DRAFT ENVIRONMENTAL IMPACT STATEMENT

SPACEX STARSHIP-SUPER HEAVY LAUNCH VEHICLE AT LAUNCH COMPLEX 39A

at the Kennedy Space Center, Merritt Island, Florida

Volume II, Appendix B.6, Part 1

August 2025

Federal Aviation Administration

THIS PAGE INTENTIONALLY LEFT BLANK.

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK.

Appendix B *Regulatory Consultations*

This appendix provides regulatory consultation documentation for Endangered Species Act Section 7 consultation with the United States (U.S.) Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), Magnuson-Stevenson Fishery Conservation and Management Act consultation with the NMFS, National Historic Preservation Act (NHPA) Section 106 consultation with the Florida State Historic Preservation Officer (SHPO), U.S. Department of Transportation Act Section 4(f) consultation with officials with jurisdiction over affected properties, Coastal Zone Management Act consultation with the Florida Department of Environmental Protection, and Marine Mammal Protection Act Incidental Harassment Authorization with NMFS.

B.6 Endangered Species Act Section 7 Consultation (NMFS)

A Biological Assessment (BA) was submitted to NMFS on May 24, 2024.

On January 17, 2025, NMFS provided a Conference and Biological Opinion (CBO) on the effects of Starship-Super Heavy operations on endangered and threatened species under NMFS' jurisdiction, as well as critical habitat for those species, in the North Atlantic Ocean, Gulf of America, North Pacific Ocean, South Pacific Ocean, and Indian Ocean. The Federal Aviation Administration provided addendums to NMFS describing proposed modifications to Starship-Super Heavy operations at Launch Complex (LC)-39A, among other locations, on March 10, 2025, March 28, 2025, and April 1, 2025. The addendum submitted on April 1, 2025, supersedes the previous addendums and is included in the EIS appendix. On April 18, 2025, based on the addendum requests, NMFS provided a revised CBO on the effects of Starship-Super Heavy operations in the North Atlantic Ocean, Gulf of Mexico (non-U.S. waters), Gulf of America, North Pacific Ocean, South Pacific Ocean, and Indian Ocean. This revised CBO replaced the original CBO submitted on January 17, 2025; thus, only the revised CBO is included in the EIS appendix.

B.6.1 Biological Assessment

Biological Assessment of SpaceX Starship-Super Heavy Launch Vehicle and Reentry Operations to

Support Endangered Species Act Section 7 Consultation with the National Marine Fisheries Service

24 May 2024

Prepared for

Space Exploration Technologies
47100 SC Phillips Parkway
Cape Canaveral Air Force Station, Florida 32920

Prepared by

ManTech SRS Technologies, Inc.
300 North G Street
Lompoc, CA 93436

Table of Contents

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

° S	degrees South
AGL	above ground level
AOI	Area of Interest
BA	Biological Assessment
BIA	Biologically Important Area
C	Celsius
CBD	Convention on Biological Diversity
CCSFS	Cape Canaveral Space Force Station
CDFW	California Department of Fish and Wildlife
C.F.R.	Code of Federal Regulations
DAF	Department of the Air Force
DoD	Department of Defense
DPS	Distinct Population Segment
E	east
EBSA	Ecologically or Biologically Significant Area
ESA	Endangered Species Act
ESU	Evolutionarily Significant Units
FAA	Federal Aviation Administration
ft	foot or feet
ft^2	square feet
FE	federally listed endangered
FR	Federal Register
FT	federally listed threatened
IMMA	Important Marine Mammal Area
IOTC	Indian Ocean Tuna Commission
IUCN	International Union for Conservation of Nature
km	kilometer(s)
km^2	square kilometers
KSC	Kennedy Space Center
LOC	letter of concurrence
LOX	liquid oxygen
m	meter(s)
mi.	mile(s)
MMPA	Marine Mammal Protection Act
NCI	norther Channel Islands
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PEA	Programmatic Environmental Assessment
PTS	Permanent Threshold Shift
psf	pounds per square foot
SAR	Stock Assessment Report
SLD 30	Space Launch Delta 30
SLC	Space Landing or Launch Complex
SMI	San Miguel Island
SpaceX	Space Exploration Technologies Corporation
TNT	Trinitrotoluene
TTS	Temporary Threshold Shift
UME	Unusual Mortality Event
U.S.	United States
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
USSF	United States Space Force
VSFB	Vandenberg Space Force Base
W	west

1 Introduction

The purpose of this Biological Assessment (BA) is to evaluate potential impacts on species listed under the Endangered Species Act (ESA) under the authority of the National Marine Fisheries Service (NMFS) resulting from the Federal Aviation Administration (FAA) Office of Commercial Space Transportation's Proposed Action. Issuance and modification of a license is considered a major federal action under the National Environmental Policy Act of 1969 and requires an environmental review in order to grant authority to Space Exploration Technologies Corporation (SpaceX) for Starship-Super Heavy launch and reentry operations.

SpaceX is proposing to increase the number of Starship-Super Heavy launches to a total of 145 times per year. The Boca Chica launch site is the only current operationally Starship launch site. LC-39A and Cape Canaveral Launch Sites would be completely new launch sites. (See Table 1.1).

Table 1-1: Proposed Launches per year from Each Launch Site

Launch Complex	Launches per year
Starbase, Boca Chica, TX	25
LC-39A at Kennedy Space Center, FL	44
Cape Launch Site, Cape Canaveral Space Force Station (CCSFS), FL	76

SpaceX currently lands the Super Heavy booster in the Gulf of Mexico and the Starship in the Pacific Ocean west of Hawaii and the Indian Ocean. SpaceX is proposing to expand the potential landing sites of the booster and ship.

SpaceX plans to land the reusable Super Heavy (booster) and Starship (ship) back on land at its launch site or on floating platforms in the ocean. As SpaceX continues to develop the capability to perform a return to launch site landing of the booster and/or ship, some vehicles may not be reused and are instead expended in the ocean in the following three conditions depending on the stage of development of the program:

1. In-flight breakup - Breakup during reentry resulting in debris falling into the ocean
2. Explosion at the surface of the water
    - 2A. Hard landing at terminal velocity and break up on impact resulting in an explosive event at the surface of the water
    - 2B. Soft water landing and tip over and explode on impact at the surface of the water
3. Soft water landing and tip over and sink

Of the above scenarios, SpaceX anticipates no more than 25 in-flight breakups of each vehicle resulting in debris falling into the water and 20 explosive events at the surface of the water for each vehicle from October 2024-October 2025. Super Heavy could be expended in a target area in the Atlantic Ocean or the Gulf of Mexico while Starship could be expended in the Pacific Ocean west of Hawaii, northeast Pacific Ocean, southeast Pacific Ocean or Indian Ocean.

1.1.1 Background and Consultation History

In 2022, the FAA prepared a Programmatic Environmental Assessment (PEA) that described the affected environment and environmental impacts of Starship-Super Heavy operations at the Boca Chica Launch Site for the *SpaceX Starship/Super Heavy Launch Vehicle Program at the SpaceX Boca Chica Launch Site in Cameron County, Texas* (Federal Aviation Administration, 2022). NMFS issued a single programmatic letter of concurrence (2022 LOC) to the FAA for launch and reentry vehicle operations in the marine environment, which included Starship-Super Heavy launch vehicle operations at Space Exploration Technologies Corp.'s (SpaceX) Boca Chica Launch Site (National Marine Fisheries Service, 2022c).

On 4 April 2023, the FAA transmitted a BA to NMFS for a project specific consultation for SpaceX landings in the Pacific Ocean, in accordance with the FAA's obligations under Section 7(a)(2) of the ESA. That consultation package supplemented the 2022 programmatic consultation and described the affected environment and environmental impacts of Starship-Super Heavy operations at the Boca Chica Launch Site. SpaceX's proposed operations included the first three flights originating from Boca Chica, as well as site-specific analysis for Starship landings in in the Pacific Ocean as well as Super Heavy intact landing in the Gulf of Mexico. NMFS concurred with FAA's determination that the Action may affect, but not likely adversely affect, ESA-listed species for SpaceX Super Heavy landings in the Gulf of Mexico and Starship landings in the Pacific (Federal Aviation Administration, 2022; National Marine Fisheries Service, 2023e).

On 2 February 2024, the FAA transmitted a letter to NMFS providing information to supplement the previous consultation with similar proposed activities in the Indian Ocean. On 14 March 2024, NMFS issued a letter of concurrence (2024 LOC) for 10 flights originating from the Boca Chica Launch Site to the FAA for launch and reentry vehicle operations in the marine environment, which included Starship operations in the Indian Ocean. NMFS concurred with FAA's determination that the Action may affect, but not likely adversely affect, ESA-listed species (National Marine Fisheries Service, 2024b).

The Action Area (described in Section 2.1) includes areas within and outside of the territorial waters of the United States (U.S.) and contains critical habitat for ESA-listed species. Section 2.2 describes the Action. Consistent with the NMFS requirements for ESA Section 7 analyses, the spatial and temporal overlap of activities with the presence of listed species is assessed in this BA. The definitions used in this BA for effects determinations under Section 7 of the ESA are based on the U.S. Fish and Wildlife Service (USFWS) and NMFS Endangered Species Consultation Handbook (U.S. Fish and Wildlife Service & National Marine Fisheries Service, 1998).

2 Description of the Action and the Action Area

2.1.1 Proposed Action

Super Heavy (First Stage) Launches and Landings

SpaceX plans to land the reusable Super Heavy (booster) back on land at its launch site or on floating platforms in the ocean, land at terminal velocity and break up upon impact or soft water land and tip over or explode. A return to launch site (RTLS) or landing on a floating platform would occur after stage separation of the Super Heavy from Starship. The nominal flight plan is for Super Heavy to conduct a boost-back burn prior to descending into the atmosphere. After descent through the atmosphere, Super Heavy would conduct a landing burn as it returns to the launch site or lands on a floating platform. Overpressure events are described in the following paragraph below.

The Action includes up to 20 total overpressure events of the Super Heavy booster (first stage) resulting in an explosion in the Gulf of Mexico Landing Area (Figure 4) off the coast of Boca Chica, Texas and in the Atlantic Ocean off the coast of CCSFS (Figure 5). After stage separation of the booster from the ship, the booster would conduct a boost-back burn prior to descending into the atmosphere. During descent, when the first stage is supersonic, a sonic boom (overpressure of high-energy impulsive sound) would be generated but would be directed entirely at the ocean or uninhabited land masses. After descent through the atmosphere some residual propellant (approximately 74 metric tons) would remain in the booster, which would impact the Gulf of Mexico or Atlantic Ocean action area. As described in Section 1.1, an overpressure event would result from the following two conditions: (1) landing at terminal velocity and break up on impact resulting in an explosive event at the surface of the water or (2) soft water landing and tip over and sink or explode on impact with the surface of the water.

Starship (Second Stage) Landings

SpaceX plans to land the reusable Starship (ship) back on land at its launch site or on floating platforms in the ocean, land at terminal velocity and break up upon impact or soft water land and tip over or explode. Starship would complete its payload mission and maintain trajectory to the landing locations (RTLS or floating platform). Overpressure events for Starship are described in the following paragraph below.

The Action also includes up to 20 total overpressure events of Starship (second stage) at the surface of the water in the Indian Ocean Landing Area (Figure 3) and/or in three potential landing areas in the Pacific Ocean (Figure 1 and 2) to accommodate new trajectories proposed by SpaceX. Landing events would generally proceed as follows- after ascent engine cutoff, the ship would retain residual propellant in the main tanks and in the header tanks (approximately 101 metric tons). Following an in-space coast phase, Starship would begin its descent. During descent, when the second stage is supersonic, a sonic boom (overpressure of high-energy impulsive sound) would be generated but would be directed entirely at the ocean or uninhabited land masses. Some residual propellant (approximately 31 metric tons in the headers and approximately 70 metric tons in the main tanks) would remain in the ship. As described in Section 1.1, an overpressure event would result from the following two conditions in the landing areas: (1) landing at terminal velocity and break up on impact resulting in an explosive event at the surface of the water or (2) soft water landing and tip over and explode on impact with the surface of the water. The impact would disperse settled remaining propellants and drive structural failure of the vehicle, which would allow the remaining LOX and methane to mix, resulting in an explosive event at the surface of the ocean.

2.1.2 Action Area

Launch operations would occur day or night, at any time during the year. Up to 145 Starship/Super Heavy launches would be performed at KSC, Florida, CCSFS, Florida, and Boca Chica, Texas. The Action Area includes four proposed landing areas for Starship and two landing areas for Super Heavy. The Starship could be expended in the Northwest Pacific Starship Landing Area (Figure 1, pink area), Northeast Pacific Landing Area (Figure 1, green area), Southeast Pacific Starship Landing Area (Figure 2), or Indian Ocean Starship Landing Area (Figure 3). For each mission, Super Heavy could be expended in in the Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location (Figure 4) or the North Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location (Figure 5), depending on the launch location.

Due to its large size, the North Pacific Starship Landing Area spans a wide range of species' habitats. To better represent species densities and distributions in the analysis, the North Pacific Starship Landing Area was divided into two areas, the Northwestern and Hawaii area and the Northeastern Pacific area.

It is anticipated that the overpressure events associated with the Proposed Action would begin in October 2024 and end in October 2025.

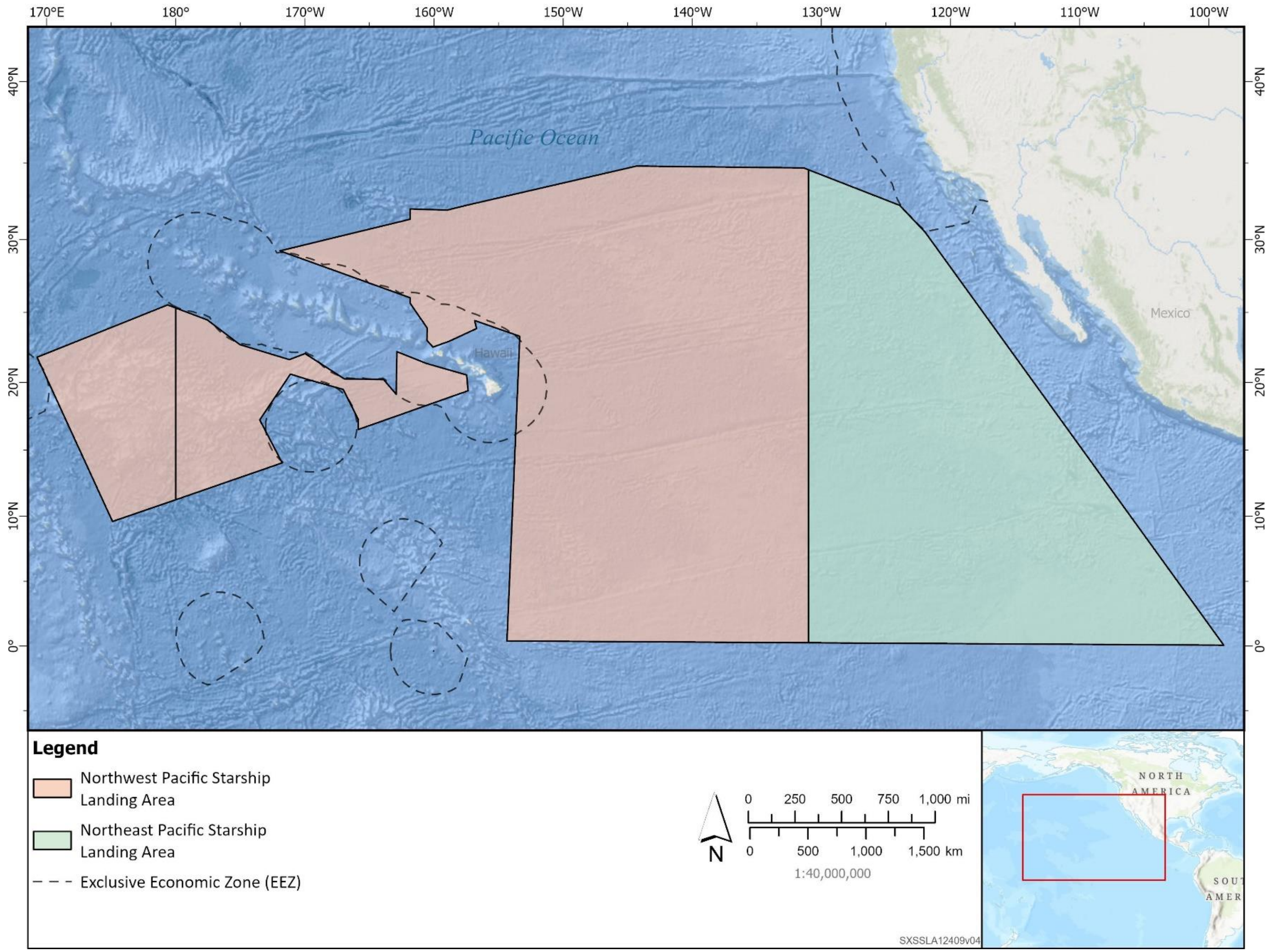


Figure 1: Northwest Pacific and Northeast Pacific Starship Landing Areas

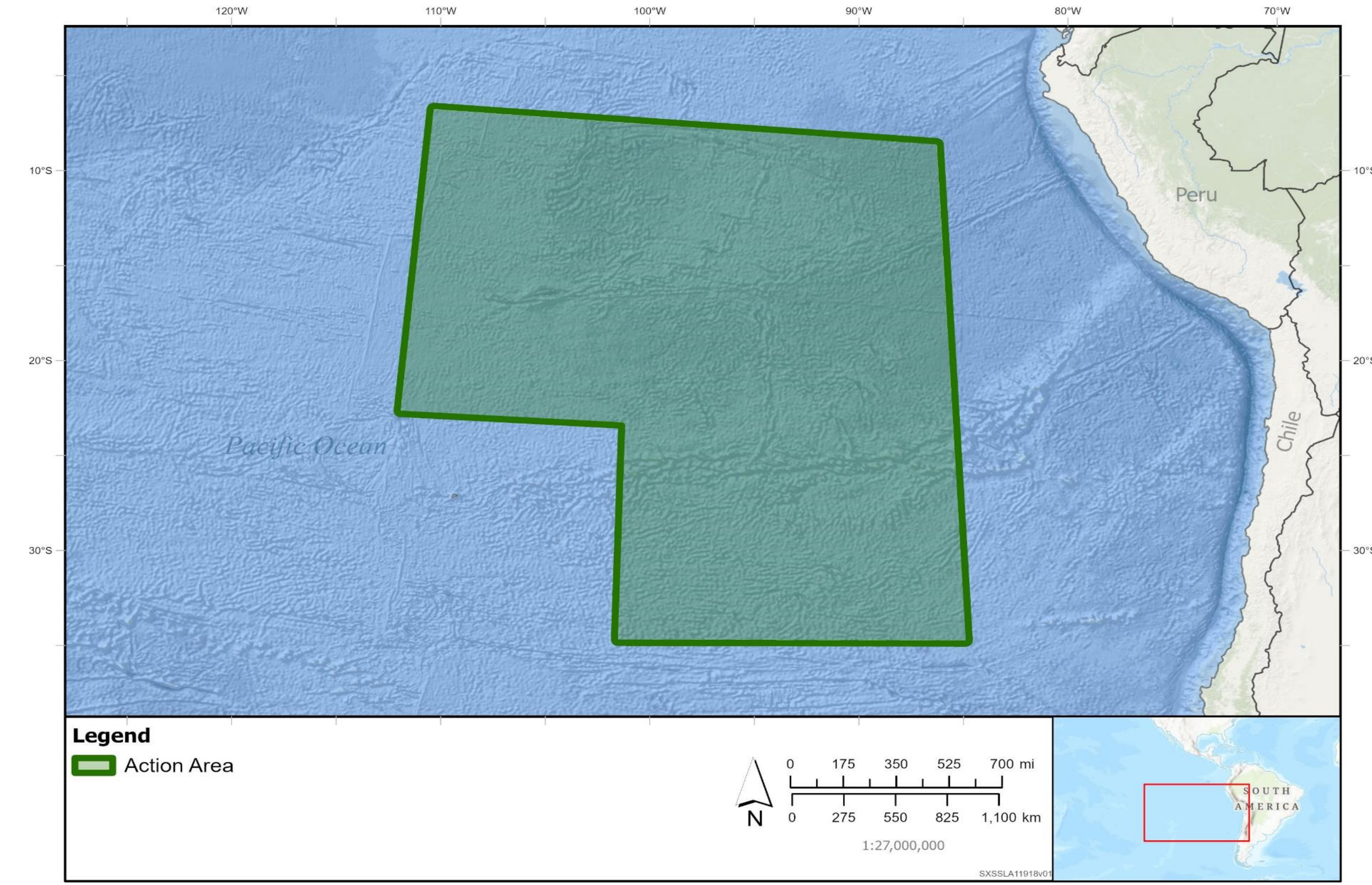


Figure 2: Southeast Pacific Starship Landing Area

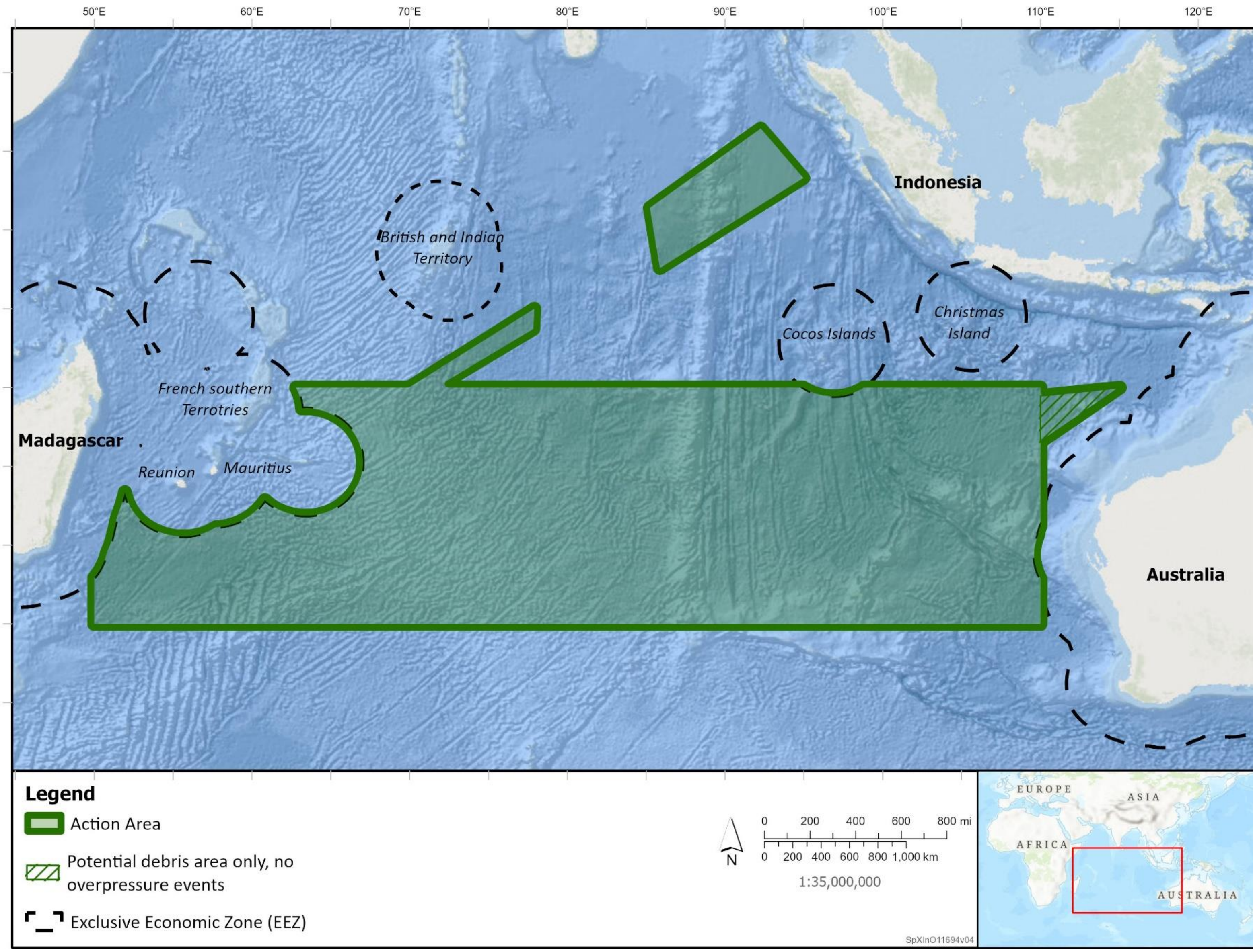


Figure 1: Indian Ocean Starship Landing Area

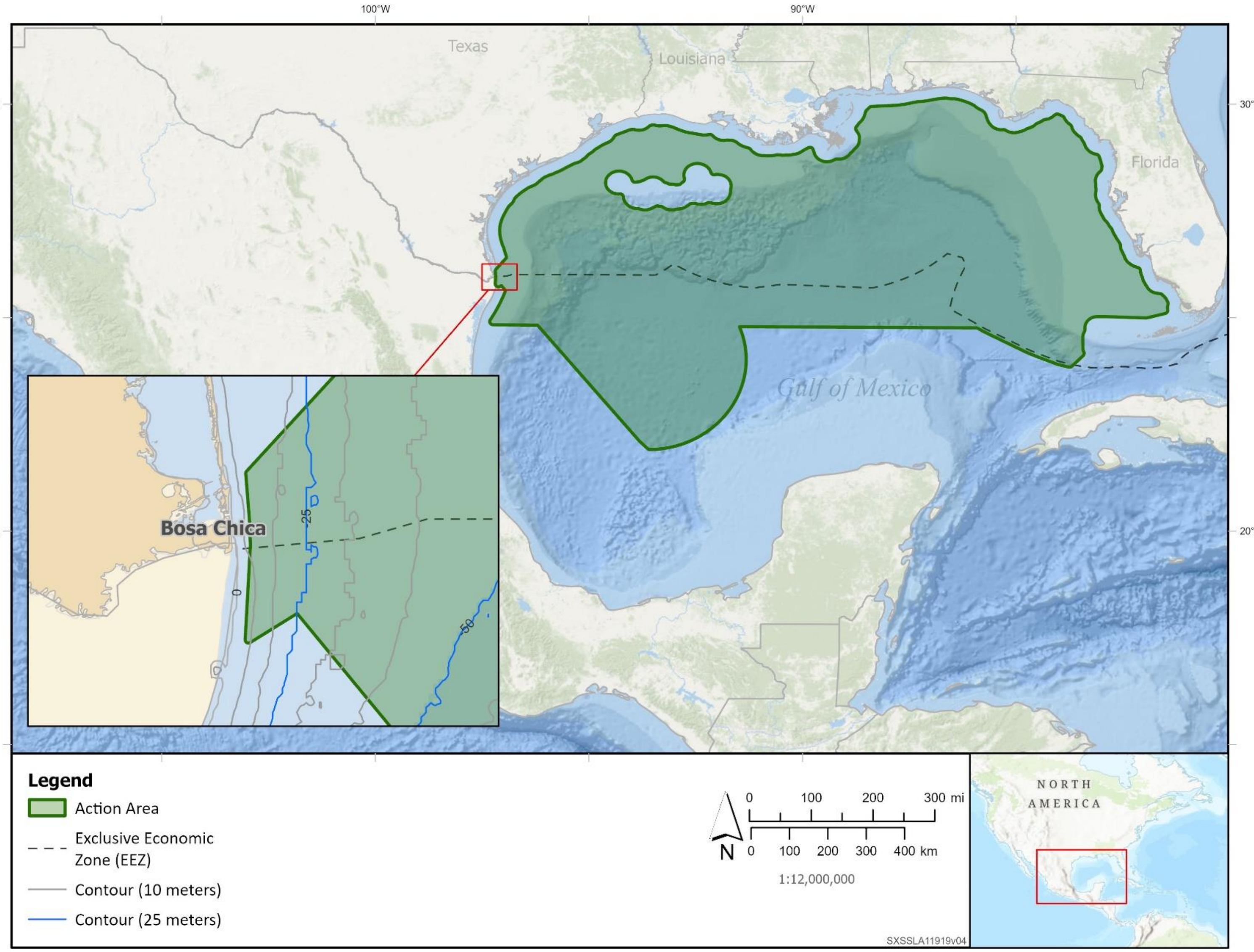


Figure 4: Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

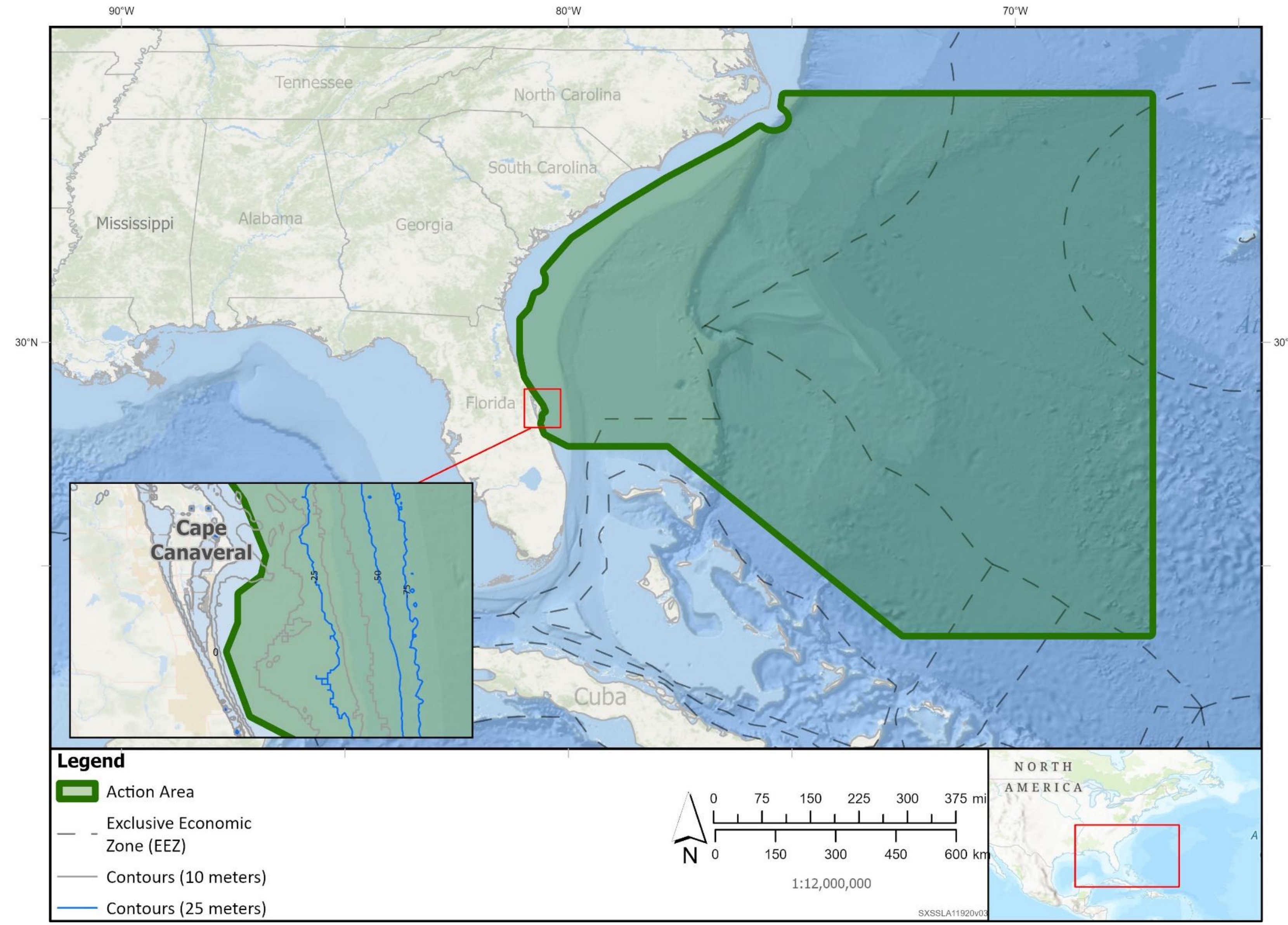


Figure 5: Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

2.1.3 Conservation Measures

SpaceX will adopt applicable conservation measures from previous consultation documents in the portions of the Action Area within the Gulf of Mexico, Atlantic, Pacific, and Indian Oceans (see Section 2.3.1). The Southeast Pacific Starship Landing Area is a new portion of the Action Area not previously analyzed. Relative to other landing areas, marine resources (including ESA-listed species occurrence and seasonality) within the landing area proposed within the Indian Ocean are less known. Accordingly, SpaceX proposed avoidance areas for the Indian Ocean portion of the Action Area.

2.1.4 Conservation Measures within the Gulf of Mexico, Atlantic Ocean, and Pacific Ocean

General Measures Applicable to Launches and Reentry Trajectory Planning

- Launch activities and reentry activities will occur in the proposed action area at least 5 NM offshore the coast of the United States or islands. The only operations component that will occur near shore will be watercraft transiting to and from a port when recovering spacecraft or launch vehicle components, or possibly for surveillance.
- No launch operator will site a landing area in coral reef areas.
- No activities will occur in or affect a National Marine Sanctuary unless the appropriate authorization has been obtained from the Sanctuary.
- Landing operations will not occur in the aquatic zone extending 20 NM (37 km) seaward from the baseline or basepoint of each major rookery and major haul-out of the Western DPS Steller sea lion located west of 144° W.
- Reentry trajectories will be planned to avoid rice's whale core habitat.
- Each launch operator will provide a dedicated observer(s) (e.g., biologist or person other than the watercraft operator that can recognize ESA-listed and MMPA-protected species) that is responsible for monitoring for ESA-listed and MMPA-protected species with the aid of binoculars during all in-water activities, including transiting marine waters for surveillance or to retrieve boosters, spacecraft, other launch-related equipment or debris.
- The FAA would open an action-specific consultation if SpaceX's trajectory tracks to the Atlantic Super Heavy Landing Area during the month of March and in that portion of the Action Area where fin whales might be expected to occur.
- Additional conservation measures for the new portion of the action area will be determined through consultation with NMFS.

General Measures Applicable to Operations of Support Vessels

- SpaceX will ensure that all personnel associated with vessel support operations are instructed about marine species and any critical habitat protected under the ESA that could be present in the proposed landing area. Personnel will be advised of the civil and criminal penalties for harming, harassing, or killing ESA-listed species.
- Support vessels will maintain a minimum distance of 150 ft (45 m) from sea turtles and a minimum distance of 300 ft (90 m) from all other ESA-listed species. If the distance ever becomes less, the vessel will reduce speed and shift the engine to neutral. Engines would not be re-engaged until the animal(s) are clear of the area.
- Support vessels will maintain an average speed of 10 knots or less.
- Support vessels will attempt to remain parallel to an ESA-listed species' course when sighted while the watercraft is underway (e.g., bow-riding) and avoid excessive speed or abrupt changes in direction until the animal(s) has left the area.

- SpaceX will immediately report any collision(s), injuries, or mortalities to ESA-listed species to the appropriate NMFS contact.
- Additional conservation measures for the new portion of the action area will be determined through consultation with NMFS.

2.1.5 Conservation Measures within the Indian Ocean portion of the Action Area

SpaceX contractors and subject matter experts, in preparation of this consultation, completed a literature review in August 2023 that identified ESA-listed species with potential occurrence in the Action Area and locations within the Action Area that may (1) aggregate ESA-listed species and prey for ESA-listed species, (2) offer other refugia for ESA-listed species, or (3) otherwise provide conservation benefit. These areas are shown on Figure 2. Potential Indian Ocean landing areas within the Action Area will be prioritized to avoid these locations, referred to as avoidance areas and further defined below.

Conservation measures are incorporated into SpaceX's proposed action for the purposes of avoiding and minimizing potential adverse effects (see Figure 6). These measures include:

- SpaceX has revised the Action Area to restrict any landings within 200 nm of any land area. Areas within 200 nm are not planned to be used for landings and are therefore excluded from the Action Area.
- SpaceX will, to the maximum extent practicable, avoid areas determined to be sensitive to disturbance or highly productive and presumed to have an increased probability of supporting higher densities of marine life. These areas are categorized as Avoidance Level 1 Areas, and landing sites would be selected to avoid these areas. Other physiographic features with the potential to support sensitive habitat are categorized as Avoidance Level 2 Areas and would also be avoided, if possible, but are not considered as high of a priority to avoid due to a lower expectation of aggregating ESA-listed species:
    - **Avoidance Level 1 Area.** Areas determined to have higher potential for conservation value that are located within the Action Area:
        - **Important Marine Mammal Areas (IMMAs**). IMMAs are defined as discrete portions of habitat, important to marine mammal species, that have the potential to be delineated and managed for conservation. IMMAs consist of areas that may merit place-based protection and/or monitoring. The IMMA concept was developed by the International Union for Conservation of Nature (IUCN) Joint Species Survival Commission (SSC) and World Commission on Protected Area (WCPA) Marine Mammal Protected Areas Task Force (MMPATF). The Action Area overlaps with two Areas of Interest (AOI)—the Exmouth and Wallaby Plateau Offshore Western Australia AOI and the Subtropical Convergence Zone AOI.
        - **Ecologically or Biologically Significant Area (EBSA)**. An EBSA is an area of the ocean that has special importance in terms of its ecological and biological characteristics: for example, by providing essential habitats, food sources or breeding grounds for particular species.
    - Avoidance Level 2 area. Locations that include physiographic features (e.g., plateaus, ridges, spreading zones, known seamounts and ocean vents) outside of Avoidance Level 1 Areas.

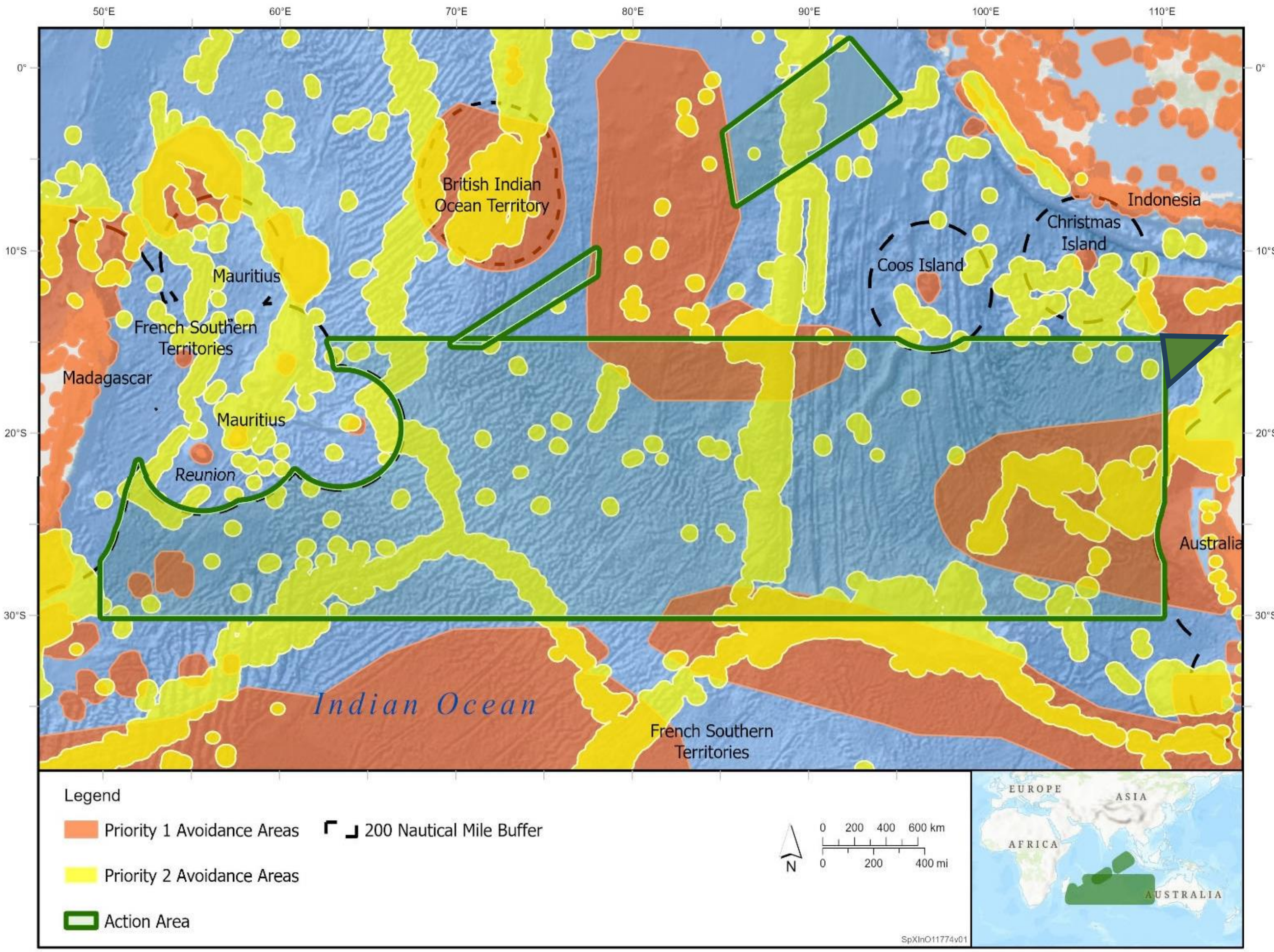


Figure 2: Priority 1 and Priority 2 Indian Ocean Avoidance Areas

3 Description of the Species

The list of ESA-listed endangered and threatened species that may be affected by the Action were developed by reviewing NMFS endangered species web sites, scientific literature, and available reports, and consulting with species experts. Table 3-1 lists the ESA-listed species under NMFS jurisdiction that may be affected by the Action. Table 3-2 lists designated critical habitat within each Action Area.

3.1.1 Species Density Estimates

Species densities (i.e., number of animals per unit area) are needed to quantitatively estimate the number of potential exposures to ESA-listed marine mammals that result from the Action. Data on species abundances and distributions are derived from systematic marine species surveys and are needed to estimate species densities with an acceptable level of uncertainty. Only marine mammal density estimates are used in this BA; however, SpaceX's model can be used for other species' guilds (i.e., sea turtles, fishes) as more data becomes available in the literature.

For all marine species, a significant amount of effort is required to collect and analyze data to produce a density estimate, and many ocean regions have not been surveyed in a manner that supports the derivation of a quantitative density estimate (Kaschner et al., 2012). The Action Area include regions that have been extensively surveyed (e.g., the U.S. East Coast), and other areas where there has been little to no systematic survey effort (e.g., offshore areas of the Indian Ocean). Available density data thus include robust, spatially-explicit density estimates derived from habitat-based density models or species distribution models (SDMs) developed from multiple years of systematic survey data (E. A. Becker et al., 2022; Elizabeth A. Becker et al., 2022; Roberts et al., 2016), as well as large scale density estimates produced from habitat suitability models or relative environmental suitability (RES) models for areas that have not been surveyed (Kaschner et al., 2006). RES models are derived from an assessment of the species occurrence in association with evaluated environmental explanatory variables that result in defining the suitability of a given environment. Abundance is estimated based on the values of the environmental variables, providing a means to estimate density for areas that have not been surveyed. The uncertainty associated with density estimates derived from RES models is very high, and results can substantially diverge from adjacent empirically-based results or from density estimates derived from actual survey data.

The marine mammal density estimates presented in Table 3-1 for each landing area include both an average of all densities and the maximum density for each species in that landing area. The maximum densities were used in the analysis as a conservative approach to estimating potential exposures, but the densities are not necessarily representative of species distributions throughout each landing area and overestimate effects from the Action. For example, a maximum density estimate for many coastal dolphin species is typically in nearshore waters over the continental shelf, while densities farther from shore, in deep waters that make up most of the area in each landing site, are orders of magnitude lower and may approach zero. To address higher than expected exposure estimates for specific species, a mean, or average density estimate was also calculated for each species and used in the analysis to present a more representative analysis of potential effects. The data sources and methods used to derive average and maximum density estimates are described below for each portion of the Action Area.

3.1.2 Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

Density data for the Atlantic Action Area were acquired from habitat-based SDMs developed by a collaboration of federal, state, academic, and independent research organizations who pool scientific data and expertise to develop SDMs spanning the U.S. east coast and southeast Canada. The collaborative effort is led by the Duke Marine Geospatial Ecology Laboratory, who initially published model results in

2016 (Roberts et al. 2016) but have since updated the habitat-based SDMs with additional data (Roberts et al. 2023). The most recent SDMs use over 2.8 million linear kilometers of survey effort collected between 1992-2020, yielding density maps at approximately 5 km x 5 km spatial resolution for over 30 species and multi-species guilds, and are considered the most robust estimates of species density available for these regions.

Two separate SDMs were developed as part of this collaborative effort, one set specific to the U.S. east coast ("East Coast models") and another set that covered waters within the U.S. Navy's Atlantic Fleet Training and Testing (AFTT) study area ("AFTT models"), including U.S. East Coast and Gulf of Mexico waters. Given methodological differences, density estimates from the AFTT models were intended to cover regions offshore and beyond the geographic extents of the East Coast models (Roberts et al. 2023). Therefore, where there was overlap between the East Coast and AFTT modeled estimates, preference was given to data from the East Coast models. To provide seasonal and annual density estimates for the SpaceX Atlantic Action Area, the spatially-explicit density estimates were averaged within the boundaries of the Action Area. An area-weighted average was applied to account for the difference in sample sizes specific to each data source (i.e., the East Coast model estimates covered 31% and the AFTT model estimates covered 69% of the SpaceX Atlantic Action Area). In addition to the overall Action Area average, the maximum and minimum single cell density values within the Action Area were identified for each species, regardless of dataset and the maximum cell density was used to determine the take estimates for each species identified.

3.1.3 Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

Similar to the Atlantic Ocean portion of the Action Area, two separate sources of density data were available for the SpaceX Gulf of Mexico portion of the Action Area, the AFTT models described above (Roberts et al., 2023) and habitat-based SDMs developed specifically for the Gulf of Mexico using data collected during NOAA Southeast Fisheries Science Center (SEFSC) surveys ("SEFSC models"; Garrison et al., 2023). Consistent with the approach used for the Atlantic Ocean portion of the Action Area, spatially-explicit density estimates were averaged within the boundaries of the SpaceX Gulf of Mexico portion of the Action Area. Where there was overlap between the SEFSC and AFTT modeled estimates, preference was given to the SEFSC data. An area-weighted average was applied to account for the difference in sample sizes specific to each data source (i.e., the SEFSC model estimates covered 27% and the AFTT model estimates covered 73% of the SpaceX Gulf of Mexico portion of the Action Area). In addition to the overall average within the Action Area, the maximum and minimum single cell density values within each portion of the Action Area were identified for each species, regardless of dataset.

3.1.4 Northwest and Hawaii Tropical North Pacific Ocean Starship Landing Area

Density data for the Hawaii Starship study area were acquired from density estimates derived from both design- and model-based analyses of cetacean sighting data collected during systematic surveys conducted by Southwest Fisheries Science Center (SWFSC) and Pacific Islands Fisheries Science Center (PIFSC) in the Hawaiian Islands Exclusive Economic Zone (EEZ; Bradford et al. 2020, 2021; Becker et al. 2021, 2022b) and Central North Pacific (Forney et al. 2015). The SDM predictions were available at different spatial resolutions (i.e., the Hawaiian Islands EEZ estimates were available at approximately 10 km x 10 km grid size and the Central North Pacific estimates were available at approximately 25 km x 25 km grid size), the SDM density data were re-gridded to a consistent 10 km x 10 km grid size prior to averaging. Density estimates within the SpaceX Hawaii Starship Action Area were then averaged to provide a mean study area estimate, as well as identifying maximum and minimum single cell density values. For those species for which only design-based estimates were available, the single values were used to represent both the study area average, as well as maximum and minimum estimates and the maximum cell density was used to determine the take estimates for each species identified.

3.1.5 Northeastern Tropical Pacific Ocean Starship Landing Area

Given the large spatial extent of this North Pacific portion of the Action Area, density data from multiple sources were used to provide representative estimates. Density data were available from both design- and model-based analyses of cetacean sighting data described above for the Hawaiian Islands EEZ and Central North Pacific Bradford, 2020 #1327;Bradford, 2021 #201}(Elizabeth A. Becker et al., 2022; Becker et al., 2021; Forney et al., 2015). In addition, both design- and model-based estimates were available for waters off the Baja Peninsula, Mexico and the greater Eastern Tropical Pacific (E. A. Becker et al., 2022; Ferguson & Barlow, 2003; Forney et al., 2012). All the SDM density data were re-gridded to a consistent 10 km x 10 km grid size prior to averaging. For areas where there were overlapping density data, preference was given to the most recent estimates, and to data derived from habitat-based SDMs (i.e., vs. uniform design-based estimates). For those species for which only design-based estimates were available, the single values were used to represent both the study area average, as well as maximum and minimum estimates.

3.1.6 Southeast Pacific Starship Landing Area

There are very limited systematic survey data in the South Pacific, particularly for offshore areas that include the SpaceX portion of the Action Area (Kaschner et al., 2012). A literature review was conducted in an attempt to identify potential sources of density data, but quantitative data were only available for a few coastal, shallow regions that would not be representative of offshore waters within the SpaceX portion of the Action Area, or the published data did not provide quantitative density data. Examples of some of the published papers that were found as a result of the literature review are provided below. Results suggest that there are no suitable density data available for the SpaceX portion of the Action Area in the South Pacific.

3.1.7 Indian Ocean Starship Landing Area

The Indian Ocean has not been surveyed for the occurrence and distribution of marine mammals in a manner that would support quantifiable density estimation based on distance sampling theory. Therefore, a uniform density for each species was estimated for the Action Area based on RES data models (Kaschner et al., 2006; Sea Mammal Research Unit [SMRU] Ltd., 2012) as presented in the Navy's *Final Supplemental Environmental Impact Statement/Supplemental Overseas Environmental Impact Statement for Surveillance Towed Array Sensor System Low Frequency (SURTASS LFA) Sonar* (U.S. Department of the Navy, 2019).

Table 3-1: ESA-listed Species Occurring or Potentially Occurring in the Action Area

Species Name	***DPS***	***ESA Status***	**Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location**	**Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location**	**Indian Ocean Starship Landing Area**	**Northwest and Hawaii Tropical Pacific Starship Landing Area**	**Southeast Pacific Starship Landing Area**	**Northeast Pacific Starship Landing Area**
Fishes								
Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus*[1]	Carolina DPS	Endangered	**X**	**X**	**-**	**-**	**-**	**-**
	South Atlantic DPS	Endangered	**X**	**X**	**-**	**-**	**-**	**-**
Giant manta ray *Manta birostris*	-	Threatened	**X**	**X**	**X**	**X**	**X**	**X**
Gulf sturgeon *Acipenser oxyrinchus desotoi*	**-**	Threatened	**X**	**-**	**-**	**-**	**-**	**-**
Nassau grouper *Epinephelus striatus*	**-**	Threatened	**X**	**-**	**-**	**-**	**-**	**-**
Oceanic whitetip shark *Carcharhinus longimanus*	**-**	Threatened	**X**	**X**	**X**	**X**	**X**	**X**
Scalloped hammerhead shark *Sphyrna lewini*	Eastern Atlantic DPS	Endangered (Foreign)		**X**	**-**	**-**	**-**	**-**
	Central and Southwest Atlantic DPS	Threatened	**X**	**X**	**-**	**-**	**-**	**-**
	Eastern Pacific DPS	Endangered	**-**	**-**		**X**	**X**	**X**

Species Name	*DPS*	*ESA Status*	Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location	Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location	Indian Ocean Starship Landing Area	Northwest and Hawaii Tropical Pacific Starship Landing Area	Southeast Pacific Starship Landing Area	Northeast Pacific Starship Landing Area
	Indo-West Pacific DPS	Threatened	-	-	X	-	-	-
Sea Turtles								
Green sea turtle *Chelonia mydas*	North Atlantic Ocean DPS	Threatened	X	X	-	-	-	
	East Pacific DPS	Threatened	-	-	-	-	X	X
	Central North Pacific DPS	Threatened	-	-	-	X	-	-
	East Indian-West Pacific DPS	Threatened (Foreign)	-	-	X	-	-	-
	North Indian DPS	Threatened (Foreign)	-	-	X	-	-	-
	Southwest Indian Ocean DPS	Threatened (Foreign)	-	-	X	-	-	-
Olive ridley sea turtle *Lepiodochelys olivacea*	-	Endangered/ Threatened[2]	-	-	X	X	X	X
Kemp's ridley sea turtle *Lepidochelys kempii*	-	Endangered	X	X	-	-	-	-

Species Name	***DPS***	***ESA Status***	**Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location**	**Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location**	**Indian Ocean Starship Landing Area**	**Northwest and Hawaii Tropical Pacific Starship Landing Area**	**Southeast Pacific Starship Landing Area**	**Northeast Pacific Starship Landing Area**
Hawksbill sea turtle *Eretmochelys imbricata*	-	Endangered	**X**	**X**	**X**	**X**	**X**	**X**
Leatherback sea turtle *Demochelys coriacea*	-	Endangered	**X**	**X**	**X**	**X**	**X**	**X**
Loggerhead sea turtle *Caretta caretta*	Northwest Atlantic Ocean DPS	Threatened	**X**	**X**	**-**	**-**	**-**	**-**
	North Pacific Ocean DPS	Endangered	**-**	**-**	**-**	**X**	**-**	**X**
	South Pacific Ocean DPS	Endangered (Foreign)	**-**	**-**	**-**	**-**	**X**	**-**
	North Indian Ocean DPS	Endangered (Foreign)	**-**	**-**	**X**	**-**	**-**	**-**
	Southwest Indian Ocean DPS	Threatened (Foreign)	**-**	**-**	**X**	**-**	**-**	**-**
	Southeast Indo-Pacific DPS	*Threatened (Foreign)*	**-**	**-**	**X**	**-**	**-**	**-**
Marine Mammals								
Blue whale/pygmy blue whale *Balaenoptera musculus*	-	Endangered	**-**	AVG= 0.000018 MAX= 0.000024	0.0000281[3]	AVG= 0.000008 MAX= 0.00006	**X**	AVG= 0.000077 MAX= 0.002009

Species Name	***DPS***	***ESA Status***	**Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location**	**Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location**	**Indian Ocean Starship Landing Area**	**Northwest and Hawaii Tropical Pacific Starship Landing Area**	**Southeast Pacific Starship Landing Area**	**Northeast Pacific Starship Landing Area**
False killer whale *Pseudorca crassidens*	main Hawaiian Islands Insular DPS	Endangered	-	-	-	X	-	-
Fin whale *Balaenoptera physalus*	-	Endangered	-	AVG = 0.018352 MAX = 0.000029	0.000871	AVG, MAX = 0.000080	X	AVG = 0.000060 MAX = 0.000080
Humpback whale[1] *Megaptera novaeangliae*	Central America DPS	Endangered	-	-	-	-	X	AVG= 0.000146 MAX= 0.001211
	Mexico DPS	Threatened	-	-	-	AVG= 0.001917 MAX= 0.025324	-	AVG= 0.000146 MAX= 0.001211
North Atlantic right whale *Eubalaena glacialis*	-	Endangered	-	AVG= 0.000003 MAX= 0.001939	-	-	-	-
Rice's whale *Balaenoptera ricei*	-	Endangered	AVG= 0.00016 MAX= 0.01123	-	-	-	-	-
Sei whale *Balaenoptera borealis*	-	Endangered	-	AVG= 0.000141 MAX= 0.000319	X	AVG, MAX= 0.000160	X	AVG= 0.000110 MAX= 0.00160
Sperm whale *Physeter macrocephalus*	-	Endangered	AVG= 0.00252 MAX= 0.01392	AVG= 0.002871 MAX= 0.032160	0.002362	AVG= 0.001498 MAX= 0.002375	X	AVG= 0.000461 MAX= 0.003829
Guadalupe Fur Seal *Arctocephalus townsendii*	-	Threatened	-	-	-	-	X	AVG, MAX= 0.06283
Hawaiian monk seal *Neomonachus schauinslandi*	-	Endangered	-	-	-	AVG= 0.000031 MAX= 0.000040	-	-

[1] Insufficient data are available to estimate densities at the DPS level; therefore, densities are representative of the species.

Species Name	*DPS*	*ESA Status*	**Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location**	**Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location**	**Indian Ocean Starship Landing Area**	**Northwest and Hawaii Tropical Pacific Starship Landing Area**	**Southeast Pacific Starship Landing Area**	**Northeast Pacific Starship Landing Area**

DPS=Distinct Population Segment, ESA=Endangered Species Act, "X" indicates presence in the landing area, however the densities are unknown.

Notes:

1 Chesapeake Bay, New York Bight, and the Gulf of Maine DPS may also occur in the action area in small numbers (see 3.5.1.2).

2 Olive ridley sea turtles belonging to Mexico's Pacific coast breeding populations are considered endangered by NMFS. All other populations are considered threatened. Accordingly, olive ridleys in the Southeast Pacific Starship Landing Area are endangered and threatened in other portions of the Action Area.

3 Density estimates for the Indian Ocean are not presented as averages and max values.

Table 3-2: Species with Designated or Proposed Critical Habitat in the Action Area

Species Name	***DPS***	***Critical Habitat Designation***	**Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location**	**Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location**	**Indian Ocean Starship Landing Area**	**Hawaii and NW Pacific Starship Landing Area**	**Southeast Pacific Starship Landing Area**	**Northeast Pacific Starship Landing Area**
Green sea turtle *Chelonia mydas*	North Atlantic Ocean DPS	88 FR 46572	**X**	**X**	**-**	**-**	**-**	**-**
Loggerhead sea turtle	Northwest Atlantic Ocean DPS	79 FR 39855	**X**	**X**	**-**	**-**	**-**	**-**
North Atlantic right whale *Eubalaena glacialis*	-	81 FR 4838		**X**	-	-	-	-

3.1.5 Fishes

3.5.1 Atlantic Sturgeon (Acipenser oxyrinchus oxyrinchus)

3.5.1.1 Status and Trends

Atlantic sturgeon were once abundant, but overfishing and habitat loss have caused sharp population declines. NMFS issued a moratorium on harvesting in federal waters 1999 (64 FR 9449). However, populations continued to decline, prompting NOAA to list the species as endangered or threatened throughout its range in 2012 (77 FR 5880; 77 FR 5914). Atlantic sturgeon population is comprised of five DPS: the Carolina, South Atlantic, Chesapeake Bay, and New York Bight DPSs, which are listed as endangered, and the Gulf of Maine DPS, which is listed as threatened (77 FR 5880). Atlantic sturgeon in the Action Area would most likely be part of the Carolina DPS and South Atlantic DPS. However, individuals from the Carolina, South Atlantic, Chesapeake Bay, New York Bight, and the Gulf of Maine DPSs also could occur in this region (Kahn et al., 2019).

The Atlantic sturgeon is an anadromous fish, which is born in fresh water, migrates into salt water where they grow and mature, and migrates back into fresh water as adults to spawn. They forage and mature in shallow marine waters (Hager & Mathias, 2018). Adult and juvenile Atlantic sturgeon range widely throughout the marine environment and adults may undertake north-south seasonal migrations (Kahn et al., 2019)

In the mid-1800s, incidental catch of Atlantic sturgeon in the shad and river herring seine fisheries indicated that the species was abundant (Armstrong & Hightower, 2002). By 1870, females were collected for their eggs, which were sold as caviar. By 1890, over 3,350 metric tons were landed from rivers along the Atlantic coast (Smith & Clugston, 1997). Despite a moratorium on commercial fishing for this species since 1998, there has been no indication of recovery. The lack of recovery is attributed to coastal development, pollution, poor water quality, and habitat degradation and loss.

3.5.1.2 Distribution

<u>Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location</u>

Rothermel et al. (2020) observed that Atlantic sturgeon along the mid-Atlantic coastal shelf tend to stay closer to shore in spring and summer and move to deeper waters in winter. During non-spawning years, adults may remain in marine waters year-round, although they may enter estuarine waters as well (Kahn et al., 2014; Rothermel et al., 2020). The Carolina, South Atlantic, Chesapeake Bay, New York Bight, and the Gulf of Maine DPSs potentially occur within the Atlantic Ocean Super Heavy Landing Area.

3.5.1.3 Critical Habitat

Critical habitat has been designated within several rivers throughout the sturgeon’s range (82 FR 39160) but does not overlap the Action Area.

3.5.2 Giant Manta Ray (Manta birostris)

3.5.2.1 Status and Trends

NMFS listed the giant manta ray as threatened in 2018 (83 FR 2916). No stock assessments exist for this species. Harvesting, bycatch, habitat loss and degradation, and disease and predation have caused population declines (National Oceanic and Atmospheric Administration 2016a). Giant manta ray populations have generally declined, except in areas where they are specifically protected, such as the Hawaiian Islands (National Oceanic and Atmospheric Administration, 2023d).

3.5.2.2 Distribution

Giant manta rays are found throughout the world's oceans in tropical, subtropical, and temperate waters. They frequently utilize productive areas with regular upwelling, including oceanic island shores, offshore pinnacles, and seamounts. They utilize sandy bottom habitat, seagrass beds, shallow reefs, and the ocean surface both inshore and offshore. The species may migrate seasonally more than 621 mi. (1,000 km); however, individuals are not likely to cross ocean basins (National Oceanic and Atmospheric Administration, 2023d). Giant manta rays may occur throughout the entire Action Area.

Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

Genetic evidence has indicated that giant manta rays are present at the Flower Banks National Marine Sanctuary (FBNMS) in the northwestern Gulf of Mexico (National Oceanic and Atmospheric Administration, 2023e). Species monitoring methods conducted for over 25 years in the FBNMS concluded that approximately 80 percent of observed manta rays were smaller than the size of the species at maturity, indicating that this sanctuary may be an important juvenile manta ray habitat (Stewart et al., 2018).

The Loop Current, which is created by oceanic waters entering the Gulf of Mexico Large Marine Ecosystem from the Yucatan channel and exiting through the Straits of Florida, has upwelling along its edges, as well as in its rings and eddies that are associated with it (Heileman & Rabalais, 2008). These rings, eddies, and upwelling zones are areas where giant manta rays could also be found feeding.

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

Occasional short-lived plankton blooms occur along the Gulf Stream front and in intrusions into the Southeast U.S. Continental Shelf Large Marine Ecosystem, which ranges from south of Cape Hatteras, North Carolina to the straits of Florida (Aquarone, 2009). This draws giant manta rays to feed in this large marine ecosystem during these occasions. Shelf fronts are separated by wintertime cold air outbreaks, river discharge, tidal mixing, and wind-induced coastal upwelling, all of which attract giant manta rays for feeding, and to seagrass floors (National Marine Fisheries Service, 2022a).

Indian Ocean Starship Landing Area

Bycatch of this species by tuna fisheries and similar species fisheries in the region have indicated that giant manta rays are present throughout the Indian Ocean (Martin, 2020). This species has also been observed along all coastlines of Australia, with most individuals sighted around cleaning stations that are adjacent to deeper waters (Armstrong et al., 2020). Satellite tags of giant manta rays off the eastern coast of Africa have also registered movements of this species from Mozambique to South Africa, migrating approximately 1,100 km (National Oceanic and Atmospheric Administration, 2023d).

Hawaii and NW Pacific Starship Landing Area

Giant manta rays are found throughout the Hawaiian Islands, but large aggregations are known to occur along the Kona coast off the Big Island of Hawaii, with hundreds of individuals participating in the aggregation (Defenders of Wildlife, 2015b). These aggregations are likely timed to peak seasonal abundances of prey such as zooplankton.

Southeast Pacific Starship Landing Area

Giant manta rays have been commonly observed throughout this region, with its range recorded as far south as Central Peru (12 °S) (Moreno & Gonzalez-Pestana, 2017). There is also evidence of seasonal aggregations of giant manta rays at Isla de la Plata and Baja Copé Marine Reserve, Ecuador from June through September (Harty et al., 2022). The populations at Isla de Plata and Baja Cope Marine Reserve are largest known aggregations of this species in the world, with an estimated seasonal abundance of more than 22,000 individuals (Harty et al., 2022). Giant manta rays in these areas off Ecuador are known migrate to northern Peru and the Galapagos Islands (Harty et al., 2022).

Northeast Pacific Starship Landing Area

Sightings of giant manta rays are common in Mexico off the Revillagigedo Islands (offshore) and Bahia de Banderas (nearshore) (Miller & Klimovich, 2016). A study monitoring giant manta rays in nearshore and offshore areas off Mexico founds that there was no movement between locations, and that individuals were foraging in their respective environments instead of moving between the locations (National Oceanic and Atmospheric Administration, 2023d). As a result, the giant mantas in these areas may exist as subpopulations with a high degree of residency.

3.5.2.3 Critical Habitat

Critical habitat has not been designated for this species.

3.5.3 Gulf Sturgeon (Acipenser oxyrinchus desotoi)

3.5.3.1 Status and Trends

The gulf sturgeon was federally listed in 1991 as threatened in the Gulf of Mexico Large Marine Ecosystem in 1991 (56 FR 49653) and is co-managed by NMFS and USFWS.[2] The fishery for the species has been closed since being listed. Bycatch along the Gulf coast was a major source of mortality (U.S. Fish and Wildlife Service, 1995), and efforts to reduce bycatch include gear modifications for nearshore trawl fisheries (Smith & Clugston, 1997). NMFS and USFWS concluded that the Gulf sturgeon population was stable and had achieved recovery objectives (U.S. Fish and Wildlife Service & National Marine Fisheries Service, 2022).

3.5.3.2 Distribution

The Gulf sturgeon is an anadromous species that occurs in bays, estuaries, rivers, and the marine environment from Florida to Louisiana in the Gulf of Mexico.

Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

Adult gulf sturgeons inhabit nearshore waters in the Gulf of Mexico from October through February (Robydek & Nunley, 2012) and migrate toward natal rivers in spring (Rogillio et al., 2007). After spawning, adults leave rivers and generally remain within 1,000 m of the shoreline (Robydek & Nunley, 2012), often inhabiting estuaries and nearshore bays in water less than 10 m deep (Ross et al., 2009). Some individuals move into deeper offshore waters for short periods during cold weather (Randall & Sulak, 2012; Sulak et al., 2009).

Sub-adult and adult foraging grounds include barrier island inlets and estuaries less than 2 m deep (Rudd et al., 2014; U.S. Fish and Wildlife Service & National Marine Fisheries Service, 2022). Gulf sturgeon winter near beaches of northwestern Florida and southeast of the mouth of St. Andrew Bay (National Marine Fisheries Service, 2010a), while others moved northeast of St. Andrew Bay at depths ranging from 4 to 12 m (12 to 40 ft.) at 0.5 to 2 mi. offshore (National Marine Fisheries Service, 2022b).

Due to the propensity for Gulf sturgeon to remain near the shoreline, this species is unlikely to occur within the Gulf of Mexico Super Heavy Landing Area.

---

[2] NMFS and USFWS share jurisdiction for ESA-listed gulf sturgeon. USFWS manages recovery of this species in riverine habitats, while NMFS has jurisdiction over this species in estuaries and open waters.

3.5.3.3 Critical Habitat

In 2009 NMFS designated critical habitat for Gulf sturgeon within and adjacent to the states of Louisiana, Mississippi, Alabama, and Florida (82 FR 39160). Critical habitat does not overlap the Action Area.

3.5.4 Nassau Grouper (Epinephelus striatus)

3.5.4.1 Status and Trends

Nassau grouper was once one of the most common species of grouper in the U.S. Commercial and recreational landings of Nassau grouper declined significantly from 1986 to 1991. As a result, NMFS issued moratoriums on take and possession in 1996. By 2000, abundance had continued to decrease by approximately 60 percent over the prior three generations due to intensive fishing on and near spawning aggregation sites (Beets & Hixon, 1994; Cornish & Eklund, 2003; Waterhouse et al., 2020). These declines prompted the Nassau grouper to be listed as threatened under the ESA in 2016 (81 FR 42268).

3.5.4.2 Distribution

Nassau groupers occur in tropical and subtropical waters in the Caribbean and western North Atlantic, including south Florida, U.S. Virgin Islands, Puerto Rico, Bermuda, the Bahamas, the Greater Antilles, the Lesser Antilles, and central America (National Marine Fisheries Service, 2022d; Waterhouse et al., 2020). Generally, Nassau grouper occur at shallow reefs, but can be found in depths to approximately 426 ft. The majority of the species range is outside of the Action Area; however, Nassau grouper was reported the Gulf of Mexico at Flower Gardens Bank (Bester, 2012). Due to minimal overlap in this species range with the Gulf of Mexico Super Heavy Landing Area (Figure 2-1), Nassau grouper are extremely rare within the Action Area.

Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

The only confirmed observation of the Nassau grouper in the Gulf of Mexico at Flower Gardens Bank was recorded in September 2006 during a research cruise (Ehrhardt & Deleveaux, 2007; Waterhouse et al., 2020). It was reported at approximately 27°N and 93°W on the East Flower Bank at a depth of 36 m. There were three other sightings of this species at the Flower Gardens Bank prior to 2006, although these observations were considered unconfirmed (Foley et al., 2007).

3.5.4.3 Critical Habitat

In 2022, NMFS proposed critical habitat for Nassau Grouper off the coasts of southeastern Florida, Puerto Rico, Navassa, and the United States Virgin Islands (87 FR 62930). The proposed critical habitat does not overlap the Action Area.

3.5.5 Oceanic Whitetip Shark (Carcharhinus longimanus)

3.5.5.1 Status and Trends

NMFS completed a comprehensive status review of the oceanic whitetip shark and based on the best scientific and commercial information available, including the status review report (Young & Carlson, 2020), and listed the species as threatened in 2018 (83 FR 4153). Because the oceanic whitetip shark's range is largely outside of U.S. jurisdiction, and regulations have been enacted to reduce the impacts of all domestic fisheries on this species, one of the major components of conservation strategy focuses on strategic international cooperation. As a pelagic species that occurs mostly offshore, it is managed on the high seas across its global range by four major tuna-focused Regional Fisheries Management Organizations.

Oceanic whitetip sharks have been impacted by pelagic longline and drift net fisheries bycatch, targeted fisheries (for the shark fin trade), and destruction or modification of its habitat and range (Baum et al., 2015; Defenders of Wildlife, 2015). Oceanic whitetip sharks have declined by 80 to 95 percent across the Pacific Ocean since the mid-1990s (National Marine Fisheries, 2023). Legal and illegal fishing activities in the Atlantic have caused significant population declines for the oceanic whitetip shark. It is caught as bycatch in tuna and swordfish longlines in the northwest Atlantic and Gulf of Mexico. In the Indian Ocean, the scope and magnitude of threats are potentially higher due to wider use of pelagic longlines and gillnets, though this is uncertain. Fishing effort, harvest, and shark landings are also higher in the Indian Ocean than any other ocean (Young & Carlson, 2020). Habitat degradation has occurred due to pollutants in the environment that bioaccumulate and biomagnify to high levels in their bodies due to their high position in the food chain, long life, and large size (Defenders of Wildlife, 2015).

3.5.5.2 Distribution

Oceanic whitetip sharks are found worldwide in warm tropical and subtropical waters between the 30° North and 35° South latitude, typically near the surface of the water column (Young et al., 2016). Oceanic whitetip sharks are expected to occur throughout the entire Action Area.

This species has a clear preference for open ocean waters, with abundance decreasing in proximity to continental shelves. Allen and Cross (2006) categorized oceanic whitetip sharks as holoepipelagic and individuals would be found mostly far from shore. Preferring warm waters near or over 20 degrees Centigrade (68 degrees Fahrenheit), and offshore areas, the oceanic whitetip shark is known to undertake seasonal movements to higher latitudes in the summer (National Marine Fisheries Service, 2023b) and may regularly survey extreme environments (deep depths, low temperatures) as a foraging strategy (Young & Carlson, 2020).

Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

Oceanic whitetip sharks are a species that prefers warmer waters and is more likely to occur during the summer months in the Gulf of Mexico (Tolotti et al., 2017). This species would likely occur near the surface of offshore deep open ocean waters. U.S. pelagic longline surveys in the mid-1950s and U.S. pelagic longline observer data in the Gulf of Mexico during the late-1990s estimated a decline of the species in the Gulf over the 40-year time period. However, due to temporal changes in fishing gear and practices over the time period, the study may have exaggerated or underestimated the magnitude of population decline (National Marine Fisheries Service, 2023b).

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

In the Southeast U.S. Continental Shelf Large Marine Ecosystem, oceanic whitetip sharks would be more likely to occur far offshore in the open sea in waters that are 200 m deep near the surface of the water column, although some have been recorded to occur at depths of 152 m (National Marine Fisheries Service, 2023b). This species may also migrate southward of Cape Hatteras, North Carolina as the water temperatures in the region drop (Backus et al., 1956).

Indian Ocean Starship Landing Area

Oceanic whitetip sharks have been observed throughout the Indian Ocean, often as a low-prevalence bycatch of fisheries in the region. Spanish and French swordfish longline fisheries have recorded bycatches of oceanic whitetip sharks in the Southwest Indian Ocean. This species was present in approximately 16 percent of their tuna catches, indicating the presence of this species in the region (Ramos-Cartelle et al., 2012). Oceanic whitetips are most frequently recorded in the northern Hemisphere of the Indian Ocean and in warmer regions North of 25°S (Ramos-Cartelle et al., 2012).

Hawaii and NW Pacific Starship Landing Area

Oceanic whitetips occur throughout the Central Pacific, including the Hawaiian Islands. Catch data from the Hawaii-based longline fishery from 1995 through 2000 and 2004 through 2006 indicated that the oceanic whitetip shark was a common species incidentally caught in both the nearshore and offshore fishing sectors (National Marine Fisheries Service, 2023b). The catch data also reflected a decline in the number of whitetip sharks caught from 2004 through 2006, which was unable to be explained (National Marine Fisheries Service, 2023b).

Southeast Pacific Starship Landing Area

In the eastern Pacific, the oceanic whitetip shark range extends from southern California (including the Gulf of California) to Panama, Ecuador, and northern Peru (Bester, 1999). Bycatch data from 1993 through 2004 has recorded the presence of this species throughout the Eastern Tropical Pacific, specifically in waters off northern Peru and Ecuador with highest concentrations at approximately 110°W through 140°W (Queiroz et al., 2019).

Northeast Pacific Starship Landing Area

In the eastern Pacific, the whitetip shark range extends from southern California (including the Gulf of California) to Panama, Ecuador, and northern Peru (Bester, 1999). Although the range extends to southern California, this species is likely more abundant further south (National Marine Fisheries Service, 2023b). Records of pregnant female individuals in the region are often recorded between 20°N to the equator (National Oceanic & Atmospheric Association, 2017). Longline and purse seine fisheries in the Eastern Pacific have also reported that whitetip sharks have been commonly caught as bycatch in the region. Records from 1993 through 2009 found that this species was the second most abundant shark caught as bycatch by the tropical tuna purse seine fishery (Young & Carlson, 2020).

3.5.5.3 Critical Habitat

Critical habitat has not been designated for this species.

3.5.6 Scalloped Hammerhead Shark (Sphyrna lewini)

3.6.6.1 Status and Trends

In 2011, NMFS determined scalloped hammerhead sharks to be overfished based on a stock assessment of scalloped hammerhead sharks in U.S. waters (National Marine Fisheries Service, 2020b). As a result, NMFS issued moratoriums on take and possession in 2011. In 2014, NMFS listed the Central and Southwest Atlantic and Indo-West Pacific DPSs of the scalloped hammerhead population as threatened and the Eastern Pacific DPS as endangered under the ESA (79 FR 52576). These DPSs are expected to occur in the Action Area. The Central Pacific and Northwest Atlantic and Gulf of Mexico DPSs of scalloped hammerhead sharks have not been listed under the ESA.

3.5.6.2 Distribution

The scalloped hammerhead shark is a coastal and semi-oceanic species distributed in temperate to tropical waters across the globe. Scalloped hammerhead sharks inhabit the surface to depths of 275 m (Duncan & Holland, 2006) and prefer coastal waters with temperatures between 23°C and 26°C (National Marine Fisheries Service, 2020b) with animals generally remaining close to shore during the day and moving into deeper waters to feed at night (Bester, 1999; National Marine Fisheries Service, 2020b). Daly-Engel et al. (2012) found that females remain close to coastal habitats, while males disperse across larger open ocean areas.

Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

The Gulf of Mexico Super Heavy Landing Area slightly overlaps the range of scalloped hammerheads belonging to both the Central and Southwest Atlantic DPS. Scalloped hammerhead sharks have been observed throughout the Gulf of Mexico, particular in nearshore areas and estuarine habitats. Off the eastern coast of Florida, they have been recorded both inshore and offshore by recreational fisheries between 1981 through 1983 (National Marine Fisheries Service, 2020b). Pelagic sharks, which includes the scalloped hammerhead, were largest component of incidental catches in the area during this time (National Marine Fisheries Service, 2020b).

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

The Atlantic Heavy Landing Area overlaps the Central and Southwest Atlantic DPS of scalloped hammerhead sharks. In the western Atlantic, their range extends from New Jersey to areas south of the Action Area, including the Caribbean Sea (National Marine Fisheries Service, 2020b) with seasonal migration along the eastern United States. Juveniles rear in coastal nursery areas (Duncan & Holland, 2006) with all ages occurring in the Gulf Stream, but rarely inhabits the open ocean (Kohler & Turner, 2001).

Indian Ocean Starship Landing Area

The Indio-West Pacific DPS of scalloped hammerhead sharks overlaps the Indian Ocean Starship Landing Area. Populations of this species in the Indian Ocean in proximity to this portion of the Action Area includes waters off South Africa, Indonesia, and Australia. They have also been reported off the coast of Madagascar and are considered common in the area (National Marine Fisheries Service, 2020b). A study analyzing the distribution and movement of this species off the east coast of South Africa found that the largest number of scalloped hammerhead sharks caught and tagged in the region was during the summer, indicating that this species may be most abundant during the summertime (National Marine Fisheries Service, 2020b).

Southeast Pacific Starship Landing Area

The Eastern Pacific DPS occurs within the Southeast Pacific Starship Landing Area. Aggregations of scalloped hammerhead sharks have been particularly observed in waters off the Galapagos Islands. Ketchum, Hearn, Klimley, Espinoza, et al. (2014); Ketchum, Hearn, Klimley, Penaherrera, et al. (2014) found scalloped hammerheads formed daytime schools at specific locations in the Galapagos Islands, but dispersed at night, spending more time at the northern islands during part of the warm season (December–February) compared to the cool.

Northeast Pacific Starship Landing Area

The Eastern Pacific DPS occurs within the Northeast Pacific Starship Landing Area. Adult schools in the region are most common in offshore areas over seamounts and near islands such as the Revillagigedo Islands and within the Gulf of California (National Oceanic and Atmospheric Administration, 2014). Juvenile aggregations are most commonly observed in nearshore areas such as the coastal waters off Oaxaca, Mexico (National Oceanic and Atmospheric Administration, 2014). In the Gulf of California, is observed spending daytime hours in proximity to seamounts and islands and moving to offshore areas at night (National Oceanic and Atmospheric Administration, 2014).

3.5.6.3.Critical Habitat

Critical habitat has not been designated for this species.

3.1.6 Sea Turtles

General Background

Sea turtles are highly migratory, long-lived reptiles that occur throughout the open-ocean and coastal regions of the Action Area. Generally, sea turtles are distributed throughout tropical to subtropical latitudes (i.e., in warmer waters closer to the equator), with some species extending poleward into temperate seasonal foraging areas. In general, sea turtles spend most of their time at sea, with the notable exception of mature females returning to land, primarily beaches, to nest. The habitat preferred by sea turtles and their distribution at sea varies by species and life stage (i.e., hatchling, juvenile, adult).

3.6.1 Green Sea Turtle (Chelonia mydas)

3.6.1.1 Status and Trends

The green turtle (*Chelonia mydas*) was listed under the ESA on July 28, 1978 (43 FR 32800). Breeding populations of the green turtle in Florida and along the Pacific Coast of Mexico were listed as endangered; all other populations were listed as threatened. The major factors contributing to its status included human encroachment and associated activities on nesting beaches; commercial harvest of eggs, subadults, and adults; predation; lack of comprehensive and consistent protective regulations; and incidental take in fisheries.

In 2016, NMFS and USFWS reclassified the species into 11 DPS (see the NMFS and USFWS Final Rule published on April 6, 2016). The geographic areas that include these distinct population segments are: (1) North Atlantic Ocean (Threatened), (2) Mediterranean (Endangered), (3) South Atlantic (Threatened), (4) Southwest Indian Ocean (Threatened—Foreign), (5) North Indian Ocean (Threatened—Foreign), (6) East Indian–West Pacific Ocean (Threatened—Foreign), (7) Central West Pacific Ocean (Endangered), (8) Southwest Pacific (Threatened—Foreign), (9) Central South Pacific (Endangered), (10) Central North Pacific (Threatened), and (11) East Pacific Ocean (Threatened).

3.6.1.2 Distribution

The green sea turtle is found in tropical and subtropical coastal and open ocean waters, between 30° North and 30° South.

Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

Only the North Atlantic DPS (which is listed as threatened) is within the Gulf of Mexico portion of the Action Area. It should be noted, however, that North Atlantic green sea turtle populations have minimal mixing (gene flow) with the South Atlantic regions and no mixing with the Mediterranean region, and juvenile turtles from the North Atlantic may occasionally use South Atlantic or Mediterranean foraging grounds (Seminoff et al., 2015).

Four regions within the North Atlantic DPS support nesting concentrations: Costa Rica (Tortuguero), Mexico (Campeche, Yucatán, and Quintana Roo), the United States (Florida), and Cuba. The highest concentration of nesting is in Tortuguero, and in Mexico, where nesting occurs primarily along the Yucatán Peninsula. Most green sea turtle nesting occurs along the Atlantic coast of eastern central Florida, with smaller concentrations along the Gulf Coast and Florida Keys. In Cuba, nesting primarily occurs on the extreme western tip of the country and on islands off the southern shore of Cuba. Nesting also occurs in the Bahamas, Belize, Cayman Islands, Dominican Republic, Haiti, Honduras, Jamaica, Nicaragua, Panama, Puerto Rico, Turks and Caicos Islands, and United States (North Carolina, South Carolina, Georgia, Texas, and Virginia).

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

Only the North Atlantic DPS (which was listed as threatened) is within this portion of the Action Area. As with green sea turtles within the Gulf of Mexico, members of the North Atlantic green sea turtle DPS have minimal mixing (gene flow) with the South Atlantic regions, and juvenile turtles from the North Atlantic may occasionally use South Atlantic or Mediterranean foraging grounds (Seminoff et al., 2015).

Because the distribution of the North Atlantic DPS covers both the Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location and the Atlantic Ocean Mexico Super Heavy Landing Area and Nominal Landing Location, see the distribution information above for relevant distributions of green sea turtles within this portion of the Action Area.

Indian Ocean Starship Landing Area

The Indian Ocean portion of the Action Area supports three DPS's of green sea turtles—the North Indian Ocean DPS, Southwest Indian Ocean DPS, and the East Indian-West Pacific DPS. These three DPS are listed as threatened-foreign. Within the Indian Ocean, nesting beaches are known to occur within the Seychelles Islands, French Island holdings (Comoros Islands, Esparces Islands, locations along the Indian Coast, Pakistani coast, locations on the Arabian Peninsula (Yemen, Oman, Saudi Arabia), and locations along the Malaysian coast and Indonesian outer islands (Kelley et al., 2022). Ameri et al. (2022) noted coastal development and erosion, bycatch, pollution, direct exploitations, vessel strikes in nearshore foraging and resting habitats, predation (on eggs and hatchlings), and climate change as primary threats for green sea turtles within the Action Area.

For open ocean movements, tagging of green sea turtles since the 1970s provides the most complete understanding of distributions within the Indian Ocean. Long-term tagging and recapture records maintained for green turtles in Oman, under the Ministry of Regional Municipalities and Environment/Nature Conservation, has provided information on green turtle movements (Mobaraki et al. 2019). Some turtles in the area migrate long distances from distant feeding grounds to nesting beaches, while others are quite sedentary. Tagging studies have revealed that some turtles nesting on Ras al Hadd and Masirah can be found as far away as Somalia, Ethiopia, Yemen, Saudi Arabia, and the upper Arabian Gulf, and Pakistan (Ross, 1987; Salm, 1991). No tagging has been carried out on feeding grounds (Al-Saady et al., 2005). A green turtle tagged in Oman was found in the Maldives (Al-Saady et al., 2005). Evidence from tag returns indicates that some green turtles in Tanzania are probably resident, and others are highly migratory moving to and from nesting and feeding grounds within the southwest Indian Ocean in Kenya, Seychelles, Comoros, Mayotte, Europa Island and South Africa (Muir, 2005). Tagged green turtles observed in eastern Australia have been located elsewhere in Australia (Northern Territory, Queensland, and New South Wales) and at other neighboring countries, including Papua New Guinea, Indonesia (Java and the Anu Islands), Vanuatu, Solomon Islands, New Caledonia, and Fiji (Seminoff et al., 2015), indicating that this DPS may not be associated with pelagic Indian Ocean environments.

Hawaii and NW Pacific Starship Landing Area

The Hawaii Starship Landing Area supports the Central North Pacific DPS (threatened) of green sea turtle. The green sea turtle is the most common sea turtle species in this portion of the Action Area, occurring in the coastal waters of the main Hawaiian Islands throughout the year and commonly migrating seasonally to the Northwestern Hawaiian Islands to reproduce (Balazs & Chaloupka, 2006; Lotufo et al., 2013; Seminoff et al., 2015). Green sea turtles are found in inshore waters around all of the main Hawaiian Islands and Nihoa Island, where reefs, their preferred habitats for feeding and resting, are most abundant. They are also common in an oceanic zone surrounding the Hawaiian Islands. This area is frequently inhabited by adults migrating to the Northwestern Hawaiian Islands to reproduce during the summer and by ocean-dwelling individuals that have yet to settle into coastal feeding grounds of the main Hawaiian

Islands (Lotufo et al., 2013). Farther offshore, green sea turtles occur in much lower numbers and densities (Seminoff et al., 2015).

Southeast Pacific Starship Landing Area

The Southeast Pacific Starship Landing Area supports the East Pacific DPS (threatened) and the Central South Pacific DPS (endangered) of the green sea turtle. The East Pacific DPS extends from the California/Oregon border southward along the Pacific coast of the Americas to central Chile. The two largest nesting aggregations are found in Michoacán, Mexico and in the Galapagos Islands, Ecuador. Secondary nesting areas are found throughout the Pacific Coast of Costa Rica and Clarion and Socorro Islands in the Revillagigedos Archipelago, Mexico. Low level nesting occurs in Colombia, Ecuador, Guatemala, and Peru (Seminoff et al., 2015).

The Central South Pacific DPS extends north from northern New Zealand to Fiji, Tuvalu, and Kiribati and east to include French Polynesia. Green turtles departing nesting grounds in this DPS travel throughout the South Pacific Ocean. Post-nesting green turtles tagged in the early 1990s from Rose Atoll returned to foraging grounds in Fiji and French Polynesia (Craig et al., 2004). Green turtle population trends in the Central South Pacific DPS are poorly understood, with not even a single nesting site having five contiguous years of standardized monitoring that span entire nesting seasons and lacking information on foraging and migration corridors (Seminoff et al., 2015).

Northeast Pacific Starship Landing Area

There are very few reports of turtles from southern Pacific Ocean populations occurring in the northern Pacific Ocean (Limpus et al., 2009; Seminoff et al., 2015). This portion of the Action Area is not anticipated to support green sea turtles, as the Northeast Pacific Starship Landing Area is beyond the northern limits of both the East Pacific DPS and the Central North Pacific DPS.

3.6.1.3 Critical Habitat

On July 23, 2023, NMFS and USFWS proposed to designate new areas of critical habitat and modify existing critical habitat for threatened and endangered distinct population segments of the green sea turtle, in areas under U.S. jurisdiction (88 FR 46572). NMFS proposed to designate marine critical habitat in nearshore waters (from the mean high-water line to 20 meters depth) off the coasts of Florida, Texas, North Carolina, Puerto Rico, U.S. Virgin Islands, California, Hawaiʻi, Guam, Commonwealth of Northern Mariana Islands, American Samoa, and the Pacific Remote Island Areas. It also includes nearshore waters (from the mean high-water line to 10 kilometers offshore) between San Diego Bay and Mexico. The proposed rule includes the volume of water to 20 meters depth to protect access to nesting beaches, migratory corridors and important feeding and resting areas. USFWS's proposed critical habitat includes land where green sea turtles bask, nest, incubate, hatch and travel to the sea. Proposed critical habitat overlaps with the Gulf of Mexico portion of the Action Area (Figure 7) and the Atlantic Ocean portion of the Action Area (Figure 8).

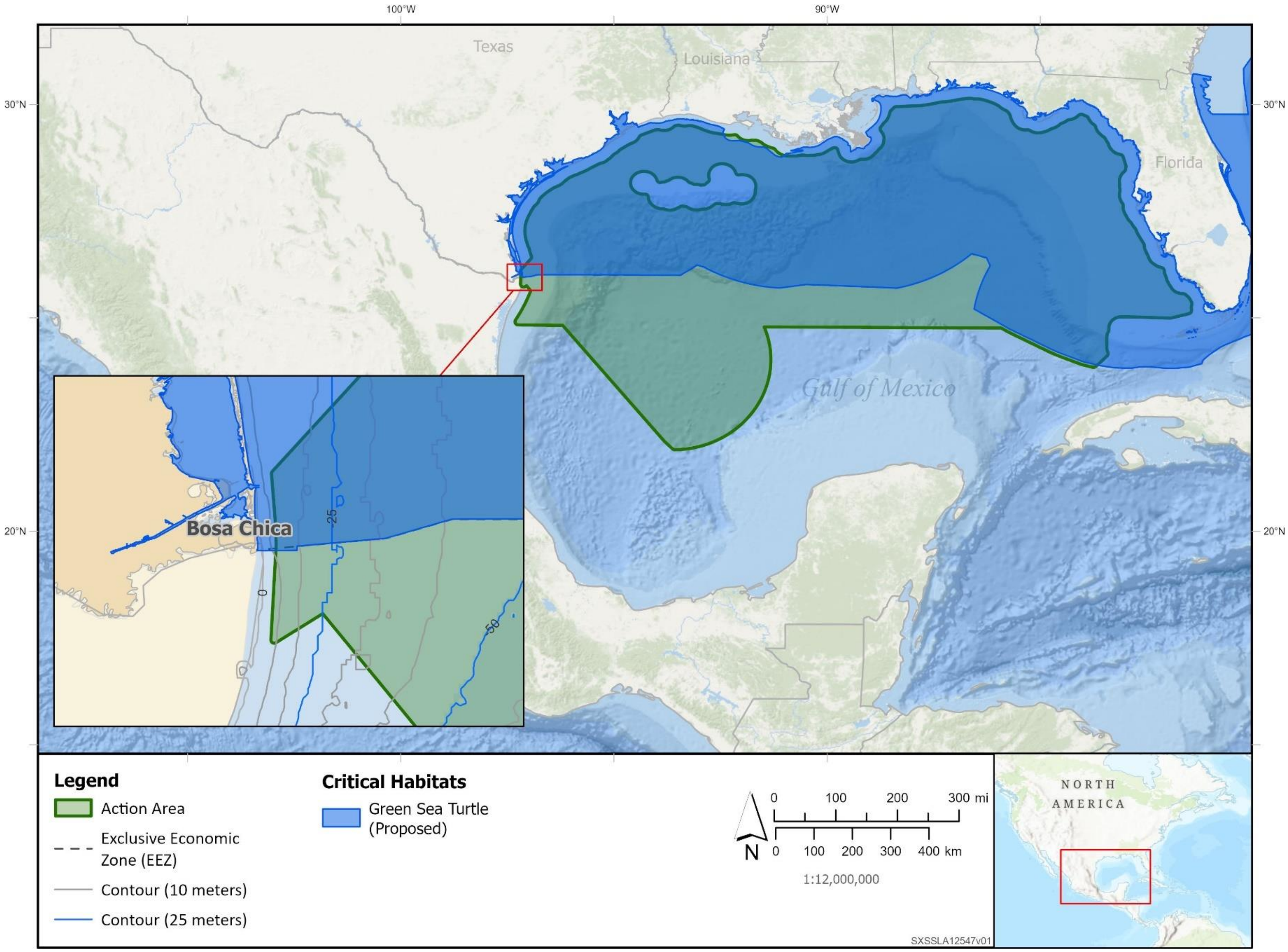


Figure 3: Proposed Green Sea Turtle Critical Habitat within the Gulf of Mexico

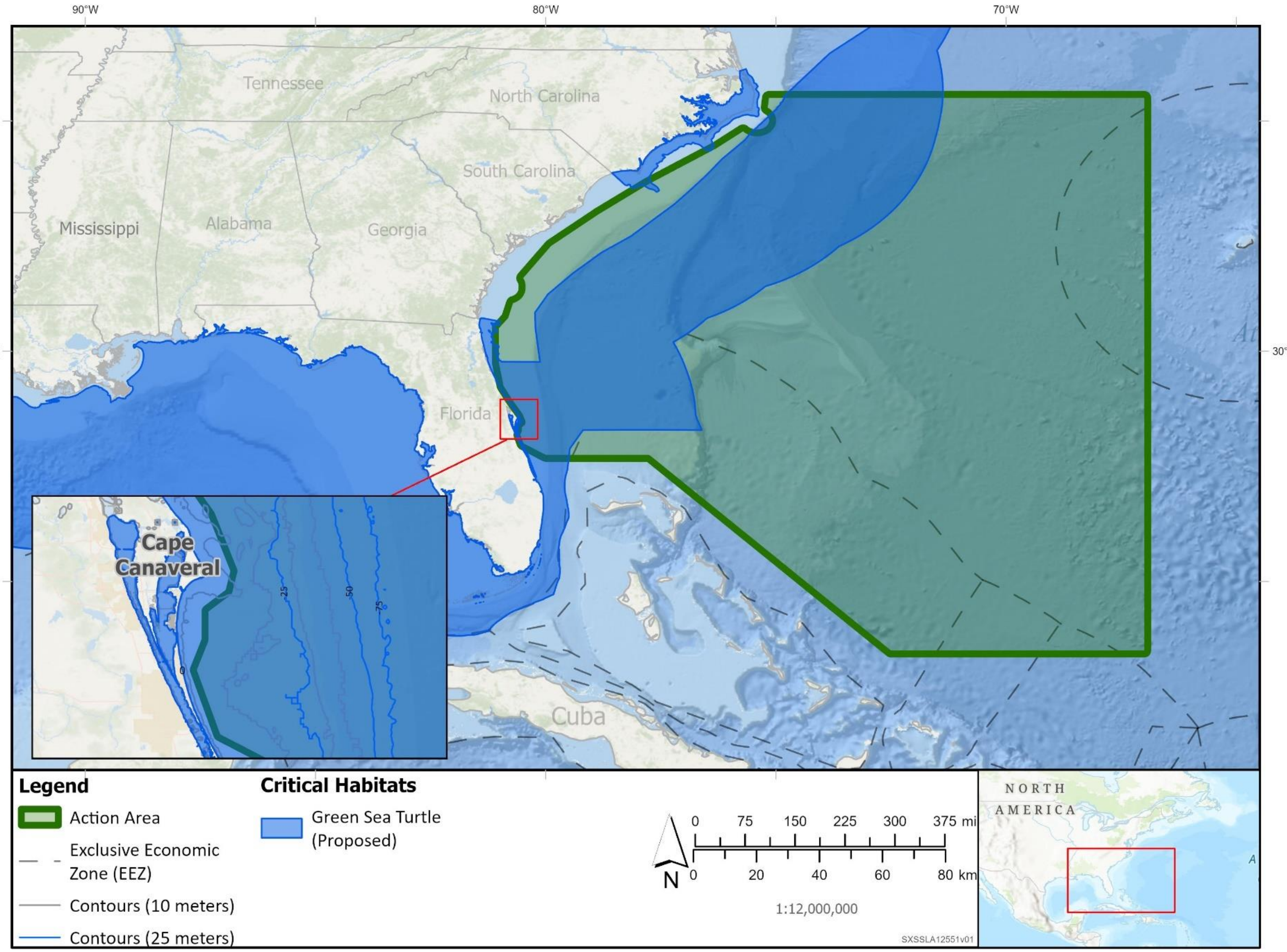


Figure 4: Proposed Green Sea Turtle Critical Habitat within the Atlantic Ocean

3.6.2 Loggerhead Turtle (*Caretta caretta*)—North Indian Ocean DPS, Southwest Indian Ocean DPS, Southeast Indo-Pacific DPS, South Pacific Ocean DPS, North Pacific Ocean DPS

3.6.2.1 Status and Trends

In 2009, a status review conducted for the loggerhead (the first turtle species subjected to a complete stock analysis) identified nine distinct population segments within the global population (Conant et al., 2009).

In a September 2011 rulemaking, the NMFS and USFWS listed five of these distinct population segments as endangered and kept four as threatened under the ESA, effective as of October 24, 2011 (76 Federal Register 58868)—(1) North Pacific Ocean (endangered), (2) South Pacific Ocean (endangered-foreign), (3) North Indian Ocean (endangered-foreign), (4) Northeast Atlantic Ocean (endangered), (5) Mediterranean Sea (threatened-foreign), (6) Southeast Indo-Pacific Ocean, Southwest Indian Ocean (threatened-foreign),(7) Northwest Atlantic Ocean (threatened), and (8) South Atlantic Ocean (threatened-foreign). Global distributions of the loggerhead have been divided into 10 regional management units (RMU).

3.6.2.2 Distribution

Loggerhead turtles are found worldwide mainly in subtropical and temperate regions of the Atlantic, Pacific, and Indian Oceans, and in the Mediterranean Sea (Conant et al. 2009). Based on satellite telemetry loggerheads migrate along a north-south trans-equatorial axis in the Indian Ocean. Loggerheads follow the currents of their respective north and south oceanic gyres between feeding, breeding, and developmental habitats. Loggerhead turtles occur in habitats ranging from coastal estuaries to waters far beyond the continental shelf (Chapman & Seminoff, 2016; Dodd, 1988). Loggerheads typically nest on beaches close to reef formations and in close proximity to warm currents (Dodd, 1988), preferring beaches facing the ocean or along narrow bays (Reece et al., 2013) (79 Federal Register 39856). Nesting generally occurs from April through September in the northern hemisphere, with a peak in June and July (Dodd, 1988; Weishampel et al., 2006; Williams-Walls et al., 1983). The largest nesting aggregation in the Pacific Ocean occurs in southern Japan, where fewer than 1,000 females breed annually (Kamezaki et al., 2003). Despite historic long-term declines from Japan nesting beaches (50 to 90 percent), nesting populations in Japan have gradually increased since 2000 (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2007).

<u>Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location</u>

The Northwest Atlantic Ocean DPS is the only one that occurs entirely within this portion of the Action Area; however, loggerheads from other DPS may rarely occur. For example, mixing likely occurs, rarely, with South Atlantic loggerheads enabling a limited amount of gene flow between these two distinct population segments (National Marine Fisheries Service, 2010a; Tucker et al., 2014). Bovery and Wyneken (2015) analyzed seasonal variation in sea turtle density and abundance off southeastern Florida and found that loggerheads were the most frequently sighted species, with increased sightings in spring. Turtles were often found in coastal waters that were west of the Florida Current (approximately 20 km offshore).

Oil spills can affect sea turtles at all life stages (NOAA 2016), as demonstrated by the Deepwater Horizon oil spill in the Gulf of Mexico, which contaminated vital foraging, migratory, and breeding habitats at the surface, in the water column, and on the ocean bottom (McDonald et al. 2017; Mitchelmore et al. 2017; Wallace et al. 2017). The Natural Resources Damage Assessment conducted following the spill estimated that approximately 2,100 to 10,000 small juveniles and 2,200 to 3,600 large juvenile and adult turtles were killed by the spill; an additional 34,000 loggerhead hatchlings were estimated to have been killed by oil spill response activities (Deepwater Horizon Natural Resource Damage Assessment Trustees 2016).

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

The Northwest Atlantic Ocean DPS is the only one that occurs entirely within this portion of the Action Area; however, loggerheads from other DPS may rarely occur. For example, mixing likely occurs, rarely, with South Atlantic loggerheads enabling a limited amount of gene flow between these two distinct population segments (National Marine Fisheries Service, 2010a; Tucker et al., 2014). Within the Mid-Atlantic Bight, some adults and large juveniles forage on benthic prey in the neritic habitats from New York to Virginia in the summer, and within the shelf waters from Florida to North Carolina in the winter (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2023).

Abundances in these waters were highest in the spring relative to summer and fall, with no presence in winter (Burt et al., 2014). Core Sound and Pamlico Sound, North Carolina, on the border between the Northeast and Southeast U.S. Continental Shelf Large Marine Ecosystems, represent important developmental habitat for juvenile loggerheads (Epperly, Braun, & Chester, 1995). Although these habitats are also used by greens and Kemp's ridleys, loggerheads are the most abundant sea turtle species within the summer developmental habitats of North Carolina (Bureau of Ocean Energy Management, 2021; Epperly, Braun, & Chester, 1995; Epperly, Braun, Chester, et al., 1995; Epperly, Braun, & Veishlow, 1995). In a sampling study from 2004 to 2007, juveniles were the most abundant age group among loggerheads found in the Charleston, South Carolina, shipping channel between May and August (Arendt et al., 2012). Immature loggerhead sea turtles may occupy coastal feeding grounds for 20 years before their first reproductive migration (Bjorndal et al., 2001; Putman et al., 2015).

Subadult and adult loggerhead turtles tend to inhabit deeper offshore feeding areas along the western Atlantic coast, from mid-Florida to New Jersey (Hopkins-Murphy et al., 2003; Roberts et al., 2005). As late juveniles and adults, loggerhead sea turtles most often occur on the continental shelf and along the shelf break of the U.S. Atlantic and Gulf coasts, as well as in coastal estuaries and bays (Putman et al., 2015). Hawkes et al. (2006) found that adult females forage predominantly in shallow coastal waters along the U.S. Atlantic coast less than 100 m deep, likely exploiting bottom-dwelling prey.

Indian Ocean Starship Landing Area

Within the Indian Ocean Starship Landing Area, three DPS are expected to occur—Southwest Indian Ocean DPS, Southeast Indo-Pacific DPS, and the North Indian Ocean DPS. All three DPS are listed as threatened-foreign. Based on satellite telemetry, loggerheads migrate along a north-south trans-equatorial axis in the Indian Ocean. Loggerheads follow the currents of their respective north and south oceanic gyres between feeding, breeding, and developmental habitats (Conant et al., 2009). Loggerheads present in the Indian Ocean nest along beaches of Oman (Masirah Island), of the South African coast, Mozambique, Madagascar, as well western Australia beaches (from Steep Point in the south to the Muiron Islands in the north) (Lohe and Possardt, 2021). The primary threat to loggerhead sea turtles in the Indian Ocean is commercial fisheries bycatch, followed by impacts associated with climate change, coastal development, predation, and poaching of eggs from nests (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2023).

The Northwest Indian Ocean RMU surrounds the islands of Masirah (Oman) and Socotra (Yemen), where several tens of thousands of females nest. The Southeast Indian Ocean RMU, around Western Australia, which has about 2,500 nesting females annually. The Southwest Indian Ocean RMU supports rookeries are shared between South Africa and Mozambique, with fewer than 1,000 annual nesters. The Northeast

Indian Ocean RMU, in the Bay of Bengal, is ranked as the world's smallest rookery, with likely fewer than 50 annual nesters.

Hawaii and NW Pacific Starship Landing Area

Loggerhead sea turtles (North Pacific Ocean DPS) that occur within the Hawaii Starship Landing Area are migrating through from foraging grounds in the eastern north Pacific from nesting grounds in the western Pacific. More information is included under the discussion for the Northeast Pacific Starship Landing Area (below).

Southeast Pacific Starship Landing Area

Nesting occurs primarily in eastern Australia and New Caledonia, primarily by members of the South Pacific Ocean DPS. Juveniles and sub-adults migrate to forage off South America, and are known to occur in pelagic waters as far south as the coast of Chile, and are concentrated off of southern Peru and northern Chile (Donoso and Dutton 2010; Mangel et al. 2011). Data on size and temporal and spatial distribution of post-hatchlings in the South Pacific suggest that these loggerheads are associated with the South Pacific gyre and that the east Australian current and Tasman Front play a role in their movement across the South Pacific Ocean (Boyle et al. 2009).

Seven rookeries in eastern Australia serve as long-term index sites for the entire DPS: Woongarra Coast and Heron Island have annual census information from the late 1960s to 2014; Wreck Island, Lady Musgrave Island, Northwest Island, and Wreck Rock beaches have census data from 1970s to 2014; and Tyron Island has census counts from 1977 and 1996 (Limpus et al. 2013). Mon Repos on the Woongarra coast, near Bundaberg, is currently the most significant nesting beach for the DPS (National Oceanic and Atmospheric Administration, 2024b).

Northeast Pacific Starship Landing Area

Most of the loggerheads observed in the eastern North Pacific Ocean are believed to come from beaches in Japan where the nesting season is late May to August. Aschettino et al. (2015) found that most loggerheads that use the Southern California Bight are more genetically similar, using stable isotope analysis, to loggerheads in the Central North Pacific, as opposed to loggerheads that nest in Baja. Migratory routes can be coastal or can involve crossing deep ocean waters (Schroeder et al., 2003). The species can be found hundreds of kilometers out to sea, as well as in inshore areas, such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky areas, and shipwrecks are often used as feeding areas. The nearshore zone provides crucial foraging habitat, as well as habitat during nesting season and overwintering habitat.

Pacific Ocean loggerheads appear to use the entire North Pacific Ocean during development. There is substantial evidence that the North Pacific Ocean stock makes two transoceanic crossings. The first crossing (west to east) is made immediately after they hatch from the nesting beach in Japan, while the second (east to west) is made when they reach either the late juvenile or adult life stage at the foraging grounds in Mexico. Offshore, juvenile loggerheads forage in or migrate through the North Pacific Subtropical Gyre as they move between North American developmental habitats and nesting beaches in Japan. The highest densities of loggerheads can be found just north of Hawaii in the North Pacific Transition Zone (Polovina et al., 2000).

3.6.2.3 Critical Habitat

Designated critical habitat for loggerhead sea turtle is found with within Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location and within the Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location. To characterize different use patterns and concentrations both seasonally and geographically, NMFS named five different habitat types that comprise the critical habitat designation, which include (1) nearshore reproductive habitat (portions of nearshore waters adjacent to nesting beaches used by females and hatchlings to egress to open-water environments), (2) winter habitats (warm waters south of Cape Hatteras where juveniles and adults tend to concentrate during winter months), (3) breeding habitats (areas with high concentrations of both male and female adults during the breeding season in proximity to Florida migratory corridor and nesting grounds), (4) constricted migratory habitat (migratory corridors restricted in width), and (5) Sargassum habitat (juvenile loggerhead developmental habitats where Sargassum supports adequate prey abundance and cover) (79 FR 39856). Physical and biological features that support the five habitat types summarized above for loggerhead sea turtle conservation include oceanic conditions that would concentrate certain life stage loggerheads together at different locations and in different seasons.

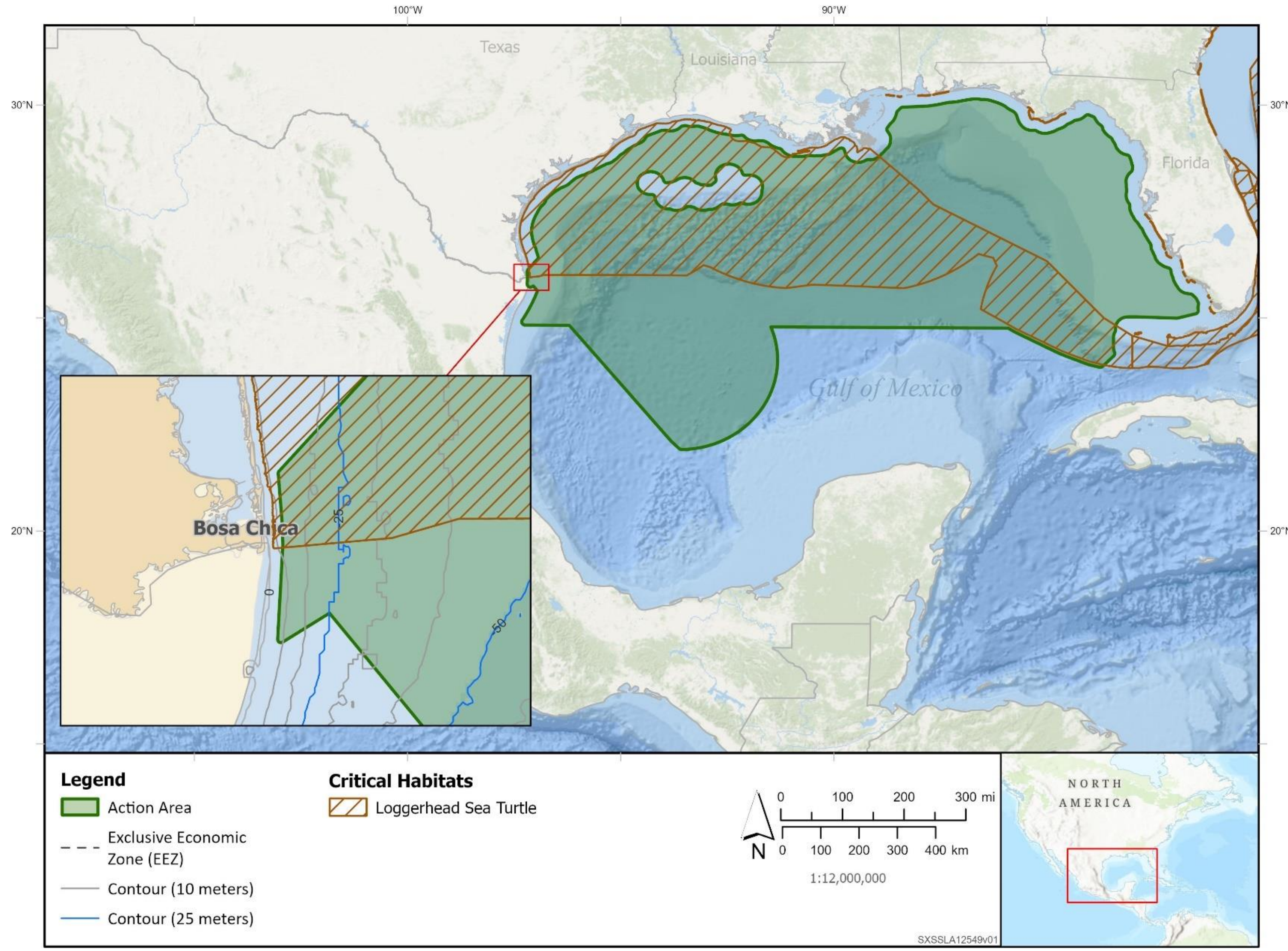


Figure 5: Critical Habitat for the Loggerhead Sea Turtle within the Gulf of Mexico Portion of the Action Area

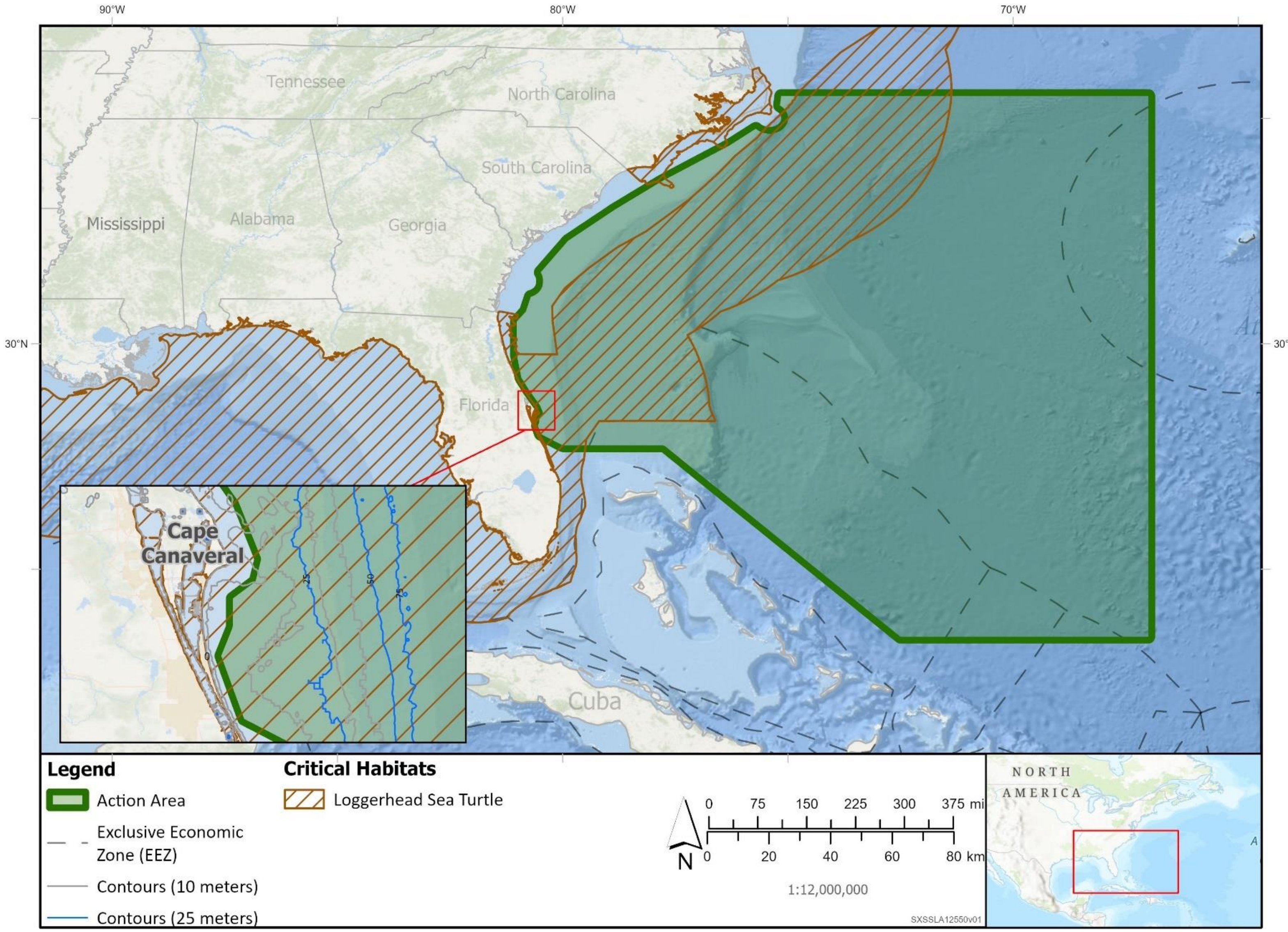


Figure 6: Critical Habitat for the Loggerhead Sea Turtle within the Atlantic Ocean Portion of the Action Area

3.6.3 Olive Ridley Sea Turtle (*Lepidochelys olivacea*)

3.6.3.1 Status and Trends

Olive ridley sea turtles that nest along the Pacific coast of Mexico are listed as endangered under the ESA in 1978, while all other populations are listed under the ESA as threatened (43 FR 32800). Based on genetic data, the worldwide olive ridley population is composed of four main lineages: east India, Indo-Western Pacific, Atlantic, and eastern Pacific Ocean (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2014).

3.6.3.2 Distribution

The olive ridley has a circumtropical distribution, occurring in the Atlantic, Pacific, and Indian Oceans (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2014). In the eastern Pacific, olive ridleys typically occur in tropical and subtropical waters, as far south as Peru and as far north as California, but occasionally have been documented as far north as Alaska. Key arribada beaches include La Flor in Nicaragua, Nancite and Ostinal in Costa Rica, La Marinera and Isla Cañas in Panama, Gahirmatha, Rushikulya, and Devi River in India, and Eilanti in Suriname. Arribada is the common term for large concentrations of nesting activity.

Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

Olive ridley sea turtles do not occur in this portion of the Action Area.

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

Olive ridley sea turtles do not occur in this portion of the Action Area.

Indian Ocean Starship Landing Area

Nesting sites for olive ridley turtles are widely dispersed throughout the Indian Ocean. Nesting occurs along the entire coast of the Indian subcontinent from Pakistan in the Arabian Sea to Bangladesh in the Bay of Bengal. Other nesting locations may include Lakshadweep, Andaman and Nicobar Islands (Frazier, 2001), Oman (Rees et al., 2012), and Maldives Islands.

Hawaii and NW Pacific Starship Landing Area

Rare instances of nesting occur in the Hawaiian Islands, with the first olive ridley nest documented in 1985 at Paia, Maui. A second nest was recorded in Hilo, Hawaii, in 2002, and a third olive ridley nest was recorded at Marine Corps Base Hawaii in Kaneohe Bay in 2009 (National Marine Fisheries Service, 2019). Therefore, it is possible for olive ridleys to occur in the nearshore and open ocean portions of the Hawaii Portion of the Action Area.

Southeast Pacific Starship Landing Area

In the eastern Pacific, olive ridleys typically occur in tropical and subtropical waters, as far south as Peru and as far north as California, but occasionally have been documented as far north as Alaska (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2014).

Northeast Pacific Starship Landing Area

The information presented here to describe olive ridley density is the same as presented above for the Southeast Pacific Starship Landing Area. Specifically, for locations off of Baja, Lopez-Castro and Rocha-Olivares (2005) determined that the southern end of the Baja Peninsula represents the northernmost reproductive area for olive ridley sea turtles.

3.6.3.3 Critical Habitat

Critical habitat has not been designated for the olive ridley turtle.

3.6.4 Kemp's Ridley Sea Turtle

3.6.4.1 Status and Trends

The Kemp's ridley sea turtle is listed as a single population and is classified as endangered under the ESA (35 FR 18319). The most recent status review was released in 2015 by the USFWS and NMFS (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2015). There is no critical habitat currently designated for this species. In 2010, the USFWS and NMFS received a petition to designate critical habitat on nesting beaches in Texas and along Gulf Coast states. The petition is still under consideration, and no proposed rule on the establishment of critical habitat has been released by either agency.

3.6.4.2 Distribution

Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

Kemp's ridley turtle nesting is essentially limited to the beaches of the western Gulf of Mexico, primarily in Tamaulipas, Mexico. Nesting also occurs in Veracruz, and a few historical records exist for Campeche, Mexico. Since 1978, the U.S. National Park Service, in partnership with USFWS, NMFS, Texas Parks and Wildlife Department, and the Instituto Nacional de Pesca (a Mexican federal agency), has led an effort to increase Kemp's ridley turtle nesting at Padre Island National Seashore, south Texas, to form a secondary nesting colony to safeguard against extinction (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2011).

Habitats frequently used by Kemp's ridley sea turtles in U.S. waters are warm-temperate to subtropical sounds, bays, estuaries, tidal passes, shipping channels, and beachfront waters, where their preferred food, the blue crab, is abundant (Foley et al., 2019; Shaver et al., 2020). The general migration pattern of females begins with travel through relatively shallow migratory corridors toward the nesting beach in the late winter in order to arrive at the nesting beach by early spring. Males and females can loop along the U.S. continental shelf large marine ecosystem in the spring, and back down the southeast U.S. continental shelf in the fall. From nesting beaches in the Gulf of Mexico, the migratory corridor traverses neritic areas of the Mexico and U.S. Gulf coasts with a mean water depth of 26 m approximately 20 kilometers (km) from the coast, occurring in late May through August with a peak in June (Shaver et al., 2020; Shaver et al., 2017). Kemp's ridley turtles that headed north and east traveled as far as the waters off southwest Florida; however, waters off the upper Texas coast through Mississippi, especially off Louisiana, appear to be a "hotspot" as turtles returned to the area to forage over multiple years (National Park Service, 2023; Williams, 2023).

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

Occasional nesting has been reported from Florida, Alabama, Georgia, South Carolina, North Carolina, and Virginia (in 2012 and 2014) (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2015) with the furthest north nesting occurring in New York where 96 sea turtles were observed on Rockaway Peninsula in Queens, New York (Phorn, 2018). Shaver et al. (2016) has noted that the known nesting range for the Kemp's ridley turtle has expanded since the late 1980s, possibly due to "head start" releases in Florida. Head starting is an accepted conservation intervention involving captive rearing and release of sea turtles, but the range expansion may also be associated with increased nesting numbers (Shaver et al., 2016).

Evidence suggests that post-hatchling and small juvenile Kemp's ridley sea turtles, similar to loggerhead and green sea turtles of the same region, forage and develop in floating *Sargassum* habitats of the North Atlantic Ocean. Juveniles migrate to habitats along the U.S. Atlantic continental shelf from Florida to New England (Morreale & Standora, 1998; Peña, 2006) at around 2 years of age. Migrating juvenile Kemp's ridleys travel along coastal corridors generally shallower than 50 m in bottom depth (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2011). A study funded by the U.S Navy conducted in Chesapeake Bay indicated that juvenile Kemp's ridley sea turtles utilize the lower to middle Chesapeake Bay in the spring and summer, similar to loggerheads that were also tagged for this study. Kemp's ridley sea turtles preferred to spend more time and forage in shallower waters closer to shore, such as small inlets, embayments, and flats close to the shore in the main stem of the Chesapeake Bay (Barco et al., 2017; Barco et al., 2018; DiMatteo et al., 2022; Naval Facilities Engineering Command Atlantic, 2020). Suitable developmental habitats are seagrass beds and mud bottoms in waters of less than 10 m bottom depth and with sea surface temperatures between 72 degrees Fahrenheit (°F) and 90°F (22 degrees Celsius [°C] and 32°C) (Coyne et al., 2000).

3.6.4.3 Critical Habitat

Critical habitat has not been designated for the Kemp's ridley turtle.

3.6.5 Hawksbill Sea Turtle (Eretmochelys imbricata)

3.6.5.1 Status and Trends

The hawksbill sea turtle is listed as endangered under the ESA in 1978 (35 FR 8491). While the current listing as a single global population remains valid, data may support separating populations at least by ocean basin under the distinct population segment policy (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2013a; State of the World's Sea Turtles, 2022).

With worldwide numbers likely below 25,000 females nesting annually (Mortimer and Donnelly, 2008), hawksbill turtles are critically endangered, and their populations are declining throughout their range (Avens et al., 2021; Mortimer & Donnelly, 2008).

3.6.5.2 Distribution

<u>Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location</u>

The hawksbill is the most tropical of the world's sea turtles, with its range in western North Atlantic also extending into subtropical areas of the Gulf of Mexico and Atlantic coasts (Avens et al., 2021). While hawksbills are known to occasionally migrate long distances in the open ocean, they are primarily found in coastal habitats and use nearshore areas more exclusively than other sea turtles.

Hatchlings in the Action Area are believed to occupy open-ocean waters, associating themselves with surface algal mats in the Atlantic Ocean (Parker, 1995; Witherington & Hirama, 2006; Witzell, 1983). Juveniles leave the open-ocean habitat after 1 to 3 years and settle in coastal foraging areas, typically coral reefs but occasionally seagrass beds, algal beds, mangrove bays, and creeks (Avens et al., 2021). Hawksbill distribution in the mainland United States is primarily through stranding records of individual hawksbills washing ashore. From these, hawksbill have regularly been observed along the coasts of Texas and Florida and to a lesser extent along other Gulf of Mexico and Atlantic states (Avens et al., 2021; Gorham et al., 2014). In Florida, hawksbills regularly occur in the nearshore waters off the southeastern coast, in the Florida Keys (including the Marquesas and Dry Tortugas). Juveniles hawksbills have been observed along the jetties near Port Aransas, Texas, and within the coral reefs at the Flower Garden Banks National Marine Sanctuary in the western Gulf of Mexico (Avens et al., 2021).

In the Caribbean Sea and Gulf of Mexico Large Marine Ecosystems, the principal nesting season is from June to November (Hillis, 1990), with only rare nesting activity in Florida, which is restricted to Volusia, Martin, Palm Beach, Broward, Miami-Dade, and Monroe Counties (Avens et al., 2021; Meylan et al., 2006). Throughout their range, hawksbill turtles typically nest in low densities; aggregations of nesting activity that usually include approximately 20 nests, but can exceed a few hundred nests in some locations (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2013a). These locations with up to 100 nests include Mona Island, Puerto Rico, and Buck Island Reef off St. Croix.

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

The population and distribution of hawksbill sea turtles within this portion of the Action Area is the same as for the Gulf of Mexico. Please see the life history description described above (Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location).

Indian Ocean Starship Landing Area

Nesting occurs along the entire coast of the Indian subcontinent from Pakistan in the Arabian Sea to Bangladesh in the Bay of Bengal, as well as Chagos Islands and the Maldives. Australia hosts the largest hawksbill turtle populations in the world, with an estimated 8,000–9,000 females nesting annually (Limpus, 2009; Miller et al., 1998) and is one of the last remaining hotspots for this critically endangered turtle species (Limpus, 2009).

Hawaii and NW Pacific Starship Landing Area

Hatchlings in the north Pacific may show different habitat and range preferences than hawksbill hatchlings in other regions, where the general progression is hatchling preference in open ocean environments and later juvenile-phase movements to coastal habitats. Van Houtan et al. (2016) suggest that hatchlings within this portion of the Action Area may move to coastal habitats and nearshore foraging grounds more quickly. Within the Hawaii Starship Landing Area, nesting occurs only in the Hawaiian Islands, with known nesting activities only at Hawaii, Maui, and Molokai Islands (Brunson et al., 2022).

Gaos et al. (2021) analyzed 30 years of nesting data within the Hawaiian Islands (between 1998 and 2018) and determined that nesting trends had historic decreases though 2006, with slight annual increases occurring for the remainder of the monitoring period. Van Houtan et al. (2016) also noted increases around the same time as observed by Gaos et al. (2021).

Southeast Pacific Starship Landing Area

Hawksbills in the eastern Pacific Ocean are probably the most endangered sea turtle population in the world (Gaos & Yañez, 2008). A lack of nesting beach surveys for hawksbill sea turtles in the Pacific Ocean and the poorly understood nature of this species' nesting have made it difficult for scientists to assess the population status of hawksbills in the Pacific (Gaos & Yañez, 2008; Seminoff et al., 2003). The largest of these regional populations is in the South Pacific Ocean, where 6,000–8,000 hawksbills nest off the Great Barrier Reef (Limpus, 1992).

Northeast Pacific Starship Landing Area

The population and distribution of hawksbill sea turtles within this portion of the Action Area is the same as for the Southeast Pacific Starship Landing Area. Please see the life history description described above (Southeast Pacific Starship Landing Area).

3.6.5.3 Critical Habitat

Critical habitat has been designated for the hawksbill turtle; however, there is no critical habitat designated in the Action Area.

3.6.6 *Leatherback Sea Turtle (Dermochelys coriacea)*

3.6.6.1 Status and Trends

The leatherback sea turtle is listed as a single population and is classified as endangered under the ESA (35 FR 8491). Although USFWS and NMFS believe the current listing is valid, preliminary information indicates an analysis and review of the species should be conducted under the DPS policy (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2013b). In early 2018, NMFS and the USFWS initiated a status review for the globally listed endangered leatherback sea turtles, to determine if DPS existed and if so, given their status, to consider whether the listing (currently "endangered") should be changed for each DPS. The status review was completed in 2020 (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2020). While seven populations of leatherbacks were found globally distinct due to their genetic discontinuity, spatial differences (i.e., marked separation of the seven populations at nesting beaches), and separation due to physical factors, including land masses, oceanographic features and currents, all populations were found to be at risk of extinction. This is as a result of reduced nesting female abundance, declining nest trends, and numerous, severe threats (National Marine Fisheries Service, 2020). Therefore, the leatherback sea turtle remains globally endangered under the ESA.

3.6.6.2 Distribution

The leatherback sea turtle is distributed worldwide in tropical and temperate waters of the Atlantic, Pacific, and Indian Oceans.

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

Females remain in the general vicinity (within 100 km) of nesting beaches between nestings, with total residence in the nesting and inter-nesting habitat lasting up to four months (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2020). Horrocks et al. (2016) tagged over 3,100 female leatherbacks in the Caribbean Sea and found that females traveled an average of 160 km between nesting events within the same season. Migrations between nesting seasons were typically to the north towards more temperate latitudes, which support high densities of jellyfish prey in the summer.

In the Atlantic Ocean, equatorial waters appear to be a barrier between breeding populations. In the northwestern Atlantic Ocean, post-nesting female migrations appear to be restricted to north of the equator, but the migration routes vary (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2020). Leatherbacks made round-trip migrations from where they started through the North Atlantic Ocean heading northwest to fertile foraging areas off the Gulf of Maine, Canada, and Gulf of Mexico; others crossed the ocean to areas off Western Europe and Africa, while others spent time between northern and equatorial waters. These data support earlier studies that found adults and subadults captured in waters off Nova Scotia stayed in waters north of the Equator (M. C. James et al., 2005; M. C. James et al., 2005; James et al., 2006).

Late juvenile and adult leatherback sea turtles are known to range from mid-ocean to the continental shelf and nearshore waters (Barco & Lockhart, 2015; Grant & Ferrell, 1993; Schroeder & Thompson, 1987; Shoop & Kenney, 1992). Although leatherbacks were observed annually in Chesapeake Bay, they were not common and unevenly distributed. Juvenile and adult foraging habitats include both coastal and offshore feeding areas in temperate waters and offshore feeding areas in tropical waters (Dodge et al., 2014). Dodge et al. (2014) tagged adults and subadult leatherback sea turtles off the coast of Massachusetts and found that the turtles showed a strong preference for the Northeast U.S. Continental Shelf waters during the summer, with the concentrated movements off Virginia and North Carolina. Additionally, turtles were recorded occurring near the mouth of the Chesapeake Bay for multiple days during the summer, ranging from 5 to 15 days. Leatherback sea turtles may prefer a temperate neritic habitat during the summer, due to the availability of their gelatinous pretty sources (e.g., jellyfish) in the summer (Dodge et al., 2014). Leatherbacks have been shown to travel shorter distances at slower rates and increased diving rates in areas of high prey abundance, which is related to seasonal availability of prey (Wallace et al., 2015). Leatherback sea turtles mate in waters adjacent to nesting beaches and along migratory corridors (Cummings et al., 2016; Figgener et al., 2016).

<u>Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location</u>

Leatherbacks are known to occur in the Gulf of Mexico, but in lower numbers than the Atlantic (Aleksa et al., 2018; Nordstrom et al., 2020). Leatherbacks are considered rare visitors to the Texas coast (Sasso et al., 2021). Aleksa et al. (2018) found that the Gulf of Mexico is an important destination for leatherbacks from the Caribbean coast of Central America with seasonal movements between high-use habitats within the Gulf of Mexico, and that leatherbacks utilize high-use habitats in both the Atlantic and the Gulf of Mexico from the same populations.

<u>Hawaii and NW Pacific Starship Landing Area</u>

Leatherback sea turtles are regularly sighted by fishermen in offshore waters surrounding the Hawaiian Islands, generally beyond the 3,800 ft. depth contour, and especially at the southeastern end of the island chain and off the northern coast of Oahu. Leatherbacks encountered in these waters, including those caught accidentally in fishing operations, may be migrating through waters surrounding the Hawaiian Island from nesting beaches along the western tropical and equatorial Pacific (National Marine Fisheries Service & U. S. Fish and Wildlife Service, 1998). Sightings and reported interactions with the Hawaii longline fishery commonly occur around seamount habitats north of the Northwestern Hawaiian Islands (from 35°N to 45°N and 175°W to 180°W) (Skillman & Balazs, 1992; Skillman & Kleiber, 1998).

Leatherbacks rarely occur in nearshore waters off the Hawaiian Islands. Although leatherback interactions with the longline fishery is common in offshore waters, leatherback-stranding events on Hawaiian beaches are uncommon. Since 1982, only five leatherbacks strandings have been reported in the Hawaiian Islands, indicating limited nearshore presence. Aerial and shipboard surveys in nearshore Hawaiian waters also suggest that nearshore occurrences are extremely rare (National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2013c). Considering these distribution characteristics, leatherbacks would be expected to occur in the Hawaii and Northwest Pacific Action Area as they make their transpacific migrations.

<u>Southeast Pacific Starship Landing Area</u>

Eastern Pacific leatherbacks nest along the Pacific coast of the Americas, primarily in Mexico and Costa Rica, and forage throughout coastal and pelagic habitats of the eastern tropical Pacific, between the months of October and February (Burns et al., 2016; Eckert et al., 2015; Kuschke et al., 2023; Stewart et al., 2016). After leaving nesting beaches in the in Mexico and Costa Rica, Eastern Pacific leatherbacks generally migrate south into the southern hemisphere and forage in waters off Peru and Chile (Benson et al., 2011; National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2013c). Sea turtles from this nesting population foraging farther offshore for jellyfish, their primary prey, may occur in the Southeast Pacific Action Area. Jellyfish aggregations have been associated with large eddies or bathymetric features where persistent upwelling occurs (Bailey et al., 2012).

<u>Northeast Pacific Starship Landing Area</u>

Western Pacific leatherbacks nest in the Indo-Pacific, primarily in Indonesia, Papua New Guinea and the Solomon Islands. A proportion of this population migrates across the Pacific past and offshore of the Hawaiian Islands to feeding areas off the Pacific coast of North America. (National Marine Fisheries

Service, 2016b). The Western Pacific leatherback group is the primary stock that occurs within the Northeast Pacific Action Area. Leatherback sea turtles are regularly seen off the west coast of the United States and Mexico, however, highest densities are found in waters off central California, north of the Action Area, during summer and fall when sea surface temperatures are warmer. Bailey et al. (2012) found that the turtles inhabited waters with temperatures ranging from 11.3 to 31.7°C (mean of 24.7°C). The authors also found that oceanographic features such as mesoscale eddies, convergence zones, and areas of upwelling attracted foraging leatherbacks, because these features are often associated with aggregations of prey (e.g., jellyfish). Hebshi et al. (2008) analyzed telemetry data from 126 leatherbacks identifying migratory patterns and associations with similar oceanographic features such as current boundaries and stationary fronts. The data recorded transoceanic migrations, potentially through the Action Area, from nesting beaches in the western North Pacific to the California Current Ecosystem where leatherbacks are known to forage (Benson et al., 2007; Hebshi et al., 2008; Kobayashi et al., 2008). Leatherback sea turtles leaving nesting beaches in the eastern Pacific Ocean off Mexico and Costa Rica generally migrate south, potentially transiting through the Northeast Pacific Action Area, into the southern hemisphere and forage in waters off Peru and Chile (Benson et al., 2011; National Marine Fisheries Service & U.S. Fish and Wildlife Service, 2013c).

Indian Ocean Starship Landing Area

Leatherbacks range widely throughout the Indian Ocean, although nesting appears restricted to a few scattered areas. In the northeast Indian Ocean and Southeast Asia, leatherbacks nest on the Indian mainland, Andaman and Nicobar Islands, Sri Lanka, western coast of Thailand, Sumatra, and Java, with recent nesting reports from Myanmar (Platt et al., 2021). The only known significant nesting of leatherbacks in the southwest Indian Ocean occurs at the Maputaland rookery in South Africa and Mozambique with a new nesting report from Kenya reported in 2020 and Miramar in 2021 (Wallace et al.)

Like other sea turtles in the Indian Ocean, leatherbacks are threatened by natural habitat degradation, coastal development, pollution, bycatch, climate change, predation by humans and animals, infectious diseases, and illegal trade.

3.6.6.3 Critical Habitat

Critical habitat for leatherback sea turtles does not overlap the Action Area.

3.1.7 Marine Mammals

3.7.1 Blue Whale (Balaenoptera musculus)

3.7.1.1 Status and Trends

The blue whale is listed as endangered under the ESA and as depleted under the MMPA throughout its range. The subspecific taxonomy has not been fully resolved, but there are five currently recognized subspecies of blue whales (National Oceanic and Atmospheric Administration, 2023a, 2024a). Four of the subspecies (*B.m. musculus*, *B.m. brevicauda*, *B.m. indica*, and the unnamed South Pacific Ocean subspecies) are present in the Action Areas (National Oceanic and Atmospheric Administration, 2023a).

Widespread whaling over the last century is believed to have decreased the worldwide population of blue whales to approximately 1 percent of its pre-whaling population size; some authors have concluded that their population was about 200,000 animals before whaling (Branch et al., 2007). The most recent population estimates of blue whales are categorized by stock. The abundance of the Eastern North Pacific stock of blue whales (*B.m. musculus*) was estimated at 1,898 in 2018 (National Marine Fisheries Service, 2020a). The abundance of the Central North Pacific stock was estimated at 133 blue whales (*B.m. musculus*) in 2010 (National Marine Fisheries Service, 2018). The abundance of the Western North Atlantic stock of blue whales (*B.m. musculus*) was estimated at 402 as of 2010, based off observations mainly in the Gulf of St. Lawrence (National Marine Fisheries Service, 2018).

3.7.1.2 Distribution

The blue whale inhabits all oceans and typically occur near the coast, over the continental shelf, though they are also found in oceanic waters (National Oceanic and Atmospheric Administration, 2023a). Most baleen whales spend their summers feeding in productive waters near the higher latitudes and winters in the warmer waters at lower latitudes (Širović et al., 2007). Densities used in the analysis are presented in Table 3-1.

Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

The blue whale species is not expected to occur in this Action Area.

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

The distribution of the blue whale (*B.m. musculus*) in the western North Atlantic generally extends from the Arctic to at least mid-latitude waters. Blue whales may be found in Labrador Current, North Atlantic Gyre, and Gulf Stream open ocean areas. Migratory movements in the western North Atlantic Ocean are largely unknown, but acoustic data indicate that blue whales winter as far north as Newfoundland and as far south as Bermuda and Florida, and they have been sighted along the mid-Atlantic ridge (Ryan et al., 2013; Ryan et al., 2022).

Indian Ocean Starship Landing Area

The *B.m. brevicauda* and *B.m. Indica* subspecies of blue whales are found in this Action Area. *B.m. brevicauda*, known as the pygmy blue whale subspecies, is located north of the Atlantic Convergence and occurs in the portion of the Indian ocean south of Madagascar, and in the eastern Indian Ocean west of Australia and Indonesia (Ichihara (International Union for the Conservation of Nature-Marine Mammal Protected Areas Task Force, 2022; Panicker & Stafford, 2021; Thums et al., 2022) 1966). *B.m. indica*, known as the Northern Indian Ocean blue whale, appears to be located year-round between Somalia and Sri Lanka (Branch et al., 2007; Panicker & Stafford, 2021; Sankalpa et al., 2021; Thums et al., 2022).

Hawaii and NW Pacific Starship Landing Area

Blue whales *(B.m. musculus*) from the Central North Pacific stock are found in Hawaii, but the sighting frequency is low and the peak abundance is seasonal, occurring in the winter (Bradford et al., 2013). Whales feeding along the Aleutian Islands and in the Gulf of Alaska likely migrate to Hawaii in winter (Stafford et al., 2001).

Southeast Pacific Starship Landing Area

The unnamed South Pacific Ocean blue whale subspecies is found in this Action Area. This blue whale subspecies is located in the southeastern Pacific Ocean Chiloense Marine Ecoregion and generally migrates to lower latitude regions such as the eastern tropical Pacific and the Galapagos Islands (National Oceanic and Atmospheric Administration, 2023a).

Northeast Pacific Starship Landing Area

Blue whales (*B.m. musculus*) in the eastern north Pacific are known to migrate between higher latitude feeding grounds of the Gulf of Alaska and the Aleutian Islands to lower latitudes including Southern California, Baja California, Mexico and the Costa Rica Dome (Calambokidis & Barlow, 2004; Calambokidis, Barlow, et al., 2009; Calambokidis, Falcone, et al., 2009; Mate et al., 2016; Mate et al., 2015). The West Coast is known to be a blue whale feeding area for the Eastern North Pacific stock during summer and fall (Bailey et al., 2009; Calambokidis, Barlow, et al., 2009; Calambokidis et al., 2015; Mate et al., 2015).

3.7.1.3 Critical Habitat

Critical habitat has not been designated for this species.

3.7.2 False Killer Whale (Pseudorca crassidens)

3.7.2.1 Status and Trends

NMFS currently recognizes three stocks of false killer whale in Hawaiian waters: the Hawaii pelagic stock, the Northwestern Hawaiian Islands stock, and the main Hawaiian Islands (MHI) insular stock (Bradford et al., 2018; Bradford et al., 2012; Bradford et al., 2015; Carretta et al., 2015; Forney et al., 2010; National Oceanic and Atmospheric Administration, 2012; Oleson et al., 2010). The MHI insular stock (considered resident to the main Hawaiian Islands consisting of Kauai, Oahu, Molokai, Lanai, Kahoolawe, Maui, and Hawaii) is the only stock listed (as an endangered) under the ESA and depleted under the MMPA throughout its range (Carretta et al., 2018b; Carretta, Oleson, Baker, et al., 2017). A recovery plan for the DPS of MHI insular false killer was completed in 2021 (National Marine Fisheries Service, 2021a; National Oceanic and Atmospheric Administration, 2017, 2023c).

3.7.2.2 Distribution

Hawaii and NW Pacific Starship Landing Area

The three false killer whale stocks are regularly found within Hawaiian waters and have been reported in groups of up to 100 over a wide range of depths and distance from shore (Baird et al., 2003; Baird et al., 2013; Bradford et al., 2012, 2017; Bradford et al., 2015; Oleson et al., 2013; Shallenberger, 1981). The range and habitat preferences which are shoreward of the Hawaii Starship Landing Area make it unlikely that any false killer whales from the MHI insular DPS would occur in the Action Area.

The estimated abundance of the MHI insular stock of false killer whales is approximately 170 (National Oceanic and Atmospheric Administration, 2023a). NMFS has evaluated all plausible modeled estimates of the population trend of the MHI Insular stock and found the population has declined since 1989 (Carretta et al., 2018b; Carretta, Oleson, Forney, et al., 2017). MHI insular false killer whales are not expected to occur in the Action Area which is farther from shore than their typical range. False killer whales occurring in the Action Area are most likely from the unlisted Hawaii pelagic stock.

3.7.2.3 Critical Habitat

NMFS has designated critical habitat for the MHI insular false killer whale DPS by designating waters from the 45 m depth contour to the 3,200 m depth contour around the main Hawaiian Islands from Niihau east to Hawaii effective as of August 23, 2018 (83 FR 35062).

The single essential feature of the MHI Insular false killer whale critical habitat has been identified as island-associated marine habitat with four characteristics that support this feature. The four characteristics include:

(1) Adequate space for movement and use within shelf and slope habitat;
(2) Prey species of sufficient quantity, quality, and availability;
(3) The habitat waters being free of pollutants; and
(4) Sound levels that will not significantly impair false killer whales' use or occupancy (83 FR 35062).

Regarding sound levels applicable to this fourth characteristic, NMFS defined those as sound levels that inhibit MHI Insular false killer whales', "…ability to receive and interpret sound for the purposes of navigation, communication, and detection of predators and prey. Such noises are likely to be long-lasting, continuous, and/or persistent in the marine environment and, either alone or added to other ambient noises, significantly raise local sound levels over a significant portion of an area" (83 FR 35062).

None of the critical habitat for the MHI false killer whale DPS is within the Action Area.

3.7.3 Fin Whale (Balaenoptera physalus)

3.7.3.1 Status and Trends

The fin whale is listed under the ESA as endangered throughout its range and depleted under the MMPA. A Recovery Plan was completed for the fin whale in 2010, and the five-year review for this species in 2021 (National Marine Fisheries Service, 2021a).

The California, Oregon, and Washington; Hawaii; Northeast Pacific; and western North Atlantic stocks of fin whales are expected to occur in the Action Area. Populations of fin whales are present in the Indian Ocean and Southeast Pacific portions of the Action Area as well. Density estimates for fin whales are shown in Table 3-1.

3.7.3.2 Distribution

The fin whale is found in all the world's oceans and is the second-largest species of whale (Jefferson & Moore, 2020). Fin whales prefer temperate and polar waters and are scarcely seen in warm, tropical waters (Archer et al., 2019; Reeves et al., 2002). Fin whales are not known to have a specific habitat and are highly adaptable, following prey, typically off the continental shelf (Azzellino et al., 2008; Panigada et al., 2008; Scales et al., 2017). Densities used in the analysis are presented in Table 3-1.

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

Visual and acoustic surveys between 2014 and 2020 have documented fin whale presence in the mid-Atlantic region (McCullough et al., 2024). Biopsy samples and satellite tagging data have also been collected, including re-sights of several individuals over the continental shelf. Vessel based surveys and satellite tagging efforts in recent years have also shown fin whales frequently occur off the coast of Virginia during winter months; observations included foraging behavior as well as adult and juvenile pairs (McCullough et al., 2024).

Fin whales have been detected frequently throughout the winter months during passive acoustic monitoring efforts conducted from 2007 through 2015 within the continental shelf break and slope waters off Onslow Bay, North Carolina (Hodge et al., 2014, 2015, 2016; U.S. Department of the Navy, 2013). Visual surveys and passive acoustic monitoring conducted from 2007 to 2011 in Onslow Bay, North Carolina, indicate fin whale occurrence in this area between late fall and early spring (Hodge, 2011). High-frequency recording packages deployed between November 2007 and April 2010 in Onslow Bay detected 20-Hz pulses from fin whales primarily in the winter months, starting in November and continuing through mid-April, suggesting that fin whales are migrating past Onslow Bay during this time (Hodge, 2011). In the western Atlantic, limited data indicate that some fin whales winter from the edge of sea ice (near the Gulf of St. Lawrence) south to the Gulf of Mexico and the West Indies (Clark, 1995).

Indian Ocean Starship Landing Area

Based on recent acoustic studies (Leroy et al., 2021; Sankalpa et al., 2021), there is a high likelihood that fin whales in the Indian Ocean migrate from south to north at the end of the austral summer after summer feeding off of Antarctica, and then move northward to sub-tropical and tropical latitudes in the winter while remaining in the Southern Hemisphere (Širović et al., 2007; Širović et al., 2004). Accordingly, fin whales are probably most abundant in the Action Area during austral winter months, and likely absent during the southern hemisphere's warmer months while feeding off the Antarctic coast, with a range from approximately 25 ° S latitude to higher latitudes towards the Antarctic coast.

Hawaii and NW Pacific Starship Landing Area

There was a total of nine fin whale sightings during systematic line-transect surveys of the Hawaiian Islands EEZ in 2002, 2010, and 2017 (Bradford et al., 2021). The survey data supported the derivation of an abundance estimate of 203 fin whales; however, uncertainty in the estimate is quite high with a 95% confidence interval of 40 to 1,028 whales (Bradford et al., 2021). Based on sighting data and acoustic recordings, fin whales are likely to occur in Hawaiian waters mainly in fall and winter (Barlow et al., 2006; Barlow et al., 2008, Barlow, 2004 #2610; Klinck et al., 2015b). In summer, fin whales are likely absent from the Hawaii Action Area; during three separate line-transect surveys of the Hawaiian Islands EEZ during summer and fall, fin whales were only seen during fall (Barlow, 2006; Bradford et al., 2017), and fin whales were not detected during summer in any year from 2011 to 2017 from passive acoustic recordings on an array of 14 hydrophones at the U.S. Navy Pacific Missile Range Facility off Kauai, Hawaii (Guazzo et al., 2021; Helble et al., 2020).

Southeast Pacific Starship Landing Area

In the Southern Hemisphere, fin whales feed in high latitude areas during the summer and migrate north to temperate or tropical waters for breeding in during the austral winter. Fin whales have been historically observed in both offshore and nearshore waters off North-Central Chile. Between 1908 and 1975, a total of 8,241 fin whales were taken from whaling stations in the Southeast Pacific, specifically in Peru and Chile (Felix et al., 2022). Records indicate they were mainly caught between October and February, suggesting this this species may be more abundant in the region during this timeframe (Felix et al., 2022).

Northeast Pacific Starship Landing Area

Fin whales have been documented from 60° North (N) to 23° N. As demonstrated by satellite tags and discovery tags[3], fin whales make long-range movements along the entire U.S. West Coast (Falcone et al., 2011; Mate et al., 2015; Mizroch et al., 2009). However, photo-identification studies of fin whales off the U.S. West Coast suggest that not all fin whales undergo long-range seasonal migrations, but instead make short-range seasonal movements in spring and fall (Falcone et al., 2011; Falcone & Schorr, 2011). Six tags were deployed on fin whales in the Southern California in August 2014 (Mate et al., 2015). The movements of these whales were highly variable, ranging from less than 1 km to approximately 232 km from the California coast, and moving as far north as the Oregon border with California and as far south as Central Baja Mexico.

3.7.3.3 Critical Habitat

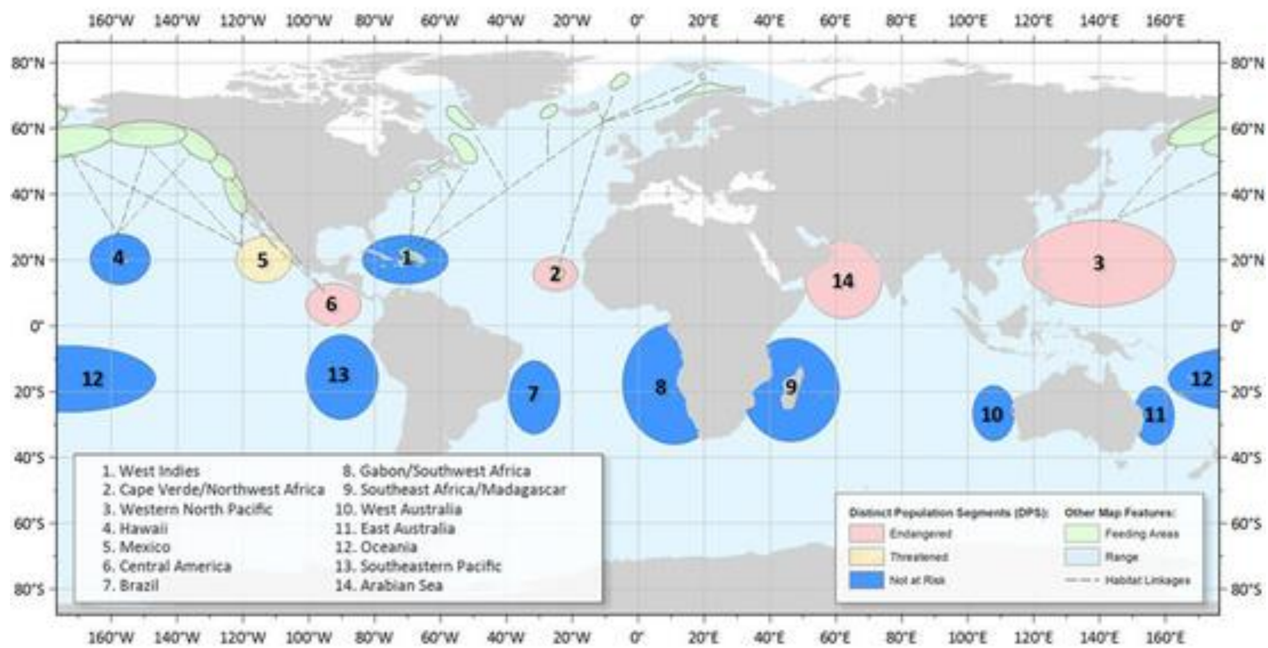
Critical habitat has not been designated for this species.

[3] As a means of data collection starting in the 1930s, discovery tags having a serial number and return address were shot into the blubber of the whale by scientists and if that whale was later harvested by the whaling industry and the tag "discovered" during flensing, it could be sent back to the researchers providing data on the movement of individual whales.

3.7.4 Humpback Whale (*Megaptera novaeangliae*)

3.7.4.1 Status and Trends

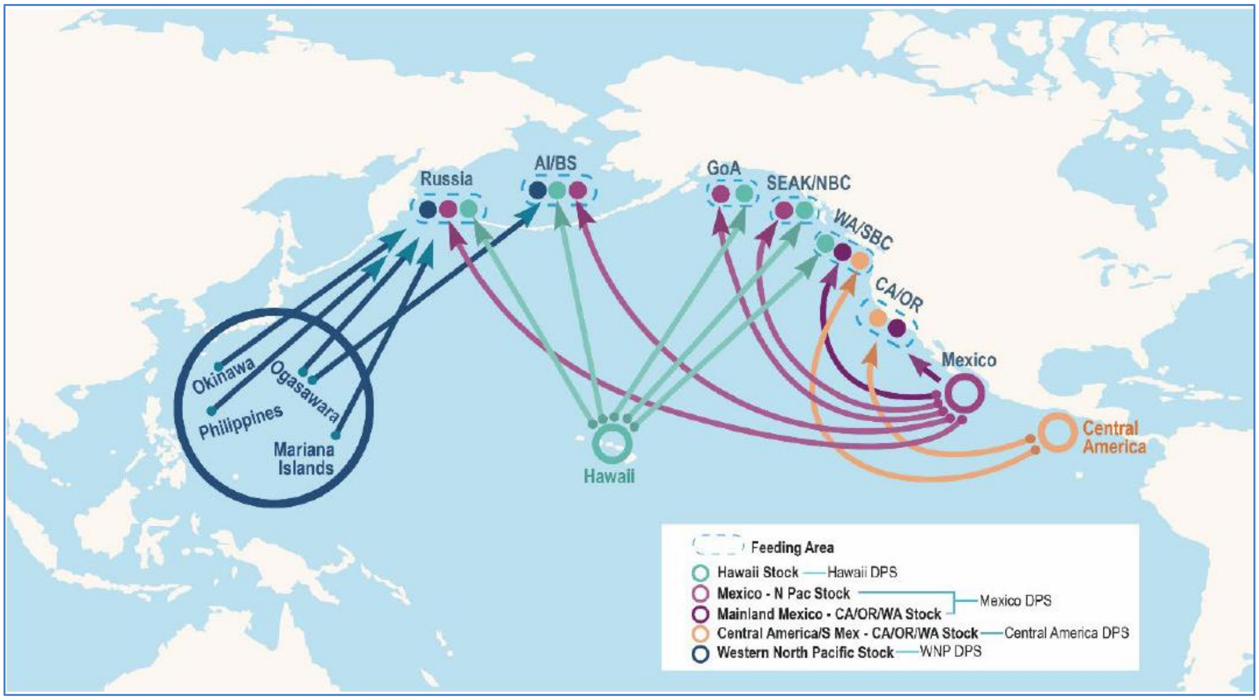
Humpback whales, as a globally distributed species, are divided into 14 DPSs (Figure 7). NMFS revised the listing status under the ESA of each breeding population in the defining the DPSs (81 Federal Register 62259). Humpback whales from the Mexico DPS are listed as threatened and those from the Central America DPS are listed as endangered under the ESA. (National Marine Fisheries Service, 2016a). Other DPSs occur in the Hawaii, Southeast Pacific, Indian Ocean, and Atlantic Action Areas, but none are listed under the ESA (Figure 7).



Source: (National Marine Fisheries Service, 2024a)

Figure 7: Distinct Population Segments of Humpback Whales

Humpback whales from two of the DPSs, the Mexico DPS and the Central America DPS, would occur in the Action Area. More specifically, humpback whales from the Central America DPS would occur seasonally within the Southeast Pacific Action Area and the Hawaii-Mexico Action Area, and humpback whales from the Mexico DPS would have seasonal occurrence during migrations in the Hawaii-Mexico Action Area (Figure 8).



AI/BS = Aleutian Islands/Bering Sea, GoA = Gulf of Alaska, SEAK/NBC = Southeast Alaska/Northern British Columbia, WA/SBC = Washington/Southern British Columbia, CA/OR = California Oregon. Source: (Carretta, 2023)

Figure 8: Humpback Whale Stocks and DPSs Defined in the North Pacific. Whales From the Hawaii, Mexico, and Central America DPSs Occur Seasonally in the Hawaii Action Area.

Together the Central America DPS and part of the Mexico DPS, plus a small number of whales from the non-listed Hawaii DPS, are considered the California, Oregon, and Washington stock of humpback whales and are listed as depleted under the MMPA (Carretta et al., 2018a; Carretta, Oleson, Baker, et al., 2017; Carretta, Oleson, Forney, et al., 2017; National Marine Fisheries Service, 2016a). The California, Oregon, and Washington stock estimate of abundance is 4,973 humpback whales based on survey data from 2015-2018 (National Marine Fisheries Service, 2021b, 2024a; Wild et al., 2023).

A portion of the Mexico DPS of humpback whales is recognized as the North Pacific stock. This stock spends winters near the Revillagigedo Archipelago and in waters off Central Mexico, and summer months in Alaska waters (National Marine Fisheries Service, 2021b; Wild et al., 2023). A partial estimated abundance for this stock was 681 humpback whales based on data from 2004-2006 (National Marine Fisheries Service, 2024a). This estimate is entirely based off the population of humpback whales located near the Revillagigedo Archipelago and does not encompass the rest of the stock located off central Mexico as there is currently no method to distinguish between this stock and the California, Oregon, and Washington stock that are both present in areas off central Mexico (National Marine Fisheries Service, 2021b).

3.7.4.2 Distribution

The habitat requirements of wintering humpbacks appear to be controlled by the conditions necessary for calving, such as warm water (75 to 80° Fahrenheit [24° to 28° Celsius]) and relatively shallow, low-relief ocean bottom in protected areas, nearshore or created by islands or reefs (Clapham, 2000; Craig & Herman, 2000; Smultea, 1994). In breeding grounds, females with calves occur in significantly shallower waters than other groups of whales, and breeding adults use deeper more offshore waters (Ersts & Rosenbaum, 2003; Smultea, 1994). While most humpback whale sightings are in nearshore and continental shelf waters, humpback whales frequently travel through deep oceanic waters during migration (Calambokidis et al., 2001; Clapham, 2000; Clapham & Mattila, 1990; Mate et al., 1998). Densities used in the analysis are presented in Table 3-1.

Hawaii and NW Pacific Starship Landing Area

A portion of humpback whales from the Mexico DPS may transit through this Action Area during spring and fall migrations between summer feeding grounds in the western and central North Pacific and winter breeding grounds off the Baja California Peninsula Mexico.

Southeast Pacific Starship Landing Area

The wintering areas for humpbacks in the Central America DPS include waters from southern Mexico and south along the coast of Central America (Calambokidis et al., 2008). Whales from this population have the potential to occur in the Action Area during the breeding season.

The California, Oregon, Washington stock of humpback whales is present in this Action Area as they migrate from feeding areas along the U.S West Coast, British Colombia, and Alaska to their winter breeding grounds in Mexico and Central America.

Northeast Pacific Starship Landing Area

Humpbacks from the Mexico DPS and the Central America DPS migrate through the Action Area as the transit between winter breeding areas and summer foraging areas. The wintering areas for humpbacks from the Mexico DPS include the waters off Mexico's Pacific coast, and humpbacks from the Central America DPS overwinter in nearshore waters from southern Mexico south along the coast of Central America (Calambokidis et al., 2008).

The California, Oregon, Washington stock of humpback whales is present in this Action Area as they migrate from feeding areas along the U.S West Coast, British Colombia, and Alaska to their winter breeding grounds in Mexico and Central America (Calambokidis et al., 2017; Carretta et al., 2018a).

3.7.4.5 Critical Habitat

In 2021, NMFS designated critical habitats for Mexico, Western North Pacific, and Central America DPSs along the U.S. West Coast and portions of Alaska (86 FR 21082). Critical habitat does not overlap the Action Area.

3.7.5 North Atlantic Right Whale (Eubalaena glacialis)

3.7.5.1 Status and Trends

The North Atlantic right whale is listed under the ESA as endangered throughout its range and is depleted under the MMPA. The North Atlantic right whale population is considered one of the most critically endangered populations of large whales in the world and is estimated at a median abundance of 338 as of November 2020 (Meyer-Gutbrod et al., 2023; National Marine Fisheries Service, 2023a, 2023d).

3.7.5.2 Distribution

Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

Right whales have been occasionally recorded in the Gulf of Mexico (LaBrecque et al., 2015b; Ward-Geiger et al., 2011; Waring et al., 2004), but their occurrence there is considered extralimital. Therefore, this species is not expected to occur in this Action Area.

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

Research suggests the existence of seven major habitats or congregation areas for western North Atlantic right whales. The summer feeding grounds include the Great South Channel, Jordan Basin, Georges Bank along its northeastern edge, Cape Cod and Massachusetts Bays, the Bay of Fundy, and the Roseway Basin on the Scotian Shelf. The winter range for North Atlantic right whales includes the Southeast U.S. Continental Shelf Large Marine Ecosystem. (LaBrecque et al., 2015a) used habitat analyses of sea surface temperatures and water depths and aerial sightings data to delineate a calving area in the southeast Atlantic, extending from Cape Lookout, North Carolina, to Cape Canaveral, Florida, that overlaps with the Atlantic Action Area. This area, identified as biologically important, encompasses waters from the shoreline to the 25-meter (m) isobath from mid-November through late April. Densities used in the analysis are presented in Table 3-1.

3.7.5.3 Critical Habitat

Two ESA-designated critical habitats for North Atlantic right whales have been designated by NMFS to encompass physical and biological features essential to conservation of the species (81 FR 4838–4874, January 27, 2016). The northern unit includes the Gulf of Maine and Georges Bank, which are key areas essential for right whale foraging. The southern unit includes the coast of North Carolina, South Carolina, Georgia, and Florida, which are key areas essential for calving. The southern unit designated critical habitat is located within the Atlantic portion of the Action Area.

3.7.6 Rice's Whale (Balaenoptera ricei)

3.7.6.1 Status and Trends

Rice's whale was formerly known as the Northern Gulf of Mexico stock of Bryde's whale. It was designated a separate species in 2021 based on genetic and morphometric data distinguishing it from other subspecies of Bryde's whale (Rosel et al., 2021). Rice's whale is listed as endangered under the ESA and considered depleted under the MMPA. The population is very small (fewer than 100 animals), exhibits very low genetic diversity, and has a restricted range, which places the stock at great risk of demographic and environmental stochasticity. There was no statistically significant trend in population size for this species.

The best abundance estimate available for Rice's whale is 51 (coefficient of variation = 0.50). This estimate is from summer 2017 and summer/fall 2018 oceanic surveys covering waters from the 200-m isobath to the seaward extent of the U.S. Exclusive Economic Zone (Garrison et al. 2020). The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long intervals between surveys. In addition, because these surveys are restricted to U.S. waters, it is not possible to distinguish between changes in population size and Gulf-wide shifts in spatial distribution. The potential for biological removal for the Rice's whale is 0.07 (much less than 1), meaning that loss of a single whale from the population (excluding natural mortalities) would reduce the stock's ability to reach is optimum sustainable population.

3.7.6.2 Distribution

<u>Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location</u>

Rice's whales occur almost exclusively in the northeastern Gulf of Mexico in the De Soto Canyon area, along the continental shelf break between 100 m and 400 m depth, with a single sighting at 408 m (Hansen et al., 1996; Maze-Foley & Mullin, 2006; Mullin & Fulling, 2004; Mullin & Hoggard, 2000; Rosel et al., 2016; Rosel et al., 2021; Širović et al., 2014). While their core distribution primarily lies within continental U.S. waters, research by Soldevilla et al. (2024) provides the first evidence of Rice's whale presence in Mexican waters using autonomous passive acoustic recording devices in the Mexican continental slope from 2020 to 2022. Rice's whales were detected 14.9 percent of days across a period of 680 days throughout the year, with a total of 579 western long-moan calls detected. These new findings suggest Rice's whales have a broader distribution than previously understood and have a transboundary range throughout the Gulf of Mexico beyond U.S. waters (Soldevilla et al., 2024). Densities used in the analysis are presented in Table 3-1.

3.7.6.3 Critical Habitat

On July 24, 2023, NMFS released the Proposed Rule for the designation of critical habitat for the Rice's whale in the Gulf of Mexico in accordance with section 4(b)(2) of the ESA (88 FR 47453). The proposed area covers 28,270.65 square miles along continental shelf and slope waters between 100 m and 400 m isobaths; spanning from the U.S. Exclusive Economic Zone boundary off the southwestern coast of Texas, to the boundary between the South Atlantic Fishery Management Council and the Gulf of Mexico Fishery Management Council off the southeastern coast of Florida (88 Federal Register 47453). This continental shelf and slope region is the critical habitat feature deemed biologically important and essential for Rice's whale conservation due to prey density, favorable oceanographic conditions, and productivity, as well as noise conditions sufficient for communication, navigation, foraging, and threat detection (88 FR 47453). The area proposed for Rice's whale critical habitat overlaps with the Gulf of Mexico portion of the Action Area. A final critical habitat designation has not been assigned for this species at this time.

3.7.7 Sei Whale (Balaenoptera borealis)

3.7.7.1 Status and Trends

The sei whale is listed as endangered under the ESA and as depleted under the MMPA throughout its range. A recovery plan for the sei whale was completed in 2011 and provided a research strategy for obtaining data required to estimate population abundance and trends, and to identify factors that may be limiting the recovery of this species (National Marine Fisheries Service, 2024c; National Marine Fisheries Service Office of Protected Resources, 2021).

The eastern North Pacific, Hawaii, and western North Atlantic stocks of sei whales are expected to occur in the Action Area. Populations of sei whales are present in the Indian Ocean and Southeast Pacific portions of the Action Area as well.

3.7.7.2 Distribution

Sei whales have a worldwide distribution and are found primarily in cold temperate to subpolar latitudes. During the winter, sei whales are found in warm tropical waters. Sei whales are typically found in the open ocean and are rarely observed near the coast (Horwood, 2008; Jefferson et al., 2015). Densities used in the analysis are presented in Table 3-1.

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

Passive acoustic monitoring conducted offshore of Cape Hatteras, North Carolina, since 2011 resulted in the detections of sei whales on bottom-mounted high-frequency acoustic recording packages that were not observed during visual surveys (McLellan et al., 2014). Passive acoustic monitoring conducted offshore of Jacksonville, Florida, from 2009 through 2012 also included detections of sei whales on marine acoustic recording units during the winter of 2009 to 2010 (Oswald et al., 2016) and possible detections on high-frequency acoustic recording packages during the winter of 2010 and 2011 (Hodge & Read, 2013).

Indian Ocean Starship Landing Area

There are no reliable distribution data for sei whales within the Indian Ocean; however, they likely follow the same pattern of fin whales, with an austral summer feeding season along the Antarctic coast, and northern migrations to subtropical waters within the Action Area (generally 20 to 25° S latitude as the northern limit).

Braham (1991) provided an estimate of 65,000 individuals in the Southern Hemisphere pre-exploitation of the sei whale population, slightly higher than Mizroch et al. (1984b)'s estimated population of 63,100 sei whales. In the Southern Hemisphere, more recent population estimates range between 9,800 and 12,000 sei whales (Mizroch et al., 1984; Perry et al., 1999). The International Whaling Commission reported an estimate of 9,718 sei whales based on results of surveys between 1978 and 1988 (National Marine Fisheries Service Office of Protected Resources, 2021).

Hawaii and NW Pacific Starship Landing Area

Sei whales have only been detected in the Hawaiian Islands on a few occasions. The first verified sei whale sighting made nearshore of the main Hawaiian Islands occurred in 2007 (Smultea et al., 2007; Smultea et al., 2010) and included the first subadults seen in the main Hawaiian Islands. The presence of these subadults was cited as evidence suggesting that the area north of the main Hawaiian Islands may be part of a reproductive area for north Pacific sei whales (Smultea et al., 2010). In December 2014, a passive acoustic recording device onboard an unmanned glider located to the south of Oahu detected very short, low-frequency downsweep vocalizations identified as potential sei whale calls and occurring occasionally during a period of approximately 2 weeks (Klinck et al., 2015a).

Southeast Pacific Starship Landing Area

There have been several observations of sei whales in the Southeast Pacific over the years. Off Chile, observations have been made as far north as Antofagasta and as far south as the Magellan Straight (Español-Jiménez et al., 2019). They have also been reported off the islands of Juan Fernandez. Although there have been confirmed observations, there are no vocalization records of this species in the Southeast Pacific.

Northeast Pacific Starship Landing Area

Sei whales are encountered during the summer off California and the North America coast from approximately the latitude of the Mexican border to as far north as Vancouver Island, Canada (Horwood, 2009; Masaki, 1976, 1977; Smultea et al., 2010). Sei whales have also been observed at least as far south as 20° N into the North Pacific Gyre (Horwood, 2009; Horwood, 1987). Although sei whales have been observed south of 20° N in the winter (Fulling et al., 2011; Horwood, 2009; Horwood, 1987), they are considered absent or at very low densities in most equatorial areas.

3.7.7.3 Critical Habitat

There is no designated critical habitat for this species.

3.7.8 Sperm Whale (*Physeter macrocephalus*)

3.7.8.1 Status and Trends

The sperm whale is listed as endangered throughout its range under the ESA. The stock structure for sperm whales remains uncertain in the Indian Ocean (Mesnick et al., 2011; Mizroch & Rice, 2013; National Marine Fisheries Service, 2015c), and sperm whales in the Indian Ocean Action Area have not been assigned to a stock (Carretta et al., 2019c). Except for waters off the U.S. West Coast, NMFS recognizes two stocks of sperm whales, one in the central Pacific (in Hawaiian waters) and one in the North Pacific (in Alaskan waters) (Carretta et al., 2019c; Muto et al., 2019). Despite lacking a stock designation, NMFS considers the Indian Ocean to support its own population that is considered separately from other populations for the purposes of conservation management and trends tracking (National Marine Fisheries Service, 2015, 2024d).

Whitehead (2002) estimated current sperm whale abundance to be approximately 300,000– 450,000 worldwide. Although his estimates are based on extrapolating surveyed areas to unsurveyed areas, without a systematic survey design, these are probably the best available and most current estimates of global sperm whale abundance. Assuming that the population is growing at about 1.1 percent/year (in Whitehead 2002), Whitehead also estimated that the global population is at about 32 percent of historical numbers.

3.7.8.2 Distribution

Sperm whales are found throughout the world's oceans in deep waters to the edge of the ice at both poles (Leatherwood & Reeves, 1983; Rice, 1989; Whitehead, 2002). Sperm whales show a strong preference for deep waters (Rice, 1989; Whitehead, 2003). Their distribution is typically associated with waters over the continental shelf break, continental slope, and into deeper mid-ocean regions. However, in some areas, adult males are reported to consistently frequent waters with depths less than 100 m and as shallow as 40 m (Jefferson et al., 2008a; Jefferson et al., 2015; Romero et al., 2001). Typically, sperm whale concentrations correlate with areas of high productivity. These areas are generally near drop-offs and areas with strong currents and steep topography (Gannier & Praca, 2007; Jefferson et al., 2015). Sperm whale migration is not well understood and is not as seasonally based as that observed in mysticete whales. Densities used in the analysis are presented in Table 3-1.

Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location

The sperm whale is the most common large cetacean in the northern Gulf of Mexico (Palka & Johnson, 2007). The distribution of sperm whales in the Gulf of Mexico is strongly linked to surface oceanography, such as Loop Current eddies that locally increase production and availability of prey (O'Hern & Biggs, 2009). Most sperm whale groups were found within regions of enhanced sea surface chlorophyll abundance (O'Hern & Biggs, 2009). Ship-based and aerial-based surveys indicate that sperm whales are widely distributed only in waters deeper than 200 m in the northern Gulf of Mexico (Waring et al., 2014), specifically inhabiting the continental slope and oceanic waters (Fulling et al., 2003; Maze-Foley & Mullin, 2006; Mullin & Fulling, 2004; Mullin & Hoggard, 2000; Mullin et al., 2004). Seasonal aerial surveys confirm that sperm whales are present in the northern Gulf of Mexico in all seasons (Hansen et al., 1996; Mullin & Hoggard, 2000; Mullin et al., 1994). Sperm whales aggregate at the mouth of the Mississippi River and along the continental slope in or near cyclonic, cold-core eddies (counterclockwise water movements in the northern hemisphere with a cold center) or anticyclone eddies (clockwise water movements in the northern hemisphere) that may aggregate prey (Davis et al., 2007) Habitat models for sperm whale occurrence indicate a high probability of suitable habitat along the shelf break off the Mississippi delta, Desoto Canyon, and western Florida (Best et al., 2012).

Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location

The nature of linkages of the U.S. habitat with those to the south, north, and offshore is unknown, but sperm whales that occur in the eastern U.S. EEZ in the Atlantic Ocean likely represent only a fraction of the total stock. Historical whaling records compiled by Schmidly (1981) suggested an offshore distribution off the southeast United States, over the Blake Plateau, and into deep ocean waters. Distribution along the East Coast of the United States is centered along the shelf break and over the slope. In winter, sperm whales are concentrated east and northeast of Cape Hatteras, North Carolina. In spring, the center of distribution shifts northward to east off Delaware and Virginia and is widespread throughout the central portion of the mid-Atlantic Bight and the southern portion of Georges Bank off New England. In summer, the distribution is similar but now also includes the area east and north of Georges Bank and into the Northeast Channel region, as well as the continental shelf (inshore of the 100-m isobath) south of New England. In fall, sperm whale occurrence south of New England on the continental shelf is at its highest level, and there remains a continental shelf break occurrence in the mid-Atlantic Bight. Similar inshore (less than 200 m) observations were made on the southwestern and eastern Scotian Shelf, particularly in the region of "the Gully" (Whitehead & Weilgart, 1991).

Aerial surveys conducted offshore of Cape Hatteras, North Carolina, from 2011 through 2017 suggest sperm whales commonly occur in the area, primarily in the spring and summer months (McLellan et al., 2014).

Passive acoustic monitoring conducted in Onslow Bay, North Carolina, between 2007 and 2013 confirmed year-round occurrence of sperm whales, along with a nocturnal increase in occurrence of clicks and greater vocal activity on recorders located in deeper waters of the monitoring area (Hodge, 2011; Read et al., 2014). Researchers confirmed occurrence of sperm whale vocalizations in Onslow Bay on a recorder deployed at water depths of 230 m and 366 m, along with regular nocturnal occurrence of sperm whale clicks near the shelf break, suggesting that foraging activities were occurring at that time (Hodge et al., 2013)). This diel pattern contrasts with what was recorded offshore of Cape Hatteras (Stanistreet et al., 2013). Habitat models also support findings of sperm whale occurrence in the U.S. Economic Exclusion Zone waters offshore of Onslow Bay (Best et al., 2012). Visual surveys in Onslow Bay and analysis of remotely sensed oceanographic data were used to determine the effects of dynamic oceanography. The findings from this study indicate that the presence of Gulf Stream frontal eddies and the location of the Gulf Stream Front influenced sperm whale vocalization rates, among other species (Thorne et al., 2012).

Indian Ocean Starship Landing Area

In the western Indian Ocean, there is evidence that concentrations of mixed female/immature whale groups exist south of the Seychelles (Sankalpa et al., 2021). In the central Indian Ocean, concentrations of sperm whales have been recorded to the north of St. Paul and Amsterdam Islands in the austral summer (National Marine Fisheries Service, 2006).

Hawaii and NW Pacific Starship Landing Area

Sperm whales occur in Hawaiian waters and are one of the more abundant large whales found in that region (Baird et al., 2003; Barlow, 2006; Bradford et al., 2017; Mobley et al., 2000). A total of 21 sperm whale sightings were made during a summer/fall 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone of the Hawaiian Islands, although only four of these sightings were around the main Hawaiian Islands (Barlow, 2006). During a follow-up survey conducted in 2010, there were 41 sperm whale sightings, mainly concentrated in the northwestern portion of the U.S. Exclusive Economic Zone of the Hawaiian Islands (Bradford et al., 2017).

Southeast Pacific Starship Landing Area

Sperm whales have been observed throughout the Southeast Pacific. They have been known to occupy waters near off the Galapagos Island for the past 200 years and have also been recognized in waters off Chile and Peru (Casamayor et al., 2022; Eguiguren et al., 2021). During a 2000 ship survey off northern Peru, there were 48 sperm whale groups observed, ranging in size from 1 to 13 individuals (Rendell et al., 2004).

Northeast Pacific Starship Landing Area

Sperm whales are found year-round in California waters, but their abundance is temporally variable, most likely due to variation in the availability of prey species (Barlow, 1995; Barlow & Forney, 2007; Forney & Barlow, 1993; Smultea, 2014). During quarterly ship surveys conducted off southern California between 2004 and 2008, there were a total of 20 sperm whale sightings, the majority (12) occurring in summer in waters greater than 2,000 m deep (Douglas et al., 2014). Their distribution is typically associated with waters over the continental shelf break, over the continental slope, and into deeper waters (Carretta, Oleson, Baker, et al., 2017; Rice, 1989; Whitehead, 2003; Whitehead et al., 2008).

3.7.8.3 Critical Habitat

Critical habitat has not been designated for this species.

3.7.9 Guadalupe Fur Seal (Arctocephalus townsendi)

3.7.9.1 Status and Trends

The Guadalupe fur seal is listed as threatened under the ESA and depleted under the MMPA throughout its range. All fur seals alive today are recent descendants from one breeding colony at Isla Guadalupe and Isla San Benito off Mexico's Pacific coast and are considered a single stock (Carretta, Oleson, Baker, et al., 2017; Pablo-Rodríguez et al., 2016).

An unpublished abundance of 43,360 Guadalupe fur seals based on pup counts was estimated by Norris (2022) as the mean of two separately derived abundance estimates of 37,940 and 48,780 fur seals. Indications are that the population is increasing.

3.7.9.2 Distribution

During the summer breeding season, adult Guadalupe fur seals return to waters off the Baja California Peninsula Mexico and Guadalupe Island to breed and pup. Following the breeding season, the fur seals distribute at sea along the coast of North America from Mexico as far as the Pacific Northwest and British Columbia, Canada (Norris & Elorriaga-Verplancken, 2020).

Densities used in the analysis are presented in Table 3-1.

Northeast Pacific Starship Landing Area

Guadalupe fur seals can be found in both deeper waters of the open ocean and coastal waters in the eastern North Pacific; however, they are only likely to occur in the northeastern portion of this Action Area, in the vicinity and north of Guadalupe Island (Hanni et al., 1997; Jefferson et al., 2015; Norris, 2017; Norris & Elorriaga-Verplancken, 2020).

3.7.9.3 Critical Habitat

Critical habitat has not been designated for this species.

3.7.10 Hawaiian Monk Seal (Neomonachus schauinslandi)

3.7.10.1 Status and Trends

The Hawaiian monk seal was listed as endangered under the ESA in 1976 (National Marine Fisheries Service, 1976) and is listed as depleted under the MMPA throughout its range (Carretta et al., 2018a, 2018b). Hawaiian monk seals are managed as a single stock. The Hawaiian monk seal is one of the world's most endangered seals and is the only pinniped regularly found in the Hawaiian Islands (Carretta et al., 2022). The majority of the population is distributed in the Northwestern Hawaiian Islands with subpopulations on French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway Atoll, Kure Atoll, and Necker and Nihoa Islands (Baker et al., 2016; Carretta et al., 2022).

Based on the most recent counts and modeling results, the range-wide abundance encompassing the smaller Main Hawaiian Island population and the larger Northwestern Hawaiian Islands population is estimated at 1,437 monk seals (Carretta et al., 2022).

3.7.10.2 Distribution

In the main Hawaiian Islands, monk seals are generally solitary and have no established rookeries. Hawaiian monk seals do, however, routinely haul out for molting and pupping in locations throughout Hawaii. When foraging, monk seals spend most of their time in nearshore, shallow marine habitats, but can rapidly cover large areas in search of food and may travel hundreds of miles in a few days (D'Amico, 2013; Littnan, 2011; Stewart et al., 2006; Wilson et al., 2012). Densities used in the analysis are presented in Table 3-1.

Hawaii and NW Pacific Starship Landing Area

Hawaiian monk seals are generally only present in nearshore waters of the main Hawaiian Islands and Northwestern Hawaiian Islands, preferring water depths less than 200 m. The monk seals are benthic foragers and foraging dives are typically less than 50 m (Robinson et al., 2022). However, monk seals will travel over deep offshore waters to seamounts and remote atolls to forage and haul out. Sightings have been reported at Johnston Atoll, Wake Island, and Palmyra Atoll (south of the Hawaiian Island chain; (Carretta et al., 2010; Gilmartin & Forcada, 2009; Harting et al., 2017; Jefferson et al., 2015; National Marine Fisheries Service, 2009, 2010b)).

3.7.10.3 Critical Habitat

Critical habitat for Hawaiian monk seals was designated August 21, 2015 (National Oceanic and Atmospheric Administration, 2015). The critical habitat encompasses 16 different areas within the Northwestern Hawaiian Islands and the main Hawaiian Islands. The critical habitat for the Northwestern Hawaiian Islands includes specific areas in Kure Atoll, Midway Islands, Pearl and Hermes Reef, Lisianski Island, Laysan Island, Maro Reef, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa Island (National Oceanic and Atmospheric Administration, 2023b). The critical habitat for the main Hawaiian Islands includes specific areas in Kaula, Niihau, Kauai, Oahu, Maui Nui (including Kahoolawe, Lanai, Maui, and Molokai), and Hawaii (National Oceanic and Atmospheric Administration, 2023b). The essential features of the critical habitat were identified as:

(1) Adjacent terrestrial and aquatic areas with characteristics preferred by monk seals for pupping and nursing.
(2) Marine areas from 0 to 200 m in depth that support adequate prey quality and quantity for juvenile and adult monk seal foraging.
(3) Significant areas used by monk seals for hauling out, resting, or molting (National Oceanic and Atmospheric Administration, 2015).

All of the critical habitat designated for this species is outside of the Action Area.

4 Effects of the Action

This chapter evaluates how, and to what degree, the activities described under the Action potentially impact ESA-listed species known to occur within the Action Area. The stressors vary in intensity, frequency, duration, and location within the Action Area. The stressors considered in this BA include the following:

- Acoustic (in-air overpressure events resulting from sonic booms and explosions).
- Impact by fallen objects (debris falling from a re-entry or in-air explosion of Starship).
- Ship strike (support ships presenting potential strike risks)
- Harassment by aircraft overflights (support aircraft and visual disturbance).
- Exposure to hazardous materials.

Previous consultations between the FAA and NMFS analyzed the potential for ingestion of parachutes and other decelerator-associated materials (such as latex). Entanglement was also a stressor analyzed as potentially harmful for ESA-listed species for other materials associated with parachutes (nylon cordage and parachute canopy materials). Because this proposed action does not include the use of these materials (Starship and Super Heavy will descend under thrust power and not using parachutes). Therefore, ingestion and entanglement are not analyzed as potential stressors in this programmatic BA.

4.1.1 Acoustic Stressors

4.1.1 Sonic Boom Overpressure Events

A sonic boom is the sound associated with the shock waves created by a vehicle traveling through the air faster than the speed of sound on reentry. As described OPR-2021-02908, Programmatic Concurrence for Launch Vehicle and Reentry Operations (National Marine Fisheries Service, 2022c), sonic booms that would occur during Starship/Super Heavy reentry operations would intercept the ocean's surface. However, exceptionally little energy from in-air noise is transmitted into water (FAA 2017). Due to the low magnitude of the sonic booms (no greater than 2 pounds per square foot [psf] for Starship), the substantial attenuation of the sonic booms at the air/water interface, and the exponential attenuation with water depth, sonic booms would not result in impacts on marine species beneath the surface.

For Super Heavy, over-pressurization at the ocean's surface could be up to 12 psf. Boom intensity, in terms of psf, is greatest under the flight path and progressively weakens with horizontal distance away from the flight track. Overpressure from sonic booms is not expected to affect marine species underwater. Acoustic energy in the air does not effectively cross the air/water interface and most of the noise is reflected off the water surface (Richardson et al. 1995) and underwater sound pressure levels from in-air noise are not expected to reach or exceed threshold levels for injury or harassment to ESA-listed species. Previous research conducted by the USAF supports this conclusion with respect to sonic booms, indicating the lack of harassment risk for protected marine species in water (U.S. Air Force Research Laboratory 2000). The researchers were using a threshold for harassment of marine mammals and sea turtles by impulsive noise of 12 pound per square inch which equates to 1728 psf peak pressure. The researchers pointed out that, to produce the 12 psi in the water, there needs to be nearly 900 psf at the water surface, assuming excellent coupling conditions. They also noted that it is very difficult to create sonic booms that even approach 50 psf.

Cetaceans and pinnipeds (when at sea) spend most of their time (~90 percent for most species) entirely submerged below the surface. When at the surface, their bodies are almost entirely below the water's surface, with only the blowhole or head exposed briefly to allow breathing. This minimizes sonic boom exposure, both natural and anthropogenic, essentially 100 percent of the time because their ears are nearly always below the water's surface. Sonic booms are not expected to have an effect on hauled out pinnipeds.

In-air noise caused by sonic boom during re-entry activities are therefore unlikely to result in take of marine mammals or ESA-listed species.

4.1.2 Near-Surface Explosions / Overpressure Events

Overpressure events from explosions generated during certain expended landings of the ship impact may affect marine species within the Action Area. Individuals, if in close proximity to the landing location and subsequent explosion, could be at risk of mortality, physical injury, auditory injury (also referred to as permanent threshold shift [PTS]), temporary threshold shift (TTS), or behavioral changes that would be considered take. NMFS has developed threshold criteria for the onset of TTS and PTS based on the auditory sensitivity of marine mammal hearing groups (Table 2; NMFS 2018).

Table 2: PTS onset and TTS onset thresholds for underwater impulsive noise (NMFS 2018).

Hearing Group	PTS	TTS
Low-Frequency Cetaceans (LF)	219 dB re 1 µPa	213 dB re 1 µPa
Mid-Frequency Cetaceans (MF)	230 dB re 1 µPa	224 dB re 1 µPa
High-Frequency Cetaceans (HF)	202 dB re 1 µPa	196 dB re 1 µPa

The FAA independently evaluated and approved an analysis methodology developed by SpaceX that relies on the robust application of scientific principles; an estimation of the necessary coefficients based on available, existing reference data; and the application of appropriate species harassment thresholds taken directly from NMFS. The approach for this analysis was derived from the assessment developed in the March 2024 NMFS LOC for Proposed Licensing of SpaceX Starship-Super Heavy Operations in the Indian Ocean. This analysis was used to estimate the affected area from the explosive event over which NMFS thresholds could be exceeded for MMPA species, if present.

Overpressure events from booster explosions generated during impact may affect ESA-listed species within the Action Area. Individuals, if in close proximity to the booster landing location and subsequent explosion, could be at risk of mortality, physical injury, PTS, TTS, or behavioral changes that would be considered take. The booster analyses will follow the same methodology developed for the ship within the Indian Ocean action area. Since the booster is used to push the ship into space, the remaining propellant within the booster is less than the ship.

In-water impulsive noise events would result from an explosion of Starship/Super Heavy upon impact with the sea surface. A marine animal in close proximity to the Starship/Super Heavy landing location at the time of an explosion could be at risk of mortality, physical injury, permanent or temporary loss of hearing sensitivity (i.e., auditory injury [PTS] or TTS), or react by changing behavior. SpaceX developed a methodology to analyze impacts from such an explosion that relies on the robust application of scientific principles; a conservative estimation of the necessary coefficients based on available, existing reference data; and the application of appropriate species harassment thresholds taken directly from NMFS. The approach for this analysis was derived from the assessment developed in the 2023 NMFS Consultation Letter, Consultation response, and Underwater Noise Analysis Methodology for Starship/Super Heavy

Attachment 142 (FAA, 2023). This analysis was used to estimate the affected area from the explosive event over which NMFS thresholds could be exceeded for marine mammals, if present.

Starship Near-Surface Explosions

Upon impact with the ocean surface, Starship would have approximately 31 metric tons and 70 metric tons of propellant remaining in the header tanks and main tanks, respectively.

For the header tanks, an explosive weight of 3,648 kilograms (kg) was used based on an 11.9 percent explosive yield, which is highly conservative value based on a simulation of uncontained mixing between two close coupled masses of propellant and no barriers impeding their mixing, comparable to the conditions of the intact impact at terminal velocity of the Starship header tanks against the ocean surface. For the main tanks, an explosive weight of 6,330 kg was used based on a 9 percent explosive yield. The analysis for 9 percent yield was used in the 2023 NMFS Consultation, and due to the small variation in propellant mass and small change to the propellant mass fill geometry, the assumption that the manner of propellant mixing will remain consistent is still appropriate. For Starship, the peak SPL would remain the same as in the 2024 NMFS consultation for SpaceX Starship Landings in the Indian Ocean (267.7 dB).

Super Heavy Near-Surface Explosions

The impact of an in-air explosive yield from a fuel explosion of the Super Heavy close to the water surface is identical to the methodology outlined in the March 2024 NMFS LOC for Proposed Licensing of SpaceX Starship-Super Heavy Operations in the Indian Ocean and includes: (1) the transfer tube location is situated in the middle of the booster (9m diameter tank), (2) the booster has headers and main tank like the ship, (3) the Kingery Bulmash calculator is used to determine the propellent remaining in the booster and (4) the most likely explosive scenario is a rupture of the transfer tube. The main differences are: (1) the header is imbedded in the main tank of the booster and (2) since the booster engines are the heaviest part of the booster, the booster would impact the ocean engines down. This will put the transfer tubes 3.0m from the water surface, instead of the 4.5m for the ship. The booster explosion is considered an impulsive source as defined by NMFS because it produces a sound that is transient, brief (less than 1 second), broadband, and consists of a high peak sound pressure with rapid rise time and rapid decay.

The Trinitrotoluene (TNT) yield for the booster is 3330 kg (as compared to 4973.68 for the ship), because booster propellant is needed to push the ship into orbit. Since the in-air explosion sends half of the remaining TNT into air, the final TNT yield entering the water would be 6660kg/2=3330kg. Using the Kingery Bulmash calculator to determine the incident pressure in air yields 17207.90kPa at an explosive distance of 3.0m. Transitioning this to surface pressure in water yields 34398.6kPa and equates to a peak SPL of 270.7dB.

Model Results

Only ESA-listed marine mammals were included in the modeling.[4] Model results for each component of the Programmatic Action Area are summarized in the following tables:

- Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location, Table 4
- Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location, Table 5
- Indian Ocean Starship Landing Area, Table 6
- Northwest and Hawaii Tropical Pacific Starship Landing Area 7
- Northeast Pacific Starship Landing Area, Table 8

[4] SpaceX prepared an Incidental Harassment Authorization (IHA) request and submitted to NMFS in May 2024, pursuant to the MMPA. The model results presented in SpaceX's IHA includes model results for all species protected under MMPA where density information was available.

- Southeast Pacific Starship Landing Area, Table 9.

There were no density estimates available for species in the eastern South Pacific; therefore, it was not possible to predict takes using the model.

To account for the possibility that all 20 landings of Starship/Super Heavy could occur in one landing area, the results presented below assume that 20 landings would take place in each of the five landing areas. If this were to occur, there would be no effects on any marine mammals located in the other four landing areas. Therefore, the results presented in the tables below for each area is a "worst-case" scenario and assumes the entire Proposed Action (i.e., all 20 landings) occurs in that specific part of the Project Area.

Two sets of predicted auditory effects on ESA-listed marine mammals were estimated in each part of the Project Area (except for the Indian Ocean). The maximum density was used in the model to predict a maximum potential effect for each species. The average density for each ESA-listed marine mammal species calculated by averaging all density values within each part of the Project Area was used to predict effects with a higher likelihood of occurring than effects based on the maximum density.

The modeling yielded one predicted TTS exposure, in the Atlantic Super Heavy landing area, on the ESA-listed fin whale. An analysis of the fin whale density data shows that the maximum densities occur only in March and are located at the northern boundary of the Project Area. The maximum density value is approximately three orders of magnitude greater than the average density and there are no predicted effects to fin whales using the average density. This was the only modeled take among all modeled ESA-listed species within the Action Area components.

Table 4-1: Super Heavy Gulf of Mexico MMPA SPL Results

Blast Inputs	
Propellant Remaining (kg)	74000
Yield Factor (%)	9
TNT Yield	3330.0
Pressure @ 1 meter (kPa)	17207.90
Water Peak Source Sound Level	
Surface Pressure in Water (kPa)	34398.6
Peak SPL dB (re 1 uPa)	270.7
# of Flights	20.0

3.0m from Kingery Bulmash Calculator

Coefficients	
Transmission Loss	0.0326
Impedance Seawater	1558528
Impedance Air	414.5

INPUTS | CALCS | RESULTS

ESA SPL

Species Data			NMFS Thresholds (dB re 1uPa)		Harassment Area (km^2)		Max. Density Species Harassment		Ave. Density Species Harassment Results		
ESA Species	**Type**	**Max. Density (per km^2)**	**PTS**	**TTS**	**PTS**	**TTS**	**PTSmax**	**TTSmax**	**Ave. Density (per km^2)**	**PTSave**	**TTSave**
Sperm Whale	MF	0.01392	230	224	0.04	0.15	0.010349	0.041200	0.00252	0.001874	0.007459
Rice's Whale	LF	0.01123	219	213	0.47	1.86	0.105096	0.418395	0.00016	0.001519	0.006047

Table 4-2: Super Heavy Atlantic Ocean MMPA SPL Result

Blast Inputs	
Propellant Remaining (kg)	74000
Yield Factor (%)	9
TNT Yield	3330.0
Pressure @ 1 meter (kPa)	17207.90
Water Peak Source Sound Level	
Surface Pressure in Water (kPa)	34398.6
Peak SPL dB (re 1 uPa)	270.7
# of Flights	20.0

3.0m from Kingery Bulmash Calculator

Coefficients	
Transmission Loss	0.0326
Impedance Seawater	1558528
Impedance Air	414.5

INPUTS | CALCS | RESULTS

ESA SPL

Species Data			NMFS Thresholds (dB re 1 uPa)		Harassment Area (km^2)		Max. Density Species Harassment		Ave. Density Species Harassment Results		
ESA Species Data	**Type**	**Max. Density (per km^2)**	**PTS**	**TTS**	**PTS**	**TTS**	**PTSmax**	**TTSmax**	**Ave. Density (per km^2)**	**PTSave**	**TTSave**
Blue Whale	LF cetacean	0.000024	219	213	0.47	1.86	0.000225	0.000894	0.000018	0.000168	0.000671
Fin Whale	LF cetacean	0.018352	219	213	0.47	1.86	0.171769	0.683824	0.000029	0.000271	0.001081
North Atlantic Right Whale	LF Cetacean	0.001939	219	213	0.47	1.86	0.018151	0.072259	0.000003	0.000028	0.000112
Sei Whale	LF cetacean	0.000319	219	213	0.47	1.86	0.002986	0.011886	0.000141	0.001320	0.005254
Sperm Whale	MF cetacean	0.032160	230	224	0.04	0.15	0.023910	0.095187	0.002871	0.002134	0.008498

Table 4-3: Starship Indian Ocean MMPA SPL Results

Surface Pressure in Water (kPa)	24210.18
Peak SPL dB (re 1 uPa)	267.7
# of Flights	20.0

INPUTS | CALCS | RESULTS

ESA SPL

Species	Type	Density (per km^2)	PTS	TTS	PTS	TTS	PTS	TTS
Blue Whale	LF cetacean	0.0000030	219	213	0.23	0.92	0.000014	0.000055
Fin Whale	LF cetacean	0.0008700	219	213	0.23	0.92	0.004034	0.016058
Sei Whale	LF cetacean	Unavailable	219	213	0.02	0.07	Unavailable	Unavailable
Sperm Whale	MF cetacean	0.00093	230	224	0.02	0.07	0.000017	0.001364
Green Turtle	Turtle	Unavailable	204	189	Unavailable	Unavailable	Unavailable	Unavailable
Hawksbill Turtle	Turtle	Unavailable	204	189	Unavailable	Unavailable	Unavailable	Unavailable
Leatherback Turtle	Turtle	Unavailable	204	189	Unavailable	Unavailable	Unavailable	Unavailable
Loggerhead Turtle	Turtle	Unavailable	204	189	Unavailable	Unavailable	Unavailable	Unavailable
Olive Ridley Turtle	Turtle	Unavailable	204	189	Unavailable	Unavailable	Unavailable	Unavailable
Species	**Type**	**Density (per km^2)**	**Onset of Physical Injury (dB re 1 uPa)**		**Injury Area (km^2)**		**Species Injury Results**	
Oceanic Whitetip Shark	Fish	Unavailable	187		Unavailable		Unavailable	Unavailable
Scalloped Hammerhead Shark	Fish	Unavailable	187		Unavailable		Unavailable	Unavailable

Table 4-4: Northeast Pacific Starship MMPA SPL Results

Blast Inputs	
TNT Yield (kg)	4973.68
Surface Pressure in air (kPa)	12111.15
Surface Pressure in Water (kPa)	24210
Peak SPL dB (re 1 uPa)	267.7
# of Flights	20.0

Enter 4.5m Incident Pressure from https://unsaferguard.org/un-saferguard/kingery-bulmash

INPUTS | CALCS | RESULTS

ESA Species

ESA SPL

Species Data (Pacific)			NMFS Thresholds (dB re 1 uPa)		Harassment Area (km^2)		Species Harassment Results at Maximum		Species Harassment Results Average Densities		
Species	**Type**	**Max. Density(per km^2)**	**PTS**	**TTS**	**PTS**	**TTS**	**PTSmax**	**TTSmax**	**Ave. Density(per km2)**	**PTSave**	**TTSave**
Blue Whale	LF cetacean	0.004515	219	213	0.23	0.92	0.020933	0.083336	0.0000083	0.000038	0.000153
False killer whale	MF cetacean	0.00242	230	224	0.02	0.07	0.000891	0.003548	0.001774	0.000653	0.002601
Fin Whale	LF cetacean	0.003897	219	213	0.23	0.92	0.018068	0.071929	0.000126	0.000584	0.002326
Humpback Whale	LF cetacean	0.00646	219	213	0.23	0.92	0.029951	0.119236	0.000128	0.000593	0.002363
Killer Whale	MF cetacean	0.00013	230	224	0.02	0.07	0.000048	0.000191	0.000071	0.000026	0.000104
Sei Whale	LF cetacean	0.0001	219	213	0.23	0.92	0.000464	0.001846	0.0001	0.000464	0.001846
Sperm Whale	MF cetacean	0.003829	230	224	0.02	0.07	0.001410	0.005614	0.001361	0.000501	0.001995
Guadalupe fur seal	Otariid in-water	0.06283	232	226	0.01	0.05	0.014600	0.058122	0.015549	0.003613	0.014384

Table 4-5: Hawaii and NW Pacific Starship MMPA SPL Results

TNT Yield (kg)	4973.68										
Surface Pressure in air (kPa)	12111.15	*Enter 4.5m Incident Pressure from https://unsaferguard.org/un-saferguard/kingery-bulmash*									
Surface Pressure in Water (kPa)	24210										
Peak SPL dB (re 1 uPa)	267.7										
# of Flights	20.0										
				ESA SPL							
Species Data (Hawaiian Islands)			**NMFS Thresholds (dB re 1 uPa)**		**Harassment Area (km^2)**		**Species Harassment Results Max. Densities**		**Species Harassment Results Ave. Densities**		
ESA Species Data	**Type**	**Max. Density (per km^2)**	**PTS**	**TTS**	**PTS**	**TTS**	**PTSmax**	**TTSmax**	**Ave. Density (per km^2)**	**PTSave**	**TTSave**
Blue Whale	LF cetacean	0.000060	219	213	0.23	0.92	0.000278	0.001107	0.000008	0.000039	0.000154
Fin Whale	LF cetacean	0.000080	219	213	0.23	0.92	0.000371	0.001477	0.000080	0.000371	0.001477
False Killer Whale	MF cetacean	0.001706	230	224	0.02	0.07	0.000628	0.002501	0.000812	0.000299	0.001191
Sei Whale	LF cetacean	0.000160	219	213	0.23	0.92	0.000742	0.002953	0.000160	0.000742	0.002953
Sperm Whale	MF cetacean	0.007734	230	224	0.02	0.07	0.002848	0.011339	0.001089	0.000401	0.001597
Hawaiian Monk Seal	Phocid Pinniped	0.00004	218	212	0.29	1.16	0.000233	0.000929	0.000033	0.000193	0.000767

Qualitative Methods

For some species, quantitative methods for estimating potential impacts (as described in Section 4.1.3.1, Approach to Analysis) were not used because density data for the species in a specific action area were not available. Accordingly, qualitative methods for determining potential effects were used. This analysis included estimating the location of impact in relation to a particular species, and the assessing the likelihood of interaction with the stressor at a threshold that would likely induce adverse effects. Exclusion areas (areas such as the Flower Banks complex where no trajectories would terminate) formed part of this assessment. As stated in Section 2.4 (Conservation Measures), FAA can assign trajectories that avoid sensitive areas identified within each Action Area component.

4.1.3 Potential Effects to ESA-Listed Species from Acoustic Stressors

In-air noise caused by sonic boom re-entry may affect ESA-listed fish, sea turtles, and marine mammals within each portion of the Action Area. ESA-listed species exposed to noise generated by a sonic boom would likely exhibit brief behavioral changes and resume normal behavior exhibited prior to the overpressure event. Because of the limited time ESA-listed species would be expected to be at or near the water's surface (oceanic whitetip shark is expected to be submerged 100 percent of the time, while ESA-listed marine mammals and sea turtles are expected to be submerged 90 percent of the time), the high altitude where the descending Starship or Super Heavy vehicle would generate a sonic boom, the known properties of sound deflection at the surface of water, and the rapid attenuation of the reduced sound that could be perceived under water, the FAA concludes that sonic boom noise is discountable (adverse effects are extremely unlikely to occur) and insignificant (adverse effects are unmeasurable or undetectable).

Overpressure events from Starship explosions generated during impact may affect ESA-listed fish, sea turtles, and marine mammals within the Action Area. ESA-listed species, if in close proximity to the Starship or Super Heavy landing location and subsequent explosion, could be at risk of mortality, physical injury, or behavioral changes that would be considered adverse effects. Based on the modeling results of near-surface explosions described above and in the 2022 PEA, however, the probability of an ESA-species included in the modeling is sufficiently low to determine that potential adverse effects are discountable (extremely unlikely to occur). Other ESA-listed species not included in the modeling (oceanic whitetip shark, sei whale because of an extremely low likelihood of spatial overlap with the Action Area, and sea turtles) have anticipated densities in the Action Area's pelagic habitats as to make exposure to overpressure events from Starship explosions discountable (extremely unlikely to occur).

The action proponent has reached the following conclusions based on the modeling described in Section 4.1.3.2 (Modeling Results) and qualitative assessments of species not included in the modeling:

- Within the Gulf of Mexico Super Heavy Landing Area and Nominal Landing Location, acoustic stressors would not likely adversely affect Atlantic sturgeon Carolina DPS, Giant manta ray, Gulf sturgeon, Nassau grouper, oceanic whitetip shark, scalloped hammerhead shark, green sea turtle North Atlantic DPS, Kemp's ridley sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle Northwest Atlantic Ocean DPS, Rice's whale, or sperm whale.
- Within the Atlantic Ocean Super Heavy Landing Area and Nominal Landing Location, acoustic stressors would not likely adversely affect Atlantic sturgeon Carolina DPS, Giant manta ray, Nassau grouper, oceanic whitetip shark, scalloped hammerhead shark, green sea turtle North Atlantic DPS, Kemp's ridley sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle Northwest Atlantic Ocean DPS, blue whale, fin whale, North Atlantic right whale, sei whale, or sperm whale. As noted previously and shown on Table 4, modeling yielded one predicted TTS exposure, in the Atlantic Super Heavy landing area, for the ESA-listed fin whale. With occurrence

only expected within this portion of the Action Area in the month of March, and with other landing locations available throughout the year, any adverse effects on the fin whale within the Atlantic Super Heavy landing area would likely be discountable (unlikely to occur). If SpaceX cannot land anywhere else, an individual consultation would be initiated for the fin whale.

- Within the Indian Ocean Starship Landing Area, acoustic stressors would not likely adversely affect Giant manta ray, oceanic whitetip shark, scalloped hammerhead shark, green sea turtle East Indian-West Pacific DPS and North Indian DPS, olive ridley sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle North Indian Ocean DPS or Southwest Indian Ocean DPS or Southeast Indo-Pacific DPS, blue whale, fin wale, sei whale, or sperm whale.
- Within the Northeast Pacific Starship Landing Area, acoustic stressors would not likely adversely affect, Giant manta ray, oceanic whitetip shark, scalloped hammerhead shark, green sea turtle East Pacific DPS and Central North Pacific DPS, olive ridley sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle North Pacific Ocean DPS, blue whale, false killer whale, fin wale, humpback whale Mexico DPS or Central America DPS, sei whale, sperm whale, Guadalupe fur seal, or Hawaiian monk seal.
- Within the Hawaii NW Pacific Starship Landing Area, acoustic stressors would not likely adversely affect Giant manta ray, oceanic whitetip shark, scalloped hammerhead shark, green sea turtle Central North Pacific DPS, olive ridley sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle North Pacific Ocean DPS, blue whale, false killer whale, fin wale, humpback whale Mexico DPS, sei whale, sperm whale, or Hawaiian monk seal.
- Within the Southeast Pacific Starship Landing Area, acoustic stressors would not likely adversely affect Giant manta ray, oceanic whitetip shark, scalloped hammerhead shark, green sea turtle East Pacific DPS, olive ridley sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle South Pacific Ocean DPS, blue whale, false killer whale, fin wale, humpback whale Central America DPS, sei whale, sperm whale.

4.1.2 Impact by Fallen Objects

A near-surface booster or ship explosion or a high-altitude breakup of the booster or ship on decent would create a debris field comprised of mostly heavy-weight metals and some composite (e.g., carbon fiber) materials. Most of these materials would sink rapidly through the water column, while some items may stay buoyant on the surface or suspended in the water column before sinking towards the seafloor.

If debris from a booster or ship near surface explosion or high-altitude disintegration struck an animal near the water's surface, the animal could be injured or killed. Therefore, debris strike from an expended booster or ship may affect ESA-listed fish, sea turtles, and marine mammals within the Action Area. Direct strikes by debris would be extremely unlikely because of the relatively small size of the components as compared to the open ocean areas and dispersion of animals. Given that relatively few ship or booster ocean descents and landings would occur over very small portions of the Action Areas, and the fact that marine wildlife spends the majority of their time submerged as opposed to on the surface, it is extremely unlikely an ESA-listed species would be impacted. The relative availability of these animals at the ocean surface, spatially and temporally, combined with the low frequency of the Action, reduce the likelihood of impacts. Additionally, there are no known interactions with any of these species after decades of similar rocket launches and reentries. Further, the projected landing areas for both Super Heavy and Starship are well offshore where density of marine species decreases compared to coastal environments and upwelling areas (FAA 2017). As stated in Section 2.4 (Conservation Measures), FAA can assign trajectories that avoid sensitive areas identified within each Action Area component. Accordingly, adverse interactions with expended debris are discountable (unlikely to occur).

4.1.3 Ship Strike

Ships and other watercraft vessels may be used to recover launch vehicle stage when first and second stage mission requirements do not require complete expenditure of first and second stage components. Depending on the landing location, vessels may also be used for surveillance to ensure that designated hazard areas are clear of non-participating crafts. These watercraft operations have potential to result in a ship strike of ESA-listed fishes, sea turtles, and marine mammals that spend time at or near the surface of the water. ESA-listed marine mammals and sea turtles can spend time at the surface, but most of their time is spent submerged. Giant manta ray, oceanic whitetip and scalloped hammerhead sharks can also spend time at or near the ocean surface and be subject to potential ship strikes, but they also dive to great depths. All vessels would be required to comply with the Conservation Measures (see Section 2.3) for vessel operations.

All watercraft would have a dedicated observer on board, adhere to maintaining minimum safety distances between ESA-listed species and vessels, and reduce speed as required. During the portion of time that ESA-listed marine mammals, sea turtles, and some fish species may spend near the ocean surface, ship strikes are considered extremely unlikely to occur and therefore discountable, due to the use of dedicated observation personnel and safety procedures for avoidance. Based on previous operation reports provided as part of ESA section 7 consultations for similar operations, there have not been reported vessel collisions with ESA listed marine species.

Rice’s whale requires additional consideration due to its very low population size (likely < 50) and its ecology. The Rice’s whale dives deep during the day to forage but at night tends to stay just below the surface, increasing the chance of the animal being struck at night. The Vessel operations measures in the PDCs for this programmatic consultation include the condition that recovery and vessel transit will not occur at night in the Rice’s whale core distribution area. The PDCs for this programmatic consultation stipulate only one splashdown, a reentry and recovery of the Dragon capsule, may occur in Rice's whale core habitat distribution area per year. These restrictions will ensure the effects of vessel strike due to recovery vessel operations are discountable.

The Proposed Action does not differ substantially with stressors for ship strike analyzed previously by NMFS. Accordingly, vessels used in support operations may affect, but not likely adversely affect, ESA-listed species.

4.1.4 Harassment by Aircraft Overflights

Noise from aircraft overflight may enter the water, but as stated in relation to sonic booms, very little of that sound is transmitted into water. Sound intensity produced at high altitudes is reduced when it reaches the water’s surface. At lower altitudes, the perceived noise will be louder, but it will decrease rapidly as the aircraft moves away. Individual ESA-listed species that occur at or very near the surface at the time of an overflight could be exposed to some level of elevated sound. There could also be a visual stimulus from overflight that could potentially lead to a change in behavior. Both noise and visual stimulus impacts would be temporary and only occur if an individual is surfacing or very close to the surface and an aircraft happens to be flying over at the same time.

Studies in the Gulf of Mexico found that most sperm whales dive when overflown by fixed wing aircraft (Wursig et al. 1998). Richter et al. (2006) documented only minor behavioral effects (i.e., both longer surface time and time to first vocalization) of whale-watching aircraft on New Zealand sperm whales. However, details on flight altitude were not provided. Smultea et al. (2008) studied sperm whales in Hawaii, documenting that diving responses to fixed winged overflights occurred at approximately 820 ft above ground level (AGL). Patenaude et al. (2002) observed bowhead whales, which are not a species considered in this consultation but serve as an example for mysticetes, during spring migration in Alaska and recorded short-term responses to fixed-wing aircraft activity. Few (approximately 2%) of the observed bowheads reacted to overflights (between 200 and 1,500 AGL), with the most common behavioral responses being abrupt dives, short surfacing episodes, breaching, and tail slaps (Patenaude et al. 2002). Most of these responses occurred when the aircraft was below altitudes of 600 ft (Patenaude et al. 2002), which is below the altitude expected to be flown by fixed wing aircraft during project-related surveillance for the activities considered in this consultation.

Species-specific studies on the reaction of sea turtles to fixed wing aircraft overflight are lacking. Based on sea turtle sensory biology (Bartol and Musick 2003), sound from low-flying aircraft could likely be heard by a sea turtle at or near the ocean surface. Sea turtles might be able to detect low-flying aircraft via visual cues such as the aircraft's shadow, similar to the findings of Hazel et al. (2007) regarding watercraft, potentially eliciting a brief reaction such as a dive or lateral movement. However, considering that sea turtles spend a significant portion of their time below the sea surface (Lutcavage and Lutz, 1997) and the low frequency and short duration of surveillance flights, the probability of exposing an individual to an acoustically or visually induced stressor from aircraft momentarily flying overhead would be very low. The same is relevant for other ESA-listed species in the action area, considering their limited time near the surface and brief aircraft overflight.

As stated in the Environmental Protection Measures, spotter aircraft will maintain a minimum of 1,000-ft over ESA-listed or MMPA-protected species and 1,500 ft over North Atlantic right whales. Additionally, aircraft will avoid flying in circles if marine mammals or sea turtles are spotted to avoid any type of harassing behavior. The chances of an individual ESA-listed species being exposed to the proposed aircraft overflights are extremely low. Given the limited and temporary behavioral responses documented in available research, it is expected that potential effects on ESA-listed species, should they even occur, would be insignificant. We conclude that effects from aircraft overflight to ESA-listed marine mammals, sea turtles, and fish in the action area because of activities covered under this programmatic may affect,but are not likely to adversely affect these animals.

4.1.5 Exposure to Hazardous Materials

Hypergolic fuels (e.g., NTO and MMH) may be on the spacecraft during a splashdown. A spacecraft’s propellant storage is designed to retain residual propellant, so any propellant remaining in the spacecraft is not expected to be released into the ocean. In an event the propellant tank actually ruptures on impact, the propellant would evaporate or be quickly diluted.

In the event of a failed launch operation, launch operators will follow the emergency response and cleanup procedures outlined in their Hazardous Material Emergency Response Plan (or similar plan). Procedures may include containing the spill using disposable containment materials and cleaning the area with absorbents or other materials to reduce the magnitude and duration of any impacts. In most launch failure scenarios, at least a portion of the propellant will be consumed by the launch/failure, and any remaining propellant will evaporate within hours or be diluted by seawater and degrade over time (timeframes are variable based on environmental conditions, but generally hours to days). Launch vehicles and spacecraft are designed to retain propellants and even if there is a rare launch failure (> 93% success rate over 30 years), propellants will evaporate and be diluted within hours. The chance for ESA-listed marine species to be exposed to the residual propellants from a Starship or Super Heavy decent is extremely low and therefore discountable. Therefore, hazardous material exposure to ESA-listed marine mammals, sea turtles, and fishes in the action area may affect, but are not likely to adversely affect these animals.

5 Determination of Effects

Table 5-1 represents the FAA's overall effects determinations for ESA-listed species analyzed in this BA.

Table 5-1: Effect Determinations Under the Action

Species Name	***DPS***	***ESA Status***	***Species Effects Determination***	***Critical Habitat Effects Determination***[1]
Fishes				
Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus*	Carolina DPS	Endangered	NLAA	-
	South Atlantic DPS	Endangered	NLAA	-
Giant manta ray *Manta birostris*	-	Threatened	NLAA	-
Gulf sturgeon *Acipenser oxyrinchus desotoi*	-	Threatened	NLAA	-
Nassau grouper *Epinephelus striatus*	-	Threatened	NLAA	-
Oceanic whitetip shark *Carcharhinus longimanus*	-	Threatened	NLAA	-
Scalloped hammerhead shark *Sphyrna lewini*	-	Threatened	NLAA	-
Sea Turtles				
Green sea turtle / *Chelonia mydas*	North Atlantic Ocean DPS	Threatened	NLAA	NLAA
	East Pacific DPS	Threatened	NLAA	
	Central North Pacific DPS	Threatened	NLAA	
	East Indian-West Pacific DPS	Threatened (Foreign)	NLAA	-
	North Indian DPS	Threatened (Foreign)	NLAA	-
	Southwest Indian Ocean DPS	Threatened (Foreign)	NLAA	-
Olive ridley sea turtle *Lepiodochelys olivacea*	-	Endangered	NLAA	-

Species Name	*DPS*	*ESA Status*	*Species Effects Determination*	*Critical Habitat Effects Determination*[1]
Kemp's ridley sea turtle	-	Endangered	NLAA	-
Hawksbill sea turtle *Eretmochelys imbricata*	-	Endangered	NLAA	-
Leatherback sea turtle *Demochelys coriacea*	-	Endangered	NLAA	-
Loggerhead sea turtle *Caretta caretta*	Northwest Atlantic Ocean DPS	Threatened	NLAA	NLAA
	North Pacific Ocean DPS	Endangered	NLAA	
	South Pacific Ocean DPS	Endangered (Foreign)	NLAA	-
	North Indian Ocean DPS	Endangered (Foreign)	NLAA	-
	Southwest Indian Ocean DPS	Threatened (Foreign)	NLAA	-
	Southeast Indo-Pacific DPS	Threatened (Foreign)	NLAA	-
Marine Mammals				
Blue whale/pygmy blue whale *Balaenoptera musculus*	-	Endangered	NLAA	-
False killer whale *Pseudorca crassidens*	MHI Insular DPS	Endangered	NLAA	-
Fin whale *Balaenoptera physalus*	-	Endangered	NLAA	-
Humpback whale *Megaptera novaeangliae*	Mexico DPS	Threatened	NLAA	-
	Central America DPS	Endangered	NLAA	-
North Atlantic right whale *Eubalaena glacialis*	-	Endangered	NLAA	NLAA
Rice's whale *Balaenoptera ricei*	-	Endangered	NLAA	-
Sei whale *Balaenoptera borealis*	-	Endangered	NLAA	-

Species Name	***DPS***	***ESA Status***	***Species Effects Determination***	***Critical Habitat Effects Determination[1]***
Sperm whale *Physeter macrocephalus*	-	Endangered	NLAA	-
Guadalupe fur seal *Arctocephalus townsendii*	-	Threatened	NLAA	-
Hawaiian monk seal *Neomonachus schauinslandi*	-	Endangered	NLAA	-

Notes: DPS=Distinct Population Segment, ESA=Endangered Species Act, NLAA=Not Likely Adversely Affect
1. "-" in the Critical Habitat column indicates that the species does not have critical habitat designated in the Action Area.

6 Literature Cited

Aleksa, K., Sasso, C., Nero, R., & Evans, D. (2018). Movements of leatherback turtles (*Dermochelys coriacea*) in the Gulf of Mexico. *Marine Biology*, *165*(158), 1–13. https://doi.org/10.1007/s00227-018-3417-9

Allen, L. G., & Cross, J. N. (2006). Surface waters. In L. G. Allen, D. J. Pondella, II, & M. H. Horn (Eds.), *The Ecology of Marine Fishes: California and Adjacent Waters* (pp. 320–341). University of California Press.

Aquarone, M. C. (2009). *XV-51 Southeast U.S. Continental Shelf TAG: LME #6* (UNEP Regional Seas Report and Studies No. 182). (The UNEP Large Marine Ecosystem Report: A Perspective on Changing Conditions in LMEs of the World's Regional Seas, Issue. http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=52:lme6&catid=41:briefs&Itemid=72

Archer, F. I., Brownell Jr., R. L., Hancock-Hanser, B. L., Morin, P. A., Robertson, K. M., Sherman, K. K., Calambokidis, J., Urbán R., J., Rosel, P. E., Mizroch, S. A., Panigada, S., & Taylor, B. L. (2019). Revision of fin whale *Balaenoptera physalus* (Linnaeus, 1758) subspecies using genetics. *Journal of Mammalogy*, 1–18.

Arendt, M. D., Schwenter, J. A., Segars, A. L., Byrd, J. I., Maier, P. P., Whitaker, J. D., Owens, D. W., Blanvillain, G., Quattro, J. M., & Roberts, M. A. (2012). Catch rates and demographics of loggerhead sea turtles (*Caretta caretta*) captured from the Charleston, South Carolina, shipping channel during the period of mandatory use of turtle excluder devices (TEDs). *Fishery Bulletin*, *110*(1), 98–109.

Armstrong, J. L., & Hightower, J. E. (2002). Potential for restoration of the Roanoke River population of Atlantic sturgeon. *Journal of Applied Ichthyology*, *18*(4-6), 475–480. https://doi.org/10.1046/j.1439-0426.2002.00389

Aronson, R., Bruckner, A., Moore, J., Precht, B., & Weil, E. (2008). *Acropora palmata*. http://www.iucnredlist.org/apps/redlist/details/133006/0

Aschettino, J., Engelhaupt, D., Engelhaupt, A., Bell, J., & Thornton, J. B. (2015, 13-18 December 2015). *Humpback Whale Presence and Habitat-Use in High-Traffic Areas off Virginia* 21st Biennial Conference on the Biology of Marine Mammals, San Francisco, CA.

Avens, L., Ramirez, M. D., Goshe, L. R., Clark, J. M., Meylan, A. B., Teas, W., Shaver, D. J., Godfrey, M. H., & Howell, L. (2021). Hawksbill sea turtle life-stage durations, somatic growth patterns, and age at maturation. *Endangered Species Research*, *45*, 127–145. https://doi.org/10.3354/esr01123

Azzellino, A., Gaspari, S., Airoldi, S., & Nani, B. (2008). Habitat use and preferences of cetaceans along the continental slope and the adjacent pelagic waters in the western Ligurian Sea. *Deep Sea Research Part I: Oceanographic Research Papers*, *55*(3), 296–323. https://doi.org/10.1016/j.dsr.2007.11.006

Bailey, H., Benson, S. R., Shillinger, G. L., Bograd, S. J., Dutton, P. H., Eckert, S. A., Morreale, S. J., Paladino, F. V., Eguchi, T., Foley, D. G., Block, B. A., Piedra, R., Hitipeuw, C., Tapilatu, R. F., & Spotila, J. R. (2012). Identification of distinct movement patterns in Pacific leatherback turtle populations influenced by ocean conditions. *Ecological Applications*, *22*(3), 735–747. https://doi.org/10.1890/11-0633

Bailey, H., Mate, B. R., Palacios, D. M., Irvine, L., Bograd, S. J., & Costa, D. P. (2009). Behavioral estimation of blue whale movements in the Northeast Pacific from state-space model analysis of satellite tracks. *Endangered Species Research*, *10*, 93–106. https://doi.org/10.3354/esr00239

Baird, R. W., McSweeney, D. J., Webster, D. L., Gorgone, A. M., & Ligon, A. D. (2003). *Studies of Odontocete Population Structure in Hawaiian Waters: Results of a Survey Through the Main Hawaiian Islands in May and June 2003* [Contract report].

Baird, R. W., Oleson, E. M., Barlow, J., Ligon, A. D., Gorgone, A. M., & Mahaffy, S. D. (2013). Evidence of an Island-Associated Population of False Killer Whales (*Pseudorca crassidens*) in the Northwestern Hawaiian Islands. *Pacific Science*, *67*(4), 513–521. https://doi.org/10.2984/67.4.2

Baker, J. D., Harting, A. L., Johanos, T. C., & Littnan, C. L. (2016). Estimating Hawaiian monk seal range-wide abundance and associated uncertainty. *Endangered Species Research*, *31*, 317–324. https://doi.org/10.3354/esr00782

Barco, S., & Lockhart, G. G. (2015). *Turtle Tagging and Tracking in Chesapeake Bay and Coastal Waters of Virginia: 2014 Annual Progress Report. Draft Report* (Contract No. N62470-10-D-3011, Task Orders 41 and 50, issued to HDR Inc., Issue.

Barco, S. G., Rose, S. A., & Lockhart, G. G. (2017). *Turtle Tagging and Tracking in Chesapeake Bay and Coastal Waters of Virginia: 2016 Annual Progress Report*.

Barco, S. G., Rose, S. A., Lockhart, G. G., & DiMatteo, A. (2018). *Sea Turtle Tagging and Tracking in Chesapeake Bay and Coastal Waters of Virginia: 2017 Annual Progress Report*.

Barlow, J. (1995). The abundance of cetaceans in California waters. Part I: Ship surveys in summer and fall of 1991. *Fishery Bulletin*, *93*, 1–14, Article PAC Library.

Barlow, J. (2006). Cetacean abundance in Hawaiian waters estimated from a Summer–Fall survey in 2002. *Marine Mammal Science*, *22*(2), 446–464. https://doi.org/10.1111/j.1748-7692.2006.00032.x

Barlow, J., Ferguson, M. C., Perrin, W. F., Ballance, L., Gerrodette, T., Joyce, G., MacLeod, C. D., Mullin, K., Palka, D. L., & Waring, G. (2006). Abundance and densities of beaked and bottlenose whales (family Ziphiidae). *Journal of Cetacean Research and Management*, *7*(3), 263–270, Article PAC Library.

Barlow, J., & Forney, K. A. (2007). Abundance and population density of cetaceans in the California Current ecosystem. *Fishery Bulletin*, *105*, 509–526, Article PAC Library.

Barlow, J., Rankin, S., Jackson, A., & Henry, A. (2008). *Marine Mammal Data Collected During the Pacific Islands Cetacean and Ecosystem Assessment Survey (PICEAS) Conducted Aboard the NOAA Ship McArthur II, July–November 2005* [Technical Memorandum](NMFS-SWFC 420).

Baum, J., Medina, E., Musick, J. A., & Smale, M. (2015). *Carcharhinus longimanus. The International Union for Conservation of Nature Red List of Threatened Species 2015: e.T39374A85699641*. Retrieved July 21 from http://www.iucnredlist.org/details/39374/0

Becker, E. A., Forney, K. A., Miller, D. L., Barlow, J., Rojas-Bracho, L., Urbán R., J., & Moore, J. E. (2022). Dynamic habitat models reflect interannual movement of cetaceans within the California Current ecosystem. *Frontiers in Marine Science*, *9*. https://doi.org/10.3389/fmars.2022.829523

Becker, E. A., Forney, K. A., Oleson, E. M., Bradford, A. L., Hoopes, R., Moore, J. E., & Barlow, J. (2022). *Abundance, distribution, and seasonality of cetaceans within the U.S. Exclusive Economic Zone around the Hawaiian Archipelago based on species distribution models*.

Becker, E. A., Forney, K. A., Oleson, E. M., Bradford, A. L., Moore, J. E., & Barlow, J. (2021). *Habitat-based density estimates for cetaceans within the waters of the U.S. Exclusive Economic Zone around the Hawaiian Archipelago* (NOAA Technical Memorandum NMFS-PIFSC-116, Issue.

Beets, J., & Hixon, M. A. (1994). Distribution, persistence, and growth of groupers (Pisces: Serranidae) on artificial and natural patch reefs in the Virgin Islands. *Bulletin of Marine Science*, *55*(2–3), 470–483.

Benson, S. R., Eguchi, T., Foley, D. G., Forney, K. A., Bailey, H., Hitipeuw, C., Samber, B. P., Tapilatu, R. F., Rei, V., & Ramohia, P. (2011). Large-scale movements and high-use areas of western Pacific leatherback turtles, Dermochelys coriacea. *Ecosphere*, *2*(7), art84.

Benson, S. R., Forney, K. A., Harvey, J. T., Carretta, J. V., & Dutton, P. H. (2007). Abundance, distribution, and habitat of leatherback turtles (*Dermochelys coriacea*) off California, 1990–2003. *Fishery Bulletin*, *105*(3), 337–347, Article PAC Library.

Best, B. D., Halpin, P. N., Read, A. J., Fujioka, E., Good, C. P., LaBrecque, E. A., Schick, R. S., Roberts, J. J., Hazen, L. J., Qian, S. S., Palka, D. L., Garrison, L. P., & McLellan, W. A. (2012). Online cetacean habitat modeling system for the U.S. East Coast and Gulf of Mexico. *Endangered Species Research*, *18*, 1–15. https://doi.org/10.3354/ers00430

Bester, C. (1999). *Biological profiles: Scalloped hammerhead*. Florida Museum of Natural History. https://www.floridamuseum.ufl.edu/fish/discover/species-profiles/sphyrna-lewini/

Bester, C. (2012). *Biological profiles: Nassau grouper*. Florida Museum of Natural History. http://www.flmnh.ufl.edu/fish/Gallery/Descript/Nassaugrouper/Nassaugrouper.html

Bjorndal, K. A., Bolten, A. B., Koike, B., Schroeder, B. A., Shaver, D. J., Teas, W. G., & Witzell, W. N. (2001). Somatic growth function for immature loggerhead sea turtles, *Caretta caretta*, in southeastern U.S. waters. *Fishery Bulletin*, *99*, 240–246, Article AtlanticReptilesEISnew.enl.

Bjorndal, K. A., Bolten, A. B., & Martins, H. R. (2000). Somatic growth model of juvenile loggerhead sea turtles *Caretta caretta*: Duration of pelagic stage. *Marine Ecology Progress Series*, *202*, 265–272, Article AtlanticReptilesEISnew.enl.

Bolten, A. B. (2003). Variation in sea turtle life history patterns: Neritic vs. oceanic developmental stages. In P. L. Lutz, J. A. Musick, & J. Wyneken (Eds.), *The Biology of Sea Turtles* (Vol. II, pp. 243–258). CRC Press.

Boulon, R., Chiappone, M., Halley, R., Jaap, W., Keller, B., Kruczynski, B., Miller, M., & Rogers, C. (2005). *Atlantic Acropora Status Review Document Report to National Marine Fisheries Service, Southeast Regional Office*. http://sero.nmfs.noaa.gov/pr/pdf/050303%20status%20review.pdf

Bowen, B. W., Bass, A. L., Chow, S.-M., Bostrom, M., Bjorndal, K. A., Bolten, A. B., Okuyama, T., Bolker, B. M., Epperly, S., Lacasella, E., Shaver, D., Dodd, M., Hopkins-Murphy, S. R., Musick, J. A., Swingle, M., Rankin-Baransky, K., Teas, W., Witzell, W. N., & Dutton, P. H. (2004). Natal homing in juvenile loggerhead turtles *(Caretta caretta)*. *Molecular Ecology*, *13*, 3797–3808, Article AtlanticReptilesEISnew.enl. https://doi.org/doi: 10.1111/j.1365-294X.2004.02356

Bradford, A. L., Baird, R. W., Mahaffy, S. D., Gorgone, A. M., McSweeney, D. J., Cullins, T., Webster, D. L., & Zerbini, A. N. (2018). Abundance estimates for management of endangered false killer whales in the main Hawaiian Islands. *Endangered Species Research*, *36*, 297–313.

Bradford, A. L., Becker, E. A., Oleson, E. M., Forney, K. A., Moore, J. E., & Barlow, J. (2020). *Abundance Estimates of False Killer Whales in Hawaiian Waters and the Broader Central Pacific* (NOAA Technical Memorandum NMFS-PIFSC-104, Issue.

Bradford, A. L., Forney, K. A., Oleson, E. A., & Barlow, J. (2013). *Line-transect abundance estimates of cetaceans in the Hawaiian EEZ* (PIFSC Working Paper WP-13-004, PSRG-2013-18, Issue.

Bradford, A. L., Forney, K. A., Oleson, E. M., & Barlow, J. (2012). *Line-transect Abundance Estimates of False Killer Whales (Pseudorca crassidens) in the Pelagic Region of the Hawaiian Exclusive Economic Zone and in the Insular Waters of the Northwestern Hawaiian Islands*.

Bradford, A. L., Forney, K. A., Oleson, E. M., & Barlow, J. (2017). Abundance estimates of cetaceans from a line-transect survey within the U.S. Hawaiian Islands Exclusive Economic Zone. *Fishery Bulletin*, *115*(2), 129–142. https://doi.org/10.7755/fb.115.2.1

Bradford, A. L., Oleson, E. A., Baird, R. W., Boggs, C. H., Forney, K. A., & Young, N. C. (2015). *Revised Stock Boundaries for False Killer Whales (Psuedorca crassidens) in Hawaiian Waters* (NOAA Technical Memorandum NMFS-PIFSC-47, Issue.

Bradford, A. L., Oleson, E. M., Forney, K. A., Moore, J. E., & Barlow, J. (2021). *Line-transect Abundance Estimates of Cetaceans in U.S. Waters around the Hawaiian Islands in 2002, 2010, and 2017* (NOAA Technical Memorandum NMFS-PIFSC-115, Issue.

Brainard, R. E., Birkeland, C., Eakin, C. M., McElhany, P., Miller, M. W., Patterson, M., & Piniak, G. A. (2011). *Status Review Report of 82 Candidate Coral Species Petitioned Under the U.S. Endangered Species Act* (NOAA Technical Memorandum NMFS-PIFSC-27). (NOAA Technical Memorandum NMFS-PIFSC-27, Issue.

Branch, T. A., Stafford, K. M., Palacios, D. M., Allison, C., Bannister, J. L., Burton, C. L. K., Cabrera, E., Carlson, C. A., Galletti Vernazzani, B., Gill, P. C., Hucke-Gaete, R., Jenner, K. C. S., Jenner, M. N. M., Matsuoka, K., Mikhalev, Y. A., Miyashita, T., Morrice, M. G., Nishiwaki, S., Sturrock, V. J., . . . Warneke, R. M. (2007). Past and present distribution, densities and movements of blue whales Balaenoptera musculus in the Southern Hemisphere and northern Indian Ocean. *Mammal Review*, *37*(2), 116–175. https://doi.org/10.1111/j.1365-2907.2007.00106.x

Briggs, C., Shjegstad, S. M., Silva, J. A. K., & Edwards, M. H. (2016). Distribution of chemical warfare agent, energetics, and metals in sediments at a deep-water discarded military munitions site. *Deep Sea Research Part II: Topical Studies in Oceanography*, *128*, 63–69.

Brunson, S., Gaos, A. R., Kelly, I. K., Van Houtan, K. S., Swimmer, Y., Hargrove, S., Balazs, G. H., Work, T. M., & Jones, T. T. (2022). Three decades of stranding data reveal insights into endangered hawksbill sea turtles in Hawaiʻi. *Endangered Species Research*, *47*, 109–118. https://doi.org/10.3354/esr01167

Bureau of Ocean Energy Management. (2021). *Atlantic Marine Assessment Program for Protected Species: FY15 – FY19*.

Burns, T. J., Davidson, H., & Kennedy, M. W. (2016). Large-scale investment in the excavation and “camouflaging” phases by nesting Leatherback Turtles (*Dermochelys coriacea*). *Canadian Journal of Zoology*, *94*(6), 443–448.

Burt, M. L., Scott-Hayward, L. A. S., & Borchers, D. L. (2014). *Analysis of Aerial Surveys Conducted in Coastal Waters of Maryland and Virginia, Including Chesapeake Bay, 2011–2013: Loggerhead Turtles. Draft Report.* U. o. S. A. Prepared by CREEM, St Andrews, Scotland. .

Calambokidis, J., & Barlow, J. (2004). Abundance of blue and humpback whales in the eastern North Pacific estimated by capture-recapture and line-transect methods. *Marine Mammal Science*, *20*(1), 63–85, Article PAC Library.

Calambokidis, J., Barlow, J., Flynn, K., Dobson, E., & Steiger, G. H. (2017). *Update on abundance, trends, and migrations of humpback whales along the U.S. West Coast* (SC/A17/NP/13, Issue.

Calambokidis, J., Barlow, J., Ford, J. K. B., Chandler, T. E., & Douglas, A. B. (2009). Insights into the population structure of blue whales in the Eastern North Pacific from recent sightings and photographic identification. *Marine Mammal Science*, *25*(4), 816–832. https://doi.org/10.1111/j.1748-7692.2009.00298

Calambokidis, J., Falcone, E., Douglas, A., Schlender, L., & Huggins, J. (2009). *Photographic Identification of Humpback and Blue Whales off the U.S. West Coast: Results and Updated Abundance Estimates from 2008 Field Season* [Final Report](Contract AB133F08SE2786). Cascadia Research Collective.

Calambokidis, J., Falcone, E. A., Quinn, T. J., Burdin, A. M., Clapham, P. J., Ford, J. K. B., Gabriele, C. M., LeDuc, R., Mattila, D., Rojas-Bracho, L., Straley, J. M., Taylor, B. L., Urbán R., J., Weller, D., Witteveen, B. H., Yamaguchi, M., Bendlin, A., Camacho, D., Flynn, K., . . . Maloney, N. (2008). *SPLASH: Structure of Populations, Levels of Abundance and Status of Humpback Whales in the North Pacific* [Final report].

Calambokidis, J., Steiger, G. H., Curtice, C., Harrison, J., Ferguson, M. C., Becker, E., DeAngelis, M., & Van Parijs, S. M. (2015). Biologically Important Areas for Selected Cetaceans Within U.S. Waters – West Coast Region. *Aquatic Mammals (Special Issue)*, *41*(1), 39–53. https://doi.org/10.1578/am.41.1.2015.39

Calambokidis, J., Steiger, G. H., Straley, J. M., Herman, L. M., Cerchio, S., Salden, D. R., Urban R., J., Jacobsen, J. K., von Ziegesar, O., Balcomb, K. C., Gabriele, C. M., Dahlheim, M. E., Uchida, S., Ellis, G., Miyamura, Y., Ladron De Guevara, P., Yamaguchi, M., Sato, F., Mizroch, S. A., . . . Quinn, T. J., II. (2001). Movements and population structure of humpback whales in the North Pacific. *Marine Mammal Science*, *17*(4), 769–794.

Carr, A. (1987). New perspectives on the pelagic stage of sea turtle development. *Conservation Biology*, *1*(2), 103–121, Article PAC Library.

Carretta, J. V., Erin M. Oleson, Karin A. Forney, David W. Weller, Aimée R. Lang, Jason Baker, Anthony J. Orr, Brad Hanson, Jay Barlow, Jeffrey E. Moore, Megan Wallen, and Robert L. Brownell Jr. (2023). *U.S. Pacific Marine Mammal Stock Assessments: 2022* (NOAA Technical Memorandum NMFS-SWFSC-684., Issue. https://doi.org/10.25923/5ysf-gt95

Carretta, J. V., Forney, K. A., Lowry, M. S., Barlow, J., Baker, J., Johnston, D., Hanson, B., Brownell, R. L., Jr., Robbins, J., Mattila, D., Ralls, K., Muto, M. M., Lynch, D., & Carswell, L. (2010). *U.S. Pacific Marine Mammal Stock Assessments: 2009* (NOAA-TM-NMFS-SWFSC-453).

Carretta, J. V., Forney, K. A., Oleson, E. M., Weller, D. W., Lang, A. R., Baker, J., Muto, M. M., Hanson, B., Orr, A. J., Huber, H., Lowry, M. S., Barlow, J., Moore, J. E., Lynch, D., Carswell, L., & Brownell, R. L., Jr. (2018a). *U.S. Pacific Draft Marine Mammal Stock Assessments: 2018* (NOAA Technical Memorandum NMFS-SWFSC-XXX, Issue.

Carretta, J. V., Forney, K. A., Oleson, E. M., Weller, D. W., Lang, A. R., Baker, J., Muto, M. M., Hanson, B., Orr, A. J., Huber, H., Lowry, M. S., Barlow, J., Moore, J. E., Lynch, D., Carswell, L., & Brownell, R. L., Jr. (2018b). *U.S. Pacific Marine Mammal Stock Assessments: 2017*.

Carretta, J. V., Oleson, E., Weller, D. W., Lang, A. R., Forney, K. A., Baker, J., Muto, M. M., Hanson, B., Orr, A. J., Huber, H., Lowry, M. S., Barlow, J., Moore, J., Lynch, D., Carswell, L., & Brownell, R. L. (2015). *U.S. Pacific Marine Mammal Stock Assessments: 2014* (NOAA Technical Memorandum NMFS-SWFSC-549, Issue.

Carretta, J. V., Oleson, E. M., Baker, J., Weller, D. W., Lang, A. R., Forney, K. A., Muto, M. M., Hanson, B., Orr, A. J., Huber, H., Lowry, M. S., Barlow, J., Moore, J. E., Lynch, D., Carswell, L., & Brownell, R. L., Jr. (2017). *U.S. Pacific Marine Mammal Stock Assessments: 2016* (NOAA Technical Memorandum NMFS-SWFSC-561, Issue.

Carretta, J. V., Oleson, E. M., Forney, K. A., Baker, J., Moore, J. E., Weller, D. W., Lang, A. R., Muto, M. M., Hanson, B., Orr, A. J., Huber, H., Lowry, M. S., Barlow, J., Lynch, D., Carswell, L., & Brownell, R. L., Jr. (2017). *U.S. Pacific Draft Marine Mammal Stock Assessments: 2017* (NOAA Technical Memorandum NMFS-SWFSC-602, Issue.

Carretta, J. V. E. M. O., Forney, K. A., Muto, M. M., Weller, D. W., Lang, A. R., Baker, J., Hanson, B., Orr, A. J., Barlow, J., Moore, J. E., & Jr., R. L. B. (2022). *U.S. Pacific Marine Mammal Stock Assessments: 2021* (NOAA Technical Memorandum NMFS-SWFSC-663, Issue. https://doi.org/10.25923/246k-7589

Casamayor, S. C., Guidino, C., & Pacheco, A. S. (2022). Spatial distribution and abundance of baleen and sperm whales in the Peruvian sea: a historical review. *Latin American Journal of Aquatic Mammals*, *17*(2), 74–92.

Ceriani, S., Casale, P., Brost, M., Leone, E., & Witherington, B. (2019). Conservation implications of sea turtle nesting trends: elusive recovery of a globally important loggerhead population. *Ecosphere*, *10*(11), 1–19. https://doi.org/10.1002/ecs2.2936

Clapham, P. J. (2000). The humpback whale: Seasonal feeding and breeding in a baleen whale. In J. Mann, R. C. Connor, P. L. Tyack, & H. Whitehead (Eds.), *Cetacean Societies: Field Studies of Dolphins and Whales* (pp. 173–196). University of Chicago Press.

Clapham, P. J., & Mattila, D. K. (1990). Humpback whale songs as indicators of migration routes. *Marine Mammal Science*, *6*(2), 155–160, Article PAC Library.

Clark, C. W. (1995). Application of U.S. Navy Underwater Hydrophone Arrays for Scientific Research on Whales. *Report of the International Whaling Commission*, *45*, 210–212.

Collier, K. J., Probert, P. K., & Jeffries, M. (2016). Conservation of aquatic invertebrates: concerns, challenges and conundrums. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *26*(5), 817-837.

Cornish, A., & Eklund, A. M. (2003). *Epinephelus striatus*. International Union for Conservation of Nature. http://www.iucnredlist.org/details/full/7862/0

Coyne, M. S., Monaco, M. E., & Landry, A. M., Jr. (2000). *Kemp's ridley habitat suitability index model* [Abstract]. Eighteenth International Sea Turtle Symposium. Mazatlán, Mexico, http://www.nmfs.noaa.gov/pr/pdfs/species/turtlesymposium1998.pdf

Craig, A. S., & Herman, L. M. (2000). Habitat preferences of female humpback whales, *Megaptera novaeangliae,* in the Hawaiian Islands are associated with reproductive status. *Marine Ecology Progress Series*, *193*, 209–216, Article PAC Library.

Cummings, E., McAlarney, R., McLellan, W., & Pabst, D. A. (2016). *Aerial Surveys for Protected Species in the Jacksonville Operating Area: 2015 Annual Progress Report* [2015 Annual Progress Report]. I. HDR.

D'Amico, A. (2013). *Analysis of Monk Seal Behavior Relative to Navy Activities*.

Daly-Engel, T. S., Seraphin, K. D., Holland, K. N., Coffey, J. P., Nance, H. A., Toonen, R. J., & Bowen, B. W. (2012). Global phylogeography with mixed-marker analysis reveals male-mediated dispersal in the endangered scalloped hammerhead shark (*Sphyrna lewini*). *PLoS ONE*, *7*(1), e29986. https://doi.org/10.1371/journal.pone.0029986

Danish, Hassan, S. T., Baloch, M. A., Mahmood, N., & Zhang, J. (2019). Linking economic growth and ecological footprint through human capital and biocapacity. *Sustainable Cities and Society*, *47*, 101516. https://doi.org/https://doi.org/10.1016/j.scs.2019.101516

Davis, R. W., Jaquet, N., Gendron, D., Markaida, U., Bazzino, G., & Gilly, W. (2007). Diving behavior of sperm whales in relation to behavior of a major prey species, the jumbo squid, in the Gulf of California, Mexico. *Marine Ecology Progress Series*, *333*, 291–302, Article PAC Library.

Defenders of Wildlife. (2015). *A Petition to List the Oceanic Whitetip Shark (Carcharhinus longimanus) as an Endangered, or Alternatively as a Threatened, Species Pursuant to the Endangered Species Act and for the Concurrent Designation of Critical Habitat*.

Dellinger, T., Zekovic, V., & Radeta, M. (2022). Long-term monitoring of in-water abundance of juvenile pelagic loggerhead sea turtles (*Caretta caretta*): Population trends in relation to North Atlantic oscillation and nesting [Original Research]. *Frontiers in Marine Science*, *9*, 1–14, Article 877636. https://doi.org/10.3389/fmars.2022.877636

DiMatteo, A., Lockhart, G., & Barco, S. (2022). Habitat models and assessment of habitat partitioning for Kemp's ridley and loggerhead marine turtles foraging in Chesapeake Bay (USA). *Endangered Species Research*, *47*, 91–107. https://doi.org/doi.org/10.3354/esr01168

Dodge, K. L., Galuardi, B., Miller, T. J., & Lutcavage, M. E. (2014). Leatherback Turtle Movements, Dive Behavior, and Habitat Characteristics in Ecoregions of the Northwest Atlantic Ocean. *PLoS ONE*, *9*(3), e91726.

Douglas, A. B., Calambokidis, J., Munger, L. M., Soldevilla, M. S., Ferguson, M. C., Havron, A. M., Camacho, D. L., Campbell, G. S., & Hildebrand, J. A. (2014). Seasonal distribution and abundance of cetaceans off Southern California estimated from CalCOFI cruise data from 2004 to 2008. *Fishery Bulletin*, *112*(2–3), 198–220. https://doi.org/10.7755/fb.112.2-3.7

Duncan, K. M., & Holland, K. N. (2006). Habitat use, growth rates and dispersal patterns of juvenile scalloped hammerhead sharks, *Sphyrna lewini,* in a nursery habitat. *Marine Ecology Progress Series*, *312*, 211–221. https://doi.org/10.3354/meps312211

Eckert, K. L., Wallace, B. P., Spotila, J. R., & Bell, B. A. (2015). Nesting Ecology and Reproductive Investments of the Leatherback Turtle. *The Leatherback Turtle: Biology and Conservation*, 63.

Eguiguren, A., Pirotta, E., Boerder, K., Cantor, M., Merlen, G., & Whitehead, H. (2021). Historical and contemporary habitat use of sperm whales around the Galapagos Archipelago: Implications for conservation. *Aquatic Conservation: Marine and Freshwater Ecosystems*, *31*(6), 1466-1481.

Ehrhardt, N. M., & Deleveaux, V. K. W. (2007). The Bahamas' Nassau grouper (*Epinephelus striatus*) fishery – Two assessment methods applied to a data-deficient coastal population. *Fisheries Research*, *87*(1), 17–27.

Environmental Sciences Group. (2005). *Canadian Forces Maritime Experimental and Test Range Environmental Assessment Update 2005*.

Epperly, S. P., Braun, J., & Chester, A. J. (1995). Aerial surveys for sea turtles in North Carolina inshore waters. *Fishery Bulletin*, *93*, 254–261, Article AtlanticReptilesEISnew.enl.

Epperly, S. P., Braun, J., Chester, A. J., Cross, F. A., Merriner, J. V., & Tester, P. A. (1995). Winter distribution of sea turtles in the vicinity of Cape Hatteras and their interactions with the summer flounder trawl fishery. *Bulletin of Marine Science*, *56*(2), 547–568, Article AtlanticReptilesEISnew.enl.

Epperly, S. P., Braun, J., & Veishlow, A. (1995). Sea turtles in North Carolina waters. *Conservation Biology*, *9*(2), 384–394, Article AtlanticReptilesEISnew.enl.

Erdman, D. S. (1970). Marine mammals from Puerto Rico to Antigua. *Journal of Mammalogy*, *51*, 636–639.

Erdman, D. S., Harms, J., & Marcial-Flores, M. (1973). Cetacean records from the northeastern Caribbean region. *Cetology*, *17*, 1–14.

Ersts, P. J., & Rosenbaum, H. C. (2003). Habitat preference reflects social organization of humpback whales (*Megaptera novaeangliae*) on a wintering ground. *Journal of Zoology*, *260*(4), 337–345. https://doi.org/10.1017/s0952836903003807

Español-Jiménez, S., Bahamonde, P. A., Chiang, G., & Häussermann, V. (2019). Discovering sounds in Patagonia: Characterizing sei whale (*Balaenoptera borealis*) downsweeps in the south-eastern Pacific Ocean. *Ocean Science*, *15*(1), 75–82.

Falcone, E. A., Diehl, B., Douglas, A., & Calambokidis, J. (2011). *Photo-Identification of Fin Whales (Balaeanoptera physalus) along the US West Coast, Baja California, and Canada*.

Falcone, E. A., & Schorr, G. S. (2011). *Distribution and Demographics of Marine Mammals in SOCAL Through Photo-Identification, Genetics, and Satellite Telemetry: A Summary of Surveys Conducted 15 July 2010 – 24 June 2011*.

Fechter, L. D., & Pouyatos, B. (2005). Ototoxicity. *Environmental Health perspectives*, *113*(7), 443–444.

Federal Aviation Administration. (2022). *SpaceX Starship/Super Heavy Launch Vehicle Program at the SpaceX Boca Chica Launch Site in Cameron County, Texas.*

Felix, F., Haase, B., Teran, C., Pozo, M., & Burneo, S. (2022). First record of a fin whale (*Balaenoptera physalus*) in coastal waters of Ecuador in a century. *Journal of Cetacean Research and Management*, *23*(1), 141–147.

Ferguson, M. C., & Barlow, J. (2003). *Addendum: Spatial Distribution and Density of Cetaceans in the Eastern Tropical Pacific Ocean Based on Summer/Fall Research Vessel Surveys in 1986–96* (U.S. Department of Commerce NOAA Administrative Report LJ-01-04, Issue.

Figgener, C., Chacón-Chaverri, D., Jensen, M. P., & Feldhaar, H. (2016). Paternity re-visited in a recovering population of Caribbean leatherback turtles (*Dermochelys coriacea*). *Journal of Experimental Marine Biology and Ecology*, *475*, 114–123.

Florida Fish and Wildlife Conservation Commission. (2023). *Index Nesting Beach Survey Totals (1989-2022)*. Retrieved August 18 from https://myfwc.com/research/wildlife/sea-turtles/nesting/beach-survey-totals/

Foley, A. M., Stacy, B. A., Hardy, R. F., Shea, C. P., Minch, K. E., & Schroeder, B. A. (2019). Characterizing watercraft-related mortality of sea turtles in Florida. *The Journal of Wildlife Management*, *83*(5), 1057–1072. https://doi.org/10.1002/jwmg.21665

Forney, K. A., Baird, R. W., & Oleson, E. M. (2010). *Rationale for the 2010 Revision of Stock Boundaries for the Hawaii Insular and Pelagic Stocks of False Killer Whales, Pseudorca crassidens*.

Forney, K. A., & Barlow, J. (1993). Preliminary winter abundance estimates for cetaceans along the California coast based on a 1991 aerial survey. *Reports of the International Whaling Commission*, *43*, 407–415, Article PAC Library.

Forney, K. A., Becker, E. A., Foley, D. G., Barlow, J., & Oleson, E. M. (2015). Habitat-based models of cetacean density and distribution in the central North Pacific. *Endangered Species Research*, *27*, 1–20. https://doi.org/10.3354/esr00632

Forney, K. A., Ferguson, M. C., Becker, E. A., Fiedler, P. C., Redfern, J. V., Barlow, J., Vilchis, I. L., & Ballance, L. T. (2012). Habitat-based spatial models of cetacean density in the eastern Pacific Ocean. *Endangered Species Research*, *16*(2), 113–133. https://doi.org/10.3354/esr00393

Frazier, J. G. (2001). General natural history of marine turtles. In K. L. Eckert & F. A. Abreu-Grobois (Eds.), *Marine Turtle Conservation in the Wider Caribbean Region: A Dialogue for Effective Regional Management: Proceedings* (pp. 3–17). Wider Caribbean Sea Turtle Conservation Network, Marine Turtle Specialist Group, World Wildlife Fund, United Nations Environment Programme.

Fulling, G. L., Mullin, K. D., & Hubard, C. W. (2003). Abundance and distribution of cetaceans in outer continental shelf waters of the U.S. Gulf of Mexico. *Fishery Bulletin*, *101*, 923–932, Article PAC Library.

Fulling, G. L., Thorson, P. H., & Rivers, J. (2011). Distribution and Abundance Estimates for Cetaceans in the Waters off Guam and the Commonwealth of the Northern Mariana Islands. *Pacific Science*, *65*(3), 321–343. https://doi.org/10.2984/65.3.321

Gaos, A. R., Kurpita, L., Bernard, H., Sundquist, L., King, C. S., Browning, J. H., Naboa, E., Kelly, I. K., Downs, K., & Eguchi, T. (2021). Hawksbill nesting in Hawaiʻi: 30-year dataset reveals recent positive trend for a small, yet vital population. *Frontiers in Marine Science*, *8*, 770424. https://doi.org/10.3389/fmars.2021.770424

Gaos, A. R., & Yañez, I. L. (2008). ¡CAREY! Where have the Eastern Pacific Hawksbills Gone?! *The State of the World's Sea Turtles*, *III*, 18–19, Article PAC Library. http://seaturtlestatus.org/report/swot-volume-3

Gilmartin, W. G., & Forcada, J. (2009). Monk seals *Monachus monachus, M. tropicalis*, and *M. schauinslandi*. In W. F. Perrin, B. Wursig, & J. G. M. Thewissen (Eds.), *Encyclopedia of Marine Mammals* (2nd ed., pp. 741–744). Academic Press.

Ginsburg, R. N., & Shinn, E. A. (1964). Distribution of the reef building community in Florida and the Bahamas. *Bulletin of the American Association of Petroleum Geologists*, *48*, 527, Article TO41MRA_10.enl.

Gorham, J., Clark, D., Bresette, M., Bagley, D., Keske, C., Traxler, S., Witherington, B., Shamblin, B., & Nairn, C. (2014). Characterization of a subtropical Hawksbill sea turtle (Eretmocheyles imbricata) assemblage utilizing shallow water natural and artificial habitats in the Florida Keys. *PLoS ONE*, *9*, 1-–16, Article e114171. https://doi.org/10.1371/journal.pone.0114171

Grant, G. S., & Ferrell, D. (1993). Leatherback turtle, *Dermochelys coriacea* (Reptilia: *Dermochelidae*): Notes on near-shore feeding behavior and association with cobia. *Brimleyana*, *19*, 77–81, Article PAC Library.

Hager, C., & Mathias, N. (2018). *Operation of the Navy's Telemetry Array in the Lower Chesapeake Bay: Annual Progress Report for 2017. Final Report.*

Halpern, B. S., Frazier, M., Potapenko, J., Casey, K. S., Koenig, K., Longo, C., Lowndes, J. S., Rockwood, R. C., Selig, E. R., Selkoe, K. A., & Walbridge, S. (2015). Spatial and temporal changes in cumulative human impacts on the world's ocean. *Nature Communications*, *6*(1), 7615. https://doi.org/10.1038/ncomms8615

Hanni, K. D., Long, D. J., Jones, R. E., Pyle, P., & Morgan, L. E. (1997). Sightings and strandings of Guadalupe fur seals in central and northern California, 1988–1995. *Journal of Mammalogy*, *78*(2), 684–690, Article PAC Library.

Hansen, L. J., Mullin, K. D., Jefferson, T. A., & Scott, G. P. (1996). *Visual Surveys Aboard Ships and Aircraft* [Final Report](Distribution and Abundance of Marine Mammals in the Northcentral and Western Gulf of Mexico, Issue.

Harting, A. L., Baker, J. D., & Johanos, T. C. (2017). Estimating Population Size for Hawaiian Monk Seals Using Haulout Data. *The Journal of Wildlife Management*, *81*(7), 1202–1209.

Hawkes, L. A., Broderick, A. C., Coyne, M. S., Godfrey, M. H., Lopez-Jurado, L.-F., Lopez-Suarez, P., Merino, S. E., Varo-Cruz, N., & Godley, B. J. (2006). Phenotypically linked dichotomy in sea turtle foraging requires multiple conservation approaches. *Current Biology*, *16*, 990–995, Article PAC Library.

Hawkins, A. D., Pembroke, A. E., & Popper, A. N. (2015). Information gaps in understanding the effects of noise on fishes and invertebrates. *Reviews in Fish Biology and Fisheries*, *25*, 39–64. https://doi.org/10.1007/s11160-014-9369-3

Hebshi, A. J., Duffy, D. C., & Hyrenbach, K. D. (2008). Associations between seabirds and subsurface predators around Oahu, Hawaii. *Aquatic Biology*, *19*(3), 89–98. https://doi.org/10.3354/ab00098

Heileman, S., & Rabalais, N. (2008). *XV-50 Gulf of Mexico: TAG: LME #5* (UNEP Regional Seas Report and Studies No. 182). (The UNEP Large Marine Ecosystem Report: A Perspective on Changing Conditions in LMEs of the World's Regional Seas, Issue. http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=51:lme5&catid=41:briefs&Itemid=72

Herbert-Read, J. E., Thornton, A., Amon, D. J., Birchenough, S. N. R., Côté, I. M., Dias, M. P., Godley, B. J., Keith, S. A., McKinley, E., Peck, L. S., Calado, R., Defeo, O., Degraer, S., Johnston, E. L., Kaartokallio, H., Macreadie, P. I., Metaxas, A., Muthumbi, A. W. N., Obura, D. O., . . . Sutherland, W. J. (2022). A global horizon scan of issues impacting marine and coastal biodiversity conservation. *Nature Ecology & Evolution*, *6*(9), 1262-1270. https://doi.org/10.1038/s41559-022-01812-0

Hillis, Z. (1990). *Buck Island Reef National Sea Turtle Research Program* Tenth Annual Workshop on Sea Turtle Biology and Conservation. Hilton Head, SC,

Hodge, L., Stanistreet, J., & Read, A. (2014). *Passive Acoustic Monitoring for Cetaceans in Navy OPAREAS off the U.S. Atlantic Coast, January 2013–December 2013*. U. S. D. o. t. Navy.

Hodge, L., Stanistreet, J., & Read, A. (2015). *Annual Report 2014: Passive Acoustic Monitoring for Marine Mammals off Virginia, North Carolina, and Florida Using High-Frequency Acoustic Recording Packages* (Contract No. N62470-10-3011, Task Orders 14 and 38). U. S. D. o. t. Navy.

Hodge, L., Stanistreet, J., & Read, A. (2016). *Annual Report 2015: Passive Acoustic Monitoring for Marine Mammals off Virginia, North Carolina, and Florida Using High-Frequency Acoustic Recording Packages*. U. S. F. F. Command.

Hodge, L. E. W. (2011). *Monitoring Marine Mammals in Onslow Bay, North Carolina, Using Passive Acoustics* [Doctoral Dissertation in Philosophy, Duke University]. Durham, NC. https://dukespace.lib.duke.edu

Hodge, L. E. W., Bell, J. T., & Kumar, A. (2013). The influence of habitat and time of day on the occurrence of odontocete vocalizations in Onslow Bay, North Carolina. *Marine Mammal Science*, *29*(4), E411–E427. https://doi.org/10.1111/mms.12006

Hopkins-Murphy, S. R., Owens, D. W., & Murphy, T. M. (2003). Ecology of immature loggerheads on foraging grounds and adults in internesting habitat in the eastern United States. In A. B. Bolten & B. E. Witherington (Eds.), *Loggerhead Sea Turtles* (pp. 79–92). Smithsonian Institution Press.

Horrocks, J. A., Stapleton, S., Guada, H., Lloyd, C., Harris, E., Fastigi, M., Berkel, J., Stewart, K., Gumbs, J., & Eckert, K. L. (2016). International movements of adult female leatherback turtles in the Caribbean: results from tag recovery data (2002–2013). *Endangered Species Research*, *29*(3), 279–287.

Horwood, J. (2009). Sei whale, *Balaenoptera borealis*. In W. F. Perrin, B. Wursig, & J. G. M. Thewissen (Eds.), *Encyclopedia of Marine Mammals* (2nd ed., pp. 1001–1003). Academic Press.

Horwood, J. W. (1987). *The Sei Whale: Population Biology, Ecology, and Management*. Croom Helm.

International Union for the Conservation of Nature-Marine Mammal Protected Areas Task Force. (2022). *Eastern Indian Ocean Blue Whale Migratory Route IMMA Factsheet*.

Isbell, F., Balvanera, P., Mori, A. S., He, J.-S., Bullock, J. M., Regmi, G. R., Seabloom, E. W., Ferrier, S., Sala, O. E., Guerrero-Ramírez, N. R., Tavella, J., Larkin, D. J., Schmid, B., Outhwaite, C. L., Pramual, P., Borer, E. T., Loreau, M., Omotoriogun, T. C., Obura, D. O., . . . Palmer, M. S. (2023). Expert perspectives on global biodiversity loss and its drivers and impacts on people. *Frontiers in Ecology and the Environment*, *21*(2), 94-103. https://doi.org/https://doi.org/10.1002/fee.2536

James, M. C., Eckert, S. A., & Myers, R. A. (2005). Migratory and reproductive movements of male leatherback turtles (*Dermochelys coriacea)*. *Marine Biology*, *147*, 845–853, Article AtlanticReptilesEISnew.enl. https://doi.org/10.1007/s00227-005-1581-1

James, M. C., Myers, R. A., & Ottensmeyer, C. A. (2005). Behaviour of leatherback sea turtles, *Dermochelys coriacea*, during the migratory cycle. *Proceedings of the Royal Society B: Biological Sciences*, *272*, 1547–1555, Article PAC Library. https://doi.org/10.1098/rspb.2005.3110

James, M. C., Sherrill-Mix, S. A., Martin, K., & Myers, R. A. (2006). Canadian waters provide critical foraging habitat for leatherback sea turtles. *Biological Conservation*, *133*(3), 347–357, Article PAC Library. https://doi.org/10.1016/j.biocon.2006.06.012

Jefferson, T. A., & Moore, J. E. (2020). Abundance and trends of Indo-Pacific finless porpoises (*Neophocaena phocaenoides*) in Hong Kong waters, 1996–2019. *Frontiers in Marine Science*, *7*, 574381. https://doi.org/https://doi.org/10.3389/fmars.2020.574381

Jefferson, T. A., Webber, M. A., & Pitman, R. L. (2015). *Marine Mammals of the World: A Comprehensive Guide to Their Identification* (2nd ed.). Academic Press.

Kahn, J. E., Hager, C., Watterson, J. C., Mathies, N., & Hartman, K. J. (2019). Comparing abundance estimates from closed population mark-recapture models of endangered adult Atlantic sturgeon. *Endangered Species Research*, *39*, 63–76. https://doi.org/https://doi.org/10.3354/esr00957

Kahn, J. E., Hager, C., Watterson, J. C., Russo, J., Moore, K., & Hartman, K. (2014). Atlantic Sturgeon Annual Spawning Run Estimate in the Pamunkey River, Virginia. *Transactions of the American Fisheries Society*, *143*(6), 1508–1514. https://doi.org/10.1080/00028487.2014.945661

Kaschner, K., Tittensor, D. P., Ready, J., Gerrodette, T., & Worm, B. (2011). Current and future patterns of global marine mammal biodiversity. *PLoS ONE*, *6*(5), e19653.

Kaschner, K., Watson, R., Trites, A., & Pauly, D. (2006). Mapping world-wide distributions of marine mammal species using a relative environmental suitability (RES) model [electronic version]. *Marine Ecology Progress Series*, *316*, 285–310.

Kelley, C., Carton, G., Tomlinson, M., & Gleason, A. (2016). Analysis of towed camera images to determine the effects of disposed mustard-filled bombs on the deep water benthic community off south Oahu. *Deep Sea Research Part II: Topical Studies in Oceanography*, *128*, 34–42. https://doi.org/10.1016/j.dsr2.2015.01.016

Kelley, J. R., Kelley, K. L., Savage, A. E., & Mansfield, K. L. (2022). Novel disease state model finds most juvenile green turtles develop and recover from fibropapillomatosis. *Ecosphere*, *13*(3), 1–13. https://doi.org/10.1002/ecs2.4000

Ketchum, J. T., Hearn, A., Klimley, A. P., Espinoza, E., Penaherrera, C., & Largier, J. L. (2014). Seasonal changes in movements and habitat preferences of the scalloped hammerhead shark (*Sphyrna lewini*) while refuging near an oceanic island. *Marine Biology*, *161*(4), 755–767.

Ketchum, J. T., Hearn, A., Klimley, A. P., Penaherrera, C., Espinoza, E., Bessudo, S., Soler, G., & Arauz, R. (2014). Inter-island movements of scalloped hammerhead sharks (*Sphyrna lewini*) and seasonal connectivity in a marine protected area of the eastern tropical Pacific. *Marine Biology*, *161*(4), 939–951.

Klinck, H., Nieukirk, S. L., Fregosi, S., Mellinger, D. K., Lastuka, S., Shilling, G. B., & Luby, J. C. (2015a). *Cetacean Studies on the Hawaii Range Complex in December 2014–January 2015: Passive Acoustic Monitoring of Marine Mammals using Gliders. Final Report* (Prepared for Naval Facilities Engineering Command Pacific under HDR Environmental, Operations and Construction, Inc., Issue.

Klinck, H., Nieukirk, S. L., Fregosi, S., Mellinger, D. K., Lastuka, S., Shilling, G. B., & Luby, J. C. (2015b). *Cetacean Studies on the Hawaii Range Complex in December 2014–January 2015: Passive Acoustic Monitoring of Marine Mammals using Gliders. Final Report* (Prepared for Naval Facilities Engineering Command Pacific under HDR Environmental, Operations and Construction, Inc. Contract No. N62470-10-D-3011, CTO KB25, Issue.

Kobayashi, D. R., Polovina, J. J., Parker, D. M., Kamezaki, N., Cheng, I.-J., Uchida, I., Dutton, P. H., & Balazs, G. H. (2008). Pelagic Habitat Characterization of Loggerhead Sea Turtles, *Caretta caretta*, in the North Pacific Ocean (1997–2006): Insights from Satellite Tag tracking and Remotely Sensed Data. *Journal of Experiemental Marine Biology and Ecology*, *356*(1), 96–114.

Kohler, N. E., & Turner, P. A. (2001). Shark tagging: A review of conventional methods and studies. *Environmental Biology of Fishes*, *60*(1–3), 191–223. https://doi.org/10.1023/a:1007679303082

Koide, S., Silva, J. A. K., Dupra, V., & Edwards, M. (2016). Bioaccumulation of chemical warfare agents, energetic materials, and metals in deep-sea shrimp from discarded military munitions sites off Pearl Harbor. *Deep Sea Research Part II: Topical Studies in Oceanography*, *128*, 53–62. https://doi.org/10.1016/j.dsr2.2015.03.002

Kuschke, S., Wyneken, J., Cray, C., Turla, E., Kinsella, M., & Miller, D. (2023). Fusarium spp. an emerging fungal threat to leatherback (*Dermochelys coriacea*) eggs and neonates. *Frontiers in Marine Science*, *10*, 1–12. https://doi.org/10.3389/fmars.2023.1170376

LaBrecque, E., Curtice, C., Harrison, J., Van Parijs, S. M., & Halpin, P. N. (2015a). Biologically Important Areas for Cetaceans Within U.S. Waters—East Coast Region. *Aquatic Mammals*, *41*(1), 17–29. https://doi.org/10.1578/am.41.1.2015.54

LaBrecque, E., Curtice, C., Harrison, J., Van Parijs, S. M., & Halpin, P. N. (2015b). Biologically Important Areas for Cetaceans Within U.S. Waters—Gulf of Mexico Region. *Aquatic Mammals*, *41*(1), 30–38. https://doi.org/10.1578/am.41.1.2015.54

Leroy, E. C., Royer, J.-Y., Alling, A., Maslen, B., & Rogers, T. L. (2021). Multiple pygmy blue whale acoustic populations in the Indian Ocean: Whale song identifies a possible new population. *Scientific Reports*, *11*(1), 8762. https://doi.org/https://doi.org/10.1038/s41598-021-88062-5

Limpus, C. J. (1992). The hawksbill turtle, *Eretmochelys imbricata*, in Queensland: Population structure within a southern Great Barrier Reef ground. *Wildlife Research*, *19*, 489–506, Article PAC Library.

Limpus, C. J. (2009). *A Biological Review of Australian Marine Turtles Hawksbill Turtle, Eretmochelys imbricata (Linnaeus)*.

Lirman, D., Schopmeyer, S., Manzello, D., Gramer, L. J., Precht, W. F., Muller-Karger, F., Banks, K., Barnes, B., Bartels, E., Bourque, A., Byrne, J., Donahue, S., Duquesnel, J., Fisher, L., Gilliam, D., Hendee, J., Johnson, M., Maxwell, K., McDevitt, E., . . . Thanner, S. (2011). Severe 2010 cold-water event caused unprecedented mortality to corals of the Florida reef tract and reversed previous survivorship patterns. *PLoS ONE*, *6*(8), e23047. https://doi.org/10.1371/journal.pone.0023047

Littnan, C. L. (2011). *Habitat Use and Behavioral Monitoring of Hawaiian Monk Seals in Proximity to the Navy Hawaii Range Complex*. San Diego, CA: U.S. Pacific Fleet

Lopez-Castro, M. C., & Rocha-Olivares, A. (2005). The panmixia paradigm of eastern Pacific olive ridley turtles revised: Consequences for their conservation and evolutionary biology. *Molecular Ecology*, *14*(11), 3325–3334, Article PAC Library. https://doi.org/10.1111/j.1365-294X.2005.02652

Mansfield, K. L. (2006). *Sources of mortality, movements and behavior of sea turtles in Virginia* [dissertation, College of William and Mary]. Williamsburg, VA.

Masaki, Y. (1976). Biological studies on the North Pacific sei whale. *Bulletin of the Far Seas Fisheries Research Laboratory*, *14*, 1–104 Article PAC Library.

Masaki, Y. (1977). The separation of the stock units of sei whales in the North Pacific. *Reports of the International Whaling Commission*, *Special Issue 1*, 71–79, Article KB02_MarMamm.enl.

Mate, B. R., Gisiner, R., & Mobley, J. (1998). Local and migratory movements of Hawaiian humpback whales tracked by satellite telemetry. *Canadian Journal of Zoology*, *76*(5), 863–868, Article PAC Library.

Mate, B. R., Palacios, D. M., Baker, C. S., Lagerquist, B. A., Irvine, L. M., Follett, T., Steel, D., Hayslip, C., & Winsor, M. H. (2016). *Baleen (Blue and Fin) Whale Tagging in Southern California in Support of Marine Mammal Monitoring Across Multiple Navy Training Areas. Final Report.*

Mate, B. R., Palacios, D. M., Irvine, L. M., Lagerquist, B. A., Follett, T., Winsor, M. H., & Hayslip, C. (2015). *Baleen (Blue & Fin) Whale Tagging in Southern California in Support of Marine Mammal Monitoring Across Multiple Navy Training Areas (SOCAL, NWTRC, GOA); Final Report*. Pearl Harbor, HI: U.S. Pacific Fleet

Maze-Foley, K., & Mullin, K. D. (2006). Cetaceans of the oceanic northern Gulf of Mexico: Distributions, group sizes and interspecific associations. *Journal of Cetacean Research and Management*, *8*(2), 203–213.

McCullough, J. L. K., Henderson, E. E., Trickey, J. S., Barlow, J., Baumann-Pickering, S., Manzano-Roth, R., Alongi, G., Martin, S., Fregosi, S., Mellinger, D. K., Klinck, H., Szesciorka, A. R., & Oleson, E. M. (2024). Geographic distribution of the Cross Seamount beaked whale based on acoustic detections. *Marine Mammal Science*, *40*(1), 164–183. https://doi.org/https://doi.org/10.1111/mms.13061

McDonald, M. A., & Fox, C. G. (1999). Passive acoustic methods applied to fin whale population density estimation. *Journal of Acoustical Society of America*, *105*(5), 2643–2651.

McLellan, W., Foley, H., McAlarney, R., Cummings, E., Swaim, Z., Hodge, L., Stanistreet, J., Urian, K., Waples, D., Paxton, C., Pabst, D., Bell, J., & Read, A. (2014, 28-30 March 2014). *Patterns of cetacean species occurrence, distribution and density at three sites along the continental shelf break of the U.S. Atlantic coast* Southeast and Mid-Atlantic Marine Mammal Symposium, Wilmington, NC.

Meyer-Gutbrod, E. L., Davies, K. T. A., Johnson, C. L., Plourde, S., Sorochan, K. A., Kenney, R. D., Ramp, C., Gosselin, J.-F., Lawson, J. W., & Greene, C. H. (2023). Redefining North Atlantic right whale habitat-use patterns under climate change. *Limnology and Oceanography*, *68*(S1), S71–S86. https://doi.org/https://doi.org/10.1002/lno.12242

Meylan, A. B., Witherington, B. E., Brost, B., Rivero, R., & Kubilis, P. S. (2006). Sea turtle nesting in Florida, USA: Assessments of abundance and trends for regionally significant populations of *Caretta, Chelonia*, and *Dermochelys*. In M. Frick, A. Panagopoulou, A. F. Rees, & K. Williams (Eds.), *Twenty-sixth Annual Symposium on Sea Turtle Biology and Conservation: Book of Abstracts* (pp. 306–307). National Marine Fisheries Service Southeast Fisheries Science Center, International Sea Turtle Society.

Mignucci-Giannoni, A. A. (1988). A stranded sperm whale, *Physeter catodon*, at Cayo Santiago, Puerto Rico. *Caribbean Journal of Science*, *24*(3–4), 173–190.

Miller, J. D., Dobbs, K. A., Limpus, C. J., Mattocks, N., Jr., & Landry, A. M. (1998). Long-distance migrations by the hawksbill turtle, *Eretmochelys imbricata*, from north-eastern Australia. *Wildlife Research*, *25*, 89–95.

Miller, M. H., & Klimovich, C. (2016). *Endangered Species Act Status Review Report: Giant Manta Ray (Manta birostris) and Reef Manta Ray (Manta alfredi).*

Mizroch, S. A., Rice, D. W., & Brewick, J. M. (1984). The sei whale, *Balaenoptera borealis*. *Marine Fisheries Review*, *46*(4), 25–29.

Mizroch, S. A., Rice, D. W., Zwiefelhofer, D., Waite, J. M., & Perryman, W. L. (2009). Distribution and movements of fin whales in the North Pacific Ocean. *Mammal Review*, *39*(3), 193–227. https://doi.org/10.1111/j.1365-2907.2009.00147.x

Mobley, J. R., Spitz, S. S., Forney, K. A., Grotefendt, R., & Forestell, P. H. (2000). *Distribution and Abundance of Odontocete Species in Hawaiian Waters: Preliminary Results of 1993–98 Aerial Surveys* [Administrative Report](LJ-00-14C).

Moore, S. E., Stafford, K. M., Dahlheim, M. E., Fox, C. G., Braham, H. W., Polovina, J. J., & Bain, D. E. (1998). Seasonal variation in reception of fin whale calls at five geographic areas in the north Pacific. *Marine Mammal Science*, *14*(3), 617–627.

Morreale, S. J., & Standora, E. A. (1998). *Early life stage ecology of sea turtles in northeastern U.S. waters* (NOAA Technical Memorandum NMFS-SEFSC 413).

Mortimer, J. A., & Donnelly, M. (2008). *Hawksbill Turtle (Eretmochelys imbricate): Marine Turtle Specialist Group 2008 International Union for Conservation of Nature Red List Status Assessment*. http://www.iucnredlist.org/details/8005/0

Mullin, K. D., & Fulling, G. L. (2004). Abundance of cetaceans in the oceanic northern Gulf of Mexico, 1996–2001. *Marine Mammal Science*, *20*(4), 787–807, Article TO41_MarMamm.enl; TO22_AllButCh06.enl.

Mullin, K. D., & Hoggard, W. (2000). *Visual surveys of cetaceans and sea turtles from aircraft and ships* [OCS Study](Cetaceans, sea turtles and seabirds in the northern Gulf of Mexico: Distribution, abundance and habitat associations, Issue.

Mullin, K. D., Hoggard, W., & Hansen, L. J. (2004). Abundance and seasonal occurrence of cetaceans in outer continental shelf and slope waters of the north-central and northwestern Gulf of Mexico. *Gulf of Mexico Science*, *22*(1), 62–73, Article TO41_MarMamm.enl; TO22_AllButCh06.enl.

Mullin, K. D., Hoggard, W., Roden, C. L., Lohoefener, R. R., & Rogers, C. M. (1994). Cetaceans on the upper continental slope in the north-central Gulf of Mexico. *Fishery Bulletin*, *92*(4), 773–786.

Musick, J. A., & Limpus, C. J. (1997). Habitat utilization and migration of juvenile sea turtles. In P. L. Lutz & J. A. Musick (Eds.), *The Biology of Sea Turtles* (pp. 137–163). CRC Press.

National Marine Fisheries Service. (1976). Hawaiian Monk Seal Final Regulations [Final]. *Federal Register*, *41*(227), 51611–51612, Article PAC Library.

National Marine Fisheries Service. (2006). *Recovery Plan for The Sperm Whale (Physeter macrocephalus)* [Draft Report].

National Marine Fisheries Service. (2009). Endangered and Threatened Species: 12–Month Finding for a Petition to Revise Critical Habitat for Hawaiian Monk Seal [Notice of 12-month finding]. *Federal Register*, *74*(112), 27988–27993, Article PAC Library.

National Marine Fisheries Service. (2010a). *Gulf Sturgeon (Acipenser oxyrinchus desotoi)*. National Oceanic and Atmospheric Administration Fisheries, Office of Protected Resources. http://www.nmfs.noaa.gov/pr/species/fish/gulf-sturgeon.htm

National Marine Fisheries Service. (2010b). *Hawaiian Monk Seal Population and Location*. Retrieved from http://www.fpir.noaa.gov/Library/PRD/Hawaiian%20monk%20seal/Fact%20Sheets/HMS-populationMAY2010.pdf

National Marine Fisheries Service. (2014). Endangered and Threatened Wildlife and Plants: Final Listing Determinations on Proposal to List 66 Reef-Building Coral Species and To Reclassify Elkhorn and Staghorn Corals. *Federal Register*, *50*(223), 53852. https://federalregister.gov/a/2014-20814

National Marine Fisheries Service. (2015). *Sperm Whale (Physeter macrocephalus) 5-Year Review: Summary and Evaluation, June 2015*.

National Marine Fisheries Service. (2016a). Endangered and Threatened Species; Identification of 14 Distinct Population Segments of the Humpback Whale (*Megaptera novaeangliae*) and Revision of Species-Wide Listing. *Federal Register*, *81*(174), 62260–62320.

National Marine Fisheries Service. (2016b). *Species in the Spotlight: Pacific Leatherback 5-Year Action Plan*. In. Silver Spring, MD: National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

National Marine Fisheries Service. (2018). *Draft Recovery Plan for the Blue Whale (Balaenoptera musculus): Revision*.

National Marine Fisheries Service. (2019). *Rare Olive Ridley Sea Turtle Nest Discovered on Oahu*. Retrieved April 13 from https://www.fisheries.noaa.gov/feature-story/rare-olive-ridley-sea-turtle-nest-discovered-oahu

National Marine Fisheries Service. (2020a). *Recovery Plan for the Blue Whale (Balaenoptera musculus) - First Revision*.

National Marine Fisheries Service. (2020b). *Scalloped Hammerhead Shark (Sphyrna lewini) 5-Year Review: Summary and Evaluation*.

National Marine Fisheries Service. (2021a). *Final Endangered Species Act Recovery Plan for the Main Hawaiian Islands Insular False Killer Whale (Pseudorca crassidens) Distinct Population Segment*.

National Marine Fisheries Service. (2021b). *National Marine Fisheries Service, Alaska Region Occurrence of Endangered Species Act (ESA) Listed Humpback Whales off Alaska: Revised August 6, 2021*.

National Marine Fisheries Service. (2022a). *Giant Manta Ray*. Retrieved January 18 from https://www.fisheries.noaa.gov/species/giant-manta-ray

National Marine Fisheries Service. (2022b). *Gulf Sturgeon Acipenser oxyrinchus desotoi*. Retrieved June 6 from https://www.fisheries.noaa.gov/species/gulf-sturgeon

National Marine Fisheries Service. (2022c). *Letter of Concurrence: SpaceX Starship Super Heavy Project at the Boca Chica Launch Site*.

National Marine Fisheries Service. (2022d). *Nassau Grouper Epinephelus striatus*. Retrieved January 10 from https://www.fisheries.noaa.gov/species/nassau-grouper

National Marine Fisheries Service. (2022e). *Staghorn coral (Acropora cervicornis), Elkhorn coral (Acropora palmata), Lobed star coral (Orbicella annularis), Mountainous star coral (Orbicella faveolata), Boulder star coral (Orbicella franksi), Rough cactus coral (Mycetophyllia ferox), Pillar coral (Dendrogyra cylindrus) 5-Year Review: Summary and Evaluation*. https://media.fisheries.noaa.gov/2022-08/Caribbean%20Corals%205%20Year%20Review_0.pdf

National Marine Fisheries Service. (2023a). *2017–2023 North Atlantic Right Whale Unusual Mortality Event*. Office of Protected Resources. https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2023-north-atlantic-right-whale-unusual-mortality-event

National Marine Fisheries Service. (2023b). *Draft Recovery Plan for the Oceanic Whitetip Shark (Carcharhinus longimanus)*.

National Marine Fisheries Service. (2023c). *Elkhorn Coral (Acropora palmata)*. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources. Last updated March 8. Retrieved July 24 from https://www.fisheries.noaa.gov/species/elkhorn-coral

National Marine Fisheries Service. (2023d, May 15). *North Atlantic Right Whale Calving Season 2023*. Retrieved September 15 from https://www.fisheries.noaa.gov/national/endangered-species-conservation/north-atlantic-right-whale-calving-season-2023

National Marine Fisheries Service. (2023e). *SpaceX Super Heavy landings in the Gulf of Mexico and Starship landings in the Pacific. Concurrence Letter issued to FAA.*

National Marine Fisheries Service. (2024a). *Humpback Whale*. Retrieved January 15 from https://www.fisheries.noaa.gov/species/humpback-whale

National Marine Fisheries Service. (2024b). *Letter of Concurrence SpaceX Starship Indian Ocean Landings*.

National Marine Fisheries Service. (2024c). *Sei Whale*. Retrieved 3/21/2024 from https://www.fisheries.noaa.gov/species/sei-whale

National Marine Fisheries Service. (2024d). *Sperm Whale*. Retrieved 3/21/2024 from https://www.fisheries.noaa.gov/species/sperm-whale

National Marine Fisheries Service, & U. S. Fish and Wildlife Service. (1998). *Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (Dermochelys coriacea)*.

National Marine Fisheries Service, & U.S. Fish and Wildlife Service. (2011). *Bi-National Recovery Plan for the Kemp's Ridley Sea Turtle (Lepidochelys kempii)* [Draft - Second Revision].

National Marine Fisheries Service, & U.S. Fish and Wildlife Service. (2013a). *Hawksbill Sea Turtle (Eretmochelys imbricata) 5-Year Review: Summary and Evaluation*.

National Marine Fisheries Service, & U.S. Fish and Wildlife Service. (2013b). *Leatherback Turtle (Dermochelys coriacea) 5-Year Review: Summary and Evaluation*.

National Marine Fisheries Service, & U.S. Fish and Wildlife Service. (2013c). *Leatherback Turtle (Dermochelys coriacea) 5-Year Review: Summary and Evaluation*. Silver Spring, MD: National Marine Fisheries Service Office of Protected Resources and U.S. Fish and Wildlife Service Southeast Region

National Marine Fisheries Service, & U.S. Fish and Wildlife Service. (2014). *Olive Ridley Sea Turtle (Lepidochelys olivacea) 5-Year Review: Summary and Evaluation*.

National Marine Fisheries Service, & U.S. Fish and Wildlife Service. (2015). *Kemp's Ridley Sea Turtle (Lepidochelys kempii) 5-Year Review: Summary and Evaluation*.

National Marine Fisheries Service, & U.S. Fish and Wildlife Service. (2020). *Endangered Species Act status review of the leatherback turtle (Dermochelys coriacea)* (Report to the National Marine Fisheries Service Office of Protected Resources and U.S. Fish and Wildlife Service, Issue.

National Marine Fisheries Service, & U.S. Fish and Wildlife Service. (2023). *Loggerhead Sea Turtle (Caretta caretta) Northwest Atlantic Ocean DPS 5-Year Review: Summary and Evaluation*.

National Marine Fisheries Service Office of Protected Resources. (2021). *Sei Whale (Balaenoptera borealis) 5-Year Review: Summary and Evaluation*.

National Oceanic and Atmospheric Administration. (2012). Taking of Marine Mammals Incidental to Commercial Fishing Operations; False Killer Whale Take Reduction Plan; Final Rule. *Federal Register*, *77*(230), 71260–71286.

National Oceanic and Atmospheric Administration. (2015). Endangered and Threatened Species: Final Rulemaking To Revise Critical Habitat for Hawaiian Monk Seals; Final Rule. *Federal Register*, *80*(162), 50926–50988.

National Oceanic and Atmospheric Administration. (2017). *Main Hawaiian Islands Insular False Killer Whale Recovery Planning Workshop: Workshop Summary*. Honolulu, HI: Pacific Islands Regional Office

National Oceanic and Atmospheric Administration. (2023a). *Blue Whale (Balaenoptera musculus)*. Retrieved March 12 from https://www.fisheries.noaa.gov/species/blue-whale

National Oceanic and Atmospheric Administration. (2023b). *Critical Habitat for Hawaiian Monk Seals*. Retrieved March 14 from https://www.fisheries.noaa.gov/action/critical-habitat-hawaiian-monk-seals#:~:text=Specific%20areas%20in%20the%20MHI,points%20on%20the%20islands%20of%3A

National Oceanic and Atmospheric Administration. (2023c). False Killer Whale. In (Vol. 2023).

National Oceanic and Atmospheric Administration. (2023d). *Giant Manta Ray*. Retrieved November 27 from https://www.fisheries.noaa.gov/species/giant-manta-ray

National Oceanic and Atmospheric Administration. (2023e). *Sanctuary Expansion: Flower Garden Banks National Marine Sanctuary*. Retrieved September 19 from https://flowergarden.noaa.gov/management/sanctuaryexpansion.html

National Oceanic and Atmospheric Administration. (2024a). *Blue Whale*. Retrieved 3/12/2024 from https://www.fisheries.noaa.gov/species/blue-whale

National Oceanic and Atmospheric Administration. (2024b). *Loggerhead Turtle*. Retrieved 3/14/2024 from https://www.fisheries.noaa.gov/species/loggerhead-turtle

National Park Service. (2023, June 4). *Satellite Tracking Kemp's Ridley, Loggerhead, and Green Sea Turtles*. Retrieved August 23 from https://www.nps.gov/pais/learn/nature/tracking.htm

Naval Facilities Engineering Command Atlantic. (2020). *Loggerhead and Kemp's Ridley Sea Turtle Habitat Models for the Chesapeake Bay*.

Nordstrom, B., James, M. C., & Worm, B. (2020). Jellyfish distribution in space and time predicts leatherback sea turtle hot spots in the Northwest Atlantic. *PLoS ONE*, *15*(5), 1–21, Article e0232628. https://doi.org/10.1371/journal.pone.0232628

Norris, T. (2017). Personal communication via email between Tenaya Norris (The Marine Mammal Center) and Conrad Erkelens (ManTech International Corporation) on Guadalupe fur seal abundance and distribution. In C. L. Erkelens (Ed.).

Norris, T. (2022). Personal communication via email between Tenaya Norris (The Marine Mammal Center) and Michael Zickel (ManTech International) regarding updated abundance estimate for Guadalupe fur seals off California. In.

Norris, T. A., & Elorriaga-Verplancken, F. R. (2020). *Guadalupe Fur Seal Population Census and Tagging in Support of Marine Mammal Monitoring Across Multiple Navy Training Areas in the Pacific Ocean*.

O'Hern, J. E., & Biggs, D. C. (2009). Sperm whale (*Physeter macrocephalus*) habitat in the Gulf of Mexico: Satellite observed ocean color and altimetry applied to small-scale variability in distribution. *Aquatic Mammals*, *35*(3), 358–366, Article TO41_MarMamm.enl. https://doi.org/10.1578/AM.35.3.2009.358

Oleson, E. M., Baird, R. W., Martien, K. K., & Taylor, B. L. (2013). *Island-associated stocks of odontocetes in the main Hawaiian Islands: A synthesis of available information to facilitate evaluation of stock structure* (Pacific Islands Fisheries Science Center Working Paper WP-13-003, Issue.

Oleson, E. M., Boggs, C. H., Forney, K. A., Hanson, M. B., Kobayashi, D. R., Taylor, B. L., Wade, P. R., & Ylitalo, G. M. (2010). *Status Review of Hawaiian Insular False Killer Whales (Pseudorca crassidens) under the Endangered Species Act* (NOAA Technical Memorandum NMFS-PIFSC-22, Issue.

Pablo-Rodríguez, N., Aurioles-Gamboa, D., & Montero-Muñoz, J. L. (2016). Niche overlap and habitat use at distinct temporal scales among the California sea lions (*Zalophus californianus*) and Guadalupe fur seals (*Arctocephalus philippii townsendi*). *Marine Mammal Science*, *32*(2), 466–489. https://doi.org/10.1111/mms.12274

Palka, D., & Johnson, M. (2007). *Cooperative Research to Study Dive Patterns of Sperm Whales in the Atlantic Ocean* (OCS Study MMS 2007-033, Interagency Agreement RU98-15958).

Panicker, D., & Stafford, K. M. (2021). Northern Indian Ocean blue whale songs recorded off the coast of India. *Marine Mammal Science*(4), 1564–1571. https://doi.org/10.1111/mms.12827

Panigada, S., Zanardelli, M., Mackenzie, M., Donovan, C., Melin, F., & Hammond, P. S. (2008). Modelling habitat preferences for fin whales and striped dolphins in the Pelagos Sanctuary (Western Mediterranean Sea) with physiographic and remote sensing variables. *Remote Sensing of Environment*, *112*(8), 3400–3412. https://doi.org/10.1016/j.rse.2007.11.017

Parker, L. G. (1995). Encounter with a juvenile hawksbill turtle offshore Sapelo Island, Georgia. *Marine Turtle Newsletter*, *71*, 19–22, Article PAC Library. http://www.seaturtle.org/mtn/archives/mtn71/mtn71p19.shtml

Peña, J. (2006). *Plotting Kemp's Ridleys, plotting the future of sea turtle conservation* (SWOT Report, Issue.

Perry, S. L., DeMaster, D. P., & Silber, G. K. (1999). The great whales: History and status of six species listed as endangered under the U.S. Endangered Species Act of 1973. *Marine Fisheries Review*, *61*(1), 1–74, Article PAC Library.

Phorn, B. (2018, October 2). *Dozens of endangered baby sea turtles hatched in New York City and crawled to the sea*. Retrieved August 23 from https://abcnews.go.com/US/dozens-endangered-baby-sea-turtles-hatched-york-city/story?id=58229791

Platt, S. G., Kingsley, C., Latt, A. Z., Platt, K., & Owens, D. W. (2021). Recent nesting record of the Leatherback in coastal Myanmar. *Indian Ocean Turtle Newsletter*, *33*, 5-6.

Polovina, J. J., Kobayashi, D. R., Parker, D. M., Seki, M. P., & Balazs, G. H. (2000). Turtles on the edge: Movement of loggerhead turtles (*Caretta caretta*) along oceanic fronts, spanning longline fishing grounds in the central North Pacific, 1997–1998. *Fisheries Oceanography*, *9*(1), 71–82, Article PAC Library.

Putman, N. F., Verley, P., Endres, C. S., & Lohmann, K. J. (2015). Magnetic navigation behavior and the oceanic ecology of young loggerhead sea turtles. *The Journal of Experimental Biology*, *218*(7), 1044–1050.

Queiroz, N., Humphries, N. E., Couto, A., Vedor, M., da Costa, I., Sequeira, A. M. M., Mucientes, G., Santos, A. M., Abascal, F. J., Abercrombie, D. L., Abrantes, K., Acuña-Marrero, D., Afonso, A. S., Afonso, P., Anders, D., Araujo, G., Arauz, R., Bach, P., Barnett, A., . . . Sims, D. W. (2019). Global spatial risk assessment of sharks under the footprint of fisheries. *Nature*, *572*(7770), 461–466. https://doi.org/10.1038/s41586-019-1444-4

Ramos-Cartelle, A., García-Cortés, B., Ortíz de Urbina, J., Fernández-Costa, J., González-González, I., & Mejuto, J. (2012). *Standardized catch rates of the oceanic whitetip shark (Carcharhinus longimanus) from observations of the Spanish longline fishery targeting swordfish in the Indian Ocean during the 1998–2011 period*.

Randall, M. T., & Sulak, K. J. (2012). Evidence of autumn spawning in Suwannee River Gulf sturgeon, *Acipenser oxyrinchus desotoi* (Vladykov, 1955). *Journal of Applied Ichthyology*, *28*(4), 489–495. https://doi.org/10.1111/j.1439-0426.2012.01960

Rappucci, G., Garrison, L., Soldevilla, M., Ortega-Ortiz, J., Reid, J., Aichinger-Dias, L., Mullin, K., & Litz, J. (2023). *Gulf of Mexico Marine Assessment Program for Protected Species (GoMMAPPS): Marine Mammals*. https://seamap.env.duke.edu/models/SEFSC/GOM/

Read, A. J., Barco, S., Bell, J., Borchers, D. L., Burt, M. L., Cummings, E. W., Dunn, J., Fougeres, E. M., Hazen, L., Hodge, L. E. W., Laura, A.-M., McAlarney, R. J., Nilsson, P., Pabst, D. A., Paxton, C. G. M., Schneider, S. Z., Urian, K. W., Waples, D. M., & McLellan, W. A. (2014). Occurrence, distribution, and abundance of cetaceans in Onslow Bay, North Carolina, USA. *Journal of Cetacean Research and Management*, *14*, 23–35.

Rees, A. F., Al-Kiyumi, A., Broderick, A. C., Papathanasopoulou, N., & Godley, B. J. (2012). Conservation related insights into the behaviour of the olive ridley sea turtle *Lepidochelys olivacea* nesting in Oman. *Marine Ecology Progress Series*, *450*, 195–205.

Reeves, R. R., Smith, T. D., Webb, R. L., Robbins, J., & Clapham, P. J. (2002). Humpback and fin whaling in the Gulf of Maine from 1800 to 1918. *Marine Fisheries Review*, *64*(1), 1–12, Article KB02_MarMamm.enl.

Rendell, L., Whitehead, H., & Escribano, R. (2004). Sperm whale habitat use and foraging success off northern Chile: evidence of ecological links between coastal and pelagic systems. *Marine Ecology Progress Series*, *275*, 289-295.

Rice, D. W. (1989). Sperm whale *Physeter macrocephalus* Linnaeus, 1758. In. In S. H. Ridgway & R. Harrison (Eds.), *Handbook of Marine Mammals* (Vol. 4, pp. 177–234). Academic Press.

Roberts, J. J., Best, B. D., Mannocci, L., Fujioka, E., Halpin, P. N., Palka, D. L., Garrison, L. P., Mullin, K. D., Cole, T. V. N., Khan, C. B., McLellan, W. A., Pabst, D. A., & Lockhart, G. G. (2016). Habitat-based cetacean density models for the U.S. Atlantic and Gulf of Mexico. *Scientific Reports*, *6*, 22615. https://doi.org/10.1038/srep22615

Roberts, M. A., Anderson, C. J., Stender, B., Segars, A., Whittaker, J. D., Grady, J. M., & Quattro, J. M. (2005). Estimated contribution of Atlantic coastal loggerhead turtle nesting populations to offshore feeding aggregations. *Conservation Genetics*, *6*, 133–139, Article AtlanticReptilesEISnew.enl. https://doi.org/10.1007/s10592-004-7737-6

Robinson, S., Barbieri, M., & Johanos, T. (2022). The Hawaiian Monk Seal: Ethology Applied to Endangered Species Conservation and Recovery. In Daniel P. Costa & E. A. McHuron (Eds.), *Ethology and Behavioral Ecology of Phocids* (pp. 599-635). Springer Nature.

Robydek, A., & Nunley, J. M. (2012). *Determining Marine Migration Patterns and Behavior of Gulf Sturgeon in the Gulf of Mexico off Eglin Air Force Base, Florida* (Department of Defense Legacy Program Technical Notes, Issue.

Roden, C. L., & Mullin, K. D. (2000). Sightings of cetaceans in the northern Caribbean Sea and adjacent waters, winter 1995. *Caribbean Journal of Science*, *36*(3–4), 280–288, Article TO41_MarMamm.enl; TO22_AllButCh06.enl.

Rogillio, H. E., Ruth, R. T., Behrens, E. H., Doolittle, C. N., Granger, W. J., & Kirk, J. P. (2007). Gulf sturgeon movements in the Pearl River drainage and the Mississippi Sound. *North American Journal of Fisheries Management*, *27*(1), 89–95, Article TO41MRA_10_AND_13.enl. https://doi.org/10.1577/m05-170.1

Rosel, P. E., Corkeron, P., Engleby, L., Epperson, D., Mullin, K. D., Soldevilla, M. S., & Taylor, B. L. (2016). *Status Review of Byrde's Whales (Balaenopter edeni) in the Gulf of Mexico Under the Endangered Species Act* (NOAA Technical Memorandum NMFS-SEFSC-692, Issue.

Rosel, P. E., Wilcox, L. A., Yamada, T. K., & Mullin, K. D. (2021). A new species of baleen whale (*Balaenoptera*) from the Gulf of Mexico, with a review of its geographic distribution. *Marine Mammal Science*, *37*(2), 577–610.

Ross, S. T., Slack, W. T., Heise, R. J., Dugo, M. A., Rogillio, H., Bowen, B. R., Mickle, P., & Heard, R. W. (2009). Estuarine and coastal habitat use of Gulf sturgeon (*Acipenser oxyrinchus desotoi*) in the North-Central Gulf of Mexico. *Estuaries and Coasts*, *32*(2), 360–374, Article TO41MRA_10_AND_13.enl. https://doi.org/10.1007/s12237-008-9122-z

Rothermel, E. R., Balazik, M. T., Best, J. E., Breece, M. W., Fox, D. A., Gahagan, B. I., Haulsee, D. E., Higgs, A. L., O'Brien, M. H. P., Oliver, M. J., Park, I. A., & Secor, D. H. (2020). Comparative migration ecology of striped bass and Atlantic sturgeon in the US Southern mid-Atlantic bight flyway. *PLoS ONE*, *15*(6), e0234442. https://doi.org/10.1371/journal.pone.0234442

Rudd, M. B., Ahrens, R. N. M., Pine, W. E., Bolden, S. K., & Jacobson, L. (2014). Empirical, spatially explicit natural mortality and movement rate estimates for the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*). *Canadian Journal of Fisheries and Aquatic Sciences*, *71*(9), 1407–1417. https://doi.org/10.1139/cjfas-2014-0010

Ryan, C., Boisseau, O., Cucknell, A., Romagosa, M., Moscrop, A., & McLanaghan, R. (2013). *Final Report for the trans-Atlantic Research Passages Between the UK and USA via the Azores and Iceland, Conducted from R/V Song of the Whale 26 March to 28 September 2012*.

Ryan, J. P., Benoit-Bird, K. J., Oestreich, W. K., Leary, P., Smith, K. B., Waluk, C. M., Cade, D. E., Fahlbusch, J. A., Southall, B. L., & Joseph, J. E. (2022). Oceanic giants dance to atmospheric rhythms: Ephemeral wind-driven resource tracking by blue whales. *Ecology Letters*.

Sankalpa, D. M. R., Thilakarathne, E., Lin, W., Thilakanayaka, V., Kumarasinghe, C. P., Liu, M., Lin, M., & Li, S. (2021). Cetacean occurrence and diversity in whale-watching waters off Mirissa, Southern Sri Lanka. *Integrative Zoology*, *16*(4), 462-476. https://doi.org/10.1111/1749-4877.12540

Sasso, C., Richards, P., Benson, S., Judge, M., Putman, N., Snodgrass, D., & Stacy, B. (2021). Leatherback turtles in the eastern Gulf of Mexico: Foraging and migration behavior during the autumn and winter. *Frontiers in Marine Science*, *8*(660798), 1–8. https://doi.org/10.3389/fmars.2021.660798

Scales, K. L., Schorr, G. S., Hazen, E. L., Bograd, S. J., Miller, P. I., Andrews, R. D., Zerbini, A. N., & Falcone, E. A. (2017). Should I stay or should I go? Modelling year-round habitat suitability and drivers of residency for fin whales in the California Current. *Biodiversity Research*, *23*(10), 1204–1215. https://doi.org/10.1111/ddi.12611

Schmidly, D. J. (1981). *Marine Mammals of the Southeastern United States Coast and the Gulf of Mexico* (FWS/OBS-80/41).

Schroeder, B. A., Foley, A. M., & Bagley, D. A. (2003). Nesting patterns, reproductive migrations, and adult foraging areas of loggerhead turtles. In A. B. Bolten & B. E. Witherington (Eds.), *Loggerhead Sea Turtles* (pp. 114–124). Smithsonian Institution Press.

Schroeder, B. A., & Thompson, N. B. (1987). *Distribution of the Loggerhead Turtle, Caretta caretta, and the Leatherback Turtle, Dermochelys coriacea, in the Cape Canaveral, Florida Area: Results of Aerial Surveys* (National Oceanic and Atmospheric Administration Technical Report National Marine Fisheries Service 53). (Proceedings of the Cape Canaveral, Florida Sea Turtle Workshop, Issue.

Sea Mammal Research Unit [SMRU] Ltd. (2012). *Supporting Documentation for Global Predicted Density Data. Unpublished Sea Mammal Research Unit (SMRU) Ltd. report*. St. Andrews, United Kingdom: Scottish Oceans Institute, University of St. Andrews, Scotland.

Seminoff, J. A., Allen, C. D., Balazs, G. H., Dutton, P. H., Eguchi, T., Haas, H. L., Hargrove, S. A., Jensen, M. P., Klemm, D. L., Lauritsen, A. M., MacPherson, S. L., Opay, P., Possardt, E. E., Pultz, S. L., Seney, E. E., Van Houtan, K. S., & Waples, R. S. (2015). *Status Review of the Green Turtle (Chelonia mydas) Under the U.S. Endangered Species Act* (NOAA Technical Memorandum NMFS-SWFSC-592).

Seminoff, J. A., Nichols, W. J., Resendiz, A., & Brooks, L. (2003). Occurrence of hawksbill turtles, *Eretmochelys imbricata* (Reptilia: Cheloniidae), near the Baja California peninsula, Mexico. *Pacific Science*, *57*(1), 9–16, Article PAC Library.

Shallenberger, E. W. (1981). *The Status of Hawaiian Cetaceans* [Final report](MMC-77/23).

Shaver, D., Frandsen, H., Walker, J., George, J., & Gredzens, C. (2020). Threats to Kemp's ridley sea turtle (*Lepidochelys kempii* Garman, 1880) nests incubating in situ on the Texas coast. *Herpetology Notes*, *13*, 907–923.

Shaver, D. J., Hart, K. M., Fujisaki, I., Bucklin, D., Iverson, A. R., Rubio, C., Backof, T. F., Burchfield, P. M., Miron, R. J. G. D., Dutton, P. H., Frey, A., Peña, J., Gomez Gamez, D., Martinez, H. J., & Ortiz, J. (2017). Inter-nesting movements and habitat-use of adult female Kemp's ridley turtles in the Gulf of Mexico. *PLoS ONE*, *12*(3), 1–27, Article e0174248. https://doi.org/10.1371/journal.pone.0174248

Shaver, D. J., Hart, K. M., Fujisaki, I., Rubio, C., Sartain-Iverson, A. R., Peña, J., Gamez, D. G., Miron, R. J. G. D., Burchfield, P. M., & Martinez, H. J. (2016). Migratory corridors of adult female Kemp's ridley turtles in the Gulf of Mexico. *Biological Conservation*, *194*, 158–167.

Shoop, C. R., & Kenney, R. D. (1992). Seasonal distributions and abundances of loggerhead and leatherback sea turtles in waters of the northeastern United States. *Herpetological Monographs*, *6*, 43–67, Article AtlanticReptilesEISnew.enl.

Širović, A., Bassett, H. R., Johnson, S. C., Wiggins, S. M., & Hildebrand, J. A. (2014). Bryde's whale calls recorded in the Gulf of Mexico. *Marine Mammal Science*, *30*(1), 399–409. https://doi.org/10.1111/mms.12036

Širović, A., Hildebrand, J. A., & Wiggins, S. M. (2007). Blue and fin whale call source levels and propagation range in the Southern Ocean. *The Journal of the Acoustical Society of America*, *122*(2), 1208–1215. https://doi.org/10.1121/1.2749452

Širović, A., Hildebrand, J. A., Wiggins, S. M., McDonald, M. A., Moore, S. E., & Thiele, D. (2004). Seasonality of blue and fin whale calls and the influence of sea ice in the Western Antarctic Peninsula. *Deep Sea Research II*, *51*(17–19), 2327–2344, Article PAC Library. https://doi.org/10.1016/j.dsr2.2004.08.005

Skillman, R. A., & Balazs, G. H. (1992). Leatherback turtle captured by ingestion of squid bait on swordfish longline. *Fishery Bulletin*, *90*(4), 807–808, Article PAC Library.

Skillman, R. A., & Kleiber, P. (1998). *Estimation of Sea Turtle Take and Mortality in the Hawaii-based Longline Fishery, 1994–1996* (NOAA Technical Memorandum NMFS-SWFSC-257). (NOAA Technical Memorandum NMFS-SWFSC-257, Issue.

Smith, T. I. J., & Clugston, J. P. (1997). Status and management of Atlantic sturgeon, *Acipenser oxyrinchus*, in North America. *Environmental Biology of Fishes*, *48*, 335–346.

Smultea, M. (2014). Changes in Relative Occurrence of Cetaceans in the Southern California Bight: A Comparison of Recent Aerial Survey Results with Historical Data Sources. *Aquatic Mammals*, *40*(1), 32–43. https://doi.org/10.1578/am.40.1.2014.32

Smultea, M. A. (1994). Segregation by humpback whale (*Megaptera novaeangliae*) cows with a calf in coastal habitat near the island of Hawaii. *Canadian Journal of Zoology*, *72*, 805–811, Article PAC Library.

Smultea, M. A., Hopkins, J. L., & Zoidis, A. M. (2007). *Marine Mammal Visual Survey in and near the Alenuihaha Channel and the Island of Hawaii: Monitoring in Support of Navy Training Exercises in the Hawaii Range Complex, January 27–February 2, 2007* [Final Report].

Smultea, M. A., Jefferson, T. A., & Zoidis, A. M. (2010). Rare sightings of a Bryde's whale (*Balaenoptera edeni*) and Sei whales (*B. borealis*) (Cetacea: Balaenopteridae) northeast of Oahu, Hawaii. *Pacific Science*, *64*(3), 449–457. https://doi.org/10.2984/64.3.449

Spalding, M. D., Ravilious, C., & Green, E. P. (2001). *World Atlas of Coral Reefs*. University of California Press.

Stafford, K. M., Nieukirk, S. L., & Fox, C. G. (2001). Geographic and seasonal variation of blue whale calls in the North Pacific. *Journal of Cetacean Research Management*, *3*(1), 65–76.

Stanistreet, J. E., Hodge, L. E. W., Nowacek, D. P., Bell, J. T., Hildebrand, J. A., Wiggins, S. M., & Read, A. J. (2013). *Passive acoustic monitoring of beaked whales and other cetaceans off Cape Hatteras,* *North Carolina* 20th Biennial Conference on the Biology of Marine Mammals. Dunedin, New Zealand,

State of the World's Sea Turtles. (2022). *Hawksbill Turtles*.

Stewart, B. S., Antonelis, G. A., Baker, J. D., & Yochem, P. K. (2006). Foraging biogeography of Hawaiian monk seals in the Northwestern Hawaiian Islands. *Atoll Research Bulletin*, *543*, 131–146, Article PAC Library.

Stewart, K. R., LaCasella, E. L., Roden, S. E., Jensen, M. P., Stokes, L. W., Epperly, S. P., & Dutton, P. H. (2016). Nesting population origins of leatherback turtles caught as bycatch in the US pelagic longline fishery. *Ecosphere*, *7*(3), 1–18.

Sulak, K. J., Randall, M. T., Edwards, R. E., Summers, T. M., Luke, K. E., Smith, W. T., Norem, A. D., Harden, W. M., Lukens, R. H., Parauka, F., Bolden, S., & Lehnert, R. (2009). Defining winter trophic habitat of juvenile Gulf sturgeon in the Suwannee and Apalachicola rivermouth estuaries, acoustic telemetry investigations. *Journal of Applied Ichthyology*, *25*, 505–515.

Swartz, S. L., & Burks, C. (2000). *Windwards Humpback (Megaptera novaeangliae) Survey* (NOAA Technical Memorandum NMFS-SEFSC-438).

Swartz, S. L., Martinez, A., Stamates, J., Burks, C., & Mignucci-Giannoni, A. A. (2002). *Acoustic and Visual Survey of Cetaceans in the Waters of Puerto Rico and the Virgin Islands: February – March 2001*.

Taruski, A. G., & Winn, H. E. (1976). Winter sightings of odontocetes in the West Indies. *Cetology*, *22*, 1–12.

Thorne, L. H., Hodge, L. W., & Read, A. J. (2012, 20-24 February). *Combining passive acoustics and satellite oceanography to evaluate cetacean habitat use in the South Atlantic Bight* 2012 Ocean Sciences Meeting. Salt Lake City, UT,

Thums, M., Ferreira, L. C., Jenner, C., Jenner, M., Harris, D., Davenport, A., Andrews-Goff, V., Double, M., Möller, L., & Attard, C. R. (2022). Pygmy blue whale movement, distribution and important areas in the Eastern Indian Ocean. *Global Ecology and Conservation*, *35*, e02054. https://doi.org/https://doi.org/10.1016/j.gecco.2022.e02054

Tolotti, M., Bauer, R., Forget, F., Bach, P., Dagorn, L., & Travassos, P. (2017). Fine-scale vertical movements of oceanic whitetip sharks (*Carcharhinus longimanus*). *Fishery Bulletin*, *115*(3), 380–395. https://doi.org/10.7755/Fb.115.3.8

U.S. Department of the Navy. (2013). *Water Range Sustainability Environmental Program Assessment: Potomac River Test Range*.

U.S. Department of the Navy. (2019). *Final Supplemental Environmental Impact Statement/Supplemental Overseas Environmental Impact Statement for Surveillance Towed Array Sensor System Low Frequency (SURTASS LFA) Sonar*.

U.S. Fish and Wildlife Service. (1995). *Gulf Sturgeon Recovery/Management Plan*.

U.S. Fish and Wildlife Service, & National Marine Fisheries Service. (1998). *Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act*.

U.S. Fish and Wildlife Service, & National Marine Fisheries Service. (2022). *Gulf Sturgeon (Acipenser oxyrinchus desotoi) 5-Year Review: Summary and Evaluation*.

University of Hawaii. (2014). *Ordnance Reef (HI-06) Follow-Up Investigation, Final Assessment Report* (Contract No. W91ZLK-10-D-005, Issue.

University of Hawaii, & Environet. (2010). *Hawai'i Undersea Military Munitions Assessment (HUMMA), Final Investigation Report for Hawaii-05* (Contract No. W74V8H-04- 005, Task Number 0496, Issue.

Van Houtan, K. S., Francke, D. L., Alessi, S., Jones, T. T., Martin, S. L., Kurpita, L., King, C. S., & Baird, R. W. (2016). The developmental biogeography of hawksbill sea turtles in the North Pacific. *Ecology and evolution*, *6*(8), 2378–2389. https://doi.org/10.1002/ece3.2034

Wallace, B., DiMatteo, A., Hurley, B., & AB, E. F. FIRST RECORDED LEATHERBACK TURTLE (DERMOCHELYS CORIACEA) NESTING EVENT IN KENYA. *PLoS ONE*, *5*, e15465.

Wallace, B. P., Zolkewitz, M., & James, M. C. (2015). Fine-scale foraging ecology of leatherback turtles. *Frontiers in Ecology and Evolution*, *3*, 15.

Ward-Geiger, L., Knowlton, A., Amos, A., Pitchford, T., Mase-Guthrie, B., & Zoodsma, B. (2011). Recent sightings of the north Atlantic right whale in the Gulf of Mexico. *Gulf of Mexico Science*, *29*(1), 74–78.

Waring, G. T., Josephson, E., Maze-Foley, K., & Rosel, P. E. (2014). *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments–2013* (NOAA Technical Memorandum NMFS-NE-228, Issue.

Waring, G. T., Pace, R. M., Quintal, J. M., Fairfield, C. P., & Maze-Foley, K. (2004). *U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments–2003* (NOAA Technical Memorandum NMFS-NE-182). (NOAA Technical Memorandum NMFS-NE-182, Issue.

Waterhouse, L., Heppell, S. A., Pattengill-Semmens, C. V., McCoy, C., Bush, P., Johnson, B. C., & Semmens, B. X. (2020). Recovery of critically endangered Nassau grouper (*Epinephelus striatus*) in the Cayman Islands following targeted conservation actions. *Proceedings of the National Academy of Sciences*, *117*(3), 1587–1595. https://doi.org/doi:10.1073/pnas.1917132117

Watkins, W. A., Moore, K. E., & Tyack, P. (1985). Sperm whale acoustic behavior in the southeast Caribbean. *Cetology*, *49*, 1–15.

Whitehead, H. (2003). *Sperm Whales Social Evolution in the Ocean*. University of Chicago Press.

Whitehead, H., Coakes, A., Jaquet, N., & Lusseau, S. (2008). Movements of sperm whales in the tropical Pacific. *Marine Ecology Progress Series*, *361*, 291–300. https://doi.org/10.3354/meps07412

Whitehead, H., & Weilgart, L. (1991). Patterns of visually observable behaviour and vocalizations in groups of female sperm whales. *Behaviour*, *118*, 276–296, Article TO41_MarMamm.enl; KB02_MarMamm.enl.

Wild, L. A., Riley, H. E., Pearson, H. C., Gabriele, C. M., Neilson, J. L., Szabo, A., Moran, J., Straley, J. M., & DeLand, S. (2023). Biologically Important Areas II for cetaceans within U.S. and adjacent waters – Gulf of Alaska Region [Original Research]. *Frontiers in Marine Science*, *10*. https://doi.org/10.3389/fmars.2023.1134085

Williams, H. (2023, June 15). *Hundreds of Kemp's ridley nests, most endangered sea turtle in world, have been found in Texas this year*. Retrieved August 23 from https://www.kiiitv.com/article/life/animals/sea-turtle-nests-in-texas/503-b7a7ac72-f841-476b-afbe-defb88c70a80

Wilson, K., D'Amico, A., & Littnan, C. (2012). *Habitat Use and Behavioral Monitoring of Hawaiian Monk Seals in Proximity to the Navy Hawaii Range Complex*. U.S. Pacific Fleet

Witherington, B., & Hirama, S. (2006). Sea turtles of the epi-pelagic *Sargassum* drift community. In M. Frick, A. Panagopoulou, A. F. Rees, & K. Williams (Eds.), *Book of Abstracts. Twenty-sixth Annual Symposium on Sea Turtle Biology and Conservation*. International Sea Turtle Society.

Witzell, W. N. (1983). *Synopsis of biological data on the hawksbill turtle, Eretmochelys imbricata (Linnaeus, 1766)* (FAO Fisheries Synopsis 137).

Worm, B., Barbier, E. B., Beaumont, N., Duffy, J. E., Folke, C., Halpern, B. S., Jackson, J. B. C., Lotze, H. K., Micheli, F., Palumbi, S. R., Sala, E., Selkoe, K. A., Stachowicz, J. J., & Watson, R. (2006). Impacts of Biodiversity Loss on Ocean Ecosystem Services. *Science*, *314*(5800), 787-790. https://doi.org/doi:10.1126/science.1132294

Young, C. N., Carlson, J., Hutt, C., Kobayashi, D., McCandless, C. T., & Wraith, J. (2016). *Status review report: Oceanic whitetip shark (Carcharhinius longimanus)* (Final Report to the National Marine Fisheries Service, Office of Protected Resources, Issue.

Young, C. N., & Carlson, J. K. (2020). The biology and conservation status of the oceanic whitetip shark (*Carcharhinus longimanus*) and future directions for recovery. *Reviews in Fish Biology and Fisheries*, *30*(2), 293–312. https://doi.org/10.1007/s11160-020-09601-3

7 List of Preparers

John LaBonte, Ph.D. (ManTech SRS Technologies, Inc.), Senior Biologist

Ph.D., Department of Biology, U.C. Santa Barbara, California
B.S., Ecology, Behavior, and Evolution
Years of Experience: 28

Mike Zickel (ManTech SRS Technologies, Inc.), Senior Environmental Scientist

M.S., Marine Estuarine Environmental Sciences
B.S., Physics
Years of Experience: 21

Elizabeth Becker (ManTech International Corporation), Senior Scientist

Ph.D., Marine Science
M.A., Geography
B.A., Geography and Environmental Studies
Years of Experience: 25

Taylor Houston (ManTech SRS Technologies, Inc.), Senior Biologist

MBA, Operations Management, Concordia University Texas
B.S. Natural Resources Management, University of Texas at Austin
Years of Experience: 21