F/SER31:SG
06/14/2023 SERO-2022-02839

Lisa S. Lovvorn
Chief, Panama City Permits Section
Jacksonville District Corps of Engineers
Department of the Army
415 Richard Jackson Boulevard, Suite 411
Panama City, Florida 32407

Ref.: SAJ-2020-01982, Bay County Tourist and Development Council, Mexico Beach Dune & Beach Restoration, Mexico Beach, Bay County, Florida

Dear Lisa Lovvorn,

The enclosed Biological Opinion (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-2022-02839. 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 Engineers' (USACE) proposal to authorize a dune and beach restoration project by the Bay County Tourist and Development Council (the applicant) in Mexico Beach, Bay County, Florida, on the following listed species and critical habitat: green sea turtle (North Atlantic and South Atlantic Distinct Population Segments [DPS]), loggerhead sea turtle (Northwest Atlantic DPS), giant manta ray, LOGG-N-32 Reproductive Unit of designated critical habitat for loggerhead sea turtle (Northwest Atlantic DPS), and Unit 11 of designated critical habitat for Gulf sturgeon. The Opinion is based on information provided by the USACE, the applicant, Marine Megafauna Foundation, Smalltooth Sawfish Recovery Implementation Team, Sea Turtle Stranding and Salvage Network, and the published literature cited within. NMFS concludes that the proposed action is not likely to adversely affect designated critical habitat for loggerhead sea turtle (Northwest Atlantic DPS). 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 and South Atlantic DPSs), loggerhead sea turtle (Northwest Atlantic DPS), or giant manta ray, or result in the destruction or adverse modification of critical habitat for Gulf sturgeon.

Effects to Kemp's ridley sea turtles, leatherback sea turtles, hawksbill sea turtles, Gulf sturgeon, and smalltooth sawfish associated with the proposed project are encompassed within the *Biological Opinion on Dredging of Gulf of Mexico Navigation Channels and Sand Mining ("Borrow") Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts* (Consultation Number F/SER/2000/01287, issued November 19, 2003 (GRBO), as revised June 24, 2005 and January 9, 2007). GRBO is a regional biological opinion that analyzes effects to ESA-listed species associated with USACE-permitted and USACE-conducted hopper dredging projects for maintenance of all navigation channels and offshore sand mining for beach nourishment within the Gulf of Mexico region and includes an Incidental Take Statement for anticipated take associated with such projects. The anticipated take in GRBO accounts for dredging and relocation trawling associated with beach nourishment projects, including those like the Bay County project. As a result, that opinion constitutes the consultation on effects to those species resulting from the proposed action. Any take of those species from the proposed action is covered by the Incidental Take Statement in GRBO, to the extent GRBO anticipated take of those species.

Similarly, NMFS is not providing a separate Incidental Take Statement for the North Atlantic and South Atlantic DPSs of green sea turtle or the Northwest Atlantic DPS of loggerhead sea turtle with this Opinion because green and loggerhead sea turtle takes are covered by the Incidental Take Statement in GRBO. We do not anticipate different effects or additional take of green sea turtles or loggerhead sea turtles from the Bay County project beyond those contemplated in GRBO, as a programmatic opinion on the effects of multiple projects. However, NMFS issued GRBO before revising the green sea turtle listing to list green sea turtles as 11 DPSs and before revising the loggerhead sea turtle listing to list loggerhead sea turtles as 9 DPSs. The green sea turtles evaluated in GRBO and covered by that Incidental Take Statement include the individuals that are now considered part of the North Atlantic and South Atlantic DPSs and the loggerhead sea turtles are now considered part of the Northwest Atlantic DPS. The GRBO Incidental Take Statement for green sea turtles, therefore, represents the anticipated amount of take from the North Atlantic and SA DPSs, combined, and the GRBO Incidental Take Statement for loggerhead sea turtles represents the anticipated amount of take from the Northwest Atlantic DPS, for dredging projects in the Gulf of Mexico region, including the proposed action. Therefore, while we are not including separate take limits for the North Atlantic and South Atlantic DPSs of green sea turtles or for the Northwest Atlantic DPS of loggerhead sea turtles from the proposed action, we have analyzed the effects of those takes on the North Atlantic and South Atlantic DPSs of green sea turtles and the Northwest Atlantic DPS of loggerhead sea turtles in our jeopardy analyses included in the enclosed Opinion for the subject permit. NMFS expects these DPSs to be addressed in GRBO once it is reinitiated.

NMFS is providing with this Opinion an Incidental Take Statement for giant manta ray, which was listed after the most recently revised GRBO. The Incidental Take Statement with this Opinion describes Reasonable and Prudent Measures that NMFS considers necessary or appropriate to minimize the impact of incidental take of giant manta ray associated with this action. The Incidental Take Statement also specifies Terms and Conditions, including monitoring and reporting requirements with which the USACE 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,

BERNHART.DAVID.M.1066125889
2023.06.14 16:14:27 -04'00'

for Andrew J. Strelcheck
Regional Administrator

Enclosures:
NMFS Biological Opinion SERO-2022-02839
Appendix A
cc: tracey.l.wheeler@usace.army.mil
nmfs.ser.esa.consultations@noaa.gov
File: 1514-22.f.5

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency:	U.S. Army Corps of Engineers – Jacksonville District Permit number: SAJ-2020-01982
Applicant:	Bay County Tourist and Development Council
Activity:	Dune and Beach Restoration
Location:	Mexico Beach, Bay 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-2022-02839
Approved by:	BERNHART.DAVID.M.1066125889 2023.06.14 16:15:00 -04'00' for Andrew J. Strelcheck, Regional Administrator NMFS, Southeast Regional Office St. Petersburg, Florida
Date Issued:	06/14/2023

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ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASURE

ac	acre(s)
BOEM	Bureau of Ocean Energy Management
°C	degrees Celsius
CFR	Code of Federal Regulations
cm	centimeter(s)
CPUE	Catch Per Unit Effort
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DPS	Distinct Population Segment
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
FERC	Federal Energy Regulatory Commission
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
in	inch(es)
IPCC	Intergovernmental Panel on Climate Change
km	kilometer(s)
lin ft	linear foot/feet
m	meter(s)
mcy	Million Cubic Yards
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
NAD 83	North American Datum of 1983
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
Opinion	Biological Opinion, Conference Biological Opinion, or Draft Biological Opinion
OSAT	Operational Science Advisory Team
PCB	Polychlorinated biphenyls
PFC	Perfluorochemicals
PSO	Protected Species Observer
SERO PRD	NMFS Southeast Regional Office, Protected Resources Division
SAV	Submerged Aquatic Vegetation
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
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
USN	United States Navy

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 a dune and beach restoration project by Bay County Tourist and Development Council (the applicant) in Mexico Beach, Bay County, Florida, on the following listed species and critical habitat: green sea turtle (North Atlantic and South Atlantic Distinct Population Segments [DPS]), loggerhead sea turtle (Northwest Atlantic DPS), giant manta ray, LOGG-N-32 Reproductive Unit of designated critical habitat for loggerhead sea turtle (Northwest Atlantic DPS), and Unit 11 of designated critical habitat for Gulf sturgeon. Our Opinion is based on information provided by the USACE, the applicant, USACE, the applicant, Marine Megafauna Foundation, Smalltooth Sawfish Recovery Implementation Team, Sea Turtle Stranding and Salvage Network, 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 9th Circuit granted a temporary stay of the District Court's July 5, 2022, order. As a result, the 2019 regulations are once again in effect, and we are applying the 2019 regulations here. For purposes of this consultation, 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-2022-02839, Mexico Beach Renourishment.

On January 9, 2007, we issued a second revision to the Biological Opinion on Dredging of Gulf of Mexico Navigation Channels and Sand Mining ("Borrow") Areas Using Hopper Dredges by COE Galveston, New Orleans, Mobile, and Jacksonville Districts (Consultation Number F/SER/2000/01287). GRBO is a regional biological opinion that analyzes effects to ESA-listed species associated with USACE-permitted and USACE-conducted hopper dredging projects for maintenance of all navigation channels and offshore sand mining for beach nourishment within the Gulf of Mexico region.

On November 3, 2022, we received a request for formal consultation under Section 7 of the ESA from the USACE to authorize dune and beach restoration by Bay County Tourist and Development Council (the applicant) in Mexico Beach, Bay County, Florida in a letter dated November 3, 2022.

On February 3, 2023, we requested additional information related to the implementation of relocation trawling. We received a response on March 29, 2023. On April 5, 2023, we again requested additional information concerning historic dredging and take. We received a response May 1, 2023. On May 8, 2023, we requested additional information concerning relocation trawling. We received a final response on May 8, 2023, and initiated formal consultation that day.

2 PROPOSED ACTION

2.1 Project Details

2.1.1 Project Description

The USACE proposes to issue the applicant a 15-year permit for the restoration of the beach and dunes at Mexico Beach, Bay County, Florida. The proposed project would restore 2.5 mi of shoreline to pre-Hurricane Michael beach conditions and provide protection from impacts associated with up to a 30-year storm event. The proposed project includes the following components.

- Dredging up to 1.5 mcy of beach compatible sand from a new 286-ac offshore borrow area (Mexico Beach Borrow Area) located 12,500 ft southwest of FDEP Monument R-129 on Mexico Beach.
- Placement of beach compatible sand covering an area of 172.9 ac along 13,000 lin ft (2.5 mi) of shoreline between FDEP Monuments R-127.5 and R-144.

A hydraulic cutterhead dredge and pipeline will be used to transport sand from the Mexico Beach Borrow Area to the beach fill limits. Turbidity monitoring will occur at both the dredge vessel and the beach fill discharge area. Hydraulic dredging equipment will be used when the sand source is near the beach. A submerged pipeline will be used to bring sand onto the beach. The submerged pipeline would be extended parallel to the beach as construction progresses and moved when maximum pumping distance is reached.

In addition to the hydraulic and hopper dredge vessels, additional support vessels will be used to complete the proposed project. These vessels include survey vessels, turbidity monitoring vessels, and crew boats. Survey vessels, turbidity monitoring vessels, and crew boats will range between 20 ft and 40 ft in length. Survey vessels will use both single- and multi-beam sonar to complete surveys. Several tug vessels and barges also will support the dredging equipment. It is not expected that more than 2 tug vessels and 2 barges will support dredging operations at any one time. Tug vessels will range in size between 40 and 70 ft in length. Vessels will transit between the Mexico Beach Borrow Area and Mexico Beach canal, St. Andrews Pass, or Port St. Joe. Federal navigation channels will be used to access port facilities from the project site.

The proposed project includes the construction and maintenance of temporary, shore-parallel sand dikes. These dikes promote sand deposition and decrease turbidity at the discharge location.

All fill material proposed for placement will be sand that is similar in both coloration and grain size distribution to what already exists at the beach site. Fill material will also be suitable for sea turtle nesting.

The initial portion of proposed project is expected to take approximately 5 months to complete and is not expected to use a hopper dredge.

After the initial restoration, it is estimated that there will be one additional nourishment event completed during the 15-year lifespan of the permit. It is anticipated that this second nourishment will require dredging an additional 1,000,000 yds^3 of material from the Mexico Beach Borrow Area using a hopper dredge. All hopper dredging will comply with the terms and conditions stipulated for hopper dredging in GRBO (NMFS 2007).

2.1.2 Mitigation Measures

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

- The applicant will comply with the NMFS SERO's *Vessel Strike Avoidance Measures* for species protected under the ESA and the Marine Mammal Protection Act (MMPA) (NMFS 2021).

- All work would occur during daylight hours.

- Construction will avoid sea turtle nesting season. Generally, the sea turtle nesting season defined by the FWC falls between May 1 and October 31 in Bay County.

- The applicant, and its authorized contractors, will comply with the terms and conditions for hopper dredging as prescribed by NMFS GRBO, including the use of screens/observers, drag head deflectors, and relocation trawling within the active borrow areas for the protection of sea turtles, whales, and Gulf sturgeon (NMFS 2007).

- All construction personnel will be responsible for observing water-related activities to detect the presence of threatened and endangered species as described in the *Protected Species Construction Conditions* (NMFS 2021).

- Turbidity monitoring will be conducted at both the dredge in the borrow area and at the beach fill discharge area. Monitoring will occur during daylight hours commencing no more than one (1) hour after sunrise and no later than one (1) hour before sunset, at least 3 times a day and at least 2 hours apart, during all dredging operations, unless the weather or sea state conditions make it unsafe to do so. If monitoring reveals turbidity levels at the compliance sites greater than 29 NTUs above the corresponding background turbidity levels, then construction activities shall cease immediately and not resume until corrective measures have been taken and turbidity has returned to acceptable levels.

- The submerged pipeline for hopper dredging will be placed in water depths deep enough to preclude the creation of a migration barrier for nesting and hatching sea turtles.

2.2 Action Area

The center point of the project area is located at 29.941206ºN, 85.409293ºW (NAD 83) in Mexico Beach, Bay County, Florida. The project area includes an offshore borrow site and a 2.5-mi-long portion of public beach in the Gulf of Mexico. Fill will be placed on Mexico Beach between FDEP Beach Monuments R-127.5 and R-144.

The beach suffered significant erosion damage during Hurricane Michael in October 2018. Prior to the storm, a 0.9-mi stretch of Mexico Beach was designated as critically eroded between FDEP Beach Monuments R-132 and R-137.8. In October 2019, the City constructed Category B FEMA berms between FDEP Monuments R-127 and R-144. The berms were made of 95,000 yd^3 of beach compatible sand from an upland source and 282,400 dune plants. The current FEMA berms contain 42 open areas, or gaps, designated for public beach access.

The proposed Mexico Beach Borrow Area is located 12,500 ft southwest from FDEP Monument R-129. The proposed borrow area is a paleo-overwash feature located in close proximity to Mexico Beach. The borrow area design has 6 cut elevations ranging from -24.5 ft to -28.0 ft NAVD 88. The applicant calculated the total volume contained within the borrow area as approximately 4,270,000 yds^3. The material in the borrow area is predominantly fine-grained quartz sand with trace fines (<1%) and trace shell hash, fragments and whole shells. Fines content is defined as the percentage of material (silt and/or clay) finer than 0.0625 mm as defined by Section 62B-41.007, F.A.C. The average fines content in the borrow area is 0.89%, which is well below the State (FDEP) limit of 5% defined for beach fill projects.

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 mud, mud/sand, sand, and shell substrate with no hardbottom, corals, mangroves, or SAV present. It is anticipated the contractor's work area would extend approximately 2,500 ft offshore of the landward edge of the beach fill between FDEP Monuments R-127.5 to R-144 and would serve as the nearshore pipeline corridor.

The action area is within the boundary of Unit 11 of Gulf sturgeon designated critical habitat and within the boundary of LOGG-N-32 Reproductive Unit of loggerhead sea turtle (Northwest Atlantic DPS) designated critical habitat.

Figure 1. Project location in Bay County, Florida, with beach nourishment area indicated by the red line (image provided by USACE).

3 EFFECTS DETERMINATIONS

This Opinion for the proposed action supplements and complements our analysis in GRBO, as revised. With this stacked approach, NMFS considered the effects associated with the proposed project along with other USACE-permitted dredging projects to Kemp's ridley sea turtle, leatherback sea turtle, hawksbill sea turtle, Gulf sturgeon, and smalltooth sawfish (U.S. DPS) in GRBO, and that opinion constitutes the consultation on effects to those species. Any take of those species from the proposed action is covered by the Incidental Take Statement in GRBO, to the extent GRBO anticipated take of those species. This Opinion considers effects to green sea turtle (North Atlantic and South Atlantic DPSs), loggerhead sea turtle (Northwest Atlantic DPS), giant manta ray, and designated critical habitat for loggerhead sea turtle (Northwest Atlantic DPS), each of which were listed or designated following the completion of GRBO. In addition, this Opinion considers the proposed action's effects associated with dredging on designated critical habitat for Gulf sturgeon because GRBO specifically did not address dredging activities within Gulf sturgeon designated critical habitat, noting that such activities require evaluation on a case-by-case basis.

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; P = Proposed; LAA = likely to adversely affect; NLAA = may affect, not likely to adversely affect.

3.1 Effects Determinations for ESA-Listed Species

3.1.1 Agency Effects Determinations

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	LAA	LAA
Green sea turtle (South Atlantic DPS)	T	81 FR 20057/ April 6, 2016	October 1991	LAA	LAA
Loggerhead sea turtle (Northwest Atlantic DPS)	T	76 FR 58868/ September 22, 2011	December 2008	LAA	LAA
Fishes					

Species (DPS)	ESA Listing Status	Listing Rule/Date	Most Recent Recovery Plan (or Outline) Date	USACE Effect Determination	NMFS Effect Determination
Giant manta ray	T	83 FR 2916/ January 22, 2018	2019 (Outline)	NLAA	LAA

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

We have determined that green sea turtle (North Atlantic and South Atlantic DPSs), loggerhead sea turtle (Northwest Atlantic DPS), and giant manta ray are likely to be adversely affected by relocation trawling that will occur in connection with the proposed hopper dredging; and, handling that will occur in connection with relocation trawling. Subsequently, effects to these species 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 jeopardize the continued existence of these ESA-listed species in the wild.

3.2 Effects Determinations for Critical Habitat

3.2.1 Agency Effects Determinations

We have assessed the critical habitats that overlap with the action area and our determination of the project's potential effects is shown in **Table 2** below.

Table 2. Critical Habitat in the Action Area and Effect Determinations

Species (DPS)	Critical Habitat Unit in the Action Area	Critical Habitat Rule/Date	USACE Effect Determination	NMFS Effect Determination (Critical Habitat)
Sea Turtles				
Loggerhead sea turtle (Northwest Atlantic DPS)	LOGG-N-32 Reproductive	79 FR 39856/ July 10, 2014	LAA	NLAA
Fishes				
Gulf sturgeon	Unit 11	68 FR 13370/ March 19, 2003	NLAA	LAA

3.2.2 Effects Analysis for Critical Habitat Not Likely to be Adversely Affected by the Proposed Action

The project is located within the boundary of LOGG-N-32 Unit – Mexico Beach and St. Joe Beach, Bay and Gulf Counties, Florida, of designated critical habitat for loggerhead sea turtle (Northwest Atlantic DPS). NMFS has jurisdiction over sea turtles in the marine environment and USFWS has jurisdiction on land. "Marine environment" means oceans and seas, bays, estuaries, brackish or riparian water areas, and any other marine waters adjacent to the terrestrial environment.

Below are the physical or biological features (PBFs) essential for the conservation of the species ("essential features") are present in LOGG-N-32 Unit: nearshore reproductive habitat. We do not believe any of the essential features of LOGG-N-32 Unit may be adversely affected by the proposed action based on the following analysis.

The PBFs of nearshore reproductive habitat are defined as a portion of the nearshore waters adjacent to nesting beaches that are used by hatchlings to egress to the open-water environment as well as by nesting females to transit between beach and open water during the nesting season. The following primary constitute elements (PCEs) support this habitat:

1. nearshore waters with direct proximity to nesting beaches that support critical aggregations of nesting turtles (e.g., highest density nesting beaches) to 1.6 km offshore,
2. waters sufficiently free of obstructions or artificial lighting to allow transit through the surf zone and outward toward open water, and
3. waters with minimal man-made structures that could promote predators (i.e., nearshore predator concentration caused by submerged and emergent offshore structures), disrupt wave patterns necessary for orientation, and/or create excessive longshore currents.

We believe the only PCE that may be affected by the proposed action is PCE 2. The presence of the dredge and pipeline could affect PCE 2 of the nearshore reproductive habitat if it created an obstruction to transit or emitted artificial light. However, we believe effects on PCE 2 will be extremely unlikely to occur. Construction will occur during daylight hours only and will avoid sea turtle nesting season. The dredge will be positioned offshore over the borrow area; and is highly unlikely to be an obstruction. The artificial lighting used at night is highly unlikely to prevent transit by sea turtles through the surf zone or towards nearshore open water since the dredging equipment will be stationed several miles offshore from the surf zone. Further, even if construction activities begin soon after the end of the nesting season, the perpendicular position of the pipeline relative to the beach, and its position on the ocean bottom mean that it is highly unlikely that the pipeline will be an obstruction for late-season sea turtle hatchlings transiting the area.

3.2.3 Critical Habitat Likely to be Adversely Affected by the Proposed Action

We have determined that Gulf sturgeon critical habitat, Unit 11: Florida Nearshore Gulf of Mexico is likely to be adversely affected by the proposed action and thus requires further analysis. We provide greater detail on the potential effects to critical habitat from the proposed action in the Effects of the Action (Section 6.2) and whether those effects, when considered in the context of the Status of the Critical Habitat (Section 4.2), the Environmental Baseline

(Section 5), and the Cumulative Effects (Section 7), are likely to cause destruction or adverse modification of critical habitat.

4 STATUS OF ESA-LISTED SPECIES AND CRITICAL HABITAT CONSIDERED FOR FURTHER ANALYSIS

4.1 Rangewide Status of the Species Considered for Further Analysis

4.1.1 Overview of Status of Sea Turtles

There are 5 species (green, hawksbill, Kemp's ridley, leatherback, and loggerhead) of sea turtles that travel widely throughout the South Atlantic, Gulf of Mexico and the Caribbean. These species are highly migratory and therefore could occur within the action area. Section 4.1.2 will address the general threats that confront all sea turtle species. The remainder of Section 4.1 (Sections 4.1.3-4.1.4) will address information on the distribution, life history, population structure, abundance, population trends, and unique threats to each species of sea turtle likely to be adversely affected within the action area.

4.1.2 General Threats Faced by All Sea Turtles

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 5) of this opinion for more specific information regarding federal and state managed fisheries affecting sea turtles within the action area). The Southeast United States 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 2020). 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., DDT, PCB, and 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.

4.1.3 Green Sea Turtle (Information Relevant to all DPSs)

The green sea turtle was originally listed as threatened under the ESA on July 28, 1978, except for the Florida and Pacific coast of Mexico breeding populations, which were listed as endangered. On April 6, 2016, the original listing was replaced with the listing of 11 distinct population segments (DPSs) (81 FR 20057 2016) (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. For the purposes of this consultation, only the South Atlantic DPS and North Atlantic DPS will be considered, as they are the only two DPSs with individuals occurring in the Atlantic and Gulf of Mexico waters of the United States.

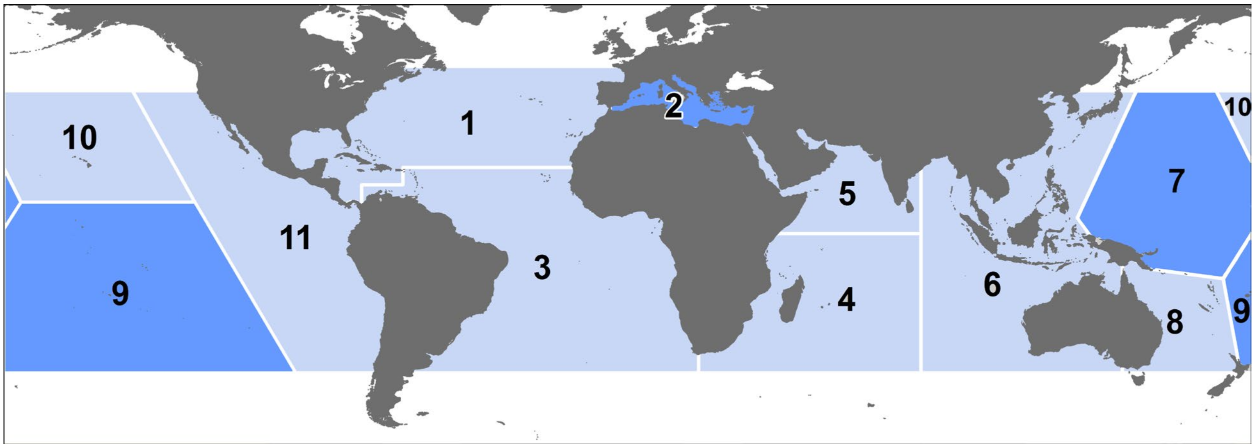

Figure 2. Threatened (light) and endangered (dark) green turtle DPSs: 1. North Atlantic, 2. Mediterranean, 3. South Atlantic, 4. Southwest Indian, 5. North Indian, 6. East Indian-West Pacific, 7. Central West Pacific, 8. Southwest Pacific, 9. Central South Pacific, 10. Central North Pacific, and 11.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

4.1.4 Species Description and Distribution

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

With the exception of post-hatchlings, green sea turtles live in nearshore tropical and subtropical waters where they generally feed on marine algae and seagrasses. They have specific foraging grounds and may make large migrations between these forage sites and natal beaches for nesting (Hays et al. 2001). Green sea turtles nest on sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands in more than 80 countries worldwide (Hirth 1997). The 2 largest nesting populations are found at Tortuguero, on the Caribbean coast of Costa Rica (part of the 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. Within U.S. waters individuals from both the North Atlantic and South Atlantic DPSs can be found on foraging grounds. While there are currently no in-depth studies available to determine the percent of North Atlantic and South Atlantic DPS individuals in any given location, two small-scale studies provide an insight into the degree of mixing on the foraging grounds. An analysis of cold-stunned green turtles in St. Joseph Bay, Florida (northern Gulf of Mexico) found approximately 4% of individuals came from nesting stocks in the SA DPS (specifically Suriname, Aves Island, Brazil, Ascension Island, and Guinea Bissau) (Foley et al. 2007). On the Atlantic coast of Florida, a study on the foraging grounds off Hutchinson Island found that approximately 5% of the turtles sampled came from the Aves Island/Suriname nesting assemblage, which is part of the South Atlantic DPS (Bass and Witzell 2000). All of the individuals in both studies were benthic juveniles. Available information on green turtle migratory behavior indicates that long distance dispersal is only seen for juvenile turtles. This suggests that larger adult-sized turtles return to forage within the region of their natal rookeries, thereby limiting the potential for gene flow across larger scales (Monzón-Argüello et al. 2010). While all of the mainland U.S. nesting individuals are part of the NA DPS, the U.S. Caribbean nesting assemblages are split between the North Atlantic and South Atlantic DPS. Nesters in Puerto Rico are part of the North Atlantic DPS, while those in the U.S. Virgin Islands are part of the South Atlantic DPS. We do not currently have information on what percent of individuals on the U.S. Caribbean foraging grounds come from which DPS.

North Atlantic DPS Distribution

The 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 going south from Brevard through Broward counties.

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

South Atlantic DPS Distribution
The South Atlantic DPS boundary is shown in Figure 2, and includes the U.S. Virgin Islands in the Caribbean. The South Atlantic DPS nesting sites can be roughly divided into 4 regions: western Africa, Ascension Island, Brazil, and the South Atlantic Caribbean (including Colombia, the Guianas, and Aves Island in addition to the numerous small, island nesting sites).

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

4.1.5 Life History Information

Green sea turtles reproduce sexually, and mating occurs in the waters off nesting beaches and along migratory routes. Mature females return to their natal beaches (i.e., the same beaches where they were born) to lay eggs (Balazs 1982; Frazer and Ehrhart 1985) every 2-4 years while males are known to reproduce every year (Balazs 1983). In the southeastern United States, females generally nest between June and September, and peak nesting occurs in June and July (Witherington and Ehrhart 1989b). During the nesting season, females nest at approximately 2-week intervals, laying an average of 3-4 clutches (Johnson and Ehrhart 1996). Clutch size often varies among subpopulations, but mean clutch size is approximately 110-115 eggs. In Florida, green sea turtle nests contain an average of 136 eggs (Witherington and Ehrhart 1989b). Eggs incubate for approximately 2 months before hatching. Hatchling green sea turtles are approximately 2 in (5 cm) in length and weigh approximately 0.9 oz (25 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 in (20-25 cm) carapace length, juveniles leave the pelagic environment and enter nearshore developmental habitats such as protected lagoons and open coastal areas rich in sea grass and marine algae. Growth studies using skeletochronology 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).

4.1.6 Status and Population Dynamics

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

North Atlantic DPS
The 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.

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 (**Figure 3**).

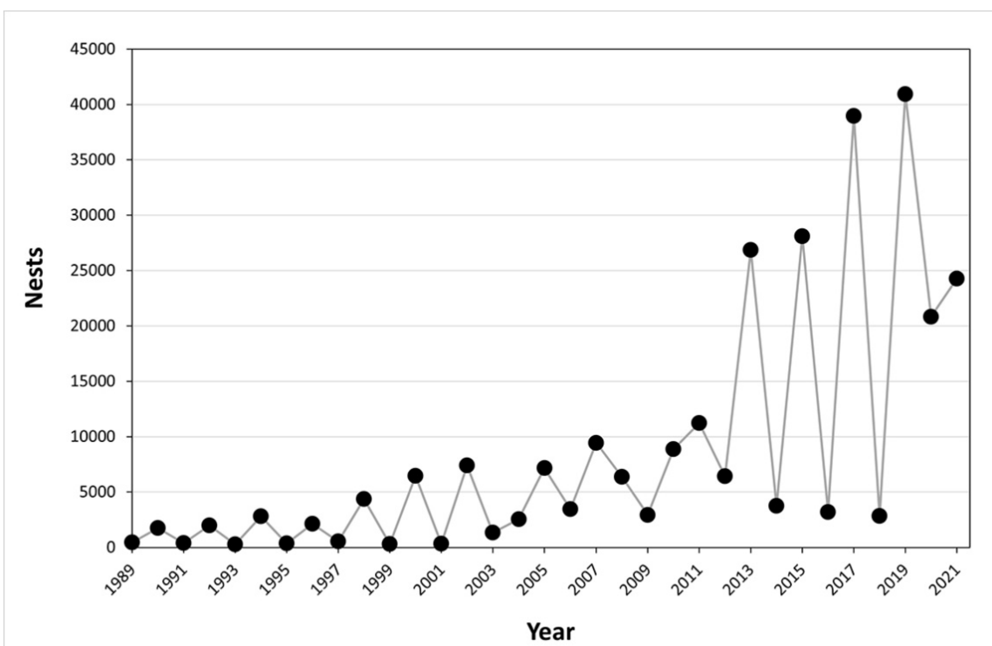

Figure 3. Green sea turtle nesting at Florida index beaches since 1989.

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% increase over 24 years (Ehrhart et al. 2007). The St Lucie Power Plant site also showed a significant increase in the annual rate of capture of immature green turtles (SCL<90 cm) over a 26 year period from 1977 to 2002 (3,557 green turtles total; M. Bressette, Inwater Research Group, unpubl. data; (Witherington et al. 2006).

South Atlantic DPS

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

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

4.1.7 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 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) 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 green sea turtles, 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 DWH, the relative proportion of the population that is expected to have been exposed to and directly impacted by the DWH event, as well as the impacts being primarily to smaller juveniles (lower reproductive value than adults and large juveniles), reduces the impact to the overall population. It is unclear what impact these losses may have caused on a population level, but it is not expected to have had a large impact on the population trajectory moving forward. However, recovery of green sea 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).

4.1.8 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.

4.1.9 Species Description and Distribution

Loggerhead sea turtles 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 sea turtle 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 Northwest Atlantic DPS, most nesting occurs along the coast of the U.S., 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 United States coast, 29% off the northeast United States 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.

4.1.10 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; "Neritic" refers to the nearshore marine environment from the surface to the sea floor where water depths do not exceed 200 m), (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). Loggerhead sea turtles 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 loggerhead sea turtles 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 U.S., 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 loggerhead sea turtles 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 loggerhead sea turtles. Adult loggerhead sea turtles 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 loggerhead sea turtles 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 loggerhead sea turtles nesting on the Cay Sal Bank in the Bahamas, but nesting females are also resident in the bights of Eleuthera, Long Island, and Ragged Islands. They also reside in Florida Bay in the U.S., and along the north coast of Cuba (A. Bolten and K. Bjorndal, University of Florida, unpublished data). Moncada et al. (2010) report the recapture of 5 adult female loggerhead sea turtles 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.

4.1.11 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 loggerhead sea turtles 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 loggerhead sea turtles, remigration interval and clutch frequency, indicate that time series on numbers of nests can provide reliable information on trends in the female population.

Peninsular Florida Recovery Unit
The PFRU is the largest loggerhead sea turtle 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 sea turtle 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 5) (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 sea turtle 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 loggerhead sea turtles 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 before dipping back to 49,100 in 2021. 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).

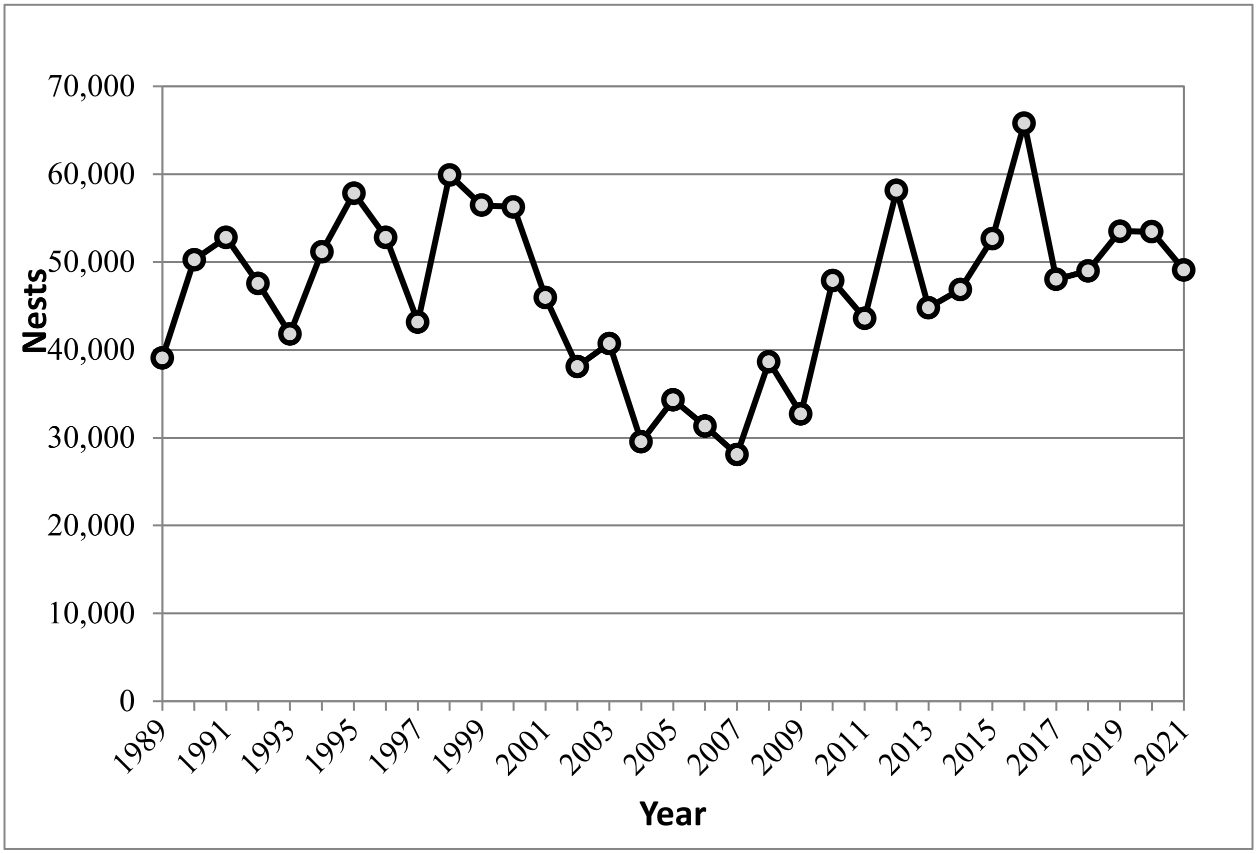

Figure 4. Loggerhead sea turtle nesting at Florida index beaches since 1989.

Northern Recovery Unit

Annual nest totals from beaches within the NRU averaged 5,215 nests from 1989-2008, a period of near-complete surveys of NRU nesting beaches (GADNR unpublished data, NCWRC unpublished data, SCDNR unpublished data), and represent approximately 1,272 nesting females per year, assuming 4.1 nests per female (Murphy and Hopkins 1984). The loggerhead sea turtle 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 4) 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 sea turtle 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 3 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.

Table 3. Total Number of NRU Loggerhead Sea Turtle 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**

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 (Figure 6).

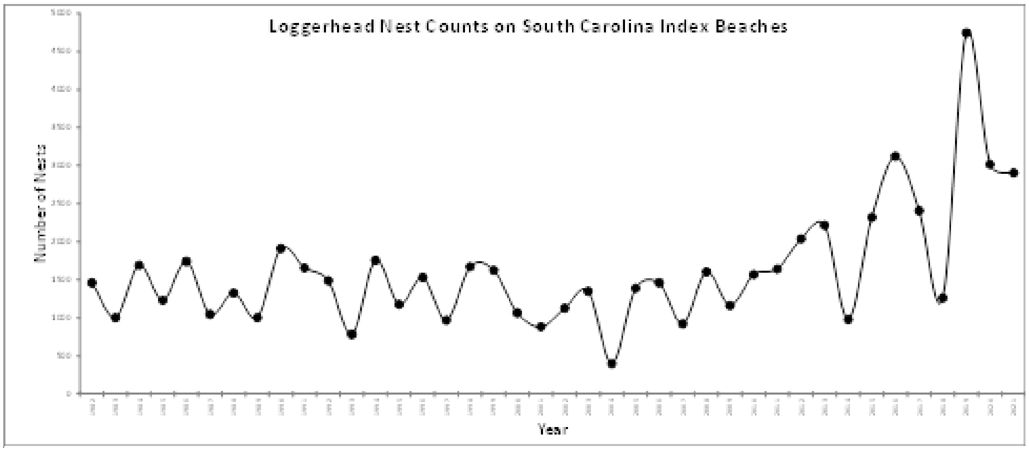

Figure 5. South Carolina index nesting beach counts for loggerhead sea turtles (from the SCDNR website: https://www.dnr.sc.gov/seaturtle/ibs.htm)

Other Northwest Atlantic DPS Recovery Units
The remaining 3 recovery units – Dry Tortugas (DTRU), Northern Gulf of Mexico (NGMRU), and Greater Caribbean (GCRU) – are much smaller nesting assemblages, but they are still considered essential to the continued existence of the species. Nesting surveys for the DTRU are conducted as part of Florida's statewide survey program. Survey effort was relatively stable during the 9-year period from 1995-2004, although the 2002 year was missed. Nest counts ranged from 168-270, with a mean of 246, but there was no detectable trend during this period (NMFS and USFWS 2008). Nest counts for the NGMRU are focused on index beaches rather than all beaches where nesting occurs. Analysis of the 12-year dataset (1997-2008) of index nesting beaches in the area shows a statistically significant declining trend of 4.7% annually. Nesting on the Florida Panhandle index beaches, which represents the majority of NGMRU nesting, had shown a large increase in 2008, but then declined again in 2009 and 2010 before rising back to a level similar to the 2003-2007 average in 2011. From 1989-2018 the average number of NGMRU nests annually on index beaches was 169 nests, with an average of 1,100 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 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 loggerhead sea turtles, 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 loggerhead sea turtles within the northwestern Atlantic continental shelf for positively identified loggerhead sea turtles in all strata estimated about 588,000 loggerhead sea turtles (interquartile range of 382,000-817,000). When correcting for unidentified sea turtles in proportion to the ratio of identified sea turtles, the estimate increased to about 801,000 loggerhead sea turtles (interquartile range of 521,000-1,111,000) (NMFS-NEFSC 2011).

4.1.12 Threats (Specific to Loggerhead Sea Turtles)

The threats faced by loggerhead sea turtles are well summarized in the general discussion of threats in Section 4.1.2. 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 loggerhead sea turtles result from cumulative fishery bycatch in neritic and oceanic habitats (Conant et al. 2009).

Regarding the impacts of pollution, loggerhead sea turtles 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 4.1.2, 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 loggerhead sea turtles (7.3% of the total small juvenile sea turtle exposures to oil from the spill) were estimated to have been exposed to oil. Of those exposed, 10,700 small juveniles are estimated to have died as a result of the exposure. In contrast to small juveniles, loggerheads represented a large proportion of the adults and large juveniles exposed to and killed by the oil. There were 30,000 exposures (almost 52% of all exposures for those age/size classes) and 3,600 estimated mortalities. A total of 265 nests (27,618 eggs) were also translocated during response efforts, with 14,216 hatchlings released, the fate of which is unknown (DWH Trustees 2015). Additional unquantified effects may have included inhalation of volatile compounds, disruption of foraging or migratory movements due to surface or subsurface oil, ingestion of prey species contaminated with oil and/or dispersants, and loss of foraging resources which could lead to compromised growth and/or reproductive potential. There is no information currently available to determine the extent of those impacts, if they occurred.

Unlike Kemp’s ridley sea turtles, 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, 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 sea turtle 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 NGRMU 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 loggerhead sea turtles, 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 loggerhead sea turtles 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 loggerhead sea turtles 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 sea turtle 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).

4.1.13 Giant Manta Ray

The giant manta ray (*Manta 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).

4.1.14 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).

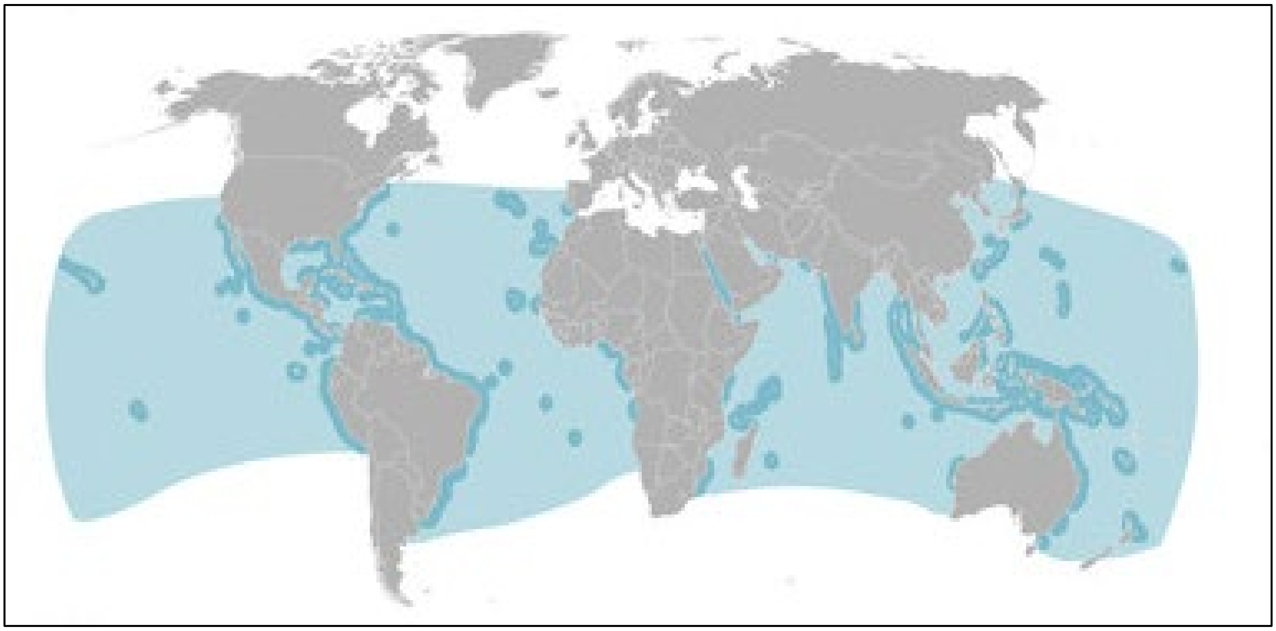

Figure 6. The Extent of Occurrence (dark blue) and Area of Occupancy (light blue) for giant manta ray, based on species distribution (Lawson et al. 2017).

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 between 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.

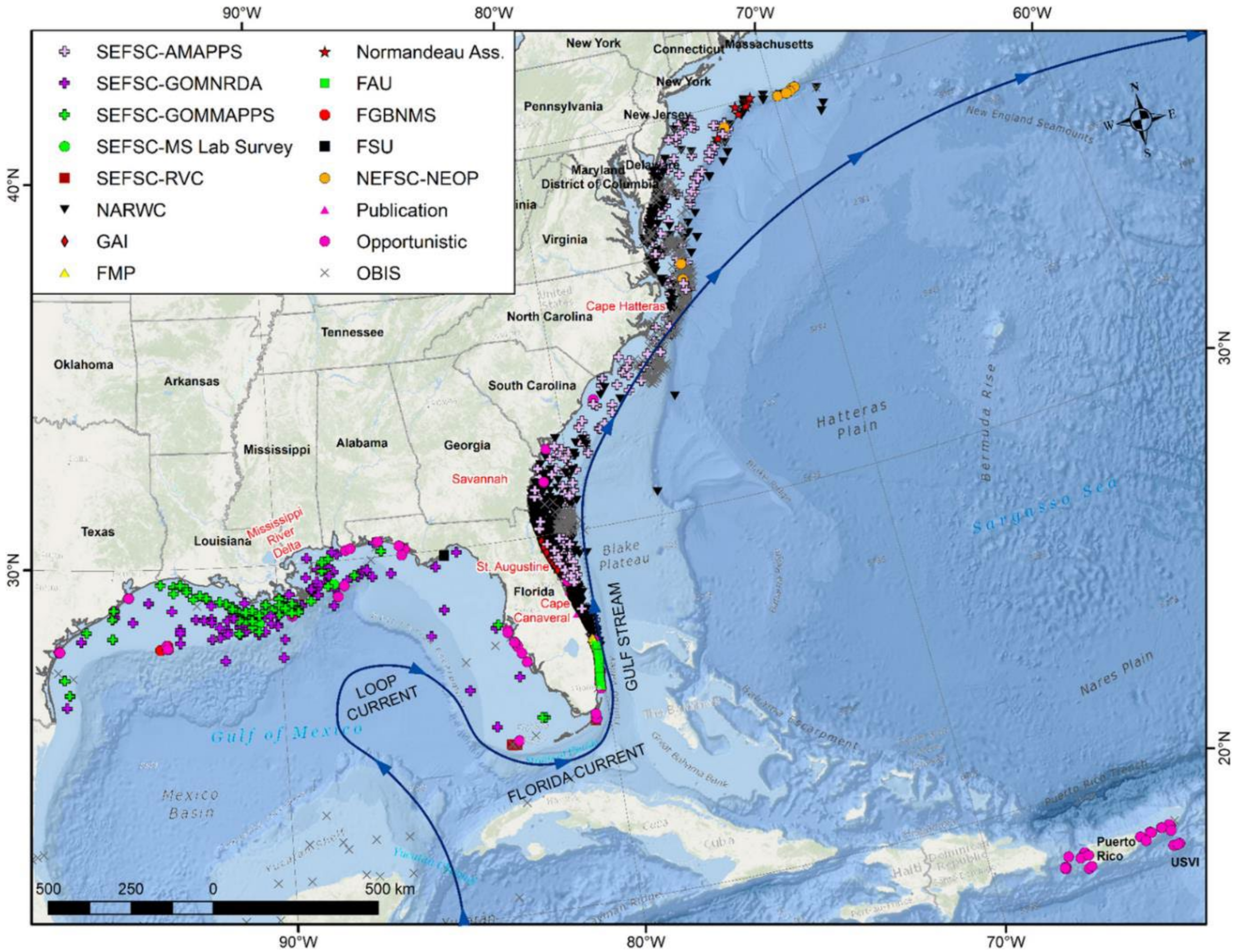

Figure 7. Reported sightings of manta rays (1925–2020) relative to regional landmarks and ocean currents, from Farmer et al. (2022).

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).

4.1.15 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 km2 (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). While these estimates are preliminary (i.e., uncorrected for availability bias), the availability bias correction would result in higher abundance estimates and therefore, these abundance estimates are conservative (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).

4.1.16 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).

Fisheries
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 US 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 Deepwater Horizon (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 tourism. 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).

4.2 Status of the Critical Habitat Considered for Further Analysis

4.2.1 Overview

NMFS and USFWS jointly designated GSCH on April 18, 2003 (*see,* 50 CFR 226.214). The agencies designated 7 riverine areas (Units 1-7) and 7 estuarine/marine areas (Units 8-14) as critical habitat based on the physical and biological features that support the species. Critical habitat units encompass a total of 2,783 rkm and 6,042 km^{2}of estuarine and marine habitats (Figure 8; **Table 4**). NMFS's jurisdiction encompasses the 7 units in marine and estuarine waters (Units 8-14), though NMFS's consultation responsibilities for projects in estuarine waters are limited to specific action agencies (Table 5).

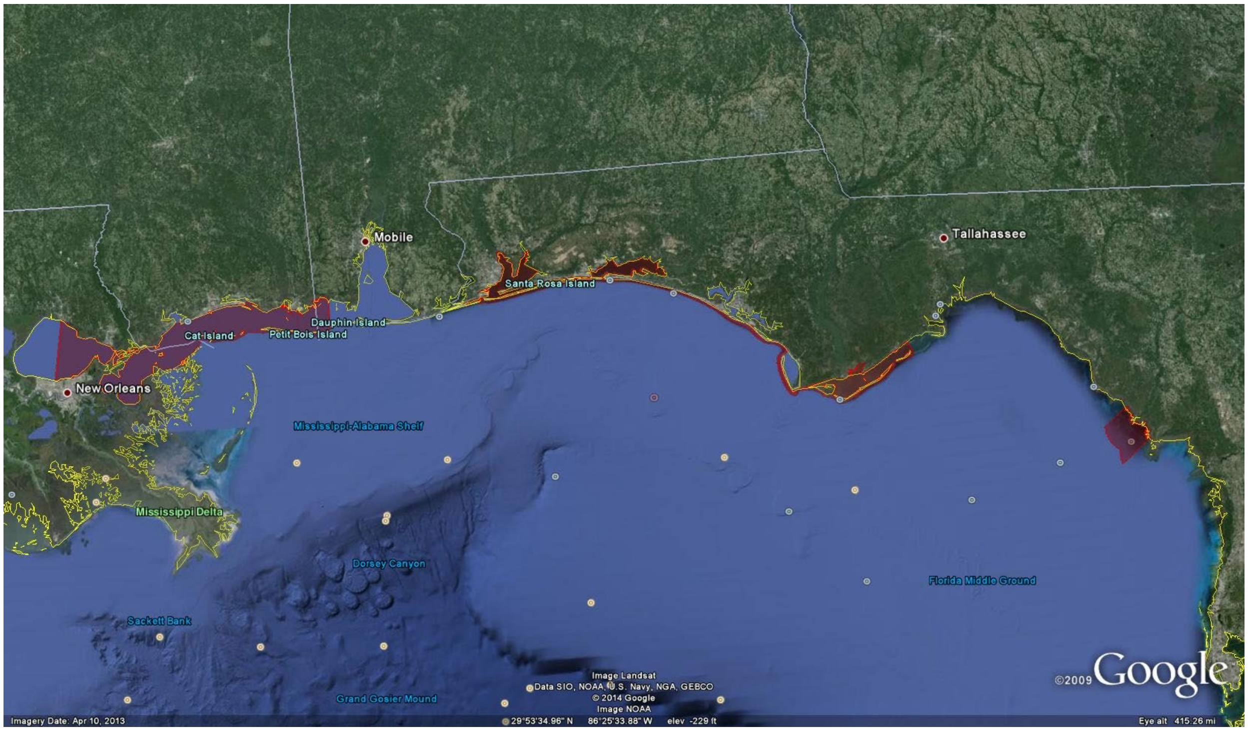

Figure 8. Gulf sturgeon critical habitat in estuarine and marine waters (Units 8-14) (©2014 Google)

Table 4. Approximate Area of the Estuarine and Marine Critical Habitat Units for Gulf Sturgeon

Critical Habitat Unit	**State**	**km^2**
8. Lake Borgne	Louisiana / Mississippi / Alabama	718
Little Lake		8
Lake Pontchartrain		763
Lake St. Catherine		26
The Rigolets		13
Mississippi Sound		1,879
MS nearshore Gulf		160
9. Pensacola Bay	Florida	381
10. Santa Rosa Sound		102
11. Near Shore Gulf of Mexico		442
12. Choctawhatchee Bay		321
13. Apalachicola Bay		683
14. Suwannee Sound		546
	Total	**6,042**

Table 5. Consultation Responsibility for Projects in Estuarine Waters

Lead Action Agency	NMFS	USFWS
Department of Transportation		X
U.S. Environmental Protection Agency		X
U.S. Coast Guard		X
Federal Emergency Management Agency		X
Department of Defense	X	
U.S. Army Corps of Engineers	X	
Minerals Management Service (now Bureau of Ocean Energy Management)	X	
Other	X	

Gulf sturgeon use rivers for spawning, larval and juvenile feeding, adult resting and staging, and to move between the areas that support these components. Gulf sturgeon use the lower riverine, estuarine, and marine environment during winter months primarily for feeding and for inter-river migrations. Within Florida estuaries, Gulf sturgeon are typically found in waters 2-4 m deep and use depths outside this range less than expected based on availability (Fox et al. 2002). Further, the 2-4-m deep habitats where Gulf sturgeon are typically found have sediments with a high percentage (> 80%) of sand (Fox et al. 2002). Gulf sturgeon in Mississippi estuaries appear to occupy habitats with lower percentages of sand (typically < 75% sand) but similar depth ranges (Michael Anders, USM, unpublished data). Adult sturgeon appear to spend extended periods of time in specific areas of the estuary and then travel relatively quickly to other areas where they again spend extended amounts of time (Edwards et al. 2007; Edwards et al. 2003). Sulak et al. (2012) believe Gulf sturgeon feed continuously during these periods which may last for 1-3 months. Additionally, it appears that there may be certain areas where Gulf sturgeon concentrate. USFWS discovered nearshore areas of concentrated feeding activity for adults from multiple riverine systems in the waters near Tyndall Air Force Base/Panama City Beach, Florida, and waters from Perdido, Florida, to Gulf Shores, Alabama (USFWS 2004; USFWS 2005; USFWS 2006; USFWS 2007). Estuaries and bays adjacent to riverine areas provide unobstructed passage of sturgeon from feeding areas to spawning grounds.

Physical and Biological Features of Critical Habitat

Critical habitat determinations focus on those physical and biological features (primary constituent elements = PCEs) that are essential to the conservation of the species (50 CFR 424.12). Federal agencies must ensure that their activities are not likely to result in the destruction or adverse modification of the PCEs within defined critical habitats. Therefore, proposed actions that may impact designated critical habitat require an analysis of potential impacts to each PCE. NMFS and USFWS identified 7 habitat features essential for the conservation of Gulf sturgeon. Four of these features are found in the marine and estuarine units of critical habitat:

1. Abundant food items, such as detritus, aquatic insects, worms, and/ or mollusks, within riverine habitats for larval and juvenile life stages; and abundant prey items, such as amphipods, lancelets, polychaetes, gastropods, ghost shrimp, isopods, mollusks and/or crustaceans, within estuarine and marine habitats and substrates for subadult and adult life stages

2. Water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages
3. Sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages
4. Safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (e.g., an unobstructed river or a dammed river that still allows for passage)

As stated in the final rule designating GSCH, the following activities, among others, when authorized, funded, or carried out by a federal agency, may destroy or adversely modify critical habitat:

(1) Actions that would appreciably reduce the abundance of estuarine and marine prey for juvenile and adult Gulf sturgeon, within a designated critical habitat unit, such as dredging, dredged material disposal, channelization, in-stream mining; and land uses that cause excessive turbidity or sedimentation;
(2) Actions that would alter water quality within a designated critical habitat unit, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, such that it is appreciably impaired for normal Gulf sturgeon behavior, reproduction, growth, or viability, such as dredging, dredged material disposal, channelization, impoundment, in-stream mining, water diversion, dam operations, land uses that cause excessive turbidity, and release of chemicals, biological pollutants, or heated effluents into surface water or connected groundwater via point sources or dispersed non-point sources;
(3) Actions that would alter sediment quality within a designated critical habitat unit such that it is appreciably impaired for normal Gulf sturgeon behavior, reproduction, growth, or viability, such as dredged material disposal, channelization, impoundment, in-stream mining, land uses that cause excessive sedimentation, and release of chemical or biological pollutants that accumulate in sediments; and
(4) Actions that would obstruct migratory pathways within and between adjacent riverine, estuarine, and marine critical habitat units, such as dams, dredging, point-source-pollutant discharges, and other physical or chemical alterations of channels and passes that restrict Gulf sturgeon movement (68 FR 13399).

The proposed action will occur in critical habitat Unit 11.

4.2.2 Unit 11

Unit 11 is a portion of the Gulf of Mexico along the shoreline of the Florida Panhandle (Figure 7). The western boundary is the line of longitude 87°20.0′W (approximately 1 nm (1.9 km) west of Pensacola Pass) from its intersection with the shore to its intersection with the southern boundary. The northern boundary is the MHW of the mainland shoreline and the 72 COLREGS line at passes as defined at 30 CFR 80.810 (a–g). The southern boundary of the unit is 1 nm (1.9 km) offshore of the northern boundary; the eastern boundary is the line of longitude 85°17.0′W from its intersection with the shore (near Money Bayou between Cape San Blas and Indian Peninsula) to its intersection with the southern boundary.

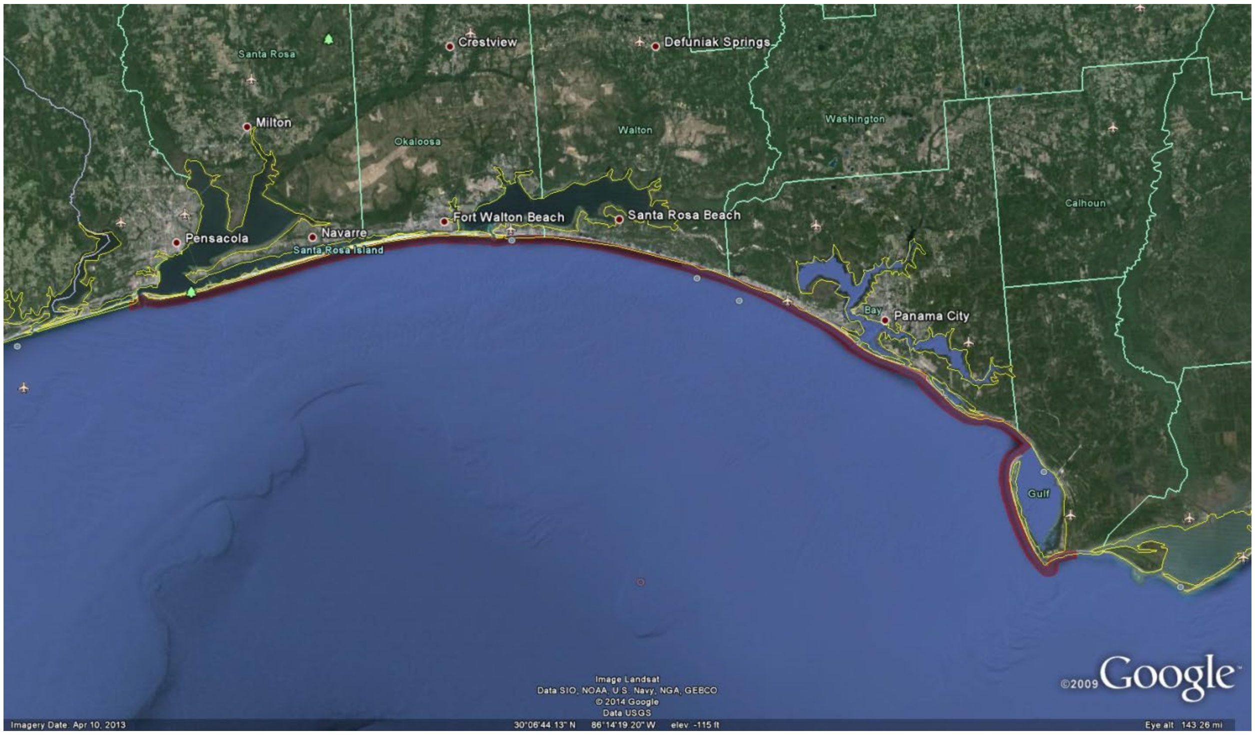

Figure 9. Gulf sturgeon critical habitat Unit 11.

Unit 11 includes winter feeding and migration habitat for Gulf sturgeon from the Yellow River, Choctawhatchee River, and Apalachicola River subpopulations. Telemetry relocation data suggest that these subpopulations feed in nearshore Gulf of Mexico waters between their natal river systems (Fox et al. 2002), Parauka, pers. comm., 2002). Gulf sturgeon from the Choctawhatchee River subpopulation have been documented both east and west of Choctawhatchee Bay (Fox et al. 2002), F. Parauka, pers. comm., 2002).

During the winter of 2001-2002, personnel from both USGS and FWS attached pop-up satellite tags to 20 Gulf sturgeon (12 from the Suwannee River, 4 from the Choctawhatchee River, 2 from the Apalachicola River, and 2 from the Yellow River) to identify winter feeding areas in the Gulf of Mexico. These data suggest that Gulf sturgeon from the Yellow River, Choctawhatchee River, and Apalachicola River remain within 1.6 km (1 mi) of the coastline between these river systems (F. Parauka, pers. comm., 2002). Examination of bathymetry data along the Gulf of Mexico coastline between the Pensacola Bay and Apalachicola Bay reveals that depths of less than 6 m (19.7 ft), where Gulf sturgeon are generally found, are all contained within 1 nm (1.9 km) from shore. Gulf nearshore substrate contains unconsolidated, fine-medium grain sands that support crustaceans such as mole crabs, sand fleas, various amphipod species, and lancelets. Based on movement patterns, it appears these Gulf sturgeon were feeding in the nearshore Gulf of Mexico on route to their natal rivers. Given this information, we included the nearshore (up to 1 nm [1.9 km]) Gulf of Mexico waters in this unit between Pensacola and Apalachicola Bays.

Activities associated with coastal development have been and continue to be the primary threat to marine and estuarine units of GSCH. These activities generally include dredge and fill projects, freshwater withdrawals, and stormwater drainage systems. Although many coastal development activities are currently regulated, some permitted direct and/or indirect damage to habitat from increased urbanization still occurs and is expected to continue in the future.

Unit 11 is impacted by a number of activities including dredging, shoreline armoring, installation of breakwaters, and construction of docks, piers, marinas, and artificial reefs. Some of these projects are not expected to adversely affect the essential features of Unit 11 as any effects are extremely unlikely to occur.

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 (including designated critical habitat), and ecosystem within the action area without the additional effects of the proposed action. In the case of ongoing actions, this section includes the effects that may contribute to the projected future status of the species, their habitats, and ecosystem. The environmental baseline describes the species' and critical habitat's 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, and areas of critical habitat 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 or critical habitat features will commonly exhibit, or be more susceptible to, adverse responses to stressors than they would be in other states, stages, or areas within their distributions. These localized stress responses or stressed baseline conditions may increase the severity of the adverse effects expected from the proposed action.

5.2 Status of ESA-Listed Species Considered for Further Analysis

The status of the species in the action area, as well as the threats to the species, is supported by the species accounts in Section 4.1 (Status of the Species).

As stated in Section 2.2 (Action Area), the proposed action occurs in Mexico Beach, Bay County, Florida. The project area includes an offshore borrow site and a 2.5-mi-long portion of public beach in the Gulf of Mexico.

We believe the hopper dredging and potential relocation trawling components of the proposed action are likely to adversely affect the North Atlantic and South Atlantic DPSs of green sea turtles, the Northwest Atlantic DPS of loggerhead sea turtles, and giant manta ray as described in Section 4.1 (Status of the Species). These species of sea turtles and giant manta ray are highly migratory. NMFS believes that no individual green sea turtle, loggerhead sea turtle, or giant manta ray is likely to be a permanent resident of the action area. Individuals will migrate into coastal and offshore waters of the Gulf of Mexico and potentially areas of the North Atlantic Ocean, and thus may be affected by activities occurring there. Therefore, the status of the DPSs of green sea turtles, the Northwest Atlantic DPS of the loggerhead sea turtle, and the giant manta ray in the action area, as well as the threats to these species, are best reflected in their range-wide statuses and supported by the species accounts in Section 4 (Status of the Species).

5.3 Status of Critical Habitat Considered for Further Analysis

The status of this species' critical habitat in the action area, as well as the threats to the species, are supported by the species' critical habitat account in Section 4.2 (Status of the Critical Habitat).

As stated in Section 2.2 (Action Area), the proposed action occurs in Mexico Beach, Bay County, Florida. The project area includes an offshore borrow site and a 2.5-mi-long portion of public beach in the Gulf of Mexico. This Opinion focuses on an activity occurring in Unit 11 of Gulf sturgeon designated critical habitat.

5.4 Factors Affecting ESA-Listed Species and Critical Habitat Considered for Further Analysis

5.4.1 Federal Actions

NMFS has undertaken a number of Section 7 consultations to address the effects of federally permitted dredging and other federal actions on threatened and endangered sea turtle species, and when appropriate, has authorized the incidental taking of these species. Each of those consultations sought to minimize the adverse effects of the action on sea turtles. The summary below of federal actions and the effects these actions have had on sea turtles includes only those federal actions in the action area that have already concluded or are currently undergoing formal Section 7 consultation.

5.4.2 Federal Dredging Activity

Marine dredging vessels are common within U.S. coastal waters. Although the underwater noises from dredge vessels are typically continuous in duration (for periods of days or weeks at a time) and strongest at low frequencies, they are not believed to have any long-term effect on sea turtles. Still, the construction and maintenance of federal navigation channels and dredging in sand mining sites (borrow areas) have been identified as sources of sea turtle mortality. While they usually move very slowly, hopper dredges in the dredging mode are capable of moving relatively quickly compared to a sea turtle in normal swimming speed (non-burst speed) and can thus overtake, entrain, and kill sea turtles as the suction draghead(s) of the advancing dredge overtakes the resting or swimming turtle. Entrained sea turtles rarely survive.

To reduce take of listed species, relocation trawling may be utilized to capture and move sea turtles. In relocation trawling, a boat equipped with nets precedes the dredge to capture sea turtles and then releases the animals out of the dredge pathway, thus avoiding lethal take. Relocation trawling has been successful and routinely moves sea turtles in the Gulf of Mexico. Between April 2016 and June 2016, relocation trawling captured and successfully moved 212 sea turtles near Navarre Beach, Florida, with no mortalities (Coastwise Consulting 2016). In GRBO, NMFS determined that (1) Gulf of Mexico hopper dredging would adversely affect Gulf sturgeon and 5 sea turtle species (i.e., green, hawksbill, Kemp's ridley, leatherback, and loggerheads), but would not jeopardize their continued existence, and (2) dredging in the Gulf of Mexico would not adversely affect smalltooth sawfish, or ESA-listed large whales. An Incidental Take Statement for those species adversely affected was issued. USACE-permitted "new" dredging or placement of material within Gulf sturgeon critical habitat is not covered by the GRBO. Maintenance dredging of navigational channels within Gulf sturgeon critical habitat is limited to maintaining the dimensions of channels (i.e. length, width, and depth) at the time of the original 2003 GRBO regardless of previous authorization. The proposed action considered in this Opinion is operating under the dredging and relocation trawling guidelines provided by GRBO. Using the stacking approach described Section 3, the effects of the beach nourishment portion of this project on Gulf sturgeon critical habitat is addressed in this Opinion. The Opinion also evaluates the potential for the proposed dredging and relocation trawling to jeopardize the continued existence of the North Atlantic and South Atlantic DPS of green sea turtles and the Northwest Atlantic DPS of loggerhead sea turtles.

The GRBO considers maintenance dredging, beach renourishment, and sand mining operations. Numerous other Opinions have been produced that analyzed hopper dredging projects that did not fall (partially or entirely) under the scope of actions contemplated by GRBO. One such project is located adjacent to the action area – USACE-authorized dredging of the City of Mexico Beach canal inlet (NMFS 2012). The Biological Opinion issued for that project has its own Incidental Take Statement and determined that hopper dredging during the proposed action is not likely to jeopardize any species of sea turtles or other listed species, or destroy or adversely modify critical habitat of any listed species, including Gulf sturgeon critical habitat.

5.4.3 Federal Vessel Activity

Watercraft are the greatest contributors to overall noise in the sea and have the potential to interact with sea turtles through direct impacts or propellers. Sound levels and tones produced are generally related to vessel size and speed. Larger vessels generally emit more sound than smaller vessels, and vessels underway with a full load, or those pushing or towing a load, are noisier than unladen vessels. Vessels operating at high speeds have the potential to strike sea turtles. Potential sources of adverse effects from federal vessel operations in the action area include operations authorized or conducted by BOEM, FERC, USCG, NOAA, and USACE. For example, vessels associated with projects funded, authorized, or permitted by federal agencies can have effects in the action area. Commercial fishing vessels operating in federally managed fisheries likely traverse through the area on their way to federal waters.

NMFS has also conducted ESA Section 7 consultations related to energy projects in the Gulf of Mexico (BOEM and FERC) to implement conservation measures for vessel operations. Through the ESA Section 7 process, where applicable, NMFS has and will continue to establish conservation measures for all these vessel operations to avoid or minimize adverse effects to listed species. At the present time, they present the potential for some level of adverse effects.

Other potential sources of adverse effects from federal vessel activity and operations in the action area include operations of the USN and USCG. Through the ESA Section 7 process, where applicable, NMFS has and will continue to establish conservation measures for all these agency vessel operations to avoid or minimize adverse effects to listed species. Refer to the Biological Opinions for the USCG (NMFS 1995; NMFS 1996) and the USN (NMFS 1996; NMFS 1997a; NMFS 2013) for details on the scope of vessel operations for these agencies and conservation measures implemented as standard operating procedures.

5.4.4 Oil and Gas Exploration and Extraction

Federal and state oil and gas exploration, production, and development are expected to result in some sublethal effects to protected species, including impacts associated with the explosive removal of offshore structures, seismic exploration, marine debris, oil spills, and vessel operation. Many Section 7 consultations have been completed on BOEM oil and gas lease activities. Until 2002, these Opinions concluded only one sea turtle take may occur annually due to vessel strikes. Opinions issued on July 11, 2002 (NMFS 2002d), November 29, 2002 (NMFS 2002a), August 30, 2003 (Lease Sales 189 and 197 (NMFS 2003b), and June 29, 2007 (2007-2012 Five-Year Lease Plan (NMFS 2007a) have concluded that sea turtle takes may also result from vessel strikes, marine debris, and oil spills. Oil drilling cannot be conducted closer than 125 miles off the Florida panhandle, but oil drilling may affect the action area and species in the action area, for example, if tar balls wash ashore or if there was a spill offshore. The effects of the Deepwater Horizon oil spill on sea turtles is discussed above and in the following subsection.

Impact of Deepwater Horizon Oil Spill on Status of Sea Turtles
The April 20, 2010, explosion of the *Deepwater Horizon* (DWH) oil rig affected sea turtles in the Gulf of Mexico. An assessment has been completed on the injury to Gulf of Mexico marine life, including sea turtles, resulting from the spill (DWH Trustees 2015a). Following the spill, juvenile Kemp's ridley, green, and loggerhead sea turtles were found in *Sargassum* algae mats in the convergence zones, where currents meet and oil collected. Sea turtles found in these areas were often coated in oil 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.

Deepwater Horizon Legacy Effects on Gulf Sturgeon Critical Habitat
According to an analysis conducted by NMFS on the DWH spill oiling legacy (M. Press, NMFS, memo to D. Bernhart, NMFS, December 8, 2014), indirect impacts to water quality could occur if dredging disturbed submerged oil mats remnant of the DWH spill. Contributors to the OSAT report have stated that while there is a possibility that dredging activities could re-suspend oil into the water column in certain areas, the likelihood of this happening is low. Additionally, an analysis of the matrix of material (oil plus sand) stranded in mats revealed that SOMs were composed mostly of sand: 83.2%-90.6% sand and 9.4%-16.8% oil (OSAT II). The effects of suffocation of infaunal organisms and toxicity of substrate would impact potential foraging areas within Gulf sturgeon critical habitat through the displacement or reduction of prey items; however, indirect impacts to sediment quality and direct effects to prey abundance would be insignificant. The likelihood of any re-suspended DWH oil being toxic is low, and should also not have measurable effects on water quality (or on listed species directly) (W. Bryant, OSAT III Science Team Lead, pers. comm. to M. Press, NMFS, July 31, 2014).

5.4.4.1 ESA Permits and Cooperative Agreements

Sea turtles are the focus of research activities authorized by Section 10 permits under the ESA. The ESA allows the issuance of permits to take listed species for the purposes of scientific research and enhancement (Section 10(a)(1)(A)). Prior to issuance of these authorizations, the proposal must be reviewed for compliance with Section 7 of the ESA. In addition, the ESA allows for NMFS to enter into cooperative agreements with states, developed under Section 6 of the ESA, to assist in recovery actions of listed species. Activities conducted under the cooperative agreements also must be reviewed for compliance with Section 7 of the ESA.

Per a search of the NOAA Fisheries Authorizations and Permits for Protected Species (APPS; https://apps.nmfs.noaa.gov/) database by the consulting biologist on March 30, 2023, there were 8 active Section 10(a)(1)(A) scientific research permits applicable to green sea turtles and loggerhead sea turtles within the action area. These permits allow the capture, handling, sampling, and release of these turtle species (all life stages except hatchlings) and range in purpose from reducing bycatch in commercial fisheries to gaining better scientific knowledge.

5.4.5 State and Private Actions

5.4.6 State Fisheries

Various fishing methods used in state commercial and recreational fisheries, including gillnets, fly nets, trawling, pot fisheries, pound nets, and vertical line are all known to incidentally take sea turtles, but information on these fisheries is sparse (NMFS 2001). Most of the state data are based on extremely low observer coverage, or sea turtles were not part of data collection; thus, these data provide insight into gear interactions that could occur but are not indicative of the magnitude of potential impacts.

Gillnet Fisheries
A detailed summary of the gillnet fisheries currently operating along the Gulf of Mexico, which are known to incidentally capture loggerhead sea turtles, can be found in the TEWG reports (1998; 2000).

Trawl Fisheries
On December 20, 2019 (84 FR 70048), we published a final rule to require all skimmer trawl vessels 40 ft and greater in length to use TEDs in their nets. The effective date of this final rule was ultimately delayed until August 1, 2021 (86 FR 16676; March 31, 2021). Subsequently, a preliminary injunction delayed implementation of the skimmer trawl TED requirements in Louisiana inshore waters until February 1, 2022. On April 20, 2021, we published an advance notice of proposed rulemaking to consider the expansion of TED requirements to skimmer trawl vessels less than 40 ft in length operating in the southeast U.S. shrimp fisheries (86 FR 20475). If we ultimately conclude additional TED requirements are necessary for the conservation and recovery of threatened and endangered sea turtle species, we will publish a proposed and final rule in the Federal Register at a future date.

Recreational Fisheries
Beyond commercial fisheries, observations of state recreational fisheries have shown that loggerhead, leatherback, Kemp's ridley, and green sea turtles are known to bite baited hooks, and loggerheads and Kemp's ridleys frequently ingest the hooks. Data reported through MRIP, MRFSS, and STSSN show recreational fishers have hooked sea turtles when fishing from boats, piers, and beach, banks, and jetties.

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

5.4.7 Vessel Traffic

Commercial traffic and recreational boating pursuits can have adverse effects on sea turtles via propeller and boat strike damage. The STSSN includes many records of vessel interactions (propeller injury) with sea turtles in the Gulf of Mexico. The area in and around the action area is known as a fishing haven and there are many fleets of charter boats and headboats that operate out of the navigational channel located adjacent to the action area.

Data show that vessel traffic is one cause of sea turtle mortality (Hazel and Gyuris 2006; Lutcavage et al. 1997; MSS 2003). Stranding data for the Gulf of Mexico coast show that vessel-related injuries are noted in stranded sea turtles (STSSN 2016). Data indicate that live- and dead-stranded sea turtles showing signs of vessel-related injuries continue in a high percentage of stranded sea turtles in coastal regions of the southeastern United States.

5.4.8 Marine Debris, Pollution, and Environmental Contamination

Marine debris is a continuing problem for sea turtles. Sea turtles living in the pelagic environment commonly eat or become entangled in marine debris (e.g., tar balls, plastic bags/pellets, balloons, and ghost fishing gear) as they feed along oceanographic fronts where debris and their natural food items converge. This is especially problematic for sea turtles that spend all or significant portions of their life cycle in the pelagic environment (i.e., leatherbacks, juvenile loggerheads, and juvenile green turtles). The number of oil drilling rigs operating in the Gulf of Mexico make the prevalence of tar balls on beaches in the action area an ongoing problem. Adult and juvenile sea turtles may consume tar balls while they are foraging in the water and hatchlings on the beach may become entangled and trapped in the tar balls as the tar balls soften and melt in the sun.

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

Coastal runoff, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased under water noise and boat traffic can degrade marine habitats used by sea turtles (Colburn et al. 1996). The development of marinas and docks in inshore waters can negatively impact nearshore habitats. An increase in the number of docks built increases boat and vessel traffic. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. The species of turtles analyzed in this Opinion travel between near shore and offshore habitats and may be exposed to and accumulate these contaminants during their life cycles.

5.4.9 Acoustic Impacts

Acoustic effects on ESA-listed sea turtles are a known impact to these species and they are difficult to measure. Where possible, conservation actions are being implemented to monitor or study the effects to sea turtles from these sources

5.4.10 Stochastic Events

Stochastic (i.e., random) events, such as hurricanes or cold snaps, occur in the action area and can affect green sea turtle (North Atlantic and South Atlantic DPSs) and loggerhead sea turtle (Northwest Atlantic DPS) in the action area. These events are unpredictable and their effect on the recovery of these ESA-listed sea turtles is unknown; yet, they have the potential to impede recovery if animals die as a result or indirectly if important habitats are damaged.

Stochastic events such as hurricanes are relatively common in and around Gulf sturgeon critical habitat (Unit 11). These events are unpredictable and their effect on the ability of the essential features to function properly is variable but can be significant. Gulf sturgeon mortalities in the Apalachicola River in Florida were directly attributed to Hurricane Michael and a severe hypoxic event from that storm (Dula et al. 2020)) where the DO concentrations dropped so low (i.e., 0.2 mg/L) that water quality became uninhabitable, resulting in the death of thousands of fish including multiple sturgeon. Historically, Gulf sturgeon, were disproportionally negatively affected by hurricanes (Category 3 or above) in the western Gulf of Mexico versus the eastern (Rudd et al. 2014). Predicted increases in the frequency and severity of hurricanes may be attributed to climate change and pose additional and recognized threats to sturgeon movement/recruitment patterns. Tropical storm events also lead to post-hurricane hypoxic and anoxic in-river conditions leading to sturgeon mortality events of all life-stages. Stochastic events such as the ones discussed here are certainly possible within the range of the Gulf sturgeon critical habitat Unit 11. More information is needed to continue to assess the impacts of stochastic events on Gulf sturgeon critical habitat.

5.4.11 Climate Change

As discussed earlier in this Opinion, there is a large and growing body of literature on past, present, and future impacts of global climate change. Potential effects commonly mentioned include changes in sea temperatures and salinity (due to melting ice and increased rainfall), ocean currents, storm frequency and weather patterns, and ocean acidification. These changes have the potential to affect species behavior and ecology including migration, foraging, reproduction (e.g., success), and distribution. For example, large-scale factors affecting riverine water quality and quantity that likely exacerbate habitat threats to Gulf sturgeon include drought, and intra- and inter-state water allocation. For sturgeon, altered precipitation patterns cause increases or decreases in rainfall distribution that can dramatically affect river habitat (flow, bottom habitat, predator/prey interactions, habitat niche partitioning, nutrient flow, pollutant dispersal, and important abiotic factors). The seasonal timing and precipitation pattern changes (e.g., summer flooding) for anadromous fish like Gulf sturgeon may undermine the functionality of critical habitat and the successful spawning or embryo survival for that spawning season. Female Gulf sturgeon may spawn every two to five years, so the potential loss of an entire reproductive effort can profoundly affect species recovery.

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 and critical habitat that are likely to be adversely affected. The analysis in this section forms the foundation for our jeopardy analysis and destruction or adverse modification analysis in Section 7. 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. This approach provides the "benefit of the doubt" to threatened and endangered 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

Hydraulic dredging

Effects to green sea turtle (North Atlantic and South Atlantic DPSs), loggerhead (Northwest Atlantic DPS) sea turtle, and giant manta ray include the risk of direct physical impact from hydraulic dredging and other in-water construction activities. We believe the risk of physical injury is extremely unlikely to occur due to the species' ability to move away from the project site and into adjacent suitable habitat, if disturbed. NMFS has previously determined in dredging Biological Opinions that, while oceangoing hopper-type dredges may lethally entrain protected species, including sea turtles, non-hopper-type dredging methods, such as the hydraulic dredge proposed for use in this project, are slower and extremely unlikely to overtake or adversely affect them (NMFS 2007). Additionally, the applicant's implementation of NMFS Southeast Region's *Protected Species Construction Conditions* (NMFS 2021) and *Vessel Strike Avoidance Measures* (NMFS 2021) will require all construction workers to observe in-water related activities for the presence of these species. If a protected species is seen within 150 ft of operations, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 150 ft of a protected species. Operation of any mechanical construction equipment shall cease immediately if a protected species is observed within a 150-ft radius of the equipment. Activities may not resume until the species has departed the project area of its own volition. Further, construction would be limited to daylight hours, which will assist construction workers in seeing listed species and, if present, avoiding interactions with them.

Vessel Strike

Vessels can strike giant manta ray, leading to injury or death. NMFS believes that it is highly unlikely that a dredge vessel, relocation trawler, or other support vessel will strike a giant manta ray. Vessel collisions with giant manta ray from the proposed action are not expected due to the slow speed of the dredge (e.g., 3.5 kt or less while dredging), relocation trawlers, and support vessels; the avoidance behavior of giant manta ray to slow moving vessels; and the presence of NMFS-approved observers on board every dredge and relocation trawler to watch for ESA-listed species in the area. While giant manta ray can be frequently observed traveling just below the surface and will often approach or show little fear toward vessels, few instances of confirmed or suspected strandings of giant manta ray are attributed to vessel strike injury. Giant manta ray appear to be able to be fast and agile enough to avoid most moving vessels, as is anecdotally evidenced by videos showing high-speed vessels passing over giant manta ray and the ray being able to avoid the interaction. Vessels covered under this Opinion will be traveling slowly in accordance with the *Vessel Strike Avoidance Measures* while working, and will operate at "Idle/No Wake" speeds while in any project construction areas, or in water depths where the draft of the vessel provide less than four feet of clearance from the bottom, or in all depths after a protected species has been observed and has recently departed the area. Giant manta ray are mobile species that appear to be able to be responsive to activity in the area and able to move out of the way of at least slow-moving equipment. In addition, we do not expect this species to be present in abundance in the project area, and there have been no reports of giant manta ray in the project area. Due to the very limited reports of vessel interactions, and ability to avoid moving vessel traffic outside of confined spaces, we think it is extremely unlikely that vessels associated with the proposed project will encounter giant manta ray while working or while transiting.

Entrainment and Impingement
We believe cutterhead and hopper dredging activities will result in no effect to giant manta ray from entrainment and impingement from dredging. This conclusion is supported by our decades of experience with reporting of take from hopper dredging (since the 1980s), and a review of the available scientific literature, which revealed no known reports of hopper dredging entrainment to this species. Furthermore, giant manta ray are not expected to be entrained due to their large size and ability to avoid the suction created by a hopper dredge. In addition, giant manta ray are a pelagic species and would not be expected to be found on the bottom and therefore are not likely to have an encounter with a cutterhead or hopper dredge while dredging.

Sand Placement
Sand placement will occur along 13,000 lin ft (2.5 mi) of shoreline between FDEP Monuments R-127.5 and R-144 on Mexico Beach, Bay County, Florida. The potential for interaction from sand placement equipment while it is depositing the material is limited to the potential of giant manta ray being directly below the material as it is passing through the water column and landing on the sea floor at the pump-out areas. We believe that risk of a mobile species being caught in the discharge through the water column and buried on the sea floor is extremely unlikely. Giant manta ray would be able to detect the presence of the material and avoid being harmed by its placement. Placement in an open water environment would allow room for species to move away from and around the placement. In addition, the implementation of our Protected Species Construction Conditions 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 a 150-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition or 20 minutes have passed since the animal was last seen in the area. Further, construction would be limited to daylight hours so construction workers are able to see protected species, if present, and avoid interactions with them.

Entanglement
Giant manta ray may become entangled in flexible materials in the water, such as buoy lines used to mark pipelines; however, we believe entanglement from flexible materials in the water associated with dredging and placement activities is extremely unlikely to occur. As stated

above, the USACE will follow the general PDCs in the updated SARBO on the use of in-water lines (see Appendix A).

Water Quality
Giant manta ray may be affected by changes in water quality from turbidity caused by cutterhead pipeline or hopper dredging and material placement. We believe this effect is extremely unlikely to occur due to the species' mobility. Giant manta ray are highly mobile and can avoid localized areas of increased turbidity. Movement away from a stimulus is a behavioral effect and is discussed in the final paragraph of this analysis.

Avoidance
Giant manta ray may be affected by being temporarily unable to access the project area for foraging, due to their avoidance of dredging activities. Although giant manta ray may be temporarily unable to use the construction area during the approximately 5 months expected to complete the initial portion of proposed project, and during the one additional nourishment event expected to be completed during the 15-year lifespan of the permit, we believe these effects will be insignificant as this is an open-water area with similar surrounding habitat, and the animals will be able to resume access to the area in between the nourishment events and after the project is completed.

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

Consistent with our conclusion that green sea turtles loggerhead sea turtles are likely to be adversely affected by the activities covered by GRBO, NMFS believes that the hopper dredging and relocation trawling components of the proposed action are likely to adversely affect the North Atlantic and South Atlantic DPSs of green sea turtles, the Northwest Atlantic DPS of loggerhead sea turtles, and giant manta ray. At the time GRBO and the two GRBO revisions were completed, green sea turtles and loggerhead sea turtles were listed globally. Thereafter, NMFS revised the listing to identify and list DPSs. The green sea turtles analyzed in GRBO are individuals that are part of the North Atlantic and South Atlantic DPSs alone, so the take in GRBO represents the anticipated amount of take of individuals from the North Atlantic and South Atlantic DPSs, combined. Likewise, the loggerhead sea turtles analyzed in GRBO are individuals that are part of the Northwest Atlantic DPS alone, and the take in GRBO represents the anticipated amount of take of individuals from the Northwest Atlantic DPS only. Because GRBO does not evaluate the potential for the anticipated amount of take of individual sea turtles from the DPSs to result in jeopardy to these species the effects of the were not analyzed were not analyzed in GRBO, we analyze those effects on the DPSs in this Opinion. However, a separate Incidental Take Statement for the DPSs is not provided in this Opinion because green sea turtle and loggerhead sea turtle take is covered by GRBO. We are evaluating the effects of the proposed action on the DPSs to evaluate the potential for the proposed action to jeopardize the continued existence of these species.

Giant manta ray is likely to be captured by relocation trawling that will occur in connection with hopper dredging, though we currently lack records of captures of this species to accurately estimate the number that may be captured. The lack of data is a result of the recent listing of this species under the ESA in 2018 (83 FR 2916, January 22, 2018), and prior reports of captures of rays that lack information that would accurately identify the species as giant manta rays. The best available information we have at the time of completion of this Opinion is from the northeast Atlantic, which is outside of the action area. The reports from the northeast Atlantic are reports of mantas caught as bycatch in fisheries where NMFS' observers document each interaction with a Mobulid ray by species when possible. Observations historically included giant manta ray, Atlantic devil ray, unidentified ray, unidentified manta, and *Mobulidae* (any manta and devil ray species that could not be confirmed to species). Because of the unique form and cephalic lobes adjacent to the mouth of manta and devil rays, it is unlikely that these records would have been listed more generally as an unidentified stingray or an unidentified ray; however, we do consider misidentification in these reports possible. Historically, many *Mobulidae* species may have been identified as giant manta rays because observers were provided with Peterson Field Guides – Atlantic Coast Fishes as a main source for identification, and the giant manta ray was the only large *Mobulidae* species shown. In 2015, NMFS NEFSC re-evaluated photo records of *Mobulidae* species and found that numerous historic records that were originally identified as giant manta rays were actually other *Mobulidae* species. Thus, historic records that did not include photos, or where photos were not detailed enough to determine a species, were then classified as an unidentified manta ray.

6.2.3 Hopper Dredging – Effects on Sea Turtles

A typical hopper dredge vessel operates with 2 trailing, suction dragheads simultaneously, 1 on each side of the vessel. Sand will be dredged from the borrow area and transported to the nearshore waters adjacent to the beach. There, it will be dispersed via pump and pipeline from the hopper dredge. As noted in the Proposed Action (Section 2.1), the initial portion of proposed project is not expected to utilize hopper dredges. It is anticipated that a hopper dredge will be used to dredge an additional 1,000,000 yds^3 of material as part of a second nourishment during the 15-year lifespan of the permit.

Effects of Hopper Dredging

It has been previously documented in NMFS Biological Opinions that hopper dredges have captured, injured, and killed sea turtles. Available data indicates that in the Gulf Region (Texas, Louisiana, Mississippi, Alabama, and Florida), USACE reported 67 takes of green sea turtles between 2004 to April 4, 2023 for regulatory and civil projects (ODESS database search April 4, 2023). During the same period (2004 through April 4, 2023), there were 77 documented takes of loggerhead sea turtles that occurred throughout the Gulf Region. Hopper dredges are equipped with large centrifugal pumps similar to those employed by other hydraulic dredges. Dredged material is raised by dredge pumps through suction pipes (dragarms) connected to the intake (drag) in contact with the channel bottom and discharged into hoppers built in the vessel. Dragarms are hinged on each side of the vessel with the drag extending downward toward the stern of the vessel. The dragarm is moved along the bottom as the vessel moves forward at speeds up to 3-5 mph. The dredged material is sucked up the pipe and deposited and stored in the hoppers of the vessel.

Most sea turtles are able to escape from the oncoming draghead. However, hopper dredges can entrain and kill sea turtles if the drag arm(s) of the moving dredge overtakes a slower moving or stationary sea turtle. Entrainment refers to the animal being sucked through the draghead into the hopper. Turtles can also be entrained if suction is created in the draghead by current flow while the device is being placed or removed, or if the dredge is operating on an uneven or rocky substrate and rises off the bottom. Reports based on dredge take during USACE navigation channel maintenance projects suggest that the risk of entrainment is highest when the bottom terrain is uneven or when the dredge is conducting "cleanup" operations at the end of a dredge cycle when the bottom is trenched and the dredge is working to level out the bottom. In these instances, it is difficult for the dredge operator to keep the draghead buried in the sand, thus sea turtles near the bottom may be more vulnerable to entrainment. In addition to entrainment, interactions with a hopper dredge result from crushing when the draghead is placed on the bottom or when an animal is unable to escape from the suction of the dredge and becomes stuck on the draghead (impingement). Mortality most often occurs when animals are sucked into the dredge draghead, pumped through the intake pipe and then killed as they cycle through the centrifugal pump and into the hopper.

Interactions with the draghead can also occur if the suction is turned on while the draghead is in the water column (i.e., not seated on the bottom). USACE implements procedures to minimize the operation of suction when the draghead is not properly seated on the bottom sediments, which reduce the risk of these types of interactions. In addition, during dredging operations, protected species observers will live aboard the dredge, monitoring every load, 24 hours a day, for evidence of dredge-related impacts to protected species, particularly sea turtles and sturgeon. When the dredge is transiting, observers will maintain a bridge watch for protected species and keep a logbook noting the date, time, location, species, number of animals, distance and bearing from dredge, direction of travel, and other information, for all sightings.

Because entrainment is believed to occur primarily while the draghead is operating on the bottom, it is likely that only those species feeding or resting on or near the bottom would be vulnerable to entrainment. Within the action area, we expect effects to green sea turtles and loggerhead sea turtles from hopper dredge operations as these species are likely to be feeding on or near the bottom of the water column and thus are vulnerable to entrainment in the suction draghead of the hopper dredge.

Estimated Mortality from Hopper Dredging Impingement and Entrainment
To estimate take of green (North and South Atlantic DPSs) and loggerhead (Northwest Atlantic DPS) sea turtles as a result of the proposed action, we analyzed the number of sea turtles killed by hopper dredging during previous hopper dredge projects within the shared jurisdictional area between USACE Mobile and Jacksonville Districts. This area includes the entire USACE Mobile District plus the area where the USACE Jacksonville District's regulatory authority and the USACE Mobile District's civil works authority overlap. The USACE Mobile District extends from Apalachee Bay near Tallahassee, Florida, to the Pearl River near the Mississippi/Louisiana border. The USACE Jacksonville District's regulatory authority partially overlaps with the eastern portion of USACE Mobile District from the Alabama/Florida state line to Tallahassee. This shared jurisdictional area is a subset of the entire Gulf Region (Texas, Louisiana, Mississippi, Alabama, and Florida) that we discussed in the previous section. Because there is no available project site-specific data on sea turtle interactions with hopper dredges, we review the data for the shared jurisdictional area of both USACE Mobile and Jacksonville Districts.

According to data provided by USACE, between September 2003 and December 2022, the USACE recorded a total of 5 lethal takes of sea turtles during 21 separate hopper dredging events within the Mobile and Jacksonville Districts. Of those 21 projects, none documented any lethal take of green sea turtles during hopper dredging activities. Based on this information, we do not anticipate any lethal take of green sea turtles from hopper dredging associated with the proposed project. For loggerhead sea turtles, there have been 5 documented lethal takes due hopper dredging activities during this period within the shared jurisdictional area of both USACE Mobile and Jacksonville Districts.

Because 0 green sea turtles have been documented as killed by hopper dredging activities, we do not anticipate any green sea turtles (North and South Atlantic DPSs) mortalities resulting from hopper dredging associated with the proposed project. To estimate the number of loggerhead sea turtles (Northwest Atlantic DPS) that may be killed by the proposed action, we examined the ratio of documented loggerhead sea turtles (Northwest Atlantic DPS) killed to the total volume of material removed by the 21 previous hopper dredging projects within the shared jurisdictional area for both USACE Districts. The cumulative volume of material dredged for these 21 projects is 20,020,566 yds^3. When we divide the total cubic yards of material dredged by the total number of loggerhead sea turtles (Northwest Atlantic DPS) observed as killed by a hopper dredge (n = 5), we can calculate the expected mortality of each species per volume of dredged material for the proposed project.

Expected Observed Mortality of Loggerhead Sea Turtles Per Volume of Dredged Material
= (total yards dredged by hopper dredge) ÷ (number of reported loggerhead sea turtle takes by hopper dredge)
= 20,020,566 yds^3 ÷ 5
= 1 expected loggerhead sea turtle mortality per 4,004,113.2 yds^3

The proposed project estimates that a total of approximately 1,000,000 yds^3 of beach compatible sand will be dredged using a hopper dredge from a new 286-ac offshore borrow area (Mexico Beach Borrow Area) as part of a second nourishment during the 15-year lifespan of the permit.

Expected Observed Loggerhead Sea Turtle Mortalities
= [(proposed volume of material to be dredged) ÷ (per volume total)] × (expected number of loggerhead sea turtle mortalities)
= [(1,000,000 yds^3) ÷ (4,004,113.2 yds^3)] × (1 loggerhead sea turtle)
= 0.250 observed loggerhead sea turtle mortalities

Because the calculated number of observed mortalities is a fraction, we round this estimate to the nearest whole number for a total estimate of 1 observed loggerhead sea turtle mortalities for the proposed project. As discussed above, dredged material screening by observers on hopper dredges is only partially effective, and observed interactions are expected to document only 50% of sea turtles entrained and killed by a hopper dredge. Thus, the anticipated observed and unobserved lethal take of loggerhead sea turtles by the proposed action is 2 loggerhead sea turtles (i.e., 1 observed loggerhead sea turtle mortalities × 2).

In addition to the sea turtle interactions by hopper dredge, project-required relocation trawling is reported. This information is discussed below, in our analysis of the effects of relocation trawling. It also helps us anticipate which species are likely to be within the action area, in the absence of specific population data (e.g., nesting and migration), and their relative abundances.

6.2.3.1 Relocation Trawling

Relocation trawling is a proven method of reducing the density of ESA-listed species in front of an advancing hopper dredge and very likely results in reduced lethal take from hopper dredging (NMFS 2007). Relocation trawling is conducted only when it can be done safely. Nets are pulled along the sea bottom for 30 minutes or less before each retrieval and re-setting. During relocation trawling, PSOs live aboard the trawlers, monitor all tows for endangered and threatened species, and record water temperatures, bycatch information, and any sightings of protected species in the area. Any sea turtle or sturgeon captured during relocation trawling are photographed, measured, biopsied for genetics, tagged, and relocated at least 3 nm away. Giant manta ray captured by relocation trawling will be handled by qualified, third-party PSOs aboard the vessel who will be responsible for collecting measurements, recording and reporting data, tagging, and taking genetic samples of the captured species. Species-specific handling guidelines are provided in the PSO PDCs in Appendix A of this Opinion that detail how the PSO will perform these tasks such as how to take a genetic sample on a specific species, when species should be brought on board or released directly into the water, and how to handle animals in distress, among others

During all phases of relocation trawling, the applicant is required to abide by established harm avoidance and minimization measures.

Effects of Relocation Trawling
The effects of relocation trawling and subsequent handling are expected to be non-lethal to captured sea turtles and giant manta ray. All sea turtles captured via relocation trawling are released unharmed in a nearby area that contains the same habitat as the areas where the trawling occurs; therefore, any habitat displacement effects associated with the relocation trawling capture are considered to be insignificant. Capturing the species and relocating it, however, is an effect to the species, which is evaluated below.

All giant manta ray will be released directly from the trawling net according to the PSO PDCs in Appendix A. Giant manta rays are large animals that are difficult to carry and maneuver; thus, releasing them directly from the net will reduce the risk of harm to this species when captured. Due to the size and maneuverability of this species, we do not expect that they will be taken by hopper dredging and therefore releasing them back into the dredging area from relocation trawling is the safest option for this species.

Estimated Take of Sea Turtles from Relocation Trawling
We consulted project managers in the USACE Mobile and Jacksonville Districts for information on the number of sea turtles captured during previous relocation trawling that occurred within the shared jurisdictional area for USACE Mobile and Jacksonville Districts (see Table 6). Using that information, we were able to calculate the number of sea turtles relocated per cubic yard of dredged material. Looking at the volume of dredge material instead of the number of dredge

events allows us to better understand and estimate the potential for interactions for a project of this size. Between September 2003 and December 2022, the USACE recorded dredging a total of 20,020,566 yds^3 of material during 21 separate hopper dredging events within the Mobile and Jacksonville Districts.

Estimated Number of Sea Turtles Relocated per Cubic Yard of Dredged Material
= (total volume dredged) ÷ (total number of sea turtles relocated)
= 20,020,566 yds^3 ÷125
= 1 sea turtle relocated per 160,164.53 yds^{3}dredged

The proposed project estimates that a total of approximately 1,000,000 yds^3 of beach compatible sand will be dredged using a hopper dredge from a new 286-ac offshore borrow area (Mexico Beach Borrow Area) using a hopper dredge as part of a second nourishment during the 15-year lifespan of the permit. We multiply this volume by the ratio calculated above to determine the estimated total number of sea turtles to be relocated during the proposed project.

Estimated Total Number of Sea Turtles Relocated (All Species)
= [(proposed volume of material to be hopper dredged) ÷ (per volume total)] × (estimated number of sea turtles relocated)
= (1,000,000 yd^3) ÷ (160,164.53 yds^3)] × (1 sea turtle relocated)
= 6.244 sea turtles relocated (all species)

Because the calculated estimate is a fraction, we round this estimate up to the nearest whole number. This gives us a total estimate of 7 sea turtles to be relocated for the 1,000,000 yds^3 of material to be dredged in the future using a hopper dredge.

To estimate the number of green (North and South Atlantic DPSs) and loggerhead (Northwest Atlantic DPS) sea turtles to be potentially relocated during the proposed project, we looked at the breakdown of sea turtles captured and identified by species during previous relocation trawling that occurred within the shared jurisdictional area for USACE Mobile and Jacksonville Districts. Table 6 shows the number of each sea turtle species captured during relocation trawling as well as the percentage of the total number of sea turtles captured represented by each species.

Table 6. Sea Turtle Relocation Trawling Data, 2004-2023 (USACE data)

Fiscal Year	Green Sea Turtle Relocations	Loggerhead Sea Turtle Relocations	Total Sea Turtle Relocations
2004	0	0	0
2005	0	0	0
2006	0	0	0
2007	0	0	0
2008	0	0	0
2009	0	0	0
2010	0	0	0
2011	0	5	5
2012	0	0	0
2013	0	0	0

Fiscal Year	Green Sea Turtle Relocations	Loggerhead Sea Turtle Relocations	Total Sea Turtle Relocations
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	0	0	0
2018	0	0	0
2019	0	0	0
2020	0	16	16
2021	0	38	38
2022	4	61	65
2023	0	1	1
TOTAL	**4**	**121**	**125**
Percentage	**3.2%**	**96.8%**	**100%**

Using the calculated species percentages for relocated sea turtles in Table 6, we can estimate the potential species composition for future captures of sea turtles during relocation trawling within the action area for the proposed project.

Table 7. Estimated Non-Lethal Take by Sea Turtle Species for Relocation Trawling

Species	Non-lethal Capture Estimate	Rounded Non-Lethal Total
Green sea turtle (North and South Atlantic DPSs)	$6.244 \times 0.032 = 0.200$	1
Loggerhead sea turtle (Northwest Atlantic DPS)	$6.244 \times 0.968 = 6.044$	7

The effects of capture and handling during relocation trawling can result in raised levels of stressor hormones and can cause some discomfort during tagging procedures. Based on past observations obtained during similar research trawling for sea turtles (i.e., small-scale trawling, not the type associated with large-scale maintenance dredging), these effects are expected to dissipate within a day (Stabenau and Vietti 2003). Since sea turtle recaptures are not common, and recaptures that do occur typically happen several days to weeks after initial capture, cumulative adverse effects of recapture are not expected. The reasoning behind this is sea turtles that are non-lethally taken by a closed-net trawl, which is observing trawl speed and tow-time limits, will be safely relocated to an area outside of the trawl area (typically 3-5 mi). If the sea turtle is captured again, the sea turtle will have had ample time to recover from the stress of the experience of the trawl net. This project differs from larger maintenance dredging projects, which would likely use larger relocation vessels with larger nets that can accommodate heavier catches and could potentially result in internal and external injuries to sea turtles, leading to the potential for post-release mortalities. Because of the smaller scale of this project, including the smaller relocation vessels and nets, and for the other reasons stated here, we do not anticipate any mortalities of healthy sea turtles associated with relocation trawling. Relocation trawling could injure or kill sea turtles with impaired health, but we do not anticipate this to occur.

Estimated Take of Giant Manta Ray from Relocation Trawling

Based on the available unpublished NEFOP data from 2001-2015 of giant manta ray and unknown ray species captured in gear types used in the Northeast fisheries, we were able to estimate a CPUE based on the number of reported ray captures and the tow effort. The rays counted included those that were identified as giant manta ray through photo identification and other reported *Mobulidae* (any manta and devil ray species that could not be confirmed to species), assuming that they may have been giant manta ray. Table 8 shows the take that may occur under this Opinion using the calculated CPUE and multiplying it by the estimated number of tows during the proposed hopper dredging in this Opinion. The USACE provided an estimate of 140 relocation trawl tows during the proposed hopper dredging for this project. This estimate is based on a similar project conducted in Gulf County, Florida, and the proximity of the borrow area to the sand placement site. We used the maximum number of relocation tows estimated to occur during the proposed hopper dredging (i.e., 140 tows) to account for the likelihood of encountering more giant manta rays in the action area than the reported captures in a fishery in the northeast. Giant mantra rays are year round residents in the action area for this Opinion, including some that migrate out of the action area.

Table 8. Estimated Relocation Trawling Captures of Giant Manta Ray, 2001-2015 (NEFOP data).

	2001-2015
Total tows	57,829.12
Total Captures	11
CPUE	0.000190
Maximum annual estimated take of giant manta ray (CPUE x 140 tows)	0.0266

Because the calculated estimate is a fraction, we round this estimate up to the nearest whole number. This gives us a total estimate of 1 giant manta ray to be relocated as part of a second nourishment that will use a hopper dredge to dredge 1,000,000 yds^3 of material.

6.3 Effects of the Proposed Action on Critical Habitat Considered for Further Analysis

The proposed action area is within the boundary of the Gulf sturgeon designated critical habitat Unit 11. Of the 7 possible habitat features essential for the conservation of Gulf sturgeon, 4 of these features are found in the marine and estuarine units of critical habitat. While Unit 11 of Gulf sturgeon critical habitat contains 4 essential features, we believe only one of those essential features may be adversely affected by the proposed action. The 4 essential features of Gulf sturgeon critical habitat that are present in Unit 11 are the following: (1) prey abundance; (2) water quality; (3) sediment quality; and (4) migratory pathways. Of these 4 essential features, we believe prey abundance is the only feature that is likely to be adversely affected by the proposed action.

The remaining 3 essential features that are not present in the action area and in Unit 11 are: (5) river spawning sites and substrates suitable for egg deposition; (6) Riverine aggregation areas, also known as resting, holding, and staging areas, used by adult, subadult, and/or juveniles, usually located in holes within riverbeds in fresh water; and, (7) flow regime in fresh water habitat necessary for normal behavior, growth and survival of all life stages in the riverine environment.

6.3.1 Routes of Effect that Are Not Likely to Adversely Affect Critical Habitat

We determined the proposed action may affect, but is not likely to adversely affect the following essential features: (2) water quality; and (3) sediment quality; and (4) migratory pathways.

Localized and temporary reductions in water quality (Essential Feature 2) through increased turbidity may result from dredging and dredged material placement. We believe the effect to Essential Feature 2 from localized and temporary increased turbidity will be insignificant because the action area is in a high wave/current area where we do not expect construction-induced turbidity to remain.

Effects to temperature, salinity, pH, hardness, oxygen content, and other chemical characteristics of Essential Feature 2 are not expected to result from dredging activities. Therefore, there is no effect to these aspects of Essential Feature 2 from localized and temporary turbidity due to dredging and dredged material placement.

Dredging and dredged material placement can affect sediment quality (Essential Feature 3). We believe the effect to Essential Feature 3 from dredging and material placement will be insignificant. The composition of materials that will be dredged from and relocated to other portions of the project area are likely to be the same as those remaining in the dredge footprint and the placement area; therefore, no permanent alteration of habitat composition will occur within the action area. Because similar habitat is expected to be present pre- and post-dredging and placement, it is anticipated that the benthic biota in the dredging areas will have the ability to recover and re-colonize.

Effects to migratory pathways (Essential Feature 4) are expected to be minimal because the nourishment work would only effect approximately 13,000 lin ft (2.5 mi) of shoreline and because the project area is in open water and would allow sufficient opportunity for Gulf sturgeon to utilize the area as a migratory pathway.

6.3.2 Routes of Effect that Are Likely to Adversely Affect Critical Habitat

6.3.3 Prey Abundance (Essential Feature 1)

When evaluating the effects to Gulf sturgeon prey abundance (Essential Feature 1), we considered the following factors: Gulf sturgeon sub-populations using affected critical habitat, mean generation time, foraging behavior, prey items, benthic community structure, potential Gulf sturgeon prey in the action area, and benthos recovery after burial. We determined that all of the aforementioned factors are relevant to the proposed action and hence are analyzed in this opinion.

Gulf sturgeon sub-populations using affected critical habitat

Both adult and subadult Gulf sturgeon from the Yellow River, Choctawhatchee River, and Apalachicola River likely use the action area for feeding. Since the beach nourishment will occur only 2 times over a 15-year period, individuals from these sub-populations will have ample alternative foraging habitat during construction and post-construction.

Mean Generation Time

Mean generation time (mean period elapsing between the birth of the parents and the birth of the offspring) is a useful tool to estimate the period of time for a population to increase in size. While mean generation time is unknown for the Gulf sturgeon, it has been calculated for the shortnose sturgeon (*A. brevirostrum*), a congener, to be between 10 and 30 years (NMFS 1998). A self-sustaining Gulf sturgeon population has been defined as one where the average rate of natural recruitment is at least equal to the average mortality rate in a 12-year period; 12 years is the approximate age at maturity for a female Gulf sturgeon (USFWS et al. 1995). Mean generation time is evaluated respective to the proposed action as it provides an estimated timeframe to expect an increase in population size. Given current measures to protect individuals, subpopulations, and habitat, NMFS is hopeful that the number of Gulf sturgeon will increase as many threats have been reduced with the protection afforded via Section 7 of the ESA. Given the long time frame of the project and the limited linear shoreline distance of the project (2.5 miles), some cohorts utilizing the project area during the project period may be temporarily affected, but we do not expect the proposed action to affect overall population trends or mean generation time.

Foraging Behavior

Gulf sturgeon possess a highly protrusible mouth that extends downward to vacuum up sediments containing their prey (i.e., infaunal macroinvertebrates). This suction feeding requires an expandable mouth cavity and a relatively narrow mouth through which to funnel water and food items (Westneat 2001). Success of suction feeding relies on the ability of the predator's mouth to protrude into the proximity of prey (Westneat 2001); the suction tube of the sturgeon's mouth must be able to maintain contact with the benthos their prey inhabit. Findeis (1997) described sturgeon as exhibiting evolutionary traits adapted for cruising the benthos in search of prey. Notably, their caudal fin morphology has presumably been adapted for benthic cruising; the hypochordal lobe is often reduced to allow sweeping of the tail while close to the substrate (Findeis 1997).

Research supports that Gulf sturgeon are typically found foraging in depths greater than 1 m. Lower energy areas, where water depth is greater than 1 to 2 m, would likely assist foraging success given their feeding biology and the dissipation of wave energy. The protrusible mouth of these suction feeders must make contact with the benthos in order to vacuum prey out of the sediments while benthic cruising. The slightly deeper depths (2 to 4 m) the sturgeon seem to prefer would have less wave energy at the substrate compared to the shallower swash zone. Downward cycloidal movement of waves dissipates energy through the water column (i.e., wave energy is exponentially dissipated with depth). A sturgeon attempting to forage in a high-energy, shallow-water environment (i.e., the swash zone) would likely be challenged to retain position and maintain contact with the benthos. Therefore, Gulf sturgeon foraging success would likely be greater in the slightly deeper, lower energy areas compared to the high-energy swash zone.

As benthic cruisers, sturgeon forage extensively in an area, presumably until preferred prey is depleted or reduced, at which point they relocate and resume foraging. Tracking observations by (Edwards et al. 2003; Fox et al. 2002; Sulak and Clugston 1999) support that individual Gulf sturgeon move over an area until they encounter suitable prey type and density, at which time they forage for extended periods of time. Individual Gulf sturgeon often remain in localized areas (less than 1 km2) for extended periods of time (greater than two weeks) and then move rapidly to another area where localized movements occurred again (Fox et al. 2002). Edwards et al. (2007) also discussed mixing of Gulf sturgeon from different populations and overlap of winter habitat utilization. Gulf sturgeon tagged in seven Florida panhandle river systems were monitored from Carrabelle, Florida, to Mobile Bay, Alabama, during the winter period in the coastal waters of the Gulf of Mexico; Gulf sturgeon from different river systems were located occupying the same area of marine habitat (Ross et al. 2009). While the exact amount of benthic area required to sustain Gulf sturgeon health and growth is unknown (and likely dependent on fish size and reproductive status), Gulf sturgeon have been known to travel long distances (greater than 161 km) during their winter feeding period. This supports the likelihood that any Gulf sturgeon in the project area will find appropriate and abundant prey in the areas adjacent to the project location, as the coastal deposits flanking the Apalachicola-Choctawhatchee coastal area are predominantly beach-ridges comprised of oxidized quartz sands of the Pleistocene age. Therefore, an abundance of sandy habitat is available nearby the project area for foraging.

Prey Items

Prey availability is essential for development of different life stages of Gulf sturgeon using critical habitat in the action area. Both adult and subadult Gulf sturgeon are known to lose up to 30% of their total body weight while over-summering in the rivers, and subsequently compensate the loss during winter feeding in estuarine and marine areas (Carr 1983; Clugston et al. 1995; Heise et al. 1999; Morrow et al. 1998; Ross et al. 2000; Sulak and Clugston 1999; Wooley and Crateau 1985). Therefore, once Gulf sturgeon leave the river after having spent at least 6 months fasting, it is presumed that they immediately begin feeding. Upon exiting the rivers, Gulf sturgeon concentrate around the mouths of their natal rivers in lakes and bays (depth less than 20 ft). These areas are very important for the Gulf sturgeon as they offer the first foraging opportunity upon exiting the rivers. Gulf sturgeon have been described as opportunistic and indiscriminate benthivores; their guts generally contain benthic marine invertebrates including amphipods, lancelets, polychaetes, gastropods, shrimp, isopods, molluscs, and crustaceans (Carr et al. 1996; Fox et al. 2000; Fox et al. 2002; Huff 1975; Mason and Clugston 1993). Generally, Gulf sturgeon prey are burrowing species (e.g., annelids, polychaetes, oligochaetes, amphipods, isopods, and lancelets) that feed on detritus and suspended particles, and inhabit sandy substrate. The project area is not an entrance to a river, lake, or bay and is therefore not utilized by sturgeon exiting a river after months of fasting. Rather, the project area is utilized by Gulf sturgeon during their winter foraging period. Prey items may not be abundant in areas that have been recently dredged or where beach nourishment has recently occurred; however, these areas are expected to recover relatively quickly and sturgeon would also be able to move to adjacent foraging sites that have not been disturbed. Before the prey items recover completely, prey availability and Gulf sturgeon foraging areas are likely to be temporarily adversely affected.

Benthic Community Structure

NMFS is not aware of any research or surveys to fully describe benthic composition in or nearby the proposed project area. Data collected nearby within Choctawhatchee Bay (Fox and Hightower 1998, Fox et al. 2002, Parauka et al. 2001) indicate that Gulf sturgeon show a preference for sandy shoreline habitats with the majority of fish being located in areas lacking seagrass. Craft et al. (2001) found that Gulf sturgeon in Pensacola Bay prefer shallow shoals with non-vegetated, fine- to medium-grain sand habitats such as sandbars and subtidal energy zones resulting in sediment sorting and a preponderance of sand supporting a variety of prey items. Habitats used with the project area tend to have a clean sand substrate and all benthic samples from the area contained lancelets (Ross et al. 2001). Other nearshore Gulf of Mexico locations where Gulf sturgeon are often located (via telemetry and tag returns) consist of unconsolidated, fine-medium grain sand habitats, including natural inlets and passes that are known to support Gulf sturgeon prey items (Menzel 1971, Abele and Kim 1986). Tagging studies have shown that Gulf sturgeon are foraging in these sandy areas where they are repeatedly located, as this habitat supports their prey (see preceding *"Prey items"* for specifics). Beach nourishment conducted in this area is performed in small sections at a time, which would only affect a limited number of prey items for a short time. Adjacent sections would be unaffected and prey abundance in those areas would not change. The applicant proposes to use sand of similar quality from nearby borrow areas to renourish the beach, so overall benthic community structure is not likely to change, though temporary adverse effects are likely before the areas are recolonized.

Potential Gulf Sturgeon Prey in the Action Area
The sandy substrate of the intertidal swash zone (where placement of dredged material will occur) provides habitat for benthic and infaunal communities characterized by low species diversity. Saloman and Naughton (1984) investigated benthic macroinvertebrate assemblages inhabiting the swash zone at Panama City Beach, Florida. Sampling data showed four dominant species representing four families: *Donax texasianus*, a burrowing bivalve; *Scolelepis squamata*, a polychaete worm; *Haustorius sp.*, an amphipod; and *Emerita talpoida*, an anomuran crab. Saloman and Naughton concluded that benthic communities inhabiting the swash zone of Panama City Beach were typical of other sandy northern Gulf of Mexico beaches. Similar benthic communities in this zone should exist along all of the beaches in Bay County, Florida.

As with most sandy beaches in Northwest Florida, the nearshore zone (the location of both the dredge and disposal sites) along this region consists of two distinct longshore sandbars. For Florida's northwest beaches, the first and second sandbars are typically located approximately 50 to 80 ft and 425 to 460 ft offshore (Wolfe et al. 1988). These sandbars and associated troughs provide habitat for a diverse benthic community. Investigations by Saloman and Naughton (1984) of benthic faunal populations inhabiting the nearshore zone off Panama City Beach, Florida, show that a variety of crabs, marine worms, clams, cumaceas, and sand hoppers dominate the nearshore zone. *Donax texasianus*, a burrowing bivalve, commonly occurred on both sandbars and troughs in between. Other dominant species found on the first offshore bar include *Haustorius sp.* (an amphipod), *Mancocuma sp.* (a cumacean), and *Scolelepis squamata* (a polychaete worm). Additional dominant species found on the second sandbar and adjacent landward trough includes the haustoriid amphipods. The project will temporarily impact Gulf sturgeon prey, but they are expected to recover, though complete recovery may not be equal in all areas or with all species initially; however, the project area should equalize over time and return to its pre-project status eventually.

Recovery of Benthic Biota

Dredging and placement of the beach-quality sand on Mexico Beach will sporadically disturb Unit 11 of designated Gulf sturgeon critical habitat during the 15-year life of the proposed permit. Sediments will be removed from the new Mexico Beach Borrow Area and placed on the nearby public beach in Mexico Beach, Florida. Beach-quality sand is ubiquitous throughout the project area and sediments removed will be homogenous with those that will remain. Therefore, no alteration of sediment composition will occur. However, prey abundance and diversity may be adversely affected until the disturbed areas are able to recolonize.

Benthic prey removed from the borrow areas may survive the sediment transfer through the hydraulic pipeline and subsequently recolonize when deposited in the nearshore habitat. Benthic prey will most likely recolonize the borrow areas given the sporadic dredging activity that has occurred so far in the life of the permit. There have been several occasions during which the areas have not been disturbed for a year or more and have allowed sediment composition and depth to remain consistent, which is required for recolonization (Nelson 1989 and 1993; Rakocinski et al. 1996). The applicant will have a 15-year permit to nourish Mexico Beach, with 2 nourishment events anticipated during the life of the permit. The habitat perturbation that will occur is expected to be sporadic. Prey species are expected to return to areas that have been disturbed, but there will be a lag time before areas completely recolonize. Subsequently, Gulf sturgeon foraging areas within Unit 11 of Gulf sturgeon critical habitat are likely to be temporarily adversely affected.

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.

Cumulative effects from unrelated, non-federal actions occurring in the area may affect sea turtles and their habitats and Gulf sturgeon critical habitat. Stranding data indicate sea turtles in Gulf of Mexico waters die of various natural causes, including cold stunning and hurricanes, as well as human activities, such as incidental capture in state fisheries, ingestion of and/or entanglement in debris, ship strikes, and degradation of nesting habitat. The cause of death of most sea turtles recovered by the stranding network is unknown.

In addition to fisheries, NMFS is not aware of any proposed or anticipated changes in other human-related actions (e.g., habitat degradation) or natural conditions (e.g., changes in oceanic conditions, etc.) that would substantially change the impacts that each threat has on the sea turtles covered by this opinion. Therefore, NMFS expects that the levels of interactions with sea turtles described above will continue at similar levels into the foreseeable future.

Due to the number of offshore oil drilling rigs in the Gulf of Mexico, oil spills have been known to occur unexpectedly. The extent and time and location of potential future oil spills are not fully known at this time. Routes of exposure associated with oil spills are generally believed to be: 1) suffocation of infaunal organisms, and 2) toxicity of substrate. Both of these effects would impact potential foraging areas within Gulf sturgeon critical habitat through the displacement and reduction of prey items.

Coastal runoff and river discharges carry large volumes of petrochemical and other contaminants from agricultural activities, cities, and industries into the Gulf of Mexico. The coastal waters of the Gulf of Mexico have more sites with high contaminant concentrations than other areas of the coastal United States due to the large number of waste discharge point sources. Chemicals and metals such as chlordane, DDE, DDT, dieldrin, PCBs, cadmium, mercury, and selenium settle to the substrate and are later incorporated into the food web as they are consumed by benthic feeders, such as sturgeon or macroinvertebrates. Some of these compounds may affect the surrounding environment by reducing DO, altering pH, and altering other water quality properties. Although little is known about contaminant effects on Gulf sturgeon critical habitat general studies on sturgeon habitats indicate that the effects of contaminants and pollution contribute to lost habitat (Barannikova 1995; Shagaeva et al. 1995; Verina and Peseridi 1979).

8 INTEGRATION AND SYNTHESIS

8.1 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 turtles (North and South Atlantic DPSs), loggerhead sea turtles (Northwest Atlantic DPS), and giant manta rays. 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.

Because hopper dredging is only anticipated as part of a second nourishment during the life of the proposed 15 year permit, but not as part of the initial phase of the project, our jeopardy analysis evaluates anticipated take for this single hopper dredging event.

8.1.1 Green Sea Turtle (North and South Atlantic DPSs)

As discussed in Section 4 of this Opinion, individuals from both the green sea turtle North and South Atlantic DPSs can be found on foraging grounds in the Gulf of Mexico region, and we expect individuals from both DPSs to be found in waters in the action area for the proposed project. To analyze effects in a precautionary manner, we will conduct 2 jeopardy analyses, one for each DPS (i.e., assuming animals would be taken from both DPSs). 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). Based on that analysis, for this Opinion, we will assume 96% of the takes would come from the North Atlantic DPS, while 4% may come from the South Atlantic DPS. From our analysis in Section 6.2.2.1, we estimated 1 non-lethal green sea turtle take from relocation trawling during the 15-year life of the project. While all of the non-lethal take is likely to come from the North Atlantic DPS, it is possible that 1 (4% of 1, rounded up) might come from the South Atlantic DPS; therefore, we will analyze the potential for non-lethal take of up to 1 individual from the North Atlantic DPS and up to 1 individual from the South Atlantic DPS.

8.1.1.1 Green Sea Turtle – North Atlantic DPS

Survival

The potential non-lethal capture of up to 1 green sea turtle from the North Atlantic DPS (relocation trawling) during the 15-year life of the project is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. The individuals suffering non-lethal injuries or stress are expected to fully recover such that no reductions in reproduction or numbers of green sea turtles from the North Atlantic DPS are anticipated. The captures may occur anywhere in the action area, which encompasses only a tiny portion of green sea turtles' overall range and distribution within the North Atlantic DPS. Any animal incidentally caught during relocation trawling would be released within the general area where caught, no change in the distribution of the North Atlantic DPS of green sea turtles is anticipated. Because the proposed action is not likely to affect the numbers, reproduction, or distribution of the North Atlantic DPS of green sea turtles, the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the species in the wild.

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 1991b) 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:

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

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.

We do not expect the non-lethal take of up to 1 green sea turtle from the North Atlantic DPS to have any detectable influence on the recovery objectives. Thus, the proposed action will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of NA DPS green sea turtles' recovery in the wild.

Conclusion
The anticipated non-lethal take of up to 1 green sea turtle from the North Atlantic DPS associated with the proposed action is not expected to cause a reduction in the likelihood of either the survival or recovery of the North Atlantic DPS of the green sea turtle in the wild.

8.1.1.2 Green Sea Turtle – South Atlantic DPS

Survival
The potential non-lethal capture of up to 1 green sea turtle from the South Atlantic DPS (relocation trawling) during the 15-year life of the project is not expected to have any measurable impact on the reproduction, numbers, or distribution of these species. The individual suffering non-lethal injuries or stress is expected to fully recover such that no reductions in reproduction or numbers of green sea turtles from the South Atlantic DPS are anticipated. The capture may occur anywhere in the action area, which encompasses only a tiny portion of green sea turtles' overall range and distribution within the South Atlantic DPS. Any animal incidentally caught during relocation trawling would be released within the general area where caught, no change in the distribution of the South Atlantic DPS of green sea turtles is anticipated. Because the proposed action is not likely to affect the numbers, reproduction, or distribution of the South Atlantic DPS of green sea turtles, the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the species in the wild.

Recovery
In certain instances, an action that does not appreciably reduce the likelihood of a species' survival might affect its likelihood of recovery or the rate at which recovery is expected to occur to an extent that the species' continued existence is jeopardized. NMFS has determined that the proposed action will not reduce the likelihood that the South Atlantic DPS of green sea turtles will survive in the wild. Here, NMFS considers the potential for the action to reduce the likelihood of recovery. Like the North Atlantic DPS, the South Atlantic DPS of green sea turtles does not have a separate recovery plan in place at this time. However, an Atlantic Recovery Plan for the population of Atlantic green sea turtles (NMFS and USFWS 1991) does exist. Since the animals within the South 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 South Atlantic DPS, is developed. In our analysis for the North Atlantic DPS, we stated that the Atlantic Recovery Plan lists the following relevant recovery objectives over a period of 25 continuous years:

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

The nesting recovery objective is specific to the North Atlantic DPS (since it specifies Florida nesting), but demonstrates the importance of increases in nesting to recovery. As previously stated, nesting at the primary South Atlantic DPS nesting beaches appears to have been increasing over the course of the decades. There are currently no estimates available specifically addressing changes in abundance of individuals on foraging grounds. Given the apparent increases in nesting abundance, however, it is likely that numbers on foraging grounds have also increased.

Non-lethal capture of sea turtles 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 a reduction in the likelihood of the South Atlantic DPS of green sea turtles' recovery in the wild.

Conclusion
The non-lethal take of up to 1 green sea turtle from the South Atlantic DPS associated with the proposed action is not expected to cause a reduction in the likelihood of either the survival or recovery of the South Atlantic DPS of the green sea turtle in the wild.

8.1.2 Loggerhead Sea Turtle (Northwest Atlantic DPS)

Survival
The proposed action is expected to result in take of up to 9 loggerhead sea turtles (2 lethal, 7 non-lethal) from the Northwest Atlantic DPS during the 15-year lifespan of the proposed project. Any potential non-lethal take is not expected to have a measurable impact on the reproduction, numbers, or distribution of this species. The individuals suffering non-lethal injuries are expected to fully recover such that no reductions in reproduction or numbers of loggerhead sea turtles are anticipated. All non-lethal take 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 captured animals would be released within the general area where caught and no change in the distribution of the Northwest Atlantic DPS of loggerhead sea turtles would be anticipated.

The potential lethal take of up to 2 loggerhead sea turtles (1 observed, 1 not observed) during the 15-year life of the project would reduce the number of Northwest Atlantic DPS loggerhead sea turtles, compared to their numbers in the absence of the proposed action, assuming all other variables remained the same. Potential 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, an adult female loggerhead sea turtle can lay 3 or 4 clutches of eggs every 2-4 years, with 100-130 eggs per clutch. Thus, the loss of 2 adult female loggerhead sea turtles could preclude the production of thousands of eggs and hatchlings of which a small percentage would be expected to survive to sexual maturity. A reduction in the distribution of loggerhead sea turtles is not expected from lethal take attributed to the proposed action. Because all the potential interactions are expected to occur at random throughout the proposed action area, which accounts for a tiny fraction of the species' overall range, the distribution of loggerhead sea turtles is expected to be unaffected.

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 (Section 4.1.4), 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 the 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 up to 2 loggerhead sea turtles during the 15-year lifespan of the project 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. While there is no site-specific dredging data for the proposed project site, the proposed project is similar to other, nearby dredge projects occurring within the shared jurisdictional area between USACE Mobile and Jacksonville Districts. Thus, impacts to this species from dredge and fill activities occurring adjacent to the action area are already factored in the abundance trends of this species. 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 proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival of the Northwest Atlantic DPS of the loggerhead sea turtle in the wild.

Recovery

The recovery plan for the Northwest Atlantic population of loggerhead sea turtles (NMFS and USFWS 2009) was written prior to the loggerhead sea turtle DPS listings. However, this plan deals with the populations that comprise the current 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 action:

- *Objective: 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*
- *Objective: 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*

In Section 4.1.1.4, we summarized available information on the 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. 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 from 2012-2016 resulting in widening confidence intervals. Nesting at the core index beaches declined in 2017 to 48,033, and rose slightly again to 48,983 in 2018, which is still the fourth highest total since 2001. However, it is important to note that with the wide confidence intervals and uncertainty around the variability in nesting parameters (changes and variability in nests/female, nesting intervals, etc.), it is unclear whether the nesting trend equates to an increase in the population or nesting females over that time frame (Ceriani et al. 2019). In-water research suggests the abundance of neritic juvenile loggerheads is also steady or increasing. Thus, the potential lethal capture of up to 2 loggerhead sea turtles during the 15-year lifespan of the proposed project 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 take 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, the proposed action will not impede achieving the recovery objectives above and will not result in an appreciable reduction in the likelihood of the Northwest Atlantic DPS of loggerhead sea turtles' recovery in the wild.

Conclusion
The combined lethal and non-lethal captures 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.

8.1.3 Giant Manta Ray

The proposed action is expected to result in the capture of 1 giant manta ray during relocation trawling associated with the proposed project. We expect all captures to be non-lethal.

Survival
The non-lethal capture of 1 giant manta ray is not expected to have any measurable impact on the reproduction, numbers, or distribution of this species. The individual captured is expected to fully recover such that no reductions in reproduction or numbers of this species are anticipated. Since this capture would 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.

Recovery
A recovery plan for the 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 interim guidance to direct recovery efforts for the giant manta ray. The recovery outline identifies two primary interim goals:

- Stabilize population trends through reduction of threats, such that the species is no longer declining throughout a significant portion of its range; and
- 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 post-release mortality), 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. Relocation trawling 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 individual suffering non-lethal capture is expected to fully recover such that no reductions in reproduction or numbers of giant manta rays are anticipated. The non-lethal capture will occur 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 1 giant manta ray associated with the proposed action is not expected to cause an appreciable reduction in the likelihood of recovery of the giant manta ray in the wild.

Conclusion
The potential non-lethal capture of 1 giant manta ray associated with the proposed action is not expected to cause an appreciable reduction in the likelihood of either the survival or recovery of the giant manta ray in the wild. Mortalities are not expected and the proposed project will not result in an appreciable reduction in the likelihood of giant manta ray recovery in the wild.

8.2 Critical Habitat Destruction or Adverse Modification Analysis

NMFS's regulations define *destruction or adverse modification* to mean "a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02). Alterations that may destroy or adversely modify critical habitat may include impacts to the area itself, such as those that would impede access to or use of the essential features. NMFS will generally conclude that a federal action is likely to "destroy or adversely modify" critical habitat if the action results in an alteration of the quantity or quality of the essential physical or biological features of critical habitat and if the effect of the alteration is to appreciably diminish the value of critical habitat as a whole for the conservation of the species.

This analysis takes into account the geographic and temporal scope of the proposed action, recognizing that "functionality" of critical habitat necessarily means that the critical habitat must now and must continue in the future to support the conservation of the species and progress toward recovery. The analysis takes into account any changes in amount, distribution, or characteristics of the critical habitat that will be required over time to support the successful recovery of the species. Destruction or adverse modification does not depend strictly on the size or proportion of the area adversely affected, but rather on the role the action area and the affected critical habitat serves with regard to the function of the overall critical habitat designation, and how that role is affected by the action.

The area of impact within Unit 11 is the direct placement of 2.5 mcy beach compatible sand on 172.9 ac along 13,000 lin ft (2.5 mi) of shoreline.

Even though sand deposited into the nearshore area may suffocate some existing benthic macroinvertebretes, it is expected that some of the existing infauna will survive, given the thin-layer deposition of sand, thereby allowing existing macroinfauna to migrate upward into aerobic habitat. Deposited sands are expected to be quickly distributed by natural currents and the system will rapidly return to equilibrium. As previously discussed, Gulf sturgeon are opportunistic feeders that forage over large distances, and thus will be able to locate prey throughout nearby portions of Unit 11 should localized prey density be reduced by this action; therefore, Gulf sturgeon will be able to traverse and forage in the remaining unaffected areas. Given that sturgeon forage opportunistically while benthic cruising, they can easily locate prey and fulfill nutritional requirements in available sandy areas adjacent to those impacted.

Finally, the proposed action will not interfere with recovery objectives, actions, or tasks identified in the Gulf sturgeon recovery plan (USFWS et al. 1995). NMFS concludes that the effects of the 15-year authorization for nourishment of Mexico Beach in Bay County, Florida, will not discernibly impact the ecological function of Gulf sturgeon critical habitat Unit 11, and thus the critical habitat as a whole, and that it will continue to serve its intended conservation role for Gulf sturgeon.

9 CONCLUSION

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

The proposed action will result in the non-lethal take of green (North and South Atlantic DPSs) sea turtles and giant manta ray, and the lethal and non-lethal take of loggerhead (Northwest Atlantic DPS) sea turtles. 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 the green sea turtle (North and South Atlantic DPSs), the loggerhead sea turtle (Northwest Atlantic DPS), and the giant manta ray.

We conclude that there will be no permanent loss of designated critical habitat for Gulf sturgeon (Unit 11) due to the proposed action. The proposed action will not interfere with achieving the relevant habitat-based recovery objectives for Gulf sturgeon and will not impede the critical habitat's ability as a whole to support the conservation of Gulf sturgeon, despite permanent adverse effects. Therefore, given the nature of the proposed action and the information provided above, we conclude that the action, as proposed, is not likely to destroy or adversely modify the critical habitat of Gulf sturgeon.

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.

Section 7(b)(4)(c) of the ESA specifies that to provide an Incidental Take Statement for an endangered or threatened species of marine mammal, the taking must be authorized under Section 101(a)(5) of the MMPA. Since no incidental take of listed marine mammals is anticipated as a result of the proposed action, no statement on incidental take of protected marine mammals is provided and no take is authorized. Nevertheless, the applicant must immediately notify (within 24 hours, if communication is possible) our Office of Protected Resources if a take of a listed marine mammal occurs.

Nonetheless, 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, Mexico Beach Renourishment, the issuance date, and ECO tracking number, SERO-2022-02839, 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 or Extent of Anticipated Incidental Take

Based on the information and analyses presented in Section 6, NMFS believes that the proposed action is likely to adversely affect green sea turtle (North and South Atlantic DPSs), loggerhead sea turtle (Northwest Atlantic DPS), and giant manta ray. These effects will result from hopper dredging and associated relocation trawling and handling.

Sea Turtles
We anticipate that the proposed action will incidentally take green (North and South Atlantic DPSs) and loggerhead (Northwest Atlantic DPS) sea turtles; however, since green and loggerhead sea turtle take is covered by the Incidental Take Statement in GRBO, no additional take is authorized in this Opinion. NMFS issued GRBO before revising the green sea turtle listing to list green sea turtles as 11 DPSs, and before revising the loggerhead sea turtle listing to list loggerhead sea turtles as 9 DPSs. We do not anticipate different effects or additional take of green sea turtles or loggerhead sea turtles from the proposed project in this Opinion beyond those contemplated in GRBO, as a programmatic opinion on the effects of multiple projects. In addition, those green and loggerhead sea turtles are individuals that are now considered part of the North and South Atlantic DPSs of green sea turtles and the Northwest Atlantic DPS of loggerhead sea turtles. The GRBO Incidental Take Statement for green sea turtles, therefore, represents the anticipated amount of take from the North and South Atlantic DPSs, combined, and the GRBO Incidental Take Statement for loggerhead sea turtles represents the anticipated amount of take from the Northwest Atlantic DPS from dredging projects in the Gulf of Mexico region, including the proposed project. Therefore, we do not need separate take limits for the North and South Atlantic DPSs of green sea turtles or for the Northwest Atlantic DPS of loggerhead sea turtles from the proposed action.

Giant Manta Ray
We anticipate that the proposed action will incidentally take 1 giant manta ray. We expect all interactions with giant manta ray to be non-lethal.

10.3 Effect of Take

NMFS has determined that the anticipated incidental take specified in Section 10.2 is not likely to jeopardize the continued existence of green sea turtle (North and South Atlantic DPSs), loggerhead sea turtle (Northwest Atlantic DPS), or giant manta ray 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 take. Only incidental take that occurs 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. USACE must ensure that the applicant provides take reports regarding all interactions with **giant manta ray** that occur during the proposed project.
2. USACE must ensure that the applicant minimizes the likelihood of injury or mortality to **giant manta ray** resulting from relocation trawling and subsequent handling of animals.

10.5 Terms and Conditions

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

- USACE must ensure that the applicant reports all known captures of ESA-listed species and any other takes of ESA-listed species to the NMFS SERO PRD.

- If and when the applicant becomes aware of any known reported capture, entanglement, stranding, or other take of **giant manta ray**, 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-2022-02839 Mexico Beach Nourishment) and date of issuance.
  - This form shall be completed for each individual known reported capture, entanglement, stranding, or other take incident for **giant manta ray**.
  - The form must include the species name, state the date and time of the incident, 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.
- After the final relocation trawling event, the applicant must submit a summary report of capture, entanglement, stranding, or other take of **giant manta ray** to NMFS SERO PRD by email: nmfs.ser.esa.consultations@noaa.gov.
  - Emails and reports must reference this Opinion by the NMFS tracking number (SERO-2022-02839 Mexico Beach Nourishment) and date of issuance.
  - The report will contain the following information: the total number of **giant manta ray** captures, entanglements, strandings, or other take that was reported during the relocation trawling.

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:

1) Gather data describing community structure of the benthos in and nearby the project area that would help determine local Gulf sturgeon prey availability and thereby assist in future assessments of impacts to designated critical habitat.

NMFS requests notification if the conservation recommendation is implemented. This will assist us with evaluating future project effects on Gulf sturgeon or designated Gulf sturgeon critical habitat.

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, USACE must immediately request reinitiation of formal consultation and project activities may only resume if USACE establishes that such continuation will not violate Sections 7(a)(2) and 7(d) of the ESA.

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APPENDIX A

1 Handling and Reporting Protocol for ESA-listed Species Observed or Encountered and Protected Species Observer (PSO) Roles and Responsibilities

All ESA-listed species that are observed or encountered during any activity covered under the 2020 SARBO, will be handled and reported as described in this Appendix, referred to as the PSO PDCs. These PDCs outline the requirements of vessel crew to report observations and for the PSO to observe for and handle ESA-listed species captured during dredging or relocation trawling. These requirements are in addition to any other applicable PDCs outlined in Appendix B-Appendix G and the requirements outlined in the 2020 SARBO. Vessel crew and PSOs working on projects covered under the 2020 SARBO should also be aware of the conditions in the PDCs that are applicable to the project upon which they are working on under the 2020 SARBO. Modifications to the handling procedures may be necessary to improve safe handling practices for both crew and animals. The current handling guidance (PSO PDCs) is available at (SERODredge@noaa.gov).

Alternative review: In limited instances, a project may be authorized under the 2020 SARBO if it does not adhere to all applicable PDCs, under the Alternative Process for Project Specific Review and Inclusion of Projects with Substantially Similar Effects outlined in Section 2.9.5 of the 2020 SARBO. As described in the 2020 SARBO, projects that do not strictly comply with all applicable PDCs, but have substantially similar effects, may be authorized under 2020 SARBO if the project undergoes separate review and approval by NMFS prior to beginning work. Projects that cannot meet all relevant PDC requirements or that do not fit under the alternative review process outlined in Section 2.9.5 of the Opinion, will require individual Section 7 consultation. Any area previously authorized or permitted to be dredged or have material placed within the action area and analyzed in a separate individual Section 7 consultation may be maintained to the same dredge or fill template under this Opinion if it meets all of the PDCs of this Opinion.

2 Observations and Reporting Observations of ESA-listed Species

This outlines how staff operating on a project covered under the 2020 SARBO will respond to ESA-listed species that are observed, but with no physical interaction occurring with the animal.

OBSERVE.1 For generally stationary construction with work contained to a specific project area, such as mechanical dredging equipment:

- All personnel working on the project will report ESA-listed species observed in the area to the on-site crew member in charge of operations.
- Operations of moving equipment will cease if an ESA-listed species is observed within 150 ft of operations by any personnel working on a project covered under this Opinion (e.g., sea turtles, sturgeon, elasmobranchs [smalltooth sawfish, giant manta ray, scalloped hammerhead shark, oceanic white tip shark] or ESA-listed marine mammal).
- Activities will not resume until the ESA-listed species has departed the project area of its own volition (e.g., species was observed departing or 20 minutes have passed since the animal was last seen in the area).

OBSERVE.2 For a vessel underway, such as a hopper dredge or support vessel, traveling within or between operations must follow speed and distance requirements, defined below, while ensuring vessel safety:

- All personnel working onboard will report ESA-listed species observed in the area to the vessel captain.
- If an ESA-listed species is spotted within the vessel's path, initiate evasive maneuvers to avoid collision.
- If a North Atlantic right whale is spotted, slow to 10 knots and maintain a distance of at least 1,500 ft in accordance with the North Atlantic Right Whale Protection Rule (62 FR 6729 provides a distance of 500 yards, which is equal to 1,500 ft) and report the observation to 1-877-WHALE-HELP. Resumption of speed should be according to the North Atlantic Right Whale Conservation Plan (Appendix F).
- If a whale (other than a North Atlantic right whale) is spotted, maintain a distance of at least 300 ft.

OBSERVE.3 Report sightings (not encountered, collided with, or injured by a project covered under 2020 SARBO) of the following species:

- North Atlantic Right whale: As defined in the North Atlantic Right Whale Conservation Plan (Appendix F) and the reporting requirements in the 2020 SARBO Section 2.9.
- Smalltooth sawfish: Report sightings to 1-844-SAWFISH or email Sawfish@MyFWC.com.

OBSERVE.4 Any collision(s) with an ESA-listed species must be immediately reported to the USACE and/or BOEM according to their internal protocol and to NMFS consistent with the reporting requirements in the 2020 SARBO Section 2.9. A vessel collision with an ESA-listed species is counted as take for the project.

In addition, reports of certain species shall also be reported as listed below. A link to the most current contact information will also be available at (SERODredge@noaa.gov).

- Sea turtle take will also be reported to the appropriate state species representative (https://www.fisheries.noaa.gov/state-coordinators-sea-turtle-stranding-and-salvage-network).
- Smalltooth sawfish take will also be reported to 1-844-4SAWFISH or email Sawfish@MyFWC.com.

OBSERVE.5 Any collision with a marine mammal will be reported immediately to the Southeast Regional Marine Mammal Stranding hotline at 1-877-WHALE-HELP (1-877-942-5343) for guidance. This includes both ESA and non-ESA listed marine mammals.

3 PSO Credentials

All handling, tagging, and/or genetic sampling of ESA-listed species captured on projects covered under 2020 SARBO will be conducted by a PSO that meets the qualifications provided by NMFS.

PSO.1 Protected Species Training and Experience: PSOs selected to work on projects covered under 2020 SARBO will meet the following requirements:

- PSOs will meet the training and experience requirements outlined by NMFS. At the time of the completion of 2020 SARBO, PSO qualifications are confirmed by the NMFS Greater Atlantic Region Office, as defined on their website (https://www.fisheries.noaa.gov/new-england-mid-atlantic/careers-and-opportunities/protected-species-observers) for endangered species observers. A link to the current NMFS PSO qualifications will also be available on the NMFS SARBO webpage (SERODredge@noaa.gov).
- PSOs will be trained and have experience to operate on the specific equipment they are aboard (e.g., hopper dredge, relocation trawler, G&G survey vessel). PSO will have training and/or experience to identify and handle all species that may occur in the geographic area of the project.
- PSO will be trained to safely install the specific tags being used and or collect genetic samples required under 2020 SARBO.
- ESA-listed species specific safe handling procedures, tagging procedures, and genetic sampling procedures must be followed, as outlined in these PSO PDCs. The most current procedures will be available on the NMFS SARBO webpage (SERODredge@noaa.gov). The PSO must carry a copy of the PSO PDCs and all other applicable PDCs while on the vessel for easy reference.
- The 2020 SARBO serves as the authority for the PSO to handle, tag, and genetic sample ESA-listed species for those projects.

PSO.2 To minimize the risk of vessel collisions, a PSO trained in species observation is also responsible for monitoring for the presence of ESA-listed species when the vessel is in motion and must therefore have the training and experience needed to identifying ESA-listed species and marine mammals in their natural environment.

4 PSO Responsibilities

The Section outlines the responsibilities of a PSO working on a relocation trawler or hopper dredge. The PSO is also responsible for all other duties outlined in the PDCs of this appendix and those described in:

- The North Atlantic Right Whale Plan in Appendix F, if working in areas when and where North Atlantic right whale may be present as defined in Appendix F.
- The duties outlined in the hopper dredging PDCs in Appendix B, Section 3, if working on a hopper dredge.

Note: PSOs are also trained and may be responsible for monitoring for non-ESA-listed species including marine mammals protected under the Marine Mammal Protection Act. While the requirements outlined in the 2020 SARBO PDCs are limited to ESA-listed species, the PSO PDCs include guidance to minimize the risk of encounter with non-ESA listed marine mammals. The 2020 SARBO does not provide MMPA authorization.

4.1 PSO Guidance for handling ESA-listed species captured or observed injured or dead

The following PDCs describe how the PSO will handle ESA-listed species captured in hopper dredging and relocation trawling. If an ESA-listed species is observed injured or dead during other forms of dredging or material placement, this guidance also applies (e.g., observed during beach sand placement, in an upland disposal area, and while mechanical or cutterhead dredging).

PSO.3 PSOs observer coverage requirements are required to monitor for ESA-listed species as described below. PSOs on any project will not be assigned any other task (i.e., captain or other vessel crew position or task) while performing the role of PSO:

- Hopper dredging:
  - More than 1 PSO will be aboard the hopper dredge at all times.
  - The PSO on-duty is responsible for personally monitoring, handling, and reporting all captured ESA-listed species at all times when the hopper dredge is operating and follow the requirements of this Opinion including the hopper dredging PDCs in Appendix B, Section 3.
  - The PSOs will stand watch to detect ESA-listed species in the area and to alert the captain of their presence to avoid vessel collision whenever the vessel is moving. The on-duty PSO will only be responsible for standing watch and not performing other tasks such as inspecting or handling captures when the vessel is in motion.
- Relocation trawling: A PSO(s) will be aboard the trawling vessel at all times.
  - The PSO is responsible for all handling and reporting of ESA-listed species.
  - Trawling crew may assist in the removal of species from the nets and data recording only and the PSO is responsible for all tagging, genetic sampling, and assuring information reported is accurate.

- All crew aboard the vessel, including the PSO, are responsible for monitoring for the presence of ESA-listed species in the area and reporting it to the vessel captain and PSO.

PSO.4 Reporting Captures of ESA-listed Species:

- Report to NMFS: All nonlethal captures and dead ESA-listed species observed or collected during a project covered under the 2020 SARBO will be recorded and reported to NMFS according to the procedures outlined in the 2020 SARBO Section 2.9. The captures will be recorded as follows:
  - Nonlethal take:
    - ESA-listed species captured and released back into the wild alive and healthy, will be considered nonlethal take.
    - If a sea turtle is entrained in a hopper dredge and is retrieved alive, the specialist such as a state sea turtle coordinator or sea turtle rehabilitation center specialist must be contacted to determine how the turtle should be handled (e.g., euthanized or taken to a rehabilitation facility). The take for a live turtle entrained in a hopper dredge is considered lethal until deemed healthy after an evaluation or rehabilitation and released back into the wild, then the take can be revised to be nonlethal.
    - If a sea turtle is captured in relocation trawling and is deemed unhealthy or injured and requires being sent to a specialist for further evaluation, the take is considered nonlethal, unless the species cannot be released back into the wild or dies, in which case the take must be updated to a lethal take.
  - Lethal take: All ESA-listed species that are captured that are determined to be fresh dead, will be considered lethal take associated with the project and counted under the total allowed take for the 2020 SARBO. This includes the capture of ESA-listed species in relocation trawling or found within the project area including material removal and material placement areas. An explanation of how to determine if a species is fresh dead or decomposed and how to handle and report the specimen is provided in PSO PDC Section 4 below.
  - Recovered dead: All ESA-listed species captured or observed in the project area that are decomposing will be considered a recovered specimen and will not be counted against the 2020 SARBO Incidental Take Statement. An explanation of how to determine if a species is fresh dead or decomposed and how to handle and report the specimen is provided in PSO PDC Section 4 below.
- Report captures to other agencies:

- Sea turtles: All captures will be reported to the appropriate state species representative including live, fresh dead, and recovered dead (https://www.fisheries.noaa.gov/state-coordinators-sea-turtle-stranding-and-salvage-network).
- Smalltooth sawfish take will be reported to 1-844-4SAWFISH or email Sawfish@MyFWC.com.
- Giant manta ray will be reported to manta.ray@noaa.gov.

PSO.5 Photo Documentation: Photograph all captured ESA-listed species for identification purposes and classify sex where applicable (e.g., sea turtles). In addition, take photographs of all injuries to ESA-listed species and provide a high resolution digital image with the take reporting forms as part of the reporting requirements outlined in the 2020 SARBO Section 2.9, as follows:

- Captures in relocation trawling that are not brought aboard the vessel or are released from the net will be photographed for identification purposes. Photographing should be done as quickly as possible to minimize the time the animal is out of the water and will not require manipulating the animal to improve the photograph.
- All injured, deceased, or otherwise debilitated sea turtles encountered during the course of dredging operations, whether intact, damaged, or partial remains, are thoroughly photographed.
- All surfaces should be clearly represented in the photos with both wide vantage and close-up images that portray any injuries and postmortem condition (if deceased).
- Minimally, this includes multiple images of the dorsal (top) and ventral (bottom) aspects of each specimen taken from different angles and perspectives.
- An identification placard and scale should appear in the images but should not obscure the specimen, injury, or specific area of interest. The identification placard will include the location of capture, date, time, and species. In addition, the time settings on the camera should be current so that the time stamp within the photo metadata is accurate.
- For any live capture that is injured or otherwise debilitated and will be taken to a rehabilitation facility, photographs can be delayed in order to minimize stress and risk of further injury prior to veterinary examination.
- For deceased specimens, photos will be taken within 2 hours following discovery so that postmortem state in the images accurately portrays the condition at the time of discovery.

PSO.6 Written Documentation: Document all relevant details of the capture according to the reporting requirements in the 2020 SARBO, Section 2.9 (e.g., species, size, sex, condition upon release, location of capture, and time of capture) that can be observed or measured by the PSO without causing harm to the animal.

PSO.7 Tagging: Nonlethal captures of ESA-listed species captured by projects covered under the 2020 SARBO will be tagged according to the following requirements. Tagging requirements only apply to those ESA-listed species that are brought aboard a relocation trawler (PSO PDC Section 3) or those captured and ultimately released alive from a hopper dredge after being evaluated by a specialist and/or rehabilitated.

- Scanning: All ESA-listed species (live and dead) and/or species parts captured by a hopper dredge or brought aboard a relocation trawler will be scanned for passive integrated transponder (PIT) tags to determine if the animal has been previously tagged. The presence of any external tags (e.g., flipper tags, dart tags) will also be noted. All previous tag numbers must be recorded and reported on the appropriate forms outlined for each species in PSO PDC Sections 5-9 below.
- Tagging: All ESA-listed species captured alive and in good health by a hopper dredge or brought aboard a relocation trawler that are scanned and lack a previous pit tag, will be PIT tagged according to the specific species procedures identified in PDC PSO.7. Additional external tags (e.g., flipper tags) are optional. The cost associated with tagging is the responsibility of the federal action agency overseeing the project (i.e., USACE or BOEM) or the company awarded the contract.

PSO.8 Genetic Sampling: All nonlethal and lethal captures ESA-listed species captured by projects covered under the 2020 SARBO will be have genetic samples taken except:

- Live ESA-listed species that are not brought aboard a relocation trawler (PSO PDC Section 3.2).
- Any leatherback sea turtles, even if brought aboard the vessel to untangle and safely release.
- Any shortnose sturgeon.
- If the PSO believes that collecting a sample would imperil human or animal safety. The rationale for this decision will be recorded on the species observation form and available digitally as part of the reporting requirements outlined in the 2020 SARBO Section 2.9.

PSO.9 Genetic samples will be collected according to the handling procedures defined for each species in the PSO PDCs Section 5-9 below.

- A tissue sample will be collected from any dead ESA-listed species. If multiple dead animal parts are found, a sample will be collected from all parts that are not connected to one another regardless of whether the tissues are believed to be from the same turtle. For example, if part of a sea turtle flipper and a detached head are found at the same time, a sample from each part will be collected for genetic analysis.

- All genetic samples will be preserved in RNAlater™ preservative. Once the sample is in buffer solution, refrigeration/freezing is not required, but care should be taken not to expose the sample to excessive heat or sunlight. Label each sample with the animal's unique identification number (PIT tag number). Since giant mantas will not be pit tagged, label any samples collected with the date, project name, and species name. Do not use glass vials; a 2 millimeter screw top plastic vial is preferred (e.g., MidWest Scientific AVFS2002 and AVC100N). Gently shake the sample to ensure the solution covers the entire sample.

- Genetic samples will be mailed to the addresses listed below with information provided in the container stating the sample was collected under the 2020 SARBO (Project name, SARBO SER-2008-05934). Package the genetic samples with an absorbent material within a double-sealed container (e.g., zip lock bag). If more than 1 sample is being sent to an address, package all of the samples together. The cost associated with taking the sample and delivering it to the appropriate entity listed below is the responsibility of the federal action agency overseeing the project (i.e., USACE or BOEM) or the company awarded the contract.

    - Sea turtles: Sea Turtle Program NOAA Southeast Fisheries Science Center Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. Contact number: 305-361-4212 Lisa.Belskis@noaa.gov

    - Sturgeon: Geological Survey Leetown Science Center, Attention Robin Johnson, Aquatic Ecology Branch, 11649 Leetown Road, Kearneysville, West Virginia 25430.

    - Elasmobranchs: NOAA Southeast Fisheries Science Center, Attention Dr. John Carlson, National Marine Fisheries Service, Panama City Laboratory, 3500 Delwood Beach Rd, Panama City, Florida, 32408).

PSO.10 Atlantic Sturgeon Genetic Sampling Testing Requirements under the 2020 SARBO:

- The USACE, BOEM, or entity designated by the USACE or BOEM are responsible for the cost to analyze/test genetic samples from Atlantic sturgeon captured to determine the DPS of Atlantic sturgeon captured (live and dead captures).

- Atlantic sturgeon genetic samples will be recorded on and submitted with the Sturgeon Genetic Sample Submission spreadsheet available on the NMFS dredging webpage https://www.fisheries.noaa.gov/content/southeast-dredging. This form should indicate in the "comment field" if the Atlantic sturgeon was previously PIT tagged. A copy of that reporting spreadsheet will also be sent to NMFS (takereport.nmfsser@noaa.gov), the genetic sampling address in PDC PSO.8 above along with the sample, and to mike_mangold@fws.gov.

4.2 PSO Guidance on Relocation Trawling

The following PDCs describe how the PSO will handle ESA-listed species captured during relocation trawling including a flow chart summarizing how to handle different species and text describing the general handling guidance, the order to release species if multiple ESA-listed species are captured in trawling, and where they should be released. Trawling within the range of ESA-listed corals is not covered under this Opinion (Appendix B, Section 3.5).

Table 9. PSO Handling Guidance

Species and handling protocol	Handling priority for multiple captures	Required to bring aboard (Y/N)	Directly measure all required data (SARBO Section 2.9)[F]	Estimate all required data (SARBO Section 2.9)	Photograph (PDC PSO.5)	Tagging and Genetic Sampling (PDC PSO.7-10)	Relocate
Smalltooth sawfish PSO PDC Section 7	1	A, C	No	Yes	Yes	No	No
Sharks PSO PDC Section 9	2	A	No	Yes	Yes	No	No
Giant manta ray PSO PDC Section 8	3	A, C	No	Yes	Yes	No	No
Leatherback sea turtle PSO PDC Section 5	4	A	No	Yes	Yes	No	No
Sturgeon PSO PDC Section 6	5	B, D, F	Yes	No	Yes	Yes	G
Green, hawksbill, Kemp's ridley, loggerhead sea turtles PSO PDC Section 5	6	B, E	Yes	No	Yes	Yes	F

A. Animals will not be brought aboard and will remain and be released from net while still in water. If necessary, cut the net to expedite release.

B. Animals will be brought aboard, except if the PSO directs removal from net to protect the safety of the animal or crew (e.g., turtle in net with large shark).

C. If juvenile manta rays or smalltooth sawfish need to be brought aboard to safely disentangle, only allowed if animal is small enough to be picked up by crew and released according to PSO handling guidance

D. Sturgeon will be brought aboard and place in holding tank. Must release within 30 minutes (20 minute if tank unavailable), even if not relocated.

E. Turtle will be kept cool, wet, and kept in a safe area such as a kiddie pool to contain for safe transportation to the relocation site. If sick, injured, or requiring resuscitation, see PSO PDC Section 5 for guidance.

F. Animals brought aboard will be measured and data collected as quick as possible to return them to the water safely.

G. Relocate according to guidance in PDC PSO.11-13.

PSO.11 Marine Relocation Trawling: Relocation trawling is authorized in the marine environment as a measure to minimize lethal take of ESA-listed species.

- Sea turtles (with the exception of leatherback sea turtles) and sturgeon will be relocated 3-5 miles from the dredge project, if relocation can be done safely, according to the guidance in PSO PDC Section 5.
- The PSO will determine the appropriate release site based on the species captured and surrounding habitat.

PSO.12 Estuarine Relocation Trawling: Relocation trawling is authorized in the estuarine environment as a measure to minimize lethal take of ESA-listed species.

- For the purposes of relocation trawling authorized in the 2020 SARBO, the estuarine environment consists of bays, harbors, estuaries, or other semi-confined areas inland of the COLREGS Demarcation Line, but outside of a river. The start of a river is not defined and varies by location and should be determined by best professional judgment. When in doubt, NMFS may be contacted for clarification.
- Atlantic sturgeon 4 ft (1.2 m) total length or larger may be relocated to any location, including marine waters. Atlantic sturgeon less than 4ft total length and all shortnose sturgeon must be relocated within the estuary where it was captured.
- The PSO will determine the appropriate release site based on the species captured and surrounding habitat.

PSO.13 Riverine Relocation Trawling: Relocation trawling is not authorized within rivers, as noted in PDC PSO.12 above, the start of a river is not defined and should be determined by best professional judgment.

PSO.14 For relocation trawling:

- If any marine mammals, or aggregation of any other species not targeted for relocation trawling (e.g., fever of rays or school of fish) are sighted prior to deploying the nets and believed to be at-risk of interaction (e.g. moving in the direction of the vessel/gear and moms/calves close to the gear), gear deployment should be delayed until the animal(s) are no longer at-risk or have left the area of their own volition.
- During relocation trawling, the PSO and vessel staff will monitor for species presence at all times. Gear will be immediately retrieved if marine mammals or other species not targeted for relocation trawling are believed to be captured/entangled or at-risk of capture/entanglement. Operations may resume when interaction with these species is deemed unlikely, based on best professional judgment and through coordination with the PSO onboard.

- If a non ESA-listed marine mammal is injured or captured during relocation trawling, we recommend that trawling activities cease if other marine mammals may be in the area that are at risk of capture until provided guidance on how to proceed by NMFS or the marine mammal stranding staff. The 2020 SARBO does not consider effects to non-ESA-listed marine mammal species.

PSO.15 Relocation trawling handling and training:

- The PSO will train all crew members on the vessel how to safely handle and remove animals from the net and record tow capture data.
    - Training will occur with each new crew before heading out to begin work (e.g., if the crew will be at sea for 3 weeks before rotating staff, the training will be done at the beginning of the 3-week period, even for crews that have worked together before).
    - ESA and non-ESA listed animals captured may be removed from the net by crew other than the PSO, if trained by the PSO on proper handling and release techniques to minimize the risk of harm to these animals.
    - All ESA-listed species tagging, and genetic sampling will be performed by the PSO. Other crew members may assist with data collection, which be checked by the PSO for accuracy before reporting.
- All crew members will have easy access to equipment used to untangle animals from the net or to cut the nets to free the animal including knives, line-cutting poles, long-handled dehookers, and/or boat hooks.
- The nets will be checked during every tow for the presence of ESA-listed species. This may require pulling the tail end of the net to the boat to confirm nothing has been captured.
- For all species, ensure the vessel is in neutral and release animal over the side, head first.

5 Handling and Reporting Dead ESA-listed Species

All dead ESA-listed species collected within the construction area or by equipment used on a project covered under the 2020 SARBO, will be handled and recorded as described in the PSO PDCs and 2020 SARBO Section 2.9.

PSO.16 Dead ESA-listed species collected within the area of work will be rated as fresh dead or decomposed and documented as described in PSO PDC.4. The determination of a specimen's condition (fresh dead or decomposed) is as follows:

- Decomposed specimens are those that exhibit obvious bloating (expansion of the body or tissues by putrefactive gases); detachment of skin upon handling; or liquefaction of organs and tissues. Examples of decomposition in sea turtles are provided in Figure 75 below. Note: foul odor alone is not considered definitive evidence of decomposition.
- If it is not clear whether the specimen is fresh dead or decomposed, the specimen will be retained for further examination by an individual that has demonstrated expertise in sea turtle necropsy and forensic pathology. Such examinations typically include complete gross examination and selective histopathology, depending on postmortem condition. Individuals that will conduct examinations should be identified prior to the onset of dredging operations along with the necessary logistical planning for transportation and storage needs. The associated stranding coordinator for the state or region of the operation may be able to advise or assist in this regard as such needs are regularly required during stranding response. NMFS retains the right to review evidence or seek the opinion of an expert if a take determined to be decomposed should have been listed as fresh take and take associated with the project.

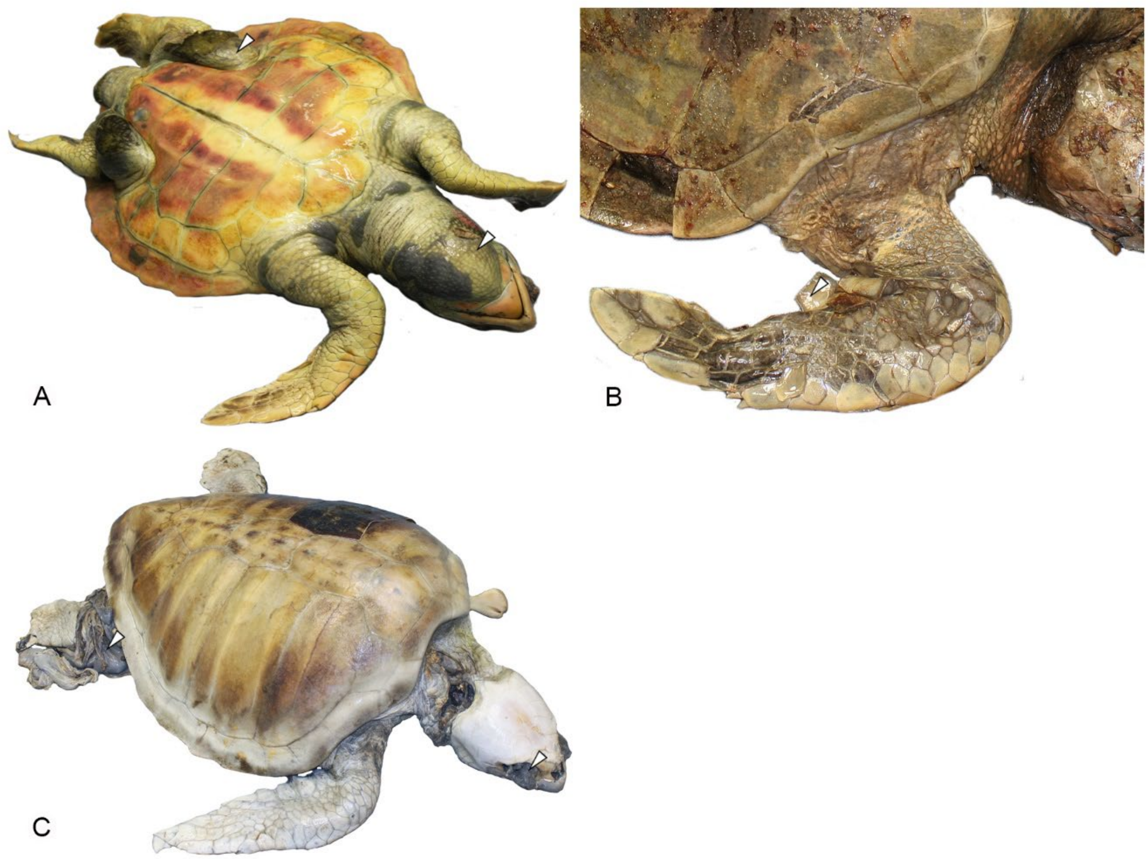


Figure 10. Examples of obvious signs of decomposition.
(A) Bloating expands the loose skin around the flippers and neck. (B) The skin starts to detach in sheets. (C) Soft tissues beginning to fall apart and easily tear when handled.

PSO.18 Dead ESA-listed species and species parts that need further examination by a specialist to determine the cause of death will be refrigerated, iced, or frozen as soon as possible, (must be iced or frozen no more than 2 hours from discovery). The timeline from discovery to transfer for examination, including ambient temperature, must be thoroughly documented. Whether the carcass/part is refrigerated or frozen will depend on predetermined logistical parameters for a given project. In general, a carcass/part may be kept refrigerated or iced, but not frozen if it will be examined within 48 hours. Remains may be frozen if examination will be delayed or maintaining refrigeration is not possible for any reason.

- Dead turtles: Follow the protocol outlined on the *Protocol for Collecting Tissue From Dead Turtles for Genetic Analysis* (https://dqm.usace.army.mil/odess/documents/geneticsampleprotocol.pdf). If a revised document is released, the PSO is required to follow the revised protocols. This document and any revisions will also be available on the NMFS dredging webpage (https://www.fisheries.noaa.gov/content/southeast-dredging).

- Dead sturgeon specimens will be reported to 1-844-STURG911 (1-844-788-7491) and via the Sturgeon Salvage Form (available on our Dredging website at: https://www.fisheries.noaa.gov/content/southeast-dredging). In addition, a fin clip and a fin ray will be collected in accordance with the Genetic Sampling Collection Requirements described in PSO PDC Section 3.1 using the genetic submission form (available on our Dredging website at: https://www.fisheries.noaa.gov/content/southeast-dredging).
- Dead elasmobranchs specimens will be stored as described in PDC PSO.16 until advised how to dispose of or provide to Dr. John Carlson, NOAA Fisheries, Panama City Laboratory at 1-850-234-6541 x 221. Dead smalltooth sawfish will also be reported to 1-844-4SAWFISH (1-844-472-93474).

6 Sea Turtle Handling, Tagging and Genetic Sampling Protocol for Relocation Trawling

6.1 Identification

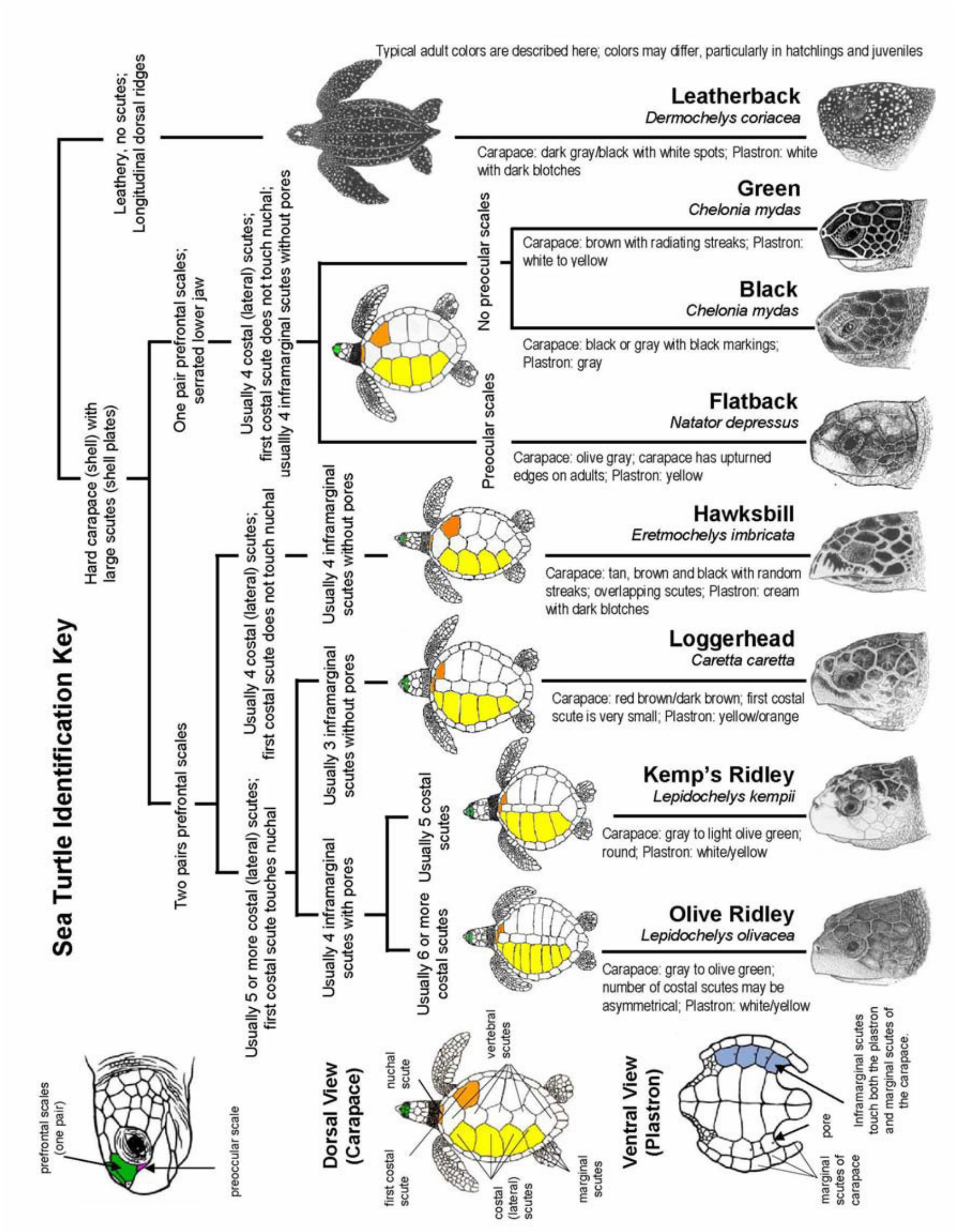


Figure 11. Sea Turtle Identification Key Image from the Southeast Fisheries Science Center Sea Turtle Research Techniques Manual, updated January 2013 (NOAA Technical Memorandum NMFS-SEFSC-579, https://repository.library.noaa.gov/view/noaa/3626)(NMFS 2008)

6.2 Handling

- Sick or injured sea turtles will be evaluated by a specialist to determine the best course of action including euthanizing animals that are severely injured or rehabilitating sea turtles before releasing them back in to the wild.
- A specialist trained to evaluate sea turtles and a sea turtle rehabilitation center will be identified prior to starting a project. Directions of how sick or injured sea turtles will be transported for an evaluation or rehabilitation will be provided to the PSO and dredging or trawling staff. NMFS will assist with identifying specialist and rehabilitation centers, if needed.

6.3 Relocating

- Do not relocate leatherback sea turtles. Release them immediately, as described in PSO Section 3.2 above.
- Green, Kemp's ridley, loggerhead, and hawksbill sea turtles will be relocated and released not less than 3 nautical miles (nmi) from the dredge site, unless sick or injured. If 2 or more released turtles are later recaptured, subsequent turtle captures will be released not less than 5 nmi away. If it can be done safely and without injury to the turtle, turtles may be transferred onto another vessel for transport to the release area to enable the relocation trawler to keep sweeping the dredge site without interruption. These turtles will be kept no longer than 12 hours prior to release. The area in which a turtle will be relocated is determined by the PSO.

6.4 Data Recording

- Record the carapace length and width (straight and curved measurements), plastron length and width, head width, and sex (if possible).
    - Follow the protocol outlined in the *Southeast Fisheries Science Center Sea Turtle Observer Manual*, updated January 2013 (NOAA Technical Memorandum NMFS-SEFSC-589, https://repository.library.noaa.gov/view/noaa/4392). Additional, specific handling techniques are required when handling turtles with fibropapilloma tumors. If a revised document is released, the PSO is required to follow the revised protocols. This document and any revisions will also be available on the NMFS dredge webpage (Https://www.fisheries.noaa.gov/content/southeast-dredging).

6.5 Tagging and Genetic Sampling

- Follow the protocol outlined in the *Southeast Fisheries Science Center Sea Turtle Observer Manual*, Updated January 2013 (NOAA Technical Memorandum NMFS-SEFSC-589, https://repository.library.noaa.gov/view/noaa/4392). If a revised document is released, the PSO is required to follow the revised protocols. This document and any revisions will also be available on the NMFS dredge webpage (Https://www.fisheries.noaa.gov/content/southeast-dredging).

- Tagging and genetic sampling of leatherback sea turtles is not required under this Opinion and priority should be given to quickly and safely release the animals due to the sensitivity of these animals to being handled.

6.6 Resuscitation

- Follow the protocol outlined in the *Southeast Fisheries Science Center Sea Turtle Observer Manual*, Updated January 2013 (NOAA Technical Memorandum NMFS-SEFSC-589, https://repository.library.noaa.gov/view/noaa/4392). If a revised document is released, the PSO is required to follow the revised protocols. This document and any revisions will also be available on the NMFS dredge webpage (https://www.fisheries.noaa.gov/content/southeast-dredging).

7 Sturgeon Handling, Tagging and Genetic Sampling Protocol for Relocation Trawling

7.1 Identification

Shortnose sturgeon are similar in appearance to Atlantic sturgeon, but can be distinguished by their color, generally smaller size, wider mouth, and smaller snout shape (Figure 77).

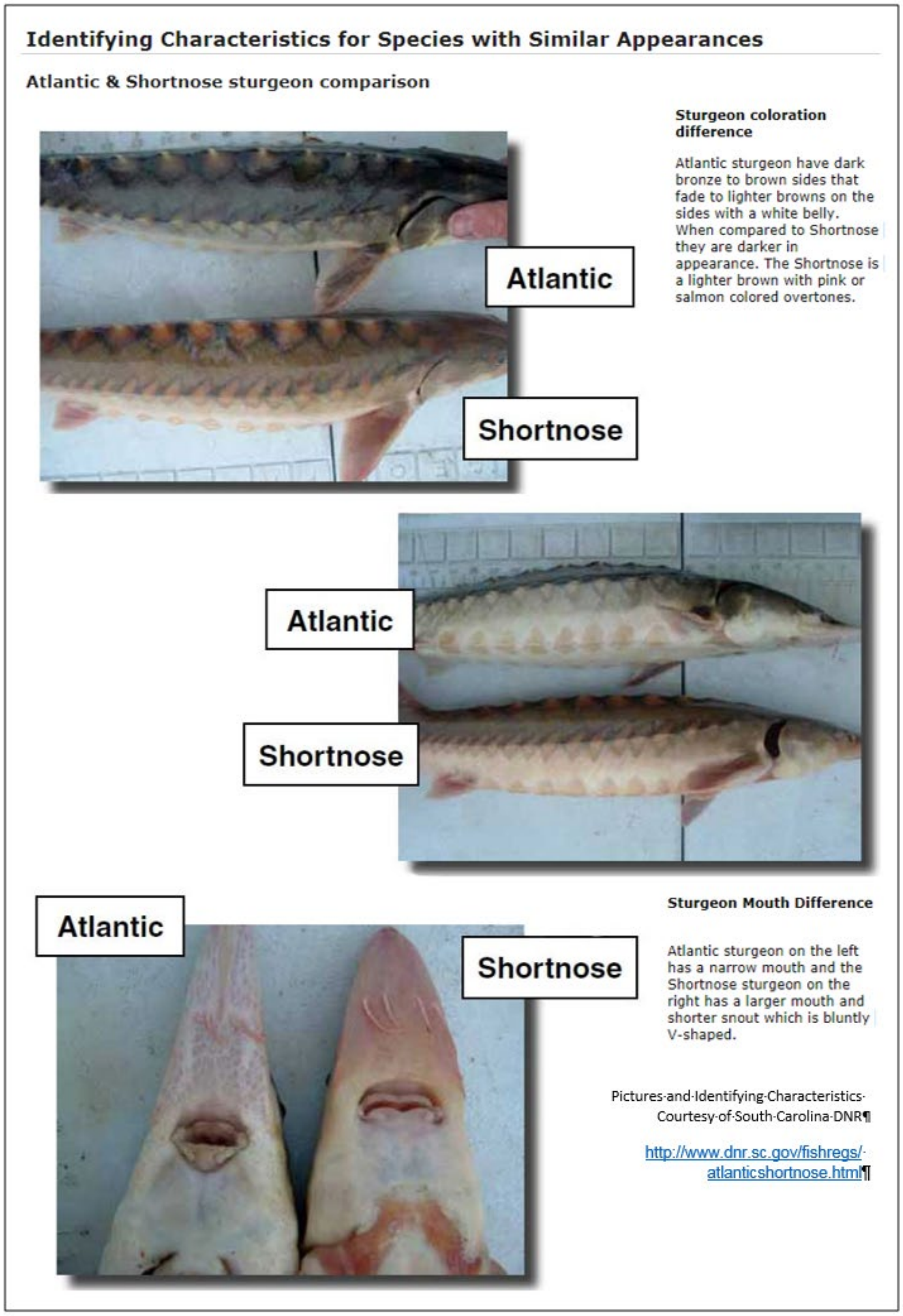


Figure 12. Atlantic and shortnose sturgeon species identification guide

7.2 Handling

- In areas where sturgeon are likely to be captured, the relocation trawler will have a sturgeon holding tank onboard that will be used during handling and relocation. The tank will be of sufficient size and shape to safely hold the size sturgeon that may be captured in the area and water from the surrounding environment must be continuously circulated and exchanged with the water in the tank to ensure it remains the proper temperature and properly oxygenated.
- If a sturgeon cannot be held in a holding tank during handling, the sturgeon will be kept wet at all times using water from the surrounding environment. Other options for holding the sturgeon while handling it include using a net pen/basket floating placed next to the vessel.
- While moving the animal or removing it from gear, covering its eyes with a wet towel may help calm it.
- All handling procedures (i.e., measuring, PIT tagging, photographing, and tissue sampling) should be completed as quickly as possible, and should not exceed 20 minutes from when the sturgeon is first brought on board the vessel or 30 minutes if placed in a holding tank (see above). Handling procedures should be prioritized in the following order: (1) collect a tissue sample (see procedure described below); (2) scan for existing PIT tags, apply new PIT tag if no pre-existing PIT tag is found; (3) measure the animal; (4) photograph the animal. If all of the handling procedures cannot be completed within 20 minutes, the animal should be returned to the water; indicate which procedures were not completed when reporting the incidental take to NMFS.

7.3 Relocating

- Sturgeon will be released immediately after capture, away from the dredge site or into already dredged areas, unless the relocation trawler is equipped with a suitable well-aerated seawater holding tank, container, trough, or pool where a maximum of a single fish may be held for not longer than 30 minutes before it must be released or relocated away from the dredge site. The area in which a sturgeon will be relocated is provided in PDCs PSO.11-13 with the exact location determined by the PSO.

7.4 Data Recording

- Length measurements for all sturgeon should be taken as a straight line measurement from the snout to the fork in the tail (i.e., fork length), and as a straight line measurement from the snout to the tip of the tail (i.e., total length) (Figure 78). Do not measure the curve of the animal's body.

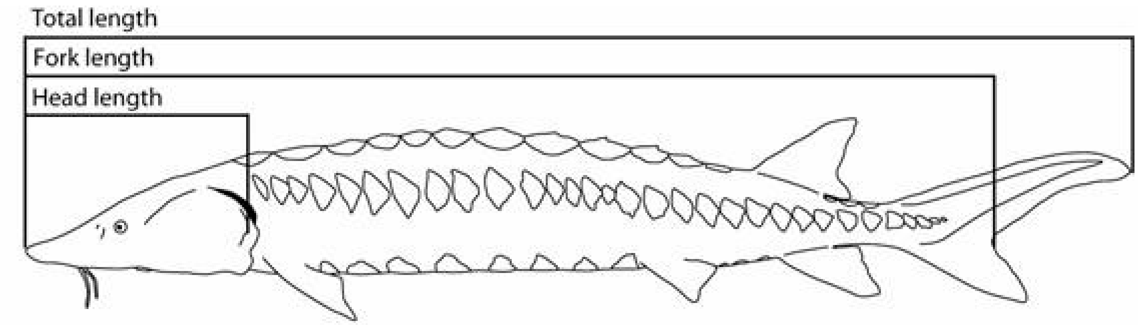


Figure 13. Diagram of different types of measurements for sturgeon.
Drawings by Eric Hilton, Virginia Institute of Marine Science in Mohead and Kahn 2010 (Kahn and Mohead 2010).

7.5 Tagging

- Every sturgeon should be scanned for PIT tags along its entire body surface ensuring it has not been previously tagged. The PIT tag readers must be able to read both 125 kHz and 134 kHz tags.
- Animals without an existing PIT tag will receive one that operates at a frequency of 134.2 kHz.
- Sturgeon smaller than 250mm will not be PIT tagged. Sturgeon measuring 250-350 mm total length will only be tagged with 8mm PIT tags. Sturgeon 350 mm or greater will receive standard sized PIT tags (e.g., 11 or 14 mm).
- PIT tags should be implanted to the left of the spine immediately anterior to the dorsal fin, and posterior to the dorsal scutes (Figure 79). This positioning optimizes the PIT tag's readability over the animal's lifetime. If necessary, to ensure tag retention and prevent harm or mortality to small juvenile sturgeon of all species, the PIT tag can also be inserted at the widest dorsal position just to the left of the 4th dorsal scute.
- Scan the newly implanted tag following insertion to ensure it is readable before the animal is released. If the tag is not readable, 1 additional tag should be implanted on the opposite side following the same procedure, if doing so will not jeopardize the safety of the animal.

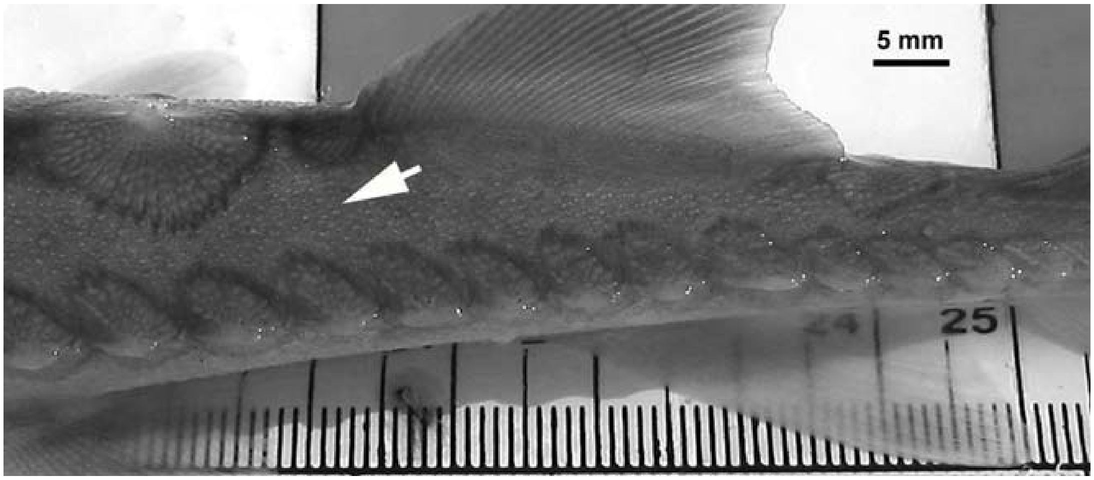


Figure 14. Standardized Location for PIT Tagging all Gulf, Atlantic, and shortnose sturgeon (Photo Credit: J. Henne, USFWS)

7.6 Genetic Sampling

- Tissue samples should be a small (1.0 cm^2) fin clip collected from soft pelvic fin tissue. Use a knife, scalpel, or scissors that has been thoroughly cleaned and wiped with alcohol.

7.7 Collected genetic samples must be stored in accordance with the requirements described in PSO PDC Section 3 above.

8 Smalltooth Sawfish Handling, Tagging and Genetic Sampling Protocol for Relocation Trawling

8.1 Identification

- The smalltooth sawfish is distinguished by the 22 to 29 teeth located on each side of the rostrum and the lack of a bottom lobe on the caudal (tail) fin (Figure 80).

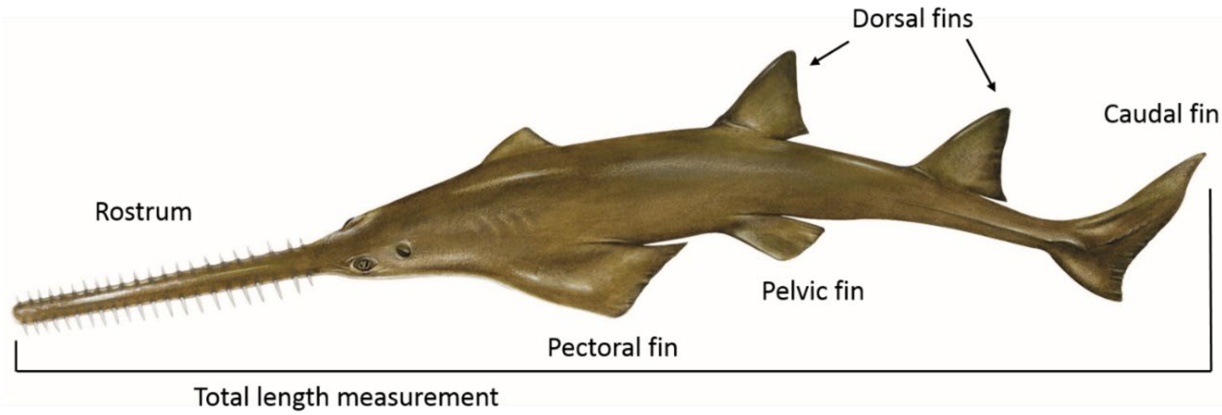


Figure 15. Image of a smalltooth sawfish.

8.2 Handling

- Attempt to release the sawfish directly from the net by pulling the net alongside the vessel and cutting the net sections that are entangled. Keep the sawfish in the water as much as possible during this process.
- Only bring the sawfish aboard the vessel if absolutely necessary to free it from the net. Larger animals should never be brought aboard due to the difficulty of returning them safely to the water. If necessary to bring a smaller animal aboard to free it from the net, make sure to keep sawfish wet and work quickly to get it safely back in the water. Smaller sawfish can be returned to the water by 2 people with the first person grasping the animal at the base of the rostrum with one hand and supporting the mid-section with the other. The second person can grasp the animal at the base of the tail and support the mid-section with the other hand.
- Use caution when near the rostrum as it can sweep side-to-side and cause injury during handling.
- Do not grab the sawfish by the spiracles (holes on the top of the head).

8.3 Relocating

- Do not relocate smalltooth sawfish. It is more important to release them as soon as possible as described above.

8.4 Data Recording

- Record the total length of the sawfish and the number of teeth on each side of the rostrum (saw). Estimate the length and number of teeth based on the photo taken of the sawfish in the net, if necessary.

8.5 Tagging and Genetic Sampling

- Tagging and genetic sampling of smalltooth sawfish is not required under this Opinion and priority should be given to quickly and safely release the animals due to the sensitivity of these animals to being handled.
- If the sawfish is brought aboard the vessel to untangle it from the net, scan the sawfish for a PIT tag generally located in the muscles at the base of the first or second dorsal fin.
- If no PIT tags are found, implant a BIOMARK HPT 12 PIT tag (12.5 mm in length, 134.2 kHz) under the skin directly adjacent to the second dorsal fin.
- Scan the newly implanted tag following insertion to ensure it is readable before the animal is released. If the tag is not readable, 1 additional tag should be implanted on the opposite side following the same procedure, if doing so will not jeopardize the safety of the animal.
- If a tissue sample is taken, it should consist of a small (1.0 cm^2) fin clip taken from the posterior edge of one of the pelvic fins. Use a thoroughly cleaned (wiped with alcohol) knife, scalpel, or scissors to collect the sample.
- Collected genetic samples must be stored in accordance with the requirements described in PSO PDC Section 3 above.

8.6 Additional Resources for Review

- Sawfish Fact Sheet (https://www.fisheries.noaa.gov/resource/educational-materials/endangered-smalltooth-sawfish-fact-sheet)
- Sawfish Handling, Release, and Reporting Procedures (https://www.fisheries.noaa.gov/resource/educational-materials/endangered-sawfish-handling-release-and-reporting-procedures)

9 Giant Manta Handling Data Recording, and Genetic Sampling Protocol for Relocation Trawling

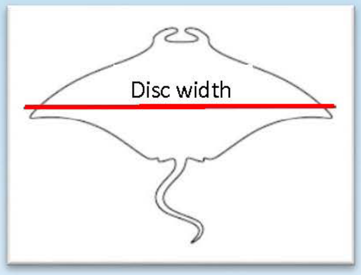
9.1 Identification

NOAA FISHERIES

Mobula Ray Identification Guide For Fisheries Observers

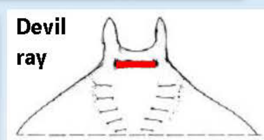
Purpose: This guide is intended to assist fishery observers in the visual identification of the giant manta ray and several devil ray species that occur in the Southeast and Mid-Atlantic.

General Observations: The size, coloring patterns, and a few morphological differences can be used to distinguish between species.



- Giant manta rays are larger than devil rays. Measurements should be taken by estimating the distance over their wingspan ["Disc Width" (DW)].
- Giant manta rays have a terminal mouth (i.e., mouth points straight forward, in front of the head); Devil rays have a sub-terminal mouth (i.e., mouth beneath the head).

Terminal mouth



Sub-terminal mouth

Manta birostris

Common Names: Giant Manta Ray, Oceanic Manta Ray

Status: U.S.: Listed as *Threatened* under Endangered Species Act.

Size: Up to 700 cm DW; appx. 200 cm DW at birth.

Dorsal Coloration: Black with distinct white patches creating a T-shaped shoulder pattern.

Ventral Coloration: White with dark spots; spots rarely found between gill slits. Dark shading along the posterior edges of the pectoral fins.

Photo credit: Joshua Stewart

NOAA Fisheries, Southeast Region, Protected Resources Division

Mobula mobular

Common Names: Giant Devil Ray, Spinetail Devil Ray

Status: U.S.: Not listed. International Union for Conservation of Nature (IUCN): *Endangered*

Size: Up to 520 cm DW

Dorsal Coloration: Predominantly dark gray; with a black (crescent shape) stripe that runs from side to side on upper shoulders. White tip on the dorsal fin.

Ventral Coloration: White.


Photo credit: Guy Stevens/Manta Trust

Mobula tarapacana

Common Names: Chilean Devil Ray, Sicklefin Devil Ray, Box Ray

Status: U.S.: Not listed. IUCN: *Vulnerable*

Size: Up to 340 cm DW

Dorsal Coloration: Golden brown to olive green.

Ventral Coloration: Predominately white with gray shading along the posterior margin of pectoral fins.


Photo credit: www.tomburd.co.uk

Mobula hypostoma

Common Names: Atlantic Devil Ray, Lesser Devil Ray

Status: U.S.: Not listed. IUCN: *Data Deficient*

Size: Up to 120 cm DW

Dorsal Coloration: Variable, brown, gray to black. Sometimes have a dark gray/black stripe that runs from side to side on the "neck" right behind the eyes.

Ventral Coloration: White.


Photo credit: Kim Basso-Hall/Mote Marine Laboratory

Figure 16. Mobula Ray Identification Guide

9.2 Handling

- Removing the giant manta ray from the water can increase the likelihood of injuries, mostly due to the crushing the animal's organs due to the weight of gravity.
- If a manta ray needs to be brought aboard, support the ray's weight by at least 2 points (i.e. one point of contact being the midsection, and the other being the posterior end of the body) or preferably have 2 or 3 people carry the ray by the sides of each wing.
- Follow the safe handling guidance: https://www.fisheries.noaa.gov/webdam/download/91927887

9.3 Relocating

- Do not relocate giant manta rays. Release them immediately, as described above.

9.4 Data recording

- Record the total disc width from wing tip to wing tip, as shown in the *Mobula Ray Identification Guide for Fisheries Observers* (Figure 81). Estimate the disc width, if released directly from the net and not brought aboard the vessel.
- Photograph animal. Manta's have unique spot patterns on the ventral side used for identification so photograph as much of the animal as possible without flipping or manipulating the animal.

9.5 Tagging and Genetic Sampling

- Tagging and genetic sampling of giant manta rays is not required under this Opinion and priority should be given to quickly and safely release the animals due to the sensitivity of these animals to being handled. Tagging of giant mantas is not recommended under the 2020 SARBO unless it is part of cooperative research with NMFS.
- If a tissue samples is taken, it should be a small tissue (1.0 cm2) fin clip taken from dorsal fin or posterior edge of pectoral fin. Use a knife, scalpel, or scissors that has been thoroughly cleaned and wiped with alcohol.
- Collected genetic samples must be stored in accordance with the requirements described in PSO PDC Section 3 above.

9.6 Additional Resources for Review

- Giant manta ray safe handling guidelines, https://repository.library.noaa.gov/view/noaa/22926 (Carlson et al. 2019).
- The giant manta ray can be visually distinguished from other rays by size, coloring, and a few morphological differences, as shown in *Mobula Ray Identification Guide for Fisheries Observers* (Figure 81).

10 Shark Handling, Tagging and Genetic Sampling Protocol for Relocation Trawling

10.1 Identification

Scalloped hammerhead and oceanic whitetip shark are ESA-listed species occurring within the action area. However, oceanic whitetip shark are a deep water (pelagic) species that are not expected to be captured during relocation trawling. Scalloped hammerhead shark may be encountered during relocation trawling, but are only protected under the ESA if they are a part of the Central and Southwest Atlantic DPS, which would only expected in the U.S. Caribbean (79 FR 38242). Scalloped hammerhead sharks encountered outside of the U.S. Caribbean are not protected under the ESA, but are still expected to be handled according to the PSO guidance in this Appendix.

Identification of both scalloped hammerhead and oceanic whitetip shark are provided on the placard used for the *Shark Identification and Federal Regulations for the Recreational Fishery of the U.S. Atlantic, Gulf of Mexico, and Caribbean* shown in Figure 82 along with identification guidance for other sharks that may be encounter that are not ESA-listed. Safe handling practices outlined in this section will be followed regardless of the ESA-listing status of the shark encountered.

10.2 Handling

- Large sharks should be released directly from the net into the water and not brought aboard the vessel.
- If sharks must be brought aboard to safely remove them from the net, cut the net quickly and release them back to the water. If necessary to bring a smaller animal aboard to free it from the net, make sure to keep shark wet and work quickly to get it safely back in the water. Smaller sharks can be returned to the water by grasping the animal under the jaw and ensuring the jaw is closed. Depending on the size of the shark, this may require 2 hands to hold the jaw closed while a second crew member helps to carry the shark back to the water.
- Sharks are reported to frequently chew through a portion of the net and are retrieved trapped in the net at the gills. In instances such as this, the net will be quickly cut and the shark removed.
- Do not pull sharks free or carry them by the gills.

10.3 Relocating

- Do not relocate sharks. It is more important to release them as soon as possible and described above.

10.4 Data Recording

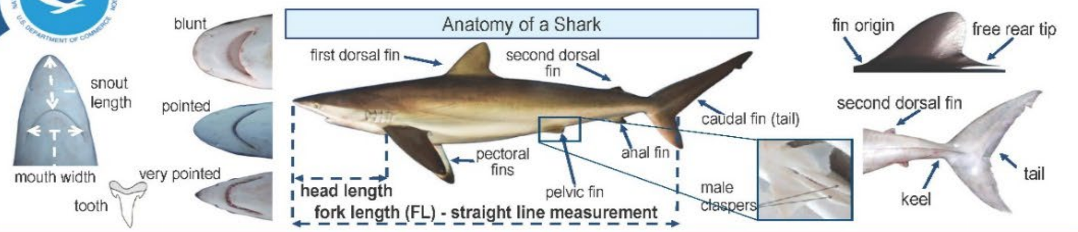
- Record the total length of the shark either by measuring the shark if brought aboard or by estimating the length based on the photo taken of the shark in the net, if necessary.

10.5 Tagging and Genetic Sampling

- Tagging and genetic sampling of sharks is not required under this Opinion and priority should be given to quickly and safely release the animals due to the sensitivity of these animals to being handled.

Shark Identification and Federal Regulations

for the Recreational Fishery of the U.S. Atlantic, Gulf of Mexico and Caribbean



Federal fishing permit required in federal waters. Purchase at hmspermits.noaa.gov.
HMS recreational permit holders that fish for sharks will need to obtain a shark endorsement.

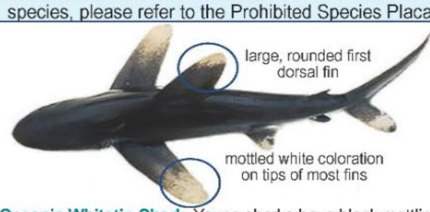
Authorized species	Minimum size (fork lenth)	Bag limit (per trip)
Smoothhound Shark	None	None
Atlantic sharpnose Shark	None	1 per person
Bonnethead Shark	None	1 per person
Shortfin Mako Shark	71 inches male 83 inches female	1 shortfin mako, hammerhead, or other shark per vessel
Hammerheads (great, scalloped, and smooth)	78 inches	
Other sharks	54 inches	

Recreational anglers are required to use non-offset, non-stainless steel circle hooks except when fishing with flies or artificial lures.

All ridgeback sharks are prohibited, except **Tiger, Oceanic Whitetip, and Smoothhound**.
Prohibited ridgeback sharks include **Bignose, Caribbean Reef, Dusky, Galapagos, Night, Sandbar,** and **Silky**. For more details on prohibited species, please refer to the Prohibited Species Placard.

Ridgeback sharks have an **interdorsal ridge** (a visible line, or crease of raised skin between dorsal fins)

Tiger Shark: Snout length much shorter than mouth width; markings fade with age; max. size 15 feet; coastal and offshore



Oceanic Whitetip Shark: Young sharks have black mottling on most fins; does not always have interdorsal ridge; max. size 8 ft; offshore
Cannot be retained if tuna, swordfish, or billfish are onboard

Smoothhound: (a.k.a. smooth dogfish and Florida/Gulf smoothhound) Predorsal ridge present; second dorsal fin slightly smaller than first dorsal fin and much larger than anal fin; max. size 5ft; coastal and offshore

Spiny Dogfish: Max. size 4 ft; coastal and offshore
There are no recreational restrictions for **Spiny Dogfish**

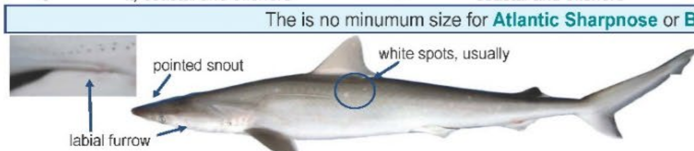
Scalloped Hammerheads, Great Hammerheads, and Smooth Hammerheads
Cannot be retained if tuna, swordfish, or billfish are onboard

Scalloped Hammerhead: Max. size 11 ft; coastal and offshore

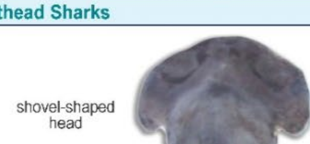
Great Hammerhead: Max. size 15 ft; coastal and offshore

Smooth Hammerhead: Max. size 12 ft; coastal and offshore

The is no minumum size for **Atlantic Sharpnose** or **Bonnethead Sharks**



Atlantic Sharpnose Shark: Max: size 3 ft; coastal and offshore; similar species: **Smalltail** sharks have very reduced labial furrows and **Caribbean Sharpnose** sharks lack white spots.



Bonnethead: small, black spots on body; max. size 4 ft; mostly coastal

All sharks are not identical. These are common characteristics. Young sharks can vary in appearance from adults. Maximum sizes are approximate.

Photographs and illustrations provided by NMFS, J. Castro, W.B. Driggers III, E.R. Hoffmayer, and S. Iglésias. Prohibited species are underlined in red
https://www.fisheries.noaa.gov/topic/atlantic-highly-migratory-species. Revised March 2019

If you don't know, let it go

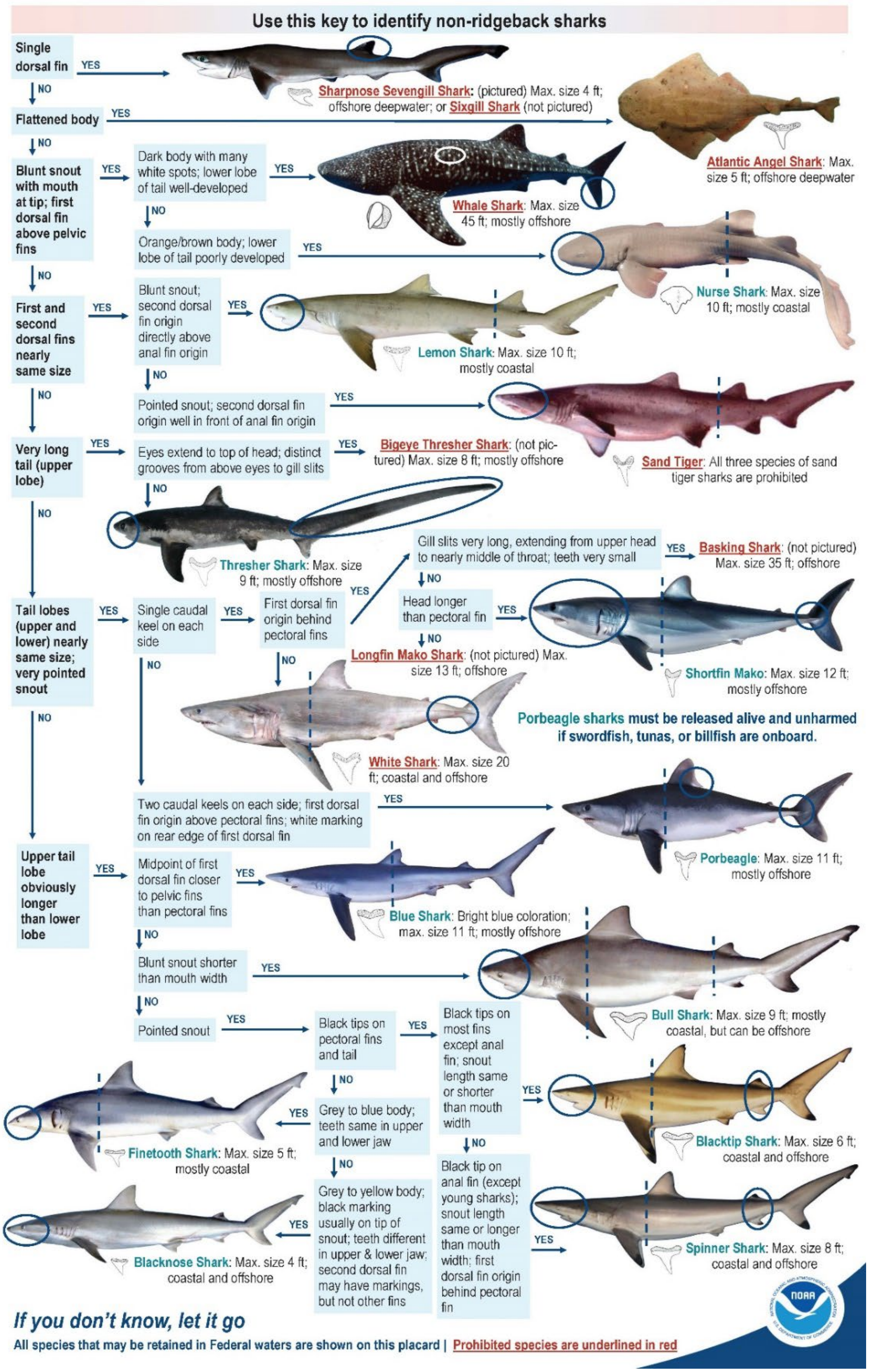

Use this key to identify non-ridgeback sharks
Single dorsal fin
YES
NO
Sharpnose Sevengill Shark: (pictured) Max. size 4 ft; offshore deepwater; or Sixgill Shark (not pictured)
Flattened body
YES
Atlantic Angel Shark: Max. size 5 ft; offshore deepwater
NO
Blunt snout with mouth at tip; first dorsal fin above pelvic fins
YES
Dark body with many white spots; lower lobe of tail well-developed
YES
Whale Shark: Max. size 45 ft; mostly offshore
NO
Orange/brown body; lower lobe of tail poorly developed
YES
Nurse Shark: Max. size 10 ft; mostly coastal
NO
First and second dorsal fins nearly same size
YES
Blunt snout; second dorsal fin origin directly above anal fin origin
YES
Lemon Shark: Max. size 10 ft; mostly coastal
NO
Pointed snout; second dorsal fin origin well in front of anal fin origin
YES
Sand Tiger: All three species of sand tiger sharks are prohibited
NO
Very long tail (upper lobe)
YES
Eyes extend to top of head; distinct grooves from above eyes to gill slits
YES
Bigeye Thresher Shark: (not pictured) Max. size 8 ft; mostly offshore
NO
Thresher Shark: Max. size 9 ft; mostly offshore
NO
Tail lobes (upper and lower) nearly same size; very pointed snout
YES
Single caudal keel on each side
YES
First dorsal fin origin behind pectoral fins
YES
Gill slits very long, extending from upper head to nearly middle of throat; teeth very small
YES
Basking Shark: (not pictured) Max. size 35 ft; offshore
NO
Head longer than pectoral fin
YES
Shortfin Mako: Max. size 12 ft; mostly offshore
NO
Longfin Mako Shark: (not pictured) Max. size 13 ft; offshore
NO
White Shark: Max. size 20 ft; coastal and offshore
Porbeagle sharks must be released alive and unharmed if swordfish, tunas, or billfish are onboard.
NO
Two caudal keels on each side; first dorsal fin origin above pectoral fins; white marking on rear edge of first dorsal fin
YES
Porbeagle: Max. size 11 ft; mostly offshore
NO
Upper tail lobe obviously longer than lower lobe
YES
Midpoint of first dorsal fin closer to pelvic fins than pectoral fins
YES
Blue Shark: Bright blue coloration; max. size 11 ft; mostly offshore
NO
Blunt snout shorter than mouth width
YES
Bull Shark: Max. size 9 ft; mostly coastal, but can be offshore
NO
Pointed snout
YES
Black tips on pectoral fins and tail
YES
Black tips on most fins except anal fin; snout length same or shorter than mouth width
YES
Blacktip Shark: Max. size 6 ft; coastal and offshore
NO
Black tip on anal fin (except young sharks); snout length same or longer than mouth width; first dorsal fin origin behind pectoral fin
YES
Spinner Shark: Max. size 8 ft; coastal and offshore
NO
Grey to blue body; teeth same in upper and lower jaw
YES
Finetooth Shark: Max. size 5 ft; mostly coastal
NO
Grey to yellow body; black marking usually on tip of snout; teeth different in upper & lower jaw; second dorsal fin may have markings, but not other fins
YES
Blacknose Shark: Max. size 4 ft; coastal and offshore
If you don't know, let it go
All species that may be retained in Federal waters are shown on this placard | Prohibited species are underlined in red
NOAA

Figure 17. Shark Identification and Federal Regulations for the Recreational Fishery of the U.S. Atlantic, Gulf of Mexico, and Caribbean
(https://www.fisheries.noaa.gov/resource/outreach-and-education/shark-identification-placard)