from which it had Previously Been Extirpated
Sub-objective:

- Sufficient numbers of juvenile smalltooth sawfish inhabit several nursery areas across a diverse geographic area to ensure survivorship and growth and to protect against the negative effects of stochastic events within parts of their range.
- Adult smalltooth sawfish (> 340 cm) are distributed throughout the historic core of the species' range (both the Gulf of Mexico and Atlantic coasts of Florida). Numbers of adult smalltooth sawfish in both the Atlantic Ocean and Gulf of Mexico are sufficiently large that there is no significant risk of extirpation (i.e., local extinction) on either coast.
- Historic occurrence and/or seasonal migration of adult smalltooth sawfish are reestablished or maintained both along the Florida peninsula into the South-Atlantic Bight, and west of Florida into the northern and/or western Gulf of Mexico.

NMFS is currently funding several actions identified in the Recovery Plan for smalltooth sawfish: adult satellite tagging studies, the ISED, and monitoring take in commercial fisheries to name a few. Additionally, NMFS has developed safe-handling guidelines for the species. Despite the ongoing threats from recreational fishing, we have seen a stable or slightly increasing trend in the population of this species. Thus, the proposed action is not likely to impede the recovery objectives above and will not result in an appreciable reduction in the likelihood of the U.S. DPS of smalltooth sawfish's recovery in the wild. NMFS must continue to monitor the status of the population to ensure the species continues to recover.

The potential non-lethal capture of up to 2 smalltooth sawfish will not affect the population of reproductive adult females. Thus, the recreational fishing at Brian H. Chappell City Park pier will not result in an appreciable reduction in the likelihood of smalltooth sawfish recovery in the wild.

8.5.3 Conclusion

The potential non-lethal capture of up to 2 smalltooth sawfish over any consecutive 3-year period associated with propose action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the U.S. DPS of smalltooth sawfish in the wild.

9 CONCLUSION

We reviewed the Status of the Species, the Environmental Baseline, the Effects of the Action, and the Cumulative Effects using the best available data.

The proposed action will result in the take of green sea turtle (North h Atlantic DPS), hawksbill sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish, and giant manta ray. Given the nature of the proposed action and the information provided above, we conclude that the action, as proposed, is not likely to jeopardize the continued existence of green sea turtle (North Atlantic DPS), hawksbill sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), smalltooth sawfish, and giant manta ray.

10 INCIDENTAL TAKE STATEMENT

10.1 Overview

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 (ESA Section 2(19)). *Incidental take* refers to takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant. 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 Incidental Take Statement of the Opinion.

The take of giant manta ray by the proposed action is not prohibited under ESA Section 9, as no Section 4(d) Rules for the species have been promulgated. However, a circuit court case held that non-prohibited incidental take must be included in the Incidental Take Statement (*CBD v. Salazar*, 695 F.3d 893 [9th Circuit 2012]). Though the *Salazar* case is not a binding precedent for this action, which occurs outside of the 9th Circuit, NMFS finds the reasoning persuasive and is following the case out of an abundance of caution and because we anticipate that the ruling will be more broadly followed in future cases. Providing an exemption from Section 9 liability is not the only important purpose of specifying take in an Incidental Take Statement. Specifying incidental take ensures we have a metric against which we can measure whether or not reinitiation of consultation is required. Including these species in the Incidental Take Statement also ensures that we identify Reasonable and Prudent Measures that we believe are necessary or appropriate to minimize the impact of such incidental take.

As soon as the applicant becomes aware of any take of an ESA-listed species under NMFS's purview that occurs during the proposed action, the applicant shall report the take to NMFS SERO PRD via the NMFS SERO Endangered Species Take Report Form (https://forms.gle/85fP2da4Ds9jEL829). This form shall be completed for each individual known reported capture, entanglement, stranding, or other take incident. Information provided via this form shall include the title, Brian H. Chappell City Park, the issuance date, and ECO tracking number, [SERO-2023-01541], for this Opinion; the species name; the date and time of the incident; the general location and activity resulting in capture; 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. At that time, consultation may need to be reinitiated.

The USACE has a continuing duty to ensure compliance with the reasonable and prudent measures and terms and conditions included in this Incidental Take Statement. If the USACE (1) fails to assume and implement the terms and conditions or (2) fails to require the terms and conditions of the Incidental Take Statement through enforceable terms that are added to the permit or grant document or other similar document, the protective coverage of Section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the USACE must report the progress of the action and its impact on the species to NMFS as specified in the Incidental Take Statement (50 CFR 402.14(i)(3)).

10.2 Amount of Extent of Anticipated 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, smalltooth sawfish, and giant manta ray that will be reported at Brian H. Chappell City Park pier is described in Section 6.

In Section 6.3.1, we developed an estimate of the total number of sea turtle captures expected to be reported annually (0.1000; **Table 4**, Line 1). We take that number and multiply by 3 to get the 3-year total estimate of reported sea turtle captures (0.1000 × 3 = 0.3000). 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 inshore Zone 26 (described in Section 6.5) 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 6.3.2. Based on the data collected from the Hill (2013) fishing pier study, we anticipate 92% of sea turtle take will go unreported.

In Section 6.5, we developed an estimate of the total number of smalltooth sawfish captures expected to be reported annually (0.0665; Table 11, Line 1). We take that number and multiply by 3 to get the 3-year total estimate of reported smalltooth sawfish captures (0.0665 × 3 = 0.1995). We round 0.1995 to 1 to reach a whole number that can be used as the take limit.

Section 6.6 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, smalltooth sawfish, and giant manta ray take expected to be reported over any consecutive 3-year period.

Table 12. Incidental Take Limits by Species for Any Consecutive 3-Year Period at Brian H. Chappell City Park pier

Species	Total Estimated Reported Captures	Incidental Take Limits that will Trigger Reinitiation
Green sea turtle (North Atlantic DPS)	0.3000 × 0.792 = 0.2376, rounded up to 1	No more than 1 reported capture
Hawksbill sea turtle	0.3000 × 0.063 = 0.0189, rounded up to 1	No more than 1 reported captures
Loggerhead sea turtle (Northwest Atlantic DPS)	0.3000 × 0.146 = 0.0438, rounded up to 1	No more than 1 reported capture

Species	Total Estimated Reported Captures	Incidental Take Limits that will Trigger Reinitiation
Giant manta ray	NA	No more than 9 reported captures
Smalltooth sawfish (U.S. DPS)	$0.0665 \times 3 = 0.1995$, rounded up to 1	No more than 1 reported capture

It is important to note that the mortality rates estimated in Section 6.4 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 10.5), we do not expect that result. At the time of the interaction, we expect sea turtle take in the above Incidental Take Statement to be non-lethal. As previously discussed in Section 6.4, up to 47.3% of the reported interactions could result in a mortality, and reports of such PRM are consistent with the analysis in this Opinion and this Incidental Take Statement. Likewise, we expect PRM of the unreported sea turtle interactions (52.7%), as described in Section 6.4.

Again, we expect all interactions with smalltooth sawfish and giant manta ray to be non-lethal with no associated PRM.

10.3 Effect of Take

NMFS has determined that the anticipated incidental take specified in Section 10.1 is not likely to jeopardize the continued existence of green sea turtle (North Atlantic DPS), hawksbill sea turtle, loggerhead sea turtle (Northwest Atlantic DPS), giant manta ray, and smalltooth sawfish if the project is developed as proposed.

10.4 Reasonable and Prudent Measures

Section 7(b)(4) of the ESA requires NMFS to issue to any federal agency whose proposed action is found to comply with Section 7(a)(2) of the ESA, but may incidentally take individuals of listed species, a statement specifying the impact of that taking. The Incidental Take Statement must specify the Reasonable and Prudent Measures necessary to minimize the impacts of the incidental taking from the proposed action on the species, and Terms and Conditions to implement those measures. “Reasonable and prudent measures” are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take” (50 CFR 402.02). Per Section 7(o)(2), any incidental taking that complies with the specified terms and conditions is not considered to be a prohibited taking of the species concerned.

The Reasonable and Prudent Measures and terms and conditions are required to document the incidental take by the proposed action and to minimize the impact of that take on ESA-listed species (50 CFR 402.14(i)(1)(ii) and (iv)). These measures and terms and conditions must be implemented by the USACE for the protection of Section 7(o)(2) to apply. The USACE has a continuing duty to ensure compliance with the reasonable and prudent measures and terms and conditions included in this Incidental Take Statement. If USACE fails to adhere to the terms and conditions of the Incidental Take Statement through enforceable terms, or fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse. To monitor the impact of the incidental take, the USACE must report the progress of the action and its impact on the species to SERO PRD as specified in the Incidental Take Statement [50 CFR 402.14(i)(3)].

NMFS has determined that the following Reasonable and Prudent Measures are necessary and appropriate to minimize impacts of the incidental take of ESA-listed species related to the proposed action. The following Reasonable and Prudent Measures and associated terms and conditions are established to implement these measures, and to document incidental takes. Only incidental takes that occur while these measures are in full implementation are not considered to be a prohibited taking of the species. These restrictions remain valid until reinitiation and conclusion of any subsequent Section 7 consultation.

1. The USACE must ensure that the applicant provides take reports regarding all interactions with ESA-listed species at the fishing pier.
2. The USACE 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.
3. The USACE must ensure that the applicant reduces the impacts to incidentally captured ESA-listed species.
4. The USACE must ensure that the applicant coordinates periodic fishing line removal (i.e., cleanup) events with non-governmental or other local organizations.

10.5 Terms and Conditions

In order to be exempt from the prohibitions established by Section 9 of the ESA, the USACE must comply (or must ensure that any applicant complies) with the following Terms and Conditions.

The following Terms and Conditions implement Reasonable and Prudent Measure #1:

- The USACE shall include a special condition of the permit that directs the applicant to report 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 and to the USACE.
    - If and when the applicant becomes aware of any known reported capture, entanglement, stranding, or other take, the applicant must report it to NMFS SERO PRD via the NMFS SERO Endangered Species Take Report Form (https://forms.gle/85fP2da4Ds9jEL829).
        - Emails must reference this Opinion by the NMFS tracking number (SERO-2023-01541 Brian H. Chappell City Park) and date of issuance.
        - This form shall be completed for each individual known reported capture, entanglement, stranding, or other take incident.
        - The form must include the species name, 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.

- 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.
  - All emails and summary reports must reference this Opinion by the NMFS tracking number (SERO-2023-01541 Brian H. Chappell City Park) and date of issuance.
  - The summary 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.
  - The summary 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)
  - The summary report shall be submitted even when there have been no reported take of ESA-listed species.
  - The summary report 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.
  - The first summary report will be submitted by January 31, 2025, and will cover the period from pier opening until December 31, 2024. 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.
- Copies of annual summary reports must be submitted to the USACE at:

  U.S. Army Corps of Engineers, Jacksonville District
  Regulatory Branch, Compliance Section
  Attn: Chief of Compliance
  701 San Marco Boulevard
  Jacksonville, Florida 32207-8175

The following Terms and Conditions implement Reasonable and Prudent Measures #2 and #3:

- The USACE shall include a special permit condition that directs the applicant to:
  - Install and maintain the following NMFS Protected Species Educational Signs: "*Save Dolphins, Sea Turtles, Sawfish, and Manta Ray*" and "*Do Not Catch or Harass Sea Turtles*".
    - Signs will be posted at least at the entrance to and terminal end of the pier.
    - Signs will be installed prior to opening the pier for public use.
    - 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-2023-01541 Brian H. Chappell City Park) and date of issuance.
    - Sign designs and installation methods are provided at the following website: https://www.fisheries.noaa.gov/southeast/consultations/protected-species-educational-signs.
    - Current photographs of the signs will be included in each annual report required by the T&C above.

- Install and maintain monofilament recycling bins and trash receptacles at the piers to reduce the probability of trash and debris entering the water.
  - Monofilament recycling bins and trash receptacles will be installed prior to opening the pier for public use.
  - 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-2023-01541 Brian H. Chappell City Park) and date of issuance.
  - The applicant must regularly empty the bins and trash receptacles and make sure they are functional and upright.
  - Additionally, current photographs of the bins will be included in each report required by T&C 1, above.

The following Terms and Conditions implement Reasonable and Prudent Measures #2, #3, and #4:

- The USACE shall include a special permit condition that directs the applicant(s) to:
  - Perform at least 1 annual underwater cleanup to remove derelict fishing line and associated gear from around the pier structure.
  - Submit a record of each cleaning event in the annual report required by T&C 1 above.

11 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authority to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation Recommendations identified in Opinions can assist action agencies in implementing their responsibilities under Section 7(a)(1). Conservation recommendations are discretionary activities designed to minimize or avoid adverse effects of a proposed action on ESA-listed species or critical habitat, to help implement recovery plans, or to develop information. The following conservation recommendations are discretionary measures that NMFS believes are consistent with this obligation and therefore should be carried out 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.

Giant manta ray:

- Conduct or fund outreach designed to increase the public's knowledge and awareness of giant manta ray.

12 REINITIATION OF CONSULTATION

This concludes formal consultation on the proposed action. As provided in 50 CFR 402.16, reinitiation of formal consultation is required and shall be requested by USACE or by the

Service, where discretionary federal action agency involvement or control over the action has been retained, or is authorized by law, and if: (a) the amount or extent of incidental take specified in the Incidental Take Statement is exceeded, (b) new information reveals effects of the action on listed species or critical habitat in a manner or to an extent not considered in this Opinion, (c) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion, or (d) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, the USACE must immediately request reinitiation of formal consultation and project activities may only resume if the USACE establishes that such continuation will not violate Sections 7(a)(2) and 7(d) of the ESA.

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