NATIONAL MARINE FISHERIES SERVICE
ENDANGERED SPECIES ACT SECTION 7
BIOLOGICAL AND CONFERENCE OPINION

Title:	Biological and Conference Opinion on the Issuance of Permit Nos. 14550, 14856, 16239, 17312, and 18636, for Research on Gulf of Mexico Bryde's whales, and Activities to be Conducted under the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies (RESTORE) Act Grant
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1 INTRODUCTION

The Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.) establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat they depend on. Section 7(a)(2) of the ESA requires Federal agencies to insure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. Federal agencies must do so in consultation with National Marine Fisheries Service (NMFS) for threatened or endangered species (ESA-listed), or designated critical habitat that may be affected by the action that are under NMFS jurisdiction (50 C.F.R. §402.14(a)). If a Federal action agency determines that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and NMFS concur with that determination for species under NMFS jurisdiction, consultation concludes informally (50 C.F.R. §402.14(b)).

The Federal action agency shall confer with the NMFS for species under NMFS jurisdiction on any action which is likely to jeopardize the continued existence of any proposed species or result in the destruction or adverse modification of proposed critical habitat (50 C.F.R. §402.10). If requested by the Federal agency and deemed appropriate, the conference may be conducted in accordance with the procedures for formal consultation in §402.14.Section 7(b)(3) of the ESA requires that at the conclusion of consultation, or conference if combined with a formal consultation, NMFS provides an opinion stating whether the Federal agency's action is likely to jeopardize ESA-listed species or destroy or adversely modify designated critical habitat. If NMFS determines that the action is likely to jeopardize listed species or destroy or adversely modify critical habitat, NMFS provides a reasonable and prudent alternative that allows the action to proceed in compliance with section 7(a)(2) of the ESA. If an incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts and terms and conditions to implement the reasonable and prudent measures. The action agencies for this consultation are NMFS, Office of Protected Resources, Permits and Conservation Division (hereafter the Permits Division), and the National Ocean Service's National Centers for Coastal Ocean Science.

The Permits Division proposes to issue amended scientific research permits pursuant to section 10(a)(1)(A) of the ESA and section 104 of the Marine Mammal Protection Act (MMPA) of 1972, as amended (16 USC 1361 et seq.) to five applicants to authorize take of Gulf of Mexico Bryde's whale, proposed for listing under the ESA. One of these amended permits, held by the NMFS Southeast Fisheries Science Center, would also receive funding from the National Centers for Coastal Ocean Science under the RESTORE Act grant titled, "*Trophic Interactions and Habitat Requirements of Gulf of Mexico Bryde's Whales*." The purpose of the proposed permit amendments are to allow an exception to the moratoria and prohibition on takes established under the ESA and MMPA in order to allow the applicants to conduct scientific research on ESA-listed Gulf of Mexico Bryde's whales should the proposed listing becomes final.

Under the ESA take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct." Harm is defined by regulation (50 C.F.R. §222.102) as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering." NMFS does not have a regulatory definition of "harass." We rely on our interim guidance, which interprets harass as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (NMFSPD 02-110-19).

Under the MMPA take is defined as "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. 1361 et seq.) and further defined by regulation (50 C.F.R. §216.3) as "to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal. This includes, without limitation, any of the following:

- the collection of dead animals, or parts thereof
- the restraint or detention of a marine mammal, no matter how temporary
- tagging a marine mammal
- the negligent or intentional operation of an aircraft or vessel
- the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal
- feeding or attempting to feed a marine mammal in the wild"

For purposes of this action, harassment is defined under the MMPA as any act of pursuit, torment, or annoyance which:

- Has the potential to injure a marine mammal or marine mammal stock in the wild (Level A Harassment); or

- Has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B Harassment). Under NMFS regulation, Level B harassment does not include an act that has the potential to injure a marine mammal or marine mammal stock in the wild.

This consultation, biological and conference opinion, and incidental take statement, were completed in accordance with section 7(a)(2) of the statute (16 U.S.C. 1536 (a)(2)), associated implementing regulations (50 C.F.R. §§401-16), and agency policy and guidance was conducted by NMFS Office of Protected Resources Endangered Species Act Interagency Cooperation Division (hereafter referred to as "we"). This biological and conference opinion (opinion) and incidental take statement were prepared by NMFS Office of Protected Resources Endangered Species Act Interagency Cooperation Division in accordance with section 7(b) of the ESA and implementing regulations at 50 C.F.R. §402.

This document represents the NMFS biological and conference opinion on the effects of these actions on ESA-listed species, species proposed for ESA listing, and designated critical habitat. A complete record of this consultation is on file at the NMFS Office of Protected Resources in Silver Spring, Maryland.

1.1 Background

The permit applicants are long-term cetacean researchers, and as such, we have previously conducted consultations on previous research permits for all the applicants considering the effects on ESA-listed species (Table 1). The activities that would be authorized under the amended permits are the same activities that those applicants have been permitted to conduct previously. Such activities include vessel surveys, close approaches, biological sampling, tagging, and active acoustics. Previous consultations considering permits to authorize the applicants to conduct these activities all resulted in biological opinions concluding that the issuance of the research permits was not likely to jeopardize the continued existence of ESA-listed species, nor destroy or adversely modify designated critical habitat of the ESA-listed species and designated critical habitat as it existed at the time of each consultation (NMFS 2013c; NMFS 2014a; NMFS 2015a; NMFS 2015b; NMFS 2016d).

The National Centers for Coastal Ocean Science have previously requested consultation on several actions funding research activities under the RESTORE Act. Each of the earlier consultations concluded that the permitting, funding, and conduct of the research activities were either not likely to adversely affect or not likely to jeopardize the continued existence of ESA-listed species and would either not effect or would not destroy or adversely modify designated critical habitat.

Table 1. Current scientific research permits held by the researchers requesting modification for Gulf of Mexico Bryde's whale takes.

Permit Number	Permit Holder	Issuance Date	Expiration Date
14450	Southeast Fisheries Science Center	March 4, 2014	February 28, 2019
14856	Bruce Mate	June 16, 2016	December 31, 2018
16239	HDR	December 17, 2015	September 30, 2018

Permit Number	Permit Holder	Issuance Date	Expiration Date
17312	Scripps Institution of Oceanography	September 11, 2013	September 13, 2018
18636	Ocean Alliance, Inc.	February 17, 2016	February 28, 2021

These applicants currently hold research permits and are authorized to take ESA-listed (and non-ESA-listed) whales during research activities. The permits that the applicants currently hold authorize takes of Bryde's whales in the Gulf of Mexico under the MMPA, but not under the ESA. The permit holders have requested that the Permits Division amend the existing research permits to authorize take for Gulf of Mexico Bryde's whales pursuant to the ESA.

Gulf of Mexico Bryde's whales were proposed to be listed as endangered on December 8, 2016. If the proposed listing becomes final, all of the take prohibitions of section 9(a)(1) of the ESA would apply once the species is listed. These include prohibitions against the import, export, use in foreign commerce, or "take" of the species. These prohibitions apply to all persons subject to the jurisdiction of the United States, including in the United States or on the high seas. Ongoing research or other activities that may affect this proposed species will require a reinitiation of ESA section 7 consultation. The action agencies for the permitting and research actions considered in this consultation, were proactive in seeking to conference with NMFS on their activities based on the proposed listing of Gulf of Mexico Bryde's whale as endangered under the ESA.

In this opinion, we have batched a number of consultation together because of the similarity of actions, and likely effects of those actions on ESA-listed species and designated critical habitat, and the reinitiation trigger of the proposed listing of Gulf of Mexico Bryde's whale.

The previous consultations on the proposed actions evaluated the effects to the species listed under the ESA at the time of consultation. All of these consultations were conducted within the last five years with the best scientific and commercial information available at that time. During the consultation we searched for new literature and information since the time of the previous consultations were completed. We did not find any new information that would substantively change our analysis or conclusions from what was considered in those consultations for the ESA-listed species. Therefore, in this opinion we summarize the take levels and conclusions of those consultations, incorporating the analysis by reference. We focus this opinion on evaluating the potential effects on Gulf of Mexico Bryde's whale as a species proposed for listing as endangered under the ESA of authorizing the continued research authorized in the existing permits based on the proposed listing of Bryde's whale as endangered under the ESA.

1.2 Consultation History

This opinion is based on information provided in the applicants' permit applications, the National Centers for Coastal Ocean Science's request for consultation, correspondence and discussions with the Permits Division, National Centers for Coastal Ocean Science, and the applicants, previous biological opinions for research permits, annual reports from the applicants' permits, and the best scientific and commercial data available from the literature.

Gulf of Mexico Bryde's whale were proposed to be listed as endangered on December 8, 2016. If the proposed listing becomes final, all of the take prohibitions of section 9(a)(1) of the ESA would apply once the species is listed. Ongoing research or other activities that may affect this proposed species will require a reinitiation of ESA section 7 consultation. The action agencies for the permitting and research actions considered in this consultation, were proactive in seeking to conference with NMFS on their activities based on the proposed listing of Gulf of Mexico Bryde's whale as endangered under the ESA.

Following publication of this proposed listing, we were contacted by the National Centers for Coastal Ocean Science and NMFS Permits Division regarding re-initiation of consultations to address the proposed listing of Gulf of Mexico Bryde's whale as endangered in their scientific research permits.

Our communication with the Permits Division and the National Centers for Coastal Ocean Science regarding their respective actions considered in this consultation is summarized as follows.

- In March 2017, the National Centers for Coastal Ocean Science informed the ESA Interagency Cooperation Division that they intended to fund a research project under the RESTORE Act for research on the proposed endangered Gulf of Mexico Bryde's whale. They requested guidance on how to proceed with the request.
- On March 17, 2017, the National Centers for Coastal Ocean Science met with the Permits Division and the ESA Interagency Cooperation Division to discuss the proposed Gulf of Mexico Bryde's whale listing, the RESTORE Act research project, and permitting options.
- On March 27, 2017, the Permits Division and the ESA Interagency Cooperation Division met to discuss how best to permit the proposed RESTORE Act research, and how to address the existing research permits affected by the proposed Gulf of Mexico Bryde's whale listing. It was recommended that, in order to most appropriately consider the effects of research on Gulf of Mexico Bryde's whales that the Permits Division identify and amend all the potentially affected research permits.
- On May 5, 2017, the Permits Division contacted all current permit holders who were authorized to conduct research on Bryde's whales in the Gulf of Mexico.
- On June 28, 2017, the Permits Division and the ESA Interagency Cooperation Division met to review the Gulf of Mexico Bryde's whale amendment requests.

- On July 25, 2017, the Permits Division notified permit holders that the amendment requests for Gulf of Mexico Bryde's whale takes pursuant to the proposed ESA listing of Gulf of Mexico Bryde's whale were due by August 9, 2017.
- On July 31, 2017, the Permits Division, National Centers for Coastal Ocean Science, and the ESA-Interagency Cooperation Division met to discuss the timeline for the batched reinitiation for all permit requests, including the RESTORE Act funding proposal.
- On August 25, 2017, the Permits Division received all the amendment requests from current permit holders who wished to be authorized to take Gulf of Mexico Bryde's whales for research purposes.
- On August 29, 2017, the Permits Division met with the ESA Interagency Cooperation Division and the NMFS Southeast Regional Office to discuss possible options for allocating take of Gulf of Mexico Bryde's whales and coordinating research.
- On September 8, 2017, the Permits Division submitted their request for reinitiation on the issuance of permit amendments for File Nos. 14550, 14856, 16239, 17312, and 18636.
- On September 18, 2017, the National Centers for Coastal Ocean Science provided a request for consultation on their action to fund the RESTORE Act project on Gulf of Mexico Bryde's whales. The information National Centers for Coastal Ocean Science provided was sufficient to consult on that date.
- On September 27, 2017, the ESA Interagency Cooperation Division met with the Permits Division to discuss the questions on the consultation package. The ESA Interagency Cooperation Division requested that the Permits Division provide additional information on their process to manage the proposed permit amendments and coordinate the research such that Gulf of Mexico Bryde's whales would not be subjected to excessive take.
- On October 3, 2017, the Permits and Conservation Division provided responses to some of the questions provided to them on September 27.
- On October 10, 2017, the Permits and Conservation Division met with the ESA Interagency Cooperation Division, and representatives from the Southeast Regional Office and the Southeast Fisheries Science Center to discuss the process for coordinating research on Gulf of Mexico Bryde's whales.
- On October 17, 2017, the ESA Interagency Cooperation Division met with the National Centers for Coastal Ocean Science RESTORE Act coordinator to discuss the timeline of the consultation.
- On November 21, 2017, the Permits Division provided a written management plan to the ESA Interagency Cooperation Division describing how the Permits Division would coordinate research on the Gulf of Mexico Bryde's whale, and conditions to be included in the amended permit.
- On December 7, 2017, the Permits and Conservation Division provided initial details on the Southeast Fisheries Science Center's permit amendment request. The ESA Interagency Cooperation Division determined that there was sufficient information to initiate consultation on that date.

2 THE ASSESSMENT FRAMEWORK

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species; or adversely modify or destroy their designated critical habitat.

"*Jeopardize the continued existence of*" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of an ESA-listed species in the wild by reducing the reproduction, numbers, or distribution of that species." 50 C.F.R. §402.02.

"*Destruction or adverse modification*" means a direct or indirect alteration that appreciably diminishes the value of designated critical habitat for the conservation of an ESA-listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 C.F.R. §402.02).

An ESA section 7 assessment involves the following steps:

Description of the Proposed Action (Section 3), *Action Area* (Section 4), *Interrelated and Interdependent Actions* (Section 5), and *Potential Stressors* (Section 6): We describe the proposed action, identify any interrelated and interdependent actions, and describe the action area with the spatial extent of those stressors associated with the proposed action.

Species and Designated Critical Habitat Not Likely to be Adversely Affected (Section 7) and *Species and Designated Critical Habitat Likely to be Adversely Affected* (Section 8): We identify the resources that may be present in the action area and whether they will or will not be affected or not likely to be adversely affected by the proposed action. *Status of Species and Designated Critical Habitat* (Section 9): We identify the ESA-listed species and designated critical habitat that are likely to co-occur with those stressors in space and time and evaluate the status of those species and habitat.

Environmental Baseline (Section 10): We describe the environmental baseline in the action area including: past and present impacts of Federal, state, or private actions and other human activities in the action area; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation, impacts of state or private actions that are contemporaneous with the consultation in process.

Effects of the Action (Section 11): We identify the stressors that are likely to result from the proposed action, any measures that will be taken to mitigate or minimize exposure of ESA-listed resources to the stressors, the number (and age or life stage, and sex, if possible) of ESA-listed individuals that are likely to be exposed to the stressors and the populations or subpopulations to which those individuals belong. We also consider whether the action "may affect" designated critical habitat. This is our exposure analysis; we evaluate the available evidence to determine how individuals of those ESA-listed species are likely to respond given their probable exposure.

We also consider how the action may affect designated critical habitat. This is our response analysis. We assess the consequences of these responses of individuals that are likely to be exposed to the populations those individuals represent, and the species those populations comprise. This is our risk analysis. The adverse modification analysis considers the impacts of the proposed action on the essential habitat features and conservation value of designated critical habitat.

Integration and Synthesis (Section 12): In this section we integrate the analyses in the opinion to summarize the consequences to ESA-listed species and designated critical habitat under NMFS' jurisdiction.

Cumulative Effects (Section 13): Cumulative effects are the effects to ESA-listed species and designated critical habitat of future state or private activities that are reasonably certain to occur within the action area. 50 C.F.R. §402.02. Effects from future Federal actions that are unrelated to the proposed action are not considered because they require separate ESA section 7 compliance.

Conclusion (Section 14): With full consideration of the status of the species and the designated critical habitat, we consider the effects of the action within the action area on populations or subpopulations and on essential habitat features when added to the environmental baseline and the cumulative effects to determine whether the action could reasonably be expected to:

- Reduce appreciably the likelihood of survival and recovery of ESA-listed species in the wild by reducing its numbers, reproduction, or distribution, and state our conclusion as to whether the action is likely to jeopardize the continued existence of such species; or
- Appreciably diminish the value of designated critical habitat for the conservation of an ESA-listed species, and state our conclusion as to whether the action is likely to destroy or adversely modify designated critical habitat.

If, in completing the last step in the analysis, we determine that the action under consultation is likely to jeopardize the continued existence of ESA-listed species or destroy or adversely modify designated critical habitat, then we must identify reasonable and prudent alternative(s) to the action, if any, or indicate that to the best of our knowledge there are no reasonable and prudent alternatives. See 50 C.F.R. §402.14.

In addition, we include an incidental take statement in Section 15 that specifies the impact of the take, reasonable and prudent measures to minimize the impact of the take, and terms and conditions to implement the reasonable and prudent measures. ESA section 7 (b)(4); 50 C.F.R. §402.14(i). We also provide discretionary conservation recommendations that may be implemented by action agency. 50 C.F.R. §402.14(j). Finally, we identify the circumstances in which reinitiation of consultation is required. 50 C.F.R. §402.16.

To comply with our obligation to use the best scientific and commercial data available, we collected information identified through searches of Google Scholar, and literature cited sections of peer reviewed articles, species listing documentation, and reports published by government and private entities. This opinion is based on our review and analysis of various information sources, including:

- Information submitted by the Permits Division, National Centers for Coastal Ocean Science, and the applicants.
- Government reports (including NMFS biological opinions and stock assessment reports).
- National Oceanic and Atmospheric Administration (NOAA) technical memos.
- Peer-reviewed scientific literature.

These resources were used to identify information relevant to the potential stressors and responses of ESA-listed sea turtles and the proposed Gulf of Mexico Bryde's whales under NMFS' jurisdiction that may be affected by the proposed action to draw conclusions on risks the action may pose to the continued existence of these species and the value of designated critical habitat for the conservation of ESA-listed species.

3 DESCRIPTION OF THE PROPOSED ACTION

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies.

There are two actions being considered in this consultation: the National Centers for Coastal Ocean Science's action to fund research activities on the Gulf of Mexico Bryde's whale, and the Permits Division's authorization of permit amendments to permit holders to allow takes of Gulf of Mexico Bryde's whales for the purposes of scientific research. The National Centers for Coastal Ocean Science's funding will be applied to the Southeast Fisheries Science Center's research permit No. 14450, one of the permits proposed for authorization by the Permits Division in this action.

3.1 National Centers for Coastal Ocean Science: Funding Research Activities under the RESTORE Act

The National Centers for Coastal Ocean Science requested consultation for activities to be conducted for the RESTORE ACT funded grant, "Trophic Interactions and Habitat Requirements of Gulf of Mexico Bryde's Whales." RESTORE Science Program award recipients—the Southeast Fisheries Science Center—would conduct research that aims to develop a comprehensive ecological understanding of Gulf of Mexico Bryde's whales through ship-based surveys to assess their habitat, spatial distribution, and foraging ecology. Project activities would take place during May 2018, November 2018, and July through August 2019.

3.1.1 Purpose

The Gulf of Mexico Bryde's whale population suffered injury due to the Deepwater Horizon oil spill with 48 percent of the available habitat exposed to surface oil from the event, an estimated 17 percent mortality, and an additional 18 percent estimated to likely suffer adverse health effects (DWHTrustees 2016). This is an extremely small, isolated population with an estimated abundance of 33 individuals, a restricted habitat range, and very low levels of genetic diversity.

The scale of the injury due to the Deepwater Horizon oil spill and the small population size makes Bryde's whales a priority species for recovery management and restoration activities to promote recovery.

The primary objective of this research project is to develop a comprehensive ecological understanding of protected Gulf of Mexico Bryde's whales, including the physical, oceanographic, and biological features defining critical habitats and their ecological role in Gulf of Mexico marine food webs. The research will target Gulf of Mexico Bryde's whales and its prey items (e.g., fish). To address this objective, the research team proposes to conduct three ship-based surveys to assess the habitat, spatial distribution, and foraging ecology of Gulf of Mexico Bryde's whales using a multi-faceted approach that integrates visual and acoustic monitoring, environmental sampling, trawling, biopsy sampling for genetic, stable isotope and pollutant analyses, and deployment of animal-borne tags sampling at fine and coarse scales. Models will be developed from the resulting data that will identify key trophic interactions, improve characterization of Bryde's whale habitat, and provide information to managers that will inform restoration and population recovery activities.

3.1.2 Project Overview

The National Centers for Coastal Ocean Science-funded study would take place over two years, starting in May 2018. During the first year, there would be two research cruises, with the primary objective of collecting biopsy samples and deploying telemetry and behavioral tags on Bryde's whales concurrent with prey field characterizations from scientific echosounder data. Cruises would take place in May and November of 2018, and each be about 15 days in length. The tagging and biopsy sampling would take place aboard charter vessels and use small boats deployed from the vessels for close approaches to the whales. In the second year, the field study would be about 30 days in duration and take place aboard a NOAA oceanographic vessel. The survey would occur in July through August 2019. The survey would:

1. Examine and quantify Gulf of Mexico Bryde's whale spatial distribution using visual and passive acoustic tools.
2. Deploy additional tags and collect biopsy samples from a small boat deployed from the ship.
3. Collect scientific echosounder data (Simrad EK 60 or EK 80) to characterize prey distribution.
4. Conduct trawling operations to collect samples of potential prey.

The effort will focus on known and suspected habitats for the Gulf of Mexico Bryde's whale in US waters with the primary study area covering the upper slope waters of the northeastern Gulf of Mexico between the 100 to 500 meter isobaths. What little is known about Gulf of Mexico Bryde's whale distribution indicates that it is likely that the researchers will encounter whales in this area. Gulf of Mexico Bryde's whales are rarely observed in other areas in the northeastern Gulf of Mexico; in the event that there is another aggregation found outside the primary study area, the researchers would consider expanding the spatial range of the study.

At this time, the National Centers for Coastal Ocean Science has not determined which research vessel would be used during the proposed action. They have identified five potential vessels that are viable platforms for the action.

1) NOAA Ship *Nancy Foster* (Charleston, SC), 187 feet long, 40 feet wide steel hulled research ship, with a 13.5 feet draft and a cruising speed of 10.5 knots.

2) *R/V Pelican* (homeport: Cocodrie, LA), 116 feet long, 26 feet wide vessel with a 9.5 feet draft and cruise speed of 9.2 knots.

3) *R/V Point Sur* (homeport: Gulfport, MS), 135 feet long, 32 feet wide vessel with 9 feet draft and a cruising speed of 9.5 knots.

4) *R/V Weatherbird II* (homeport: St. Petersburg, FL): 115 feet long, 28 feet wide vessel with 8.5 feet draft and a cruising speed of 10 knots.

5) NOAA Ship *Gordon Gunter* (homeport: Pascagoula, MS): 224 feet long, 43 feet wide vessel with 15 feet draft and a cruising speed of 10 knots. NOTE: Simrad DGPS, Simrad EQ50 echo sounder, Furuno Universal AIS FA-100 (used in 2019).

3.1.3 Research Activities

The National Centers for Coastal Ocean Science is proposing to fund a variety of research activities under the RESTORE Act grant. The directed take activities for research on Gulf of Mexico Bryde's whales would be covered under the Southeast Fisheries Science Center's research Permit No. 14450. Other activities that are part of the National Centers for Coastal Ocean Science's action would focusing on collecting environmental data to characterize habitat requirements, and sampling for fish and invertebrates to gather information on the trophic ecology in the region.

The proposed research activities directed at Gulf of Mexico Bryde's whales would be authorized under the Southeast Fisheries Science Center's Permit No. 14450, the authorization of which are the subject of the Permits Division's action. These activities are intended to provide data on the whales themselves. The proposed research activities for Permit No. 14450 will be discussed in detail in the next section, and are briefly summarized here. Researchers would sample Gulf of Mexico Bryde's whales from small boats to collect remote tissue biopsy samples and attach satellite telemetry tags and kinematic tags. The research would also include vessel approach, photo-identification, and passive acoustic monitoring.

The other proposed research activities would not target Gulf of Mexico Bryde's whales, or any other ESA-listed species. The purpose of these activities would be to develop a comprehensive ecological understanding of Gulf of Mexico Bryde's whales, by characterizing the physical, oceanographic, and biological features that the whales depend on. These activities are described below.

3.1.3.1 Environmental Data

Extensive *in-situ* environmental data will be collected during all vessel surveys and incorporated with remotely sensed data (e.g., sea surface temperature, sea surface height anomaly and ocean color) to provide information on the oceanographic conditions underlying the habitats of Bryde's whales. Hydrographic profile data would be collected using a Conductivity temperature depth unit and expendable bathythermographs. Conductivity temperature depth casts would be made several times per day to record vertical profiles of salinity, temperature, and oxygen content. Expendable bathythermographs will be cast more frequently (10 to 15 kilometer spacing) throughout the survey to collect profiles of temperature only. Expendable bathythermographs are small, torpedo shaped probes. They are deployed by hand and are attached to a launcher/data collection unit by a thin copper wire. The expendable bathythermograph body contains a spool for the copper wire, a plastic body, and a lead weight. The specific unit that will be used is the Lockheed-Martin/Sippican T-7 (formerly Deep Blue). The change in resistance in the wire with temperature and the known rate of fall of the probe is used to calculate a profile of water temperature from the surface to depths up to 760 meters. Data from the probe is recorded on a computer on board the ship. The probe is not recovered after deployment and remains on the sea floor. The copper wire is very thin and is easily snapped by hand when deployment ends, thus the risk of animal entanglement is unlikely. Aboard the NOAA Ship *Gordon Gunter,* continuous records of environmental measurements including sea surface temperature, sea surface salinity, fluorescence, and weather conditions (e.g., wind speed, wind direction) will be collected *in situ* via the ship's scientific computer system.

3.1.3.2 Scientific Echosounders

Multi-frequency scientific echosounders will continuously sample the distribution and density of secondary productivity throughout the water column during large vessel surveys in 2018 and 2019. The scientific echosounders will be calibrated to ensure that the data are comparable between different surveys to account for deviations in the behavior of the transducers and receivers over time. During the large vessel survey (NOAA Ship *Gordon Gunter*), the Simrad EK60 will be collected continuously throughout the survey on frequencies of 18 kilohertz, 38 kilohertz, 120 kilohertz, and 200 kilohertz. During the shorter duration tagging and biopsy survey, calibrated Simrad EK80 echosounder data will be collected using a towed body equipped with transducers at 38 kilohertz, 70 kilohertz, and 120 kilohertz. For the EK60 and EK80, the ping rate varies with water depth and is typically approximately one second with a ping duration of one millisecond. The source level at the transducer is 224 decibels that is broadcast downward with a nominal beam width of approximately 7 degrees. This unit can be towed either from the larger vessel or from a deployed rigid-hulled inflatable boat. Multi-frequency echosounder data will primarily be collected in the presence of encountered Bryde's whales, in particular in conjunction with the deployment of behavioral tags (see below) to generate spatially resolved prey distribution profiles (Boswell et al. 2016). The goal of this data collection will be to characterize the prey field in the immediate vicinity of encountered whales and to examine correlations between the diving and feeding behaviors of tagged whales and the structure of the prey field. These data will thus characterize the overall spatial distribution and structure of the potential Bryde's whale prey field, provide targets for net tows to verify species composition, and characterize acoustic backscatter within the vicinity of encountered and tagged whales.

3.1.3.3 Trophic Ecology Survey

The trophic ecology survey will take place in 2019 only. Preliminary data from kinematic tags and echosounders indicate Bryde's whales may be foraging on dense daytime aggregations of schooling fish near the seafloor (NMFS Southeast Fisheries Science Center (SEFSC), unpublished data). During the trophic ecology survey on the NOAA Ship *Gordon Gunter*, we would document the distributions and species composition of schooling fishes and invertebrates by conducting near-bottom net trawls at predetermined stations throughout the study area. Stations would occur along visual survey transects that run perpendicular to the shelf-break throughout the northwestern to northeastern upper slope (100 to 500 meters) Gulf of Mexico waters. The focus of the trawl studies will be limited to within the green polygon area shown in Figure 1. The precise locations of trawl stations are to be determined following the analysis of echosounder data to be conducted during the 2018 field projects. Stations will also be chosen adaptively based upon factors such as depth, acoustic backscatter from echosounders, oceanographic features, and presence (or history of presence) of feeding Bryde's whales in the region. It is anticipated that tow times will be 30 minutes or less at depth. This tow duration is consistent with recommendations to reduce the risk of interactions with sea turtles.

The trawl sampling gear will consist of a two-seam bottom trawl (27.4 meter length footrope), fished with W-style trawl doors (682 kilograms each, 3.5 square meters). The trawl opening is 15.5 meter width by 10.0 meters height, the cod-end mesh liner is 4.0 millimeters, and the trawl speed will be 6.3 kilometers per hour (speed over sea floor). Catch would be weighed either by individual baskets or, for relatively large catches, by use of a remotely controlled electronic scale (dynamometer) to weigh the entire trawl cod-end with catch and data will be recorded electronically with the Fishery Scientific Computing System. Catches (or subsamples) will be sorted by species, then enumerated and weighed. For specimens identified down to species level, length measurements will be recorded. Specimens that cannot be identified to species level would be frozen or preserved in formalin for identification. Tissue samples of finfish and invertebrates would be collected during trawling activities for stable isotope analyses.

3.1.3.4 Vessel Transit

Vessel transit paths will change depending on the availability of the platform and will be subject to prevailing wind, currents, sea conditions, and the available platform. The potential ports of call are St. Petersburg, Florida, Cocodrie, Louisiana, Morgan City, Louisiana, and Gulfport, Mississippi. Note the NOAA Ship *Nancy Foster* port is Charleston, South Carolina, but transit is usually from its last port of call.

3.2 Permits Division: Authorization for Research Activities

The Permits Division proposes to issue five permit amendments to researchers holding scientific research permits to authorize take of Gulf of Mexico Bryde's whales pursuant to the ESA. Each of the permit amendments focus on different objectives meant to address recovery goals, using similar research activities like biopsy sampling, satellite/suction-cup tagging, line-transect surveys, photo-identification, passive acoustic recording, collection of fecal and sloughed skin samples, sampling exhaled air, and other procedures. The permit holders are currently authorized to use these research techniques on Bryde's whales and other large whales listed under the ESA such as blue, fin, sei, sperm, and North Atlantic right whales. These techniques are commonly used in large whale research, and each of the permit holders has held research permits before.

In addition to describing the research techniques, we will describe the method the Permits Division will use to authorize take of Gulf of Mexico Bryde's whales. Because the population is so small, the Permits Division recognizes the need for strict limits on the amount and extent of take authorized for Gulf of Mexico Bryde's whales. The Permits Division has proposed an adaptive management plan to permit research that provides essential information for management while protecting the small population.

3.2.1 Adaptive Management Plan for Research Permitting

The Permits Division in collaboration with the Southeast Regional Office, and the Endangered Species Act Interagency Cooperation Division has developed an adaptive management plan to coordinate and monitor annual take of the proposed ESA listed Gulf of Mexico Bryde's whale subspecies under multiple Marine Mammal Protection Act and ESA scientific research permits.

If the ESA listing becomes final, the Permits Division proposes to conditionally authorize the take of Gulf of Mexico Bryde's whales so that no more than the entire population (currently estimated at 33 whales) at any given time may be intentionally taken twice annually each by tagging and biopsy across all permits combined. Takes for tagging (one dart tag and one suction-cup tag per animal) and biopsy (up to two biopsies per animal) may be done at the same time or at different times during a permit year.

In order to invoke the takes authorized in each permit, the Permit Holder must first receive written authorization from the Permits Division and follow special reporting requirements. Takes may be authorized as requested (e.g., if only one researcher is proposing to work) or reallocated among permits on an annual or other specified basis, after evaluating the status of the species, management needs, researchers' plans and funding levels, and reported takes by permit holders during the prior year.

Permit holders will be required to coordinate research activities, submit data to a shared database to develop catalogs to identify individuals in the population, submit an annual report of all research activities at the end of each field season, and receive authorization to continue to work each year. The Permits Division has drafted permit conditions codifying the key points related to adaptive management below:

1. Takes of the Gulf of Mexico Bryde's whale will be conditionally authorized in scientific research permits. In order to invoke the takes authorized in each permit, the Permit Holder must first receive written authorization from the Permits Division and follow special reporting requirements and annual reauthorization to continue each year.
2. Annual takes will be allocated by the Permits Division so that no more than the entire population may be intentionally taken twice annually, to the extent feasible, by activities that may result in Level A harassment across all permits combined. In addition, additional takes for missed attempts would be authorized (up to three attempts per animal per tagging or biopsy attempt)[1]. Takes may be authorized as requested (e.g., if only one researcher is proposing to work) or reallocated among permits on an annual, or other specified basis.
3. A mandatory annual meeting will be held with the Permit Holders, the Permits Division, the Southeast Regional Office, and the ESA Interagency Cooperation Division. The purpose of the meeting will be to discuss the status of the current population and research plans for the upcoming year(s).
4. Annual takes will be allocated by the Permits Division following these meetings (this may be for an annual timeframe or longer, depending on the results from the meeting).
5. Permit Holders will be required to collaborate with other researchers to prevent unnecessary disturbance of animals and avoid unnecessary duplication of efforts on this small population.
6. Permit Holders will be required to conduct real time monitoring during the field season and submit data (e.g., photographs, video, and biopsy samples) to a shared database. These data will be used to develop a photo-identification and genetic catalog as a shared resource among mangers and Permit Holders.
7. Permit Holders will be required to submit a final report at the end of each field season including all research activities and receive approval from the Permits Division to continue the following year.

3.2.2 Permit Conditions for Gulf of Mexico Bryde's Whales

In order to carry out the adaptive management plan for research permitting described above, the Permits Division has proposed the following permit conditions for the permit amendments. The section below is from the proposed permit and minor text changes for clarity may occur in the final permit amendment.

[1] As per their permit conditions, the Southeast Fisheries Science Center (Permit No. 14450) is authorized for four attempts to tag, and three attempts to biopsy.

<u>Duration of Permit</u>

- o Researchers must immediately stop permitted activities and the Permit Holder or Principal Investigator must contact the Chief, NMFS Permits and Conservation Division (hereinafter "Permits Division") for written permission to resume:
  - ▪ For Gulf of Mexico Bryde's whale research, at the end of each Bryde's whale research period (i.e., date to be determined upon issuance of permits). Annual re-authorization for Gulf of Mexico Bryde's whales will be based on evaluation of the report and may be denied or delayed if the report has not been received or approved. Authorization for each year's research does not guarantee or imply that NMFS will authorize subsequent years' activities.

- <u>Number and Kinds of Protected Species, Locations and Manner of Taking</u>

  - o For Gulf of Mexico Bryde's whales, researchers must comply with the following conditions related to the manner of taking:

    - o The Permit Holder must receive written authorization prior to invoking takes of Gulf of Mexico Bryde's whales.
    - o For all research permits authorizing take of Gulf of Mexico Bryde's whales combined, no more than the entire population (currently estimated at 33 whales) may be intentionally taken twice annually each by tagging (one dart tag and one suction cup tag per animal) and biopsy (up to two biopsies per animal per year).
    - o Before attempting to biopsy sample or tag an individual, researchers must take reasonable measures (e.g., compare photographs, when possible) to avoid repeated sampling/tagging of any individual, unless specifically authorized.
    - o Researchers must attempt to collect photos or high-resolution video simultaneously when biopsy sampling or tagging to identify the individual and the sampling or tag location on each individual.
    - o Researchers must, to the maximum extent feasible, avoid biopsy sampling or invasively tagging animals in obviously poor health or exhibiting species-specific body condition parameters that indicate compromised health such as, but not limited to:
      - ▪ Noticeable reductions in body mass in the post-cranial region (i.e., exhibiting a nuchal fat pad depression);
      - ▪ Prominent vertebral column;
      - ▪ Visible ribs;
      - ▪ Excessive skin lesions, parasites or cyamids;
      - ▪ Abnormal behavior; or
      - ▪ Appear in any other way compromised.
    - o Known individuals may only be intentionally biopsy sampled twice per year.

  - A skin sample from each biopsy collected must be sent to the Southeast Fisheries Science Center (SEFSC) for inclusion in a database of genetic identification of individuals in the population.
  - No more than two tags (one suction-cup and one dart/barb tag) may be attached at one time to an animal in the same permit year.
  - Known individuals that have been dart tagged must not be intentionally invasively tagged a second time within the same permit year.

Reporting

- The Permit Holder must submit a report at the end of each field trip and field season on research conducted on the Gulf of Mexico Bryde's whale. Details should include, at minimum:
  - Date, location, number, and nature of takes;
  - Identification of individuals where possible;
  - Status or plans to send biopsy samples to the SEFSC;
  - Success rate of biopsy and tagging efforts;
  - Future field plans and funding levels.
  - **Additional reporting requirements may be supplied by SERO in the future.*
- Collected photographs or video of Gulf of Mexico Bryde's whales must be sent to the SEFSC for development of a photo-identification catalog as a shared resource among managers and Permit Holders.

Notification and Coordination

- NMFS Regional Offices are responsible for ensuring coordination of the timing and location of all research activities in their areas to minimize unnecessary duplication, harassment, or other adverse impacts from multiple researchers.
- The Permit Holder must ensure written notification of planned fieldwork for each project is provided to the NMFS Regional Office listed below at least two weeks prior to initiation of each field trip/season.
- Notification must include:
  - Locations of the intended field study and/or survey routes;
  - Estimated dates of activities; and
  - Number and roles of participants (for example, principal investigator, co-investigator, boat driver, research assistant "in training").
- Notification must be sent to the following Assistant Regional Administrator for Protected Resources as applicable to the location of your activity:
  - Southeast Region, NMFS, 263 13th Ave South, St. Petersburg, FL 33701; phone (727) 824-5312; fax (727) 824-5309
  - Email (*preferred*): nmfs.ser.research.notification@noaa.gov
- Researchers must coordinate their activities with other permitted researchers to avoid unnecessary disturbance of animals or duplication of efforts. Contact the Southeast Regional

Office (SERO) for information about coordinating with other Permit Holders.

- In addition, for Gulf of Mexico Bryde's whale research:
  - Researchers must comply with recommendations provided by SERO related to coordination of Bryde's whale research, including additional measures deemed necessary to minimize unnecessary duplication, harassment, or other adverse impacts from multiple permit holders.
  - An annual meeting is required to be held with all Permit Holders, SERO, and the Permits Division. Takes will be allocated annually or over another specified timeframe as warranted to ensure that no more than the estimated population will be taken by Level A harassment activities annually.
  - The Gulf of Mexico Bryde's whale coordination meetings will include but are not limited to discussions on the following aspects of the research:
    - Geographic location and seasonality of sampling sites;
    - Number and type of takes;
    - Takes of known individuals through photo-identification or genetics;
    - Laboratory analyses; and
    - Final disposition and repository of samples.
  - The Permit Holder must coordinate their activities with other permitted researchers before and during Bryde's whale field research to avoid unnecessary disturbance of animals and duplication of efforts. Collaboration and coordination are mandatory to ensure that only one group of researchers is targeting the same animals in the course of a day.

3.2.3 Research Activities

The proposed research techniques are described in detail in this section. As shown in Table 2, not all permit holders requested the same activities, but there are methods that overlap between permits. A summary of the research techniques, including take requests for each activity, will be included at the end of this section.

Table 2. Summary of requested research activities by permit.

Permit	Count Survey	Photo-ID	Photogrammetry	Passive Acoustic Monitoring	Aerial Remote Vehicle	Sloughed Skin/Fecal Collection	Exhaled Air Sample	Dart/Barb Tag	Biopsy Sample	Suction-cup Tag
14450	X	X		X	X			X	X	X
14856		X		X		X*		X	X	X
16239	X	X	X	X	X	X		X	X	X
17312	X	X		X		X			X	X
18636	X	X		X	X	X	X		X	

*Sloughed skin collection only.

3.2.3.1 Vessel Surveys, Passive Acoustic Monitoring and Photography

Vessel surveys are the primary means by which cetacean researchers collect data as they provide a platform to collect a wealth of information on cetacean biology. This activity is referred to as "Count/Survey" in the take table. Here we describe the proposed vessel surveys, close approaches, and documentation (i.e., data collection) during these activities more generally, and then in each section below, detail the individual research activities that would occur during vessel surveys.

The Permits Division proposes to authorize the permit holders to take all age and sex classes of Gulf of Mexico Bryde's whales by means of harassment as the result of close approaches and documentation during vessel surveys. The proposed vessels surveys would use a line-transect method, and general follow the protocol described below. However, variations of this protocol would be used to meet specific research objectives, but such variations would not change the nature of effects to ESA-listed species.

Typically, a large research vessel such as the 224 foot NOAA *Gordan Gunter,* or similar, would traverse predetermined track lines within the action area at a constant speed (usually 10 knots), while observers search for cetaceans with binoculars. While researchers search for cetaceans, a variety of environmental data would be collected (e.g., sea state, visibility, glare, etc.). In addition, a hydrophone array would be towed to passively detect and record vocalizations of nearby cetaceans. Once a cetacean or group of cetaceans is spotted or detected acoustically, the vessel would either remain on the track line to record data, or depending on the species and data collection priorities, turn off the track line and approach to confirm species identification and estimate group size. If the vessel were to approach, the approach would be conducted either from behind or alongside animals at the minimum speed (less than 10 knots) needed to close the distance between the ship and the group of animals to within 300 meters. During this approach, small (five to 10 meter) rigid inflatable or fiberglass researcher vessels would sometimes be launched in order to document the encounter or conduct biological sampling or tagging, as further described below. In addition, some research operations may only involve these smaller research vessels being launched from shore. Smaller research vessels would utilize the same approach methodology as larger research vessels described above in order to minimize disturbance and harassment to cetaceans. Depending on the research objectives, the vessel(s) may fairly quickly end the encounter and resume course along the track line (or search for other animals in the event a small vessel is being used), or continue the encounter for further documentation, biological sampling, and/or tagging as further described below.

Throughout vessel surveys and close approaches, researchers would be authorized to document their encounters with cetaceans using photography, videography, and passive acoustic recordings. Photography and videography could occur from the surface or underwater. For surface photography and videography, researchers would use the same approach methods described above to come within 10 to 20 meters of large cetaceans (baleen, sperm whales, and the Gulf of Mexico Bryde's whale) in order to capture high quality photographs or video. Underwater photography and videography would be captured using pole-mounted cameras extended over the side of research vessels during close approaches.

Passive acoustic arrays consisting of two to five hydrophones could be towed at any time during vessel surveys, typically at distances 300 meters behind the vessel. All of these documentation methods are commonly used by cetacean researchers to collect data on animal behavioral, vocalizations, and physical characteristics and to identify and track individuals. Depending on the species and research objectives, documentation may be conducted from large or small vessels, or both.

Photo-identification is an important part of the proposed action, as the Permits Division intends to work with the permit holders to develop of photo catalogue of Gulf of Mexico Bryde's whales. All permit holders have requested authorization to conduct photo-identification. In addition, photogrammetry (i.e., using photographs to take measurements) has been requested as well. Both activities consist of taking photographs. During both small vessel and large vessel encounters, the total time spent in the vicinity of target animals, as well as the number of attempts made to collect photographs, would vary by species and group size but limited in duration in order to minimize harassment and disturbance. Based on typical encounters with cetaceans during similar research activities, we expect researchers to remain with a cetacean or group of cetaceans anywhere from 45 minutes to three hours (NMFS 2017b).

3.2.3.2 Unmanned Aerial Systems

The Permits Division proposes to authorize take of Gulf of Mexico Bryde's whales (any age and sex class) by means of harassment during unmanned aerial surveys (UAS). Permit Nos. 16239, 14450, and 18636 would be authorized to conduct research using UAS. The primary goals for these activities conducted under these permits are to collect photographic data to confirm species identification, assess age class and body condition, determine group size, and identify social structure of Gulf of Mexico Bryde's whales. Given the rapidly evolving field of UAS, the exact models and flight parameters that would be used during unmanned aerial surveys may change over the course of the permit. As such, here we describe the methods that are currently proposed, and recognize that variations of these methods would be authorized under the permit amendments, as long as they are expected to cause similar or lower levels of harassment and disturbance to cetaceans.

Previous research has studied the behavioral impact of small, UAS on marine mammals. Small UAS devices used in cetacean research are typically custom built, weigh less than 10 pounds (typically less than three pounds), have propeller guards, both manual and autopilot controls, and have a flight ceiling of 400 feet. The proposed research projects will use similar models. During past preliminary testing, Ocean Alliance determined their small UAS devices generate sound in the 14-kilohertz range. Each small UAS device is equipped with video, photography, and acoustic tracking equipment. Researchers will incrementally decrease the distance between the small UAS and the whale up to a minimum height of five feet from the water or until a behavior perceivably caused by the small UAS system occurs. Behaviors could include physical avoidance or evidence of auditory awareness, will be monitored, and documented using a variety of devices ranging from video cameras (on the boat and the small UAS) to hydrophones and acoustic arrays. If a behavioral change is observed, the flight will be terminated and the small UAS will return to the research vessel.

Once a whale, or group of whales, has been located using the methods identified above, the research vessel will position itself within 300 to 600 feet of the target cetacean. The small UAS device will depart from the research vessel and will fly by the target individual from five different directions, from predetermined flight altitudes. The maximum flight altitude will be 20 feet and the minimum flight altitude will be five feet. At each height, and after the small UAS has approached the animal from all five directions, the small UAS will hover for one full minute downwind of the blowhole of the animal. Flight iterations will continue until a behavioral response is documented, or until the small UAS has been inflight for 20 minutes. Only one set of flight iterations will be performed per whale. All genders, age groups (except for calves younger than six months) and species will be subject to small UAS behavioral impact testing. Typically, small UAS devices will only be deployed when wave height is 1.25 meters or less.

The following minimization measures will be employed during the operation of small UAS devices in order to reduce the effect of the activity on target and non-target individuals:

- Small UAS devices contain a sophisticated flight computer with Global Positioning System positioning, altitude lock and a number of other features that provide the operator with specific data necessary for precision flight.
- if the small UAS loses contact with the operator's remote control, on-board programming takes over and autonomously fly the small UAS back to the operator,
- Small UAS propellers are lightweight (break on impact) and have guards to minimize propeller impact to an animal, should contact occur.
- All efforts will be made so that each whale will only experience one set of flight missions. The potential for sampling (and thus exposing) an individual more than once will be minimized by examining photos of all previously sampled individuals prior to sampling a targeted individual.

3.2.3.3 Exhaled Breath Sampling

Following data collection on the behavioral impact of small UAS devices on cetaceans, exhaled breath condensate will be collected using small UAS. The small UAS device will depart the research vessel, approach the animal, and position itself just downwind of the blow pattern. Collection height will be the lowest height in which no behavioral responses were observed during the behavioral impact study, and not lower than five feet.

3.2.3.4 Sloughed Skin and Fecal Collection

Fecal and sloughed skin sampling are well-established noninvasive sample collection methods that can be used to assess reproductive hormones, stress, parasites, red tide effects, diet composition, energetics, nutrition, and genetics (Amos et al. 1992; Hunt et al. 2013). The collection of sloughed skin and feces does not usually require approaching animals directly. However, fecal and sloughed skin sampling could take place near whales, and due to this potential for close proximity, the Permits Division proposes to authorize the applicant to collect fecal and sloughed skin samples of all age and sex classes of Gulf of Mexico Bryde's whales during vessel surveys. When feces or sloughed skin is observed in the water, researchers would approach the sample (not the whale) and collect it with a hand held net. As no particular whale is expected to be "taken" during fecal and sloughed skin sampling, there is no limit on the number of samples that can be taken, but the researcher would only be authorized to take the species and number of Gulf of Mexico Bryde's whales specified in the permit as a result of the close approaches that may occur during fecal and sloughed skin sampling.

3.2.3.5 Biopsy Sampling

Biopsy sampling is a widely used method for obtaining skin and blubber tissue from cetaceans for use in studies on genetics, contaminants, disease, foraging ecology, reproduction, and other physiological and biological processes. At least 42 species of cetacean have been biopsy sampled (33 odontocetes and nine mysticetes) since the method was initially developed in 1973, including Bryde's whales in the Gulf of Mexico, and elsewhere in their range (Noren and Mocklin 2012).

The Permits Division proposes to authorize permit holders to biopsy sample Gulf of Mexico Bryde's whales during vessel surveys. Biopsy sampling would be authorized for both sexes. Calves less than a year old would not be biopsy sampled. Females with calves could be sampled as specified in the permit. Researchers would not be permitted to biopsy sample a whale forward of the pectoral fin (i.e., samples may only be taken anterior to the pectoral fin, avoiding the head of the whale). If an animal exhibits repetitive, strong adverse reactions to the activity or the vessel, the researchers must stop and discontinue the biopsy attempt. Researchers would be authorized to attempt to biopsy sample an individual up to three times in a day.

Researchers on Permit Nos. 14856, 16239, 17312, and 18636 intend to biopsy sample individual cetaceans only once in a single year, but unintentional repeat sampling could occur. However, researchers would attempt to avoid unintentional repeat biopsying by keeping detailed descriptive or photographic records of dorsal fins, flukes or other distinctively marked body parts so that previously biopsied individuals can be identified prior to repeat biopsying. The Southeast Fisheries Science Center (Permit No. 14450) is requesting authorization to biopsy sample Gulf of Mexico Bryde's whales up to twice a year (i.e., the same individual), collecting two samples at each event. Their rationale for requesting multiple samples from an individual whale is that it is necessary to conduct genetic capture-recapture abundance estimates. They are requesting taking two biopsy samples at once to ensure they obtain sufficient biological material for the analyses.

Biopsy sampling would be authorized to take place from both large vessels and small vessels, using a variety of different methods depending on the vessel platform, species, and behavior (reviewed in Noren and Mocklin 2012). Close vessel approaches for biopsy sampling would be the same as those described above except that vessels may get slightly closer, to within five to 30 meters of the target animal(s) (Palsbøll et al. 1991). Projectile biopsy sampling devices that would be used include crossbows, adjustable-pressure modified air guns, and poles. In addition, if small cetaceans were riding the bow of a large research vessel, projectile devices with tethered biopsy darts would be used. For this method, one end of a length of line would be tied to the biopsy dart and the other to handrail on the ship. With just enough line to reach the water, the dart would be projected at the target animal and then easily retrieved by an onboard researcher using the tethered line. Tethered biopsy sampling of large cetaceans may also occur if conditions make retrieving biopsy darts by small vessel unfeasible. For this method, a spool of line with one end attached to the biopsy dart and the other attached to the projectile device would be used. In both cases of tethered biopsy sampling, the lines that would be used would be light, easily breakable by cetaceans, and would not be expected to cause any entanglement or injury (NMFS 2017d). Nonetheless, permit holders would primarily use non-tethered biopsy sampling methods since tethering alters dart trajectory in windy conditions, decreasing the likelihood of successfully obtaining a biopsy sample. When targeting an individual for biopsy sampling, researchers would be required to take reasonable measures to avoid repeat sampling (e.g., compare photo-identifications). Researchers would not be authorized to biopsy sample animals anywhere forward of the pectoral fins. Once the biopsy dart hits the animal, it would recoil, fall into the water, and float for retrieval by boat or the tethered line.

Biopsy dart tips would be made of stainless steel and dimensions would vary by species in order to ensure that dart tips do not penetrate into the animal's muscle layer (i.e., only skin and blubber would be collected). Penetration depth would be controlled by a cushioned stop 25 millimeters in diameter circling the biopsy head. For large cetaceans like Gulf of Mexico Bryde's whales, biopsy darts would penetrate to depths of approximately 35 millimeters and collect samples of approximately seven millimeters in diameter. Prior to field work, biopsy tips would be thoroughly sterilized[2] with bleach and isopropyl alcohol. In the event a biopsy tip becomes contaminated while at sea (e.g., missed attempt) and a new, previously lab sterilized tip is unavailable, researchers would disinfect[3] the biopsy tip according to their approved Institutional Animal Care and Use Committee protocol (NMFS 2016c).

[2] Sterilization = destroys or eliminates all forms of microbial life and is carried out by physical or chemical methods Rutala, William A, and David J Weber. 2008. Guideline for disinfection and sterilization in healthcare facilities, 2008. Centers for Disease Control (US).

[3] Disinfection= eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects usually by liquid chemicals ibid..

3.2.3.6 Tagging Activities (Suction-Cup and Dart/Barb Tags)

Recent advances in tagging technologies have provided unprecedented detail on cetacean biology, allowing researchers to better understand their physiology, foraging, ranging, diving, and sociality, and have improved efforts to obtain better data that can be used to protect and conserve these species (Nowacek et al. 2016). The Permits Division proposes to authorize permit holders to tag Gulf of Mexico Bryde's whales with suction-cup and/or dart/barb tags. Four permits would authorize the use of suction-cup tags (Nos. 14450, 14856, 16239, and 17312), and two would authorize dart/barb tags (Nos. 14450 and 16239). Permit No. 18636 (Ocean Alliance) is not requesting authorization for any tags. Permit holders would be authorized to tag both males and females (including females with dependent calves). Calves less than a year old would not be tagged.

Dart/Barb/LIMPET Tags

Dart/Barb/LIMPET (Low Impact Minimally Percutaneous External-electronics Transmitter) tag system would be used for satellite tagging (Andrews et al. 2008, Schorr et al. 2009). Dimensions of the tags vary, and are described by permit below.

To understand the movements of individual Bryde's whales, researchers on the Southeast Fisheries Science Center's permit (No. 14450) would affix satellite telemetry tags on encountered individuals. These tags are attached to the whale and utilize Argos satellite communications to transmit locations of the individual for periods of 30 to 50 days. Tags would be deployed and attached using the LIMPET minimally invasive attachment housing (Andrews et al. 2005; Andrews et al. 2008). Tags would be deployed on individual animals through close approaches via the small vessel, using a modified compressed gas line launcher known as Air Rocket Transmitter System (ARTS). The tag electronics will be similar to Wildlife Computers SPOT-6 position-only tags that can provide location information at daily or higher resolution. Tag electronic packages that can provide GPS quality locations and/or summaries of dive-depth behaviors are currently in development and may be incorporated into the project if they become available.

Researchers on Permit No. 16239 would also use one of two types of LIMPET tags—a location-only spot tag (6.3 by 3 by 2.2 centimeters) or a Mk10-A tag (5.3 by 5.2 by 2.4 centimeters). Dart lengths will vary depending on the size of the animal as the darts will ideally penetrate below the dermis and anchor in the blubber layer. For example, the two titanium barbs that comprise the anchor system for LIMPET tags can be engineered to penetrate 6.5 or 7 centimeters for larger cetaceans (e.g. Gulf of Mexico Bryde's whales) (Mathias et al. 2013). All tags will be deployed from a vessel using a pneumatic projector, rifle, crossbow, or pole. Tags are expected to naturally migrate out of the tissue (Weller 2008b) within a year.

Researchers on Permit No. 14856 would be eligible to be authorized for up to 12 dart/barb LIMPET tags annually, similar to those proposed for use by other researchers on Permit Nos. 14450 and 16239. The exact model of dart/barb LIMPET/dart tag would be determined later. The tags would be applied from a vessel using a pneumatic projector, rifle, crossbow, or pole. Gulf of Mexico Bryde's whales would be tagged to monitor the movements and diving/foraging behavior of the tagged whales. The objectives of the proposed research are to develop a better understanding of their movements, distribution and foraging behavior.

Permit No. 14856 would also allow up to 12 suction-cup tags to be attached to Gulf of Mexico Bryde's whales along with the dart/barb LIMPET tags. Alternatively, the Permit Holder may also use 12 suction-cup tags only or 12 dart/barb LIMPET tags only.

Dart/barb/LIMPET tags will be attached to dorsal surface of the body using an adjustable-pressure modified air-gun or crossbow. The tag antenna will be inserted into the hollow shaft of a projectile bolt; and on contact with the whale, this dart will fall away and be retrieved by a tether line, leaving only the transmitter attached to the whale. In general, crossbow tag deployment distances are between 5 to 10 meters.

The ARTS is a modified marine safety line thrower powered by compressed air developed for remote deployment of satellite tags (Heide-Jørgensen et al. 2001). With this method, the tag slides into a delivery rocket, which is fired with the ARTS at pressures typically ranging from eight to 15 bars. The rocket detaches from the tag upon impact and can be retrieved and re-used. This technique provides deployment ranges much greater than the tagging pole; typically, 10 meters but deployments for up to 30 meters have occurred. The ARTS is equipped with a red-dot laser aim to improve precision. Time spent with whales before tagging is usually less than if the tagging pole were used. It usually ranges from five to 30 minutes. The use of the ARTS also allow deployment of satellite tags in other areas of the body (e.g., the mid to anterior dorsum), which are more difficult to reach with a tagging pole.

Suction-cup Tags

Four permit amendments would authorize the attachment of suction-cup tags to Gulf of Mexico Bryde's whales. Suction cup tags are minimally invasive and attach by suction onto the whale's skin, without penetrating the surface. Suction-cup tags differ in capability and size; the tag models proposed for use by each permit are described below. There are two methods used to attach suction-cup tags: a pole system or a modified crossbow. Observers select an animal for tagging and monitor this animal before tag attachment to test for any effects of tagging. The tagging vessel will approach slowly, typically from behind and to one side of the animal, and move into a position to allow attachment of the tag. Tags would be deployed using a modified crossbow at distances of up to 20 meters. Pole delivery systems for suction-cup tags consist of researchers approaching a whale in a small vessel and using a long pole to attach the tag when the animal surfaces. Tags are typically attached on the dorsal surface of the animal, caudal to the blowhole, or between the dorsal fin and blowhole. Suction-cup tags stay attached for relatively short periods (several hours to a few days), and are retrieved once they detach.

Researchers on Permit No. 14450 would use kinematic tags, attached via suction-cups. Kinematic tags include various sensors such as time-depth recorders, temperature sensors, and triaxial magnetometers and accelerometers that provide high-resolution 3-D behavioral information.

Researchers on Permit No. 14856 would use a suction-cup mounted bio-acoustic probe. The bioacoustic probe is a tag developed by Bill Burgess of Greeneridege Sciences, Inc. It will be coupled to a very high frequency (VHF) transmitter, syntactic foam float, and two rubber suction cups for attachment to a whale. The bioacoustics probe is made up of a hydrophone, pressure transducer, temperature sensor, light meter and accelerometer encapsulated in polyurethane, measuring 19.5 centimeters in length by 3.0 centimeters in diameter, and weighing 200 grams. In addition to recording ambient sound, this tag is capable of sampling dive depth, ambient temperature, light level, swim velocity and angle at pre-programmed times throughout a dive. This tag is designed for short-term deployments (less than eight hours) as it has to be recovered to retrieve the data. The VHF transmitter is incorporated into the tag for relocation of the whale and tag recovery after its release.

Researchers on Permit No. 16239 would use acoustic suction cup tags, either an Acousonde, B-probe, or a digital acoustic recording tag. Acoustic suction cup tags are minimally invasive and attach by suction onto the whale's skin, without penetrating the surface. Suction cup acoustic tags will range from 300 to 500 grams (in air) and are about 25 centimeters in length, 7 centimeters wide, and 4 centimeters high. Each suction cup is approximately 7.5 centimeters in diameter and between two to four suction cups will be used depending on the tag, Acousonde/B-probe and digital acoustic recording tag, respectively. The tags contain a time depth recorder with a velocity sensor and a VHF radio transmitter for recovery after detachment. Tags will be attached to the dorsal side of the animal using a pole from a range of 2 to 8 meters. Tags may have a timed release limited to a few hours but others may remain attached until they fall off after a few days.

Researchers on Permit No. 17312 would use acoustic recording tags attached via suction-cups. Two models would potentially be used, either an Acousonde or a B-probe tag. Currently available commercial tags (Greeneridge Sciences Inc.) have electronic data-loggers that record pressure, temperature, and sound up to a maximum sample rate of 232 kilohertz. These tags are passive acoustic recorders and do not produce or emit any sound. They are made with solid-state electronics and have no internal moving parts (e.g. disk drive). The tag provides calibrated acoustic data with a frequency response between 10 and 116,000 hertz, with 16-bit resolution and a sensitivity of -190 dB re: 1 V/μPa. The VHF radio (Advanced Telemetry Systems, Isanti, MN) is integrated into the tag floatation and has a 30-centimeter flexible antenna. The VHF transmitters operate in the frequency range of 164-166 megahertz and have transmitted power of less than 1 milliwatt. Four circular silicon suction cups (designed by Cetacean Research Technology) are used to attach the tag. With flotation housing and suction cups, the tag is approximately 22 centimeters long and 6 centimeters in diameter and weighs approximately 360 grams in air.

Standard tagging measures include:

- If signs of harassment such as rapid changes in direction, prolonged diving and other behaviors are observed from an individual or a group, tagging activities would be discontinued on that individual or group.
- When possible, attempts will be made to obtain photographs of tagged individuals to examine wound healing and modes of tag failures.
- Researchers would select the appropriate tag type, depending on the objectives.
- Exact dimensions and weights of tags would vary with the generation of tag and the specific components included. However, advancements in technology have consistently led to smaller and more effective tags, and this trend is expected to continue in the future. Tagging equipment would be updated as newer models become available.
- All considerations would be made to minimize tissue damage while allowing retention durations to match battery life.

3.2.3.7 Total number of proposed total research takes

Table 3 displays the total amount of requested take by life stage and take activity for each permit applicant. As described in Section 3.2.2, the Permits Division would limit the amount of biopsy sampling and tagging that could occur annually (not to exceed the population size), require permit holders to get written authorization prior to invoking takes, and adhere to special reporting requirements and coordination efforts to minimize the number of actual takes that occur. Upon issuance, the permit holder would be authorized for the takes, but would only be permitted to carry out the takes in the field once the Permits Division examined the research plans and funding status of all permit holders and provided written authorization for the research to occur.

Table 3. Total number of proposed takes requested by the permit applicants.

Permit	Applicant	Take Activities	Takes Requested	Life Stage
14450	NMFS Southeast Fisheries Science Center (Responsible Party: Theophilus Brainerd)	Acoustic, passive recording; Count/survey; Incidental harassment; Observations, behavioral; Photo-id; Remote vehicle, aerial	300	All
		Above activities + Sample, skin and blubber biopsy	15	Adult/juvenile
		Above activities + Instrument, dart/barb tag; Instrument suction-cup	10	Adult

Permit	Applicant	Take Activities	Takes Requested	Life Stage
14856	Bruce Mate	Acoustic, passive recording; Incidental harassment; Observation, monitoring; Observation, behavioral; Photo-id; Photograph/Video; Collect, sloughed skin; Import/export/receive parts	300	All
		Above activities + Instrument, dart/barb tag and/or Instrument, suction-cup; Sample, skin and blubber biopsy	12	Adult/juvenile
16239	HDR (Responsible Party: Dan Englehaupt)	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observations, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Sample, fecal; Tracking; Underwater photo/videography; Remote vehicle, aerial	300	All
		Above activities + Sample, skin and blubber biopsy	20	Adult/juvenile
		Above activities + Instrument, dart/barb tag; Instrument suction-cup	10	Adult/juvenile
17312	Scripps (Responsible Party: John Hildebrand)	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observations, behavioral; Photo-id; Sample, fecal	20	All
		Above activities + Sample, skin and blubber biopsy	5	Adult/juvenile
		Above activities + Instrument, suction-cup	5	Adult/juvenile
18636	Ocean Alliance (Responsible Party: Iain Kerr)	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observations, behavior; Photo-id; Photograph/Video; Remote vehicle, aerial; Sample, exhaled air; Sample, fecal; Tracking	50	All
		Above activities + Sample, skin and blubber biopsy	20	Adult/juvenile

4 ACTION AREA

Action area means all areas affected directly, or indirectly, by the Federal action, and not just the immediate area involved in the action (50 C.F.R. §402.02).

The current research permits authorize activity broadly in the Atlantic Ocean and Gulf of Mexico. Parts of the proposed action will take place in this same action area, mostly those associated with vessel transit. The range of Gulf of Mexico Bryde's whales is restricted to a small area in the northeastern Gulf of Mexico, and we expect that the majority of the research effort will be concentrated in this biologically important area. Because of indications that whales inhabited the area year-round, the area known as De Soto Canyon was identified as a biologically important area for Gulf of Mexico Bryde's whales. Biologically important areas are not a regulatory designation. They are a way for biologists and managers to identify areas where cetaceans are engaging in essential behaviors at a certain time and place (LaBrecque et al. 2015). The biologically important area for Gulf of Mexico Bryde's whales covers waters in the northeast Gulf of Mexico from Tampa, Florida, to Mobile, Alabama, between 100 and 400 meters deep (Figure 1). Gulf of Mexico Bryde's whales are also sometimes found outside the biologically important area (Figure 2), and researchers have requested the authorization to sample beyond the De Soto Canyon area in case whales are found elsewhere (see inset map). The action area includes the waters of the Atlantic Ocean, the Gulf of Mexico, and De Soto Canyon.

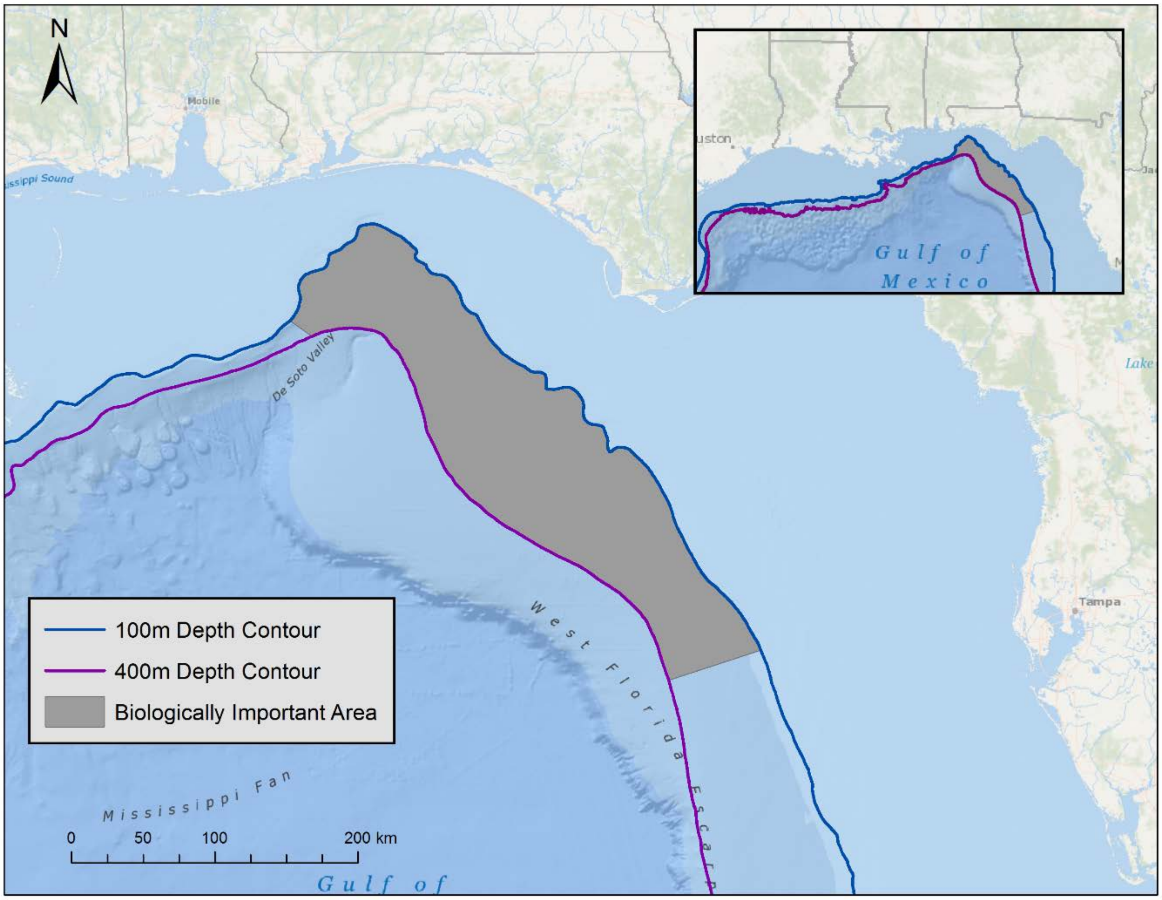


Figure 1. Map of the proposed action area.

5 Interrelated and Interdependent Actions

Interrelated actions are those that are part of a larger action and depend on that action for their justification. *Interdependent* actions are those that do not have independent utility apart from the action under consideration.

The two proposed actions considered in this opinion are interdependent. The Permits Division's proposal to issue permit amendments (i.e., Permit No. 14550 to the Southeast Fisheries Science Center) is interdependent on the National Centers for Coastal Ocean Science's proposal to fund research activities for the Southeast Fisheries Science Center for Gulf of Mexico Bryde's whale research. The National Centers for Coastal Ocean Science's proposed action would not carry forward without the authorization to exempt take from the Permits Division.

6 Potential Stressors

There are several potential stressors we expect to occur because of the proposed actions. These include those associated with vessel activity (e.g., pollution by oil or fuel leakage, ship strikes, and acoustic interference from engine noise) and research activity (e.g., close approach, tagging, biopsy sampling, etc.). These stressors are evaluated in detail in Section 11.1.

Both the Permits Division and the National Centers for Coastal Ocean Science's actions consist of vessel activity. ESA-listed whales such as fin, sei, sperm, blue whales, and proposed Gulf of Mexico Bryde's whales occur in the action area. ESA-listed sea turtles such as leatherbacks, Kemp's ridley, hawksbill, North Atlantic green, and Northwest Atlantic Ocean loggerheads could occur in the action area. ESA-listed fishes such as the proposed oceanic whitetip shark and giant manta ray could occur within the action area. These species may be exposed to stressors associated with the proposed action. These included vessel activity (strike, noise, visual disturbance, transit, discharges, and introduction of aquatic nuisance species), and the in water research activities. When a vessel transits to and from the survey areas, potential effects on the ESA-listed species include vessel strike, noise generated by the vessel, and visual disturbance from the vessel itself. Combined vessel noise and presence could cause slight response or behavioral interruptions, but they would be minor and temporary as the vessel moves away from any whales. The distance between the vessel and observed whales, per avoidance protocols, would also minimize the potential for acoustic disturbance from engine noise. Therefore, effects to ESA-listed or proposed whales, turtles, or fishes from noise or presence associated with vessel transit would be insignificant.

7 Species and Critical Habitat Not Likely to be Adversely Affected

NMFS uses two criteria to identify the ESA-listed or critical habitat that are not likely to be adversely affected by the proposed action, as well as the effects of activities that are interrelated to or interdependent with the Federal agencies' proposed action. The first criterion is exposure, or some reasonable expectation of a co-occurrence, between one or more potential stressors associated with the proposed activities and ESA-listed species or designated critical habitat. If we conclude that an ESA-listed species or designated critical habitat is not likely to be exposed to the proposed activities, we must also conclude that the species or critical habitat is not likely to be adversely affected by those activities.

The second criterion is the probability of a response given exposure. ESA-listed species or designated critical habitat that is exposed to a potential stressor but is likely to be unaffected by the exposure is also not likely to be adversely affected by the proposed action. We applied these criteria to the species ESA-listed in Table 5 and we summarize our results below.

An action warrants a "may affect, not likely to be adversely affected" finding when its effects are wholly *beneficial, insignificant* or *discountable*. *Beneficial* effects have an immediate positive effect without any adverse effects to the species or habitat. Beneficial effects are usually discussed when the project has a clear link to the ESA-listed species or its specific habitat needs and consultation is required because the species may be affected.

Insignificant effects relate to the size or severity of the impact and include those effects that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated. Insignificant is the appropriate effect conclusion when plausible effects are going to happen, but will not rise to the level of constituting an adverse effect. That means the ESA-listed species may be expected to be affected, but not harmed or harassed.

Discountable effects are those that are extremely unlikely to occur. For an effect to be discountable, there must be a plausible adverse effect (i.e., a credible effect that could result from the action and that would be an adverse effect if it did impact a listed species), but it is very unlikely to occur.

In this consultation, there are two actions being considered, the Permits Division's issuance of take for research activities on Gulf of Mexico Bryde's whales, and the National Centers for Coastal Ocean Science's funding of research activities, which include research on Gulf of Mexico Bryde's whales, and research activities designed to characterize the trophic environment. The effects of stressors associated with each set of the proposed actions are described in this section.

7.1 Vessel Activity

Because the vessel would move at a very slow speed during the survey, a vessel striking an ESA-listed or proposed whales, turtles or fishes would be improbable and extremely unlikely. Further, adherence to reduced vessel speeds, use of protected species observers, and avoidance procedures are also expected to avoid vessel strikes. Therefore, effects from vessel strikes during the survey would be discountable.

The potential for fuel or oil leakages is extremely unlikely. An oil or fuel leak would likely pose a significant risk to the vessel and its crew and actions to correct a leak should occur immediately to the extent possible. In the event that a leak should occur, the amount of fuel and oil onboard the research vessel is unlikely to cause widespread, high dose contamination (excluding the remote possibility of severe damage to the vessel) that would impact listed species directly or pose hazards to their food sources. Because the potential for fuel or oil leakage is extremely unlikely to occur, we find that the risk from this potential stressor to any ESA-listed or proposed whales, turtles or fishes is discountable.

To minimize the risk of aquatic nuisance species introduction, personnel would: avoid discharge of ballast water in designated critical habitat; use anti-fouling coatings; clean the hull regularly to remove aquatic nuisance species (but avoid doing so in critical habitat), and rinse the anchor with a high-powered hose after retrieval. These protective measures go beyond the requirements of the Vessel and Small Vessel General Permits[4], as described in the mitigation measures above. Furthermore, the vessels would not transit outside of the United States; therefore, they would not introduce foreign aquatic nuisance species. Given the protective measures, it is highly unlikely that the vessels would transfer aquatic nuisance species to any ESA-listed or proposed whales,

[4] See Vessels General Permit and Small Vessels General Permit requirements at: https://www.epa.gov/npdes/vessels-vgp

turtles or fishes during the proposed action. We find that the risk from this potential stressor to any ESA-listed or proposed whales, turtles or fishes is discountable.

Therefore, we conclude that the effects from the Permit Division's and the National Centers for Coastal Ocean Science's vessel activity, pollution by oil or fuel leakage, and risk of aquatic nuisance species introduction are discountable, and not likely to adversely affect ESA-listed or proposed whales, turtles or fishes.

7.2 Research Activities

Both the Permits Division and the National Centers for Coastal Ocean Science's proposed actions consist of research activities, most directed at the Gulf of Mexico Bryde's whales, and others intended to characterize the environment.

7.2.1 Permits Division

The Permits Division's proposed action consists of authorizing directed take of Gulf of Mexico Bryde's whales. The directed takes include use of satellite tags, biopsy sampling, passive acoustic monitoring, sloughed skin and fecal sample collection. ESA-listed whales and sea turtles, and ESA-proposed fishes may be present in the action area and exposed to the research activities.

The proposed research activities will take place from vessels, conducted by trained observers and experienced scientists capable of identifying the target species, and as such, we do not think it is likely that another species would be mistakenly taken. Each of the applicants for the permit amendment requests currently hold permits to take ESA-listed species (e.g., whales, and sea turtles in some cases) for research purposes. In the event that a researcher encountered another ESA-listed whale or sea turtle during research activities, the research could take that species as authorized under their current permit. The research will not involve any in-water capture methods that might affect other ESA-listed sea turtles or ESA-listed fishes that might be present in the area. We think it is extremely unlikely that any of the research activities would adversely affect non-target ESA-listed or proposed whales, sea turtles, or fishes, and that effects to these species is discountable.

7.2.2 National Centers for Coastal Ocean Science

In addition to the request for directed take of Gulf of Mexico Bryde's whales (to be authorized under the Southeast Fisheries Science Center's permit No. 14450), the National Centers for Coastal Ocean Science is proposing to conduct additional research activities to characterize the trophic environment of the Gulf of Mexico Bryde's whale. These activities include a passive acoustic survey, conductivity, temperature, and depth casts, use of a multibeam echosounder, and the use of a trawl net.

Species that may be present in the action area during the National Centers for Coastal Ocean Science's research activities may include ESA-listed or proposed whales such as blue, fin, sei, sperm, and Gulf of Mexico Bryde's whales. Fishes listed under the ESA include oceanic whitetip sharks and giant manta rays. ESA-listed sea turtles may also be present, including Kemp's ridley, hawksbill, leatherback, North Atlantic green, and Northwest Atlantic loggerhead sea turtles.

7.2.2.1 Passive Acoustic Survey

The National Centers for Coastal Ocean Science's action would involve passive acoustic monitoring to detect and localize Gulf of Mexico Bryde's whale calls. They would use Directional Frequency Analysis and Ranging (DIFAR) model AN-SSQ-53F sonobuoys. The DIFAR is made of a three-foot long cylinder containing the VHF (very high frequency) radio transmitter, hydrophone, and batteries. Once deployed, the hydrophone sinks to a depth of 400 meters, and is attached to the VHF radio and batteries floating at the surface by a plastic coil. The unit sinks to the bottom after 8 hours, and is not recovered. Use of the DIFAR sonobouys could result in stressors to ESA-listed or proposed species, such as acoustic harassment from the VHF radio, or entanglement or strike in the DIFAR.

The DIFAR sonobuoys have a VHF radio to transmit data; such radios operate at 30 megahertz or higher, well out of the functional hearing range of any ESA-listed or proposed species. We do not believe there will be any acoustic affect from the DIFAR sonobuoys. Another stressor from the DIFAR sonobuoys would be risk of entanglement from the plastic coil. Due to the relatively small size of the unit, and the brief amount of time in the water column (eight hours), we believe that it is extremely unlikely that ESA-listed whales, sea turtles, or ESA-proposed fishes would become entangled in the sonobuoy.

Therefore, we conclude that the effects from DIFAR sonobuoys are not likely to adversely affect any ESA-listed or proposed species.

7.2.2.2 Conductivity, Temperature, and Depth Casts

The proposed action includes the operation of conductivity, temperature, and depth (CTD) casts that could be potential stressors for ESA-listed species. The CTD casts will be used to collect water samples and data. The CTD cast is lowered into the ocean by a power winch and is tethered the entire time. Possible stressors from the CTD cast during the proposed activities include entanglement from the tether during operation, equipment strike (an ESA-listed species while in the water column).

The CTD cast would not have a camera on it while in use. Before deploying the CTD cast, researchers would use the echosounder to ensure that the water depth is greater than the maximum depth of the CTD cast. This would prevent the CTD cast from striking bottom. While there is some possibility that a CTD cast could strike an ESA-listed or proposed species while being lowered into the ocean, we consider that possibility extremely unlikely. Another stressor from the CTD cast would be risk of entanglement from the tether. Researchers would use a stiff line material, keeping the line taut during operations and reducing knots in the line as much as possible. Therefore, the risks of strike or entanglement to ESA-listed or proposed species from CTD cast are discountable, and are not likely to be adversely affected.

7.2.2.3 Multibeam Echosounder

The National Centers for Coastal Ocean Science would use a Simrad EK60 multibeam echosounder, which has an operating frequency of 38, 120, and 200 kilohertz. The multibeam echosounder would emit sound that could be within the hearing range of ESA-listed whales, sea turtles, and fishes (Table 4).

Table 4. Functional hearing ranges of species in the action area.

Species/Group	Functional Hearing Range [hertz (Hz); kilohertz (kHz)]	Source
Low frequency cetaceans (Baleen whales)	7 Hz to 25 kHz	(NMFS 2016i)
Mid-frequency cetaceans (Toothed whales)	150 Hz to 160 kHz	(NMFS 2016i)
Sea turtles (general)	Less than 1 kHz	(Moein et al. 1994)
Loggerhead sea turtles	250 Hz to 750 Hz	(Bartol et al. 1999)
Kemp's ridley sea turtles	100 Hz to 500 Hz	(Ketten and Bartol 2005)
Green sea turtles	100 Hz to 800 Hz	(Ketten and Bartol 2005)
Elasmobranchs (Lemon sharks and horn sharks)	20 Hz to 1,000 Hz	(Casper and Mann 2006)

The Simrad EK60 emits sound that is out of the functional hearing range for baleen whales (e.g., Gulf of Mexico Bryde's whales), sea turtles, and elasmobranchs (i.e., proposed giant manta rays and oceanic whitetip sharks). As a result, we do not believe there will be any effect to these species from the operation of the multibeam echosounder. However, the multibeam echosounder has an operating range that is within the functional hearing range of mid-frequency cetaceans, like the ESA-listed sperm whale.

In the northern Gulf of Mexico, sperm whales are most frequently found in waters 1,000 meters deep (Waring 2016). The National Centers for Coastal Ocean Science's proposed action would take place in the upper slope areas of the Gulf of Mexico, in waters 100 to 500 meters deep. Because the surveys will be conducted in the shallower areas of the continental slope rather than the deeper areas where sperm whales are known to occur, it is unlikely that sperm whales would be exposed to the surveys. Since it is unlikely that sperm whales would be present in the action area, we conclude that the effects of the proposed action to sperm whales would be discountable, and sperm whales not likely to be adversely affected.

Because the multibeam echosounder either operates outside the functional hearing range of ESA-listed or proposed species, or species are not likely to be present when in use, the effects from sound associated with the multibeam echosounder are discountable, and are not likely to adversely affect ESA-listed or proposed whales, sea turtles, or fishes.

7.2.2.4 Trawl Net

During the 2019 surveys, the National Centers for Coastal Ocean Science would use a trawl net to collect information on schooling fishes and invertebrates to assess the trophic ecology of Gulf of Mexico Bryde's whale. The trawl would be fished at depths of 100 to 500 meters. The trawl net is a two-seam bottom trawl, with an opening 15.5 meters wide by 10 meters high. The trawl has doors, 3.5 meters square, weighing 682 kilograms each. The trawl would be fished on the bottom, at a speed of 6.3 kilometers per hour for 30 minutes. ESA-listed sea turtles, whales, and proposed fishes may be present in the action area, and due to the size of the trawl, these species might be affected by this activity. The primary stressors associated with the action are capture or entanglement in the gear.

ESA-listed and Proposed Whales

Fin, sei, blue, sperm, and Gulf of Mexico Bryde's whales may be present in the action area and exposed to the stressors associated with trawling. The action will take place in the upper slope waters of the northeastern Gulf of Mexico, mostly near De Soto Canyon, where the researchers expect to find Gulf of Mexico Bryde's whales.

Blue, fin, sei, and sperm whales are predominantly found seaward of the continental shelf. Sei and blue whales also typically occur in deeper waters and neither is commonly observed in the waters of the Gulf of Mexico (CETAP 1982; Waring et al. 2006; Wenzel et al. 1988). In the western North Atlantic, fin whales are found off the eastern United States, Nova Scotia, and the southeastern coast of Newfoundland (Waring et al. 2006); fin whales are not considered to occupy the Gulf of Mexico. Sperm whales are most commonly found in the Gulf of Mexico in waters 1,000 meters deep; the trawling will take place in waters 100 to 500 meters deep. There have been no reported interactions between offshore or coastal large whales and trawls in the Atlantic or Gulf of Mexico (76 FR 73912). We consider it extremely unlikely that fin, sei, sperm, or blue whales would be exposed effects from the proposed trawling, such that these effects are discountable. We believe that fin, sei, sperm, and blue whales are not likely to be adversely affected by the proposed trawling.

The Gulf of Mexico Bryde's whale can be found in the action area, and may be exposed to stressors from the proposed trawling. As part of their mitigation measures, there will be trained observers on watch at all times during trawling, and would be able to alert researchers if a Gulf of Mexico Bryde's whale (or any whale) is sighted to enact avoidance protocol. Gulf of Mexico Bryde's whales are susceptible to fisheries interactions, but fishery observers in the U.S. do not frequently observe entanglements. The entanglements that have been observed were in the longline, gillnet, and trap/pot fisheries. There is not much known about the behavior of Gulf of Mexico Bryde's whales, but one tagged individual spent 47 percent of its time during daylight within 15 meters of the surface, and 88 percent of its time near the surface at night (Rosel

2016a). The trawl will be fished on the seafloor, at depths 100 to 500 meters, making it unlikely to capture or entangle Gulf of Mexico Bryde's whales. Due to the mitigation measures and the unlikelihood of the trawl interacting with Gulf of Mexico Bryde's whales, we think it is extremely unlikely that they will be exposed to the stressors associated with trawling. We conclude that these effects are discountable, and that Gulf of Mexico Bryde's whales are not likely to be adversely affected by the proposed trawling.

ESA-proposed Fishes

The oceanic whitetip shark, listed as threatened in January 2018, is distributed worldwide in tropical and subtropical waters, most commonly from 10° north and 10° south, usually found in open ocean and near the outer continental shelf. Oceanic whitetip sharks' dives are typically less than 150 meters deep (Young 2016). The mean depth of nine tagged oceanic whitetip sharks in the Caribbean was between 31 to 62 meters (Howey-Jordan et al. 2013). Oceanic whitetip sharks are generally rare in the Gulf of Mexico and the Atlantic Ocean (Young 2016).

The proposed trawling activities are unlikely to result in capture or entanglement due to the depth at which oceanic whitetips are usually found, and that the species is relatively uncommon in the region. Therefore, we believe that it is extremely unlikely that oceanic whitetip sharks will be exposed to the stressors associated with trawling, and that it will not be adversely affected.

Giant manta rays, listed as threatened in February 2018, are commonly found offshore in oceanic waters. The range of giant manta rays includes the Gulf of Mexico, and could coincide with the action area. Although capable of deep dives at night (250 to 400 meters, and even up to 1,000 meters) (Miller 2016), giant manta rays are most frequently found in waters less than 50 meters (Graham et al. 2012). Giant manta rays can grow to be as large as seven meters; fully developed pups are about 1.4 meters. The trawling would only occur during the day, when giant manta rays are generally closer to the surface. The large size of the giant manta rays makes it likely that the protected species observers would see it before sampling, and be able to avoid it. There is a small known population of giant manta rays (less than 70) in the Flower Garden Banks National Marine Sanctuary in the northwestern Gulf of Mexico, but it is not within the action area. We believe that it is extremely unlikely that giant manta rays will be affected by the stressors associated with trawling, and the effects are discountable. We conclude that giant manta rays will not be adversely affected by the proposed action.

7.3 Critical Habitat

There are two areas of designated critical habitat that may be impacted by the proposed actions. Depending on the ports, research vessels may depart from (e.g., Charleston, South Carolina); vessels may transit through the designated critical habitats listed below.

7.3.1 Northwest Atlantic Ocean Loggerhead Sea Turtle

On July 10, 2014, NMFS and the U.S. Fish and Wildlife Service designated critical habitat for the Northwest Atlantic Ocean Distinct Population Segment (DPS) loggerhead sea turtles along the U.S. Atlantic and Gulf of Mexico coasts from North Carolina to Mississippi (79 FR 39856). These areas contain one or a combination of nearshore reproductive habitat, *Sargassum*, winter area, breeding areas, and migratory corridors. The critical habitat is categorized into 38 occupied marine areas and 685 miles of nesting beaches.

All the research activities will be conducted from vessels. There will be no land-based activities that would take place on the designated critical habitat nesting beaches. We do not expect any aspect of the proposed action to "result in a loss of habitat conditions that allow for (a) hatchling egress from the water's edge to open water; and (b) nesting female transit back and forth between the open water and the nesting beach during nesting season," which are identified in the proposed critical habitat designation as issues that will impact the critical habitat (78 FR 43005). The vessels may transit through Sargassum, migratory corridors, breeding areas, or the winter area on their way to the northeastern Gulf of Mexico. Vessel transit will not impact any of the essential biological features associated with any of these critical habitat units. Therefore, the proposed activities are not expected to adversely affect the conservation value of designated critical habitat for loggerhead sea turtles and will not be considered further in this opinion.

7.3.2 North Atlantic Right Whale

On January 27, 2016, NMFS issued a final rule to expand critical habitat for the North Atlantic right whale (81 FR 4837). The new designation includes marine habitat in two regions—a unit for foraging in the Gulf of Maine and Georges Bank region and a unit for calving habitat off the southeastern U.S. coast. Vessels may transit through the calving unit while on their way to the northeastern Gulf of Mexico.

The rule identified physical and biological features essential for conservation of the species in the calving habitat unit of designated critical habitat. In the unit for calving habitat off the southeastern U.S. coast, the following features were identified as essential: calm surface conditions, appropriate sea surface temperatures and water depths between 6 and 28 meters.

NMFS believes the proposed action is not likely to affect the quantity, quality, or availability of the physical or biological features described above, and therefore, is not likely to adversely affect North Atlantic right whale critical habitat. North Atlantic right whale critical habitat will not be discussed further in this opinion.

8 SPECIES AND CRITICAL HABITAT LIKELY TO BE ADVERSELY AFFECTED

This section identifies the ESA-listed species that occur within the action area (Figure 1) that may be affected by research activities on Gulf of Mexico Bryde's whales funded or authorized by the National Centers for Coastal Ocean Science and the Permits Division. All of the species potentially occurring within the action area are ESA-listed in Table 5 along with their regulatory status.

Table 5. ESA-listed species that may be affected by the proposed actions.

Species	ESA Status	Recovery Plan
	Cetaceans	
Gulf of Mexico Bryde's Whale (*Balaenoptera edeni*)	E – 81 FR 88639 (Proposed)	-- --
	Marine Reptiles	
Loggerhead Turtle, (*Caretta caretta*) – Northwest Atlantic Ocean DPS	T – 76 FR 58868	63 FR 28359 74 FR 2995
Hawksbill Turtle (*Eretmochelys imbricata)*	E – 35 FR 8491	57 FR 38818
Kemp's Ridley Turtle (*Lepidochelys kempii*)	E – 35 FR 18319	75 FR 12496
Green Turtle, (*Chelonia mydas*) – North Atlantic DPS	T – 81 FR 20057	63 FR 28359
Leatherback Turtle (*Dermochelys coriacea*)	E – 35 FR 8491	63 FR 28359

9 Status of Species and Critical Habitat Likely to be Adversely Affected

This section examines the status of each species that would be affected by the proposed action. The status includes the existing level of risk that the ESA-listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The species status section helps to inform the description of the species' current "reproduction, numbers, or distribution," which is part of the jeopardy determination as described in 50 C.F.R. §402.02. More detailed information on the status and trends of these ESA-listed species, and their biology and ecology can be found in the listing regulations and critical habitat designations published in the Federal Register, status reviews, recovery plans, and on this NMFS Web site: [https://www.fisheries.noaa.gov/welcome].

This section also examines the condition of critical habitat throughout the designated area (such as various watersheds and coastal and marine environments that make up the designated area), and discusses the condition and current function of designated critical habitat, including the essential physical and biological features that contribute to that conservation value of the critical habitat.

One factor affecting the range wide status of Gulf of Mexico Bryde's whales and ESA-listed sea turtles, and aquatic habitat at large is climate change. Climate change will be discussed in the Environmental Baseline section.

9.1 Gulf of Mexico Bryde's Whale

Species Description

The Bryde's whale is a widely distributed baleen whale found in tropical and subtropical oceans. The Gulf of Mexico subspecies of Bryde's whale is the only known baleen whale to inhabit the Gulf of Mexico year-round. The Gulf of Mexico Bryde's whale is found in the northeastern Gulf of Mexico near De Soto Canyon between the 100 and 300 meter depth contours (Figure 2). Consequently, LaBrecque et al. (2015) designated this area as a Biologically Important Area. There have also been sightings at 302 and 309 meters depth in this region and west of Pensacola, Florida; for this reason, the core area inhabited by the species is probably better described out to the 400 meter depth contour and to Mobile Bay, Alabama, to provide some buffer around the deeper water sightings and to include all sighting locations in the northeastern Gulf of Mexico, respectively (Rosel 2016b). From historical whaling records and several recent sightings, there some evidence of a former distribution of these whales in waters of north-central and southern Gulf of Mexico.

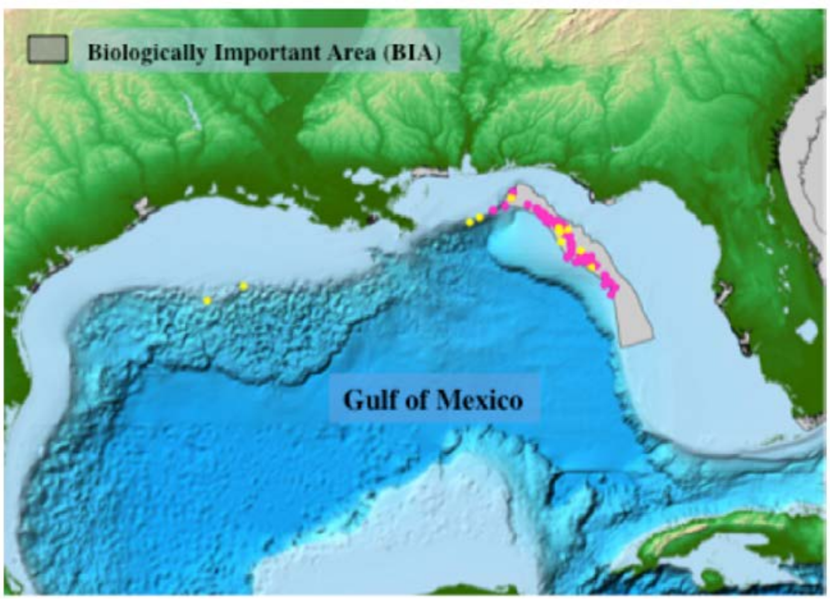


Figure 2: Map identifying the biologically important area and known range of Gulf of Mexico Bryde's whales From (Rosel 2016a).

Bryde's whales are baleen whales that grow to lengths of 40 to 55 feet (13 to 16.5 meters). Bryde's whales in the Gulf of Mexico are a taxonomically distinct subspecies. The species has a large, falcate dorsal fin, a streamlined body shape, and a pointed, flat rostrum. There are three ridges on the dorsal surface of the rostrum that distinguish it from other similar-looking species, such as the sei whale (Rosel 2016b). Bryde's whales have a counter-shaded color that is uniformly dark dorsally and light to pinkish ventrally. The Gulf of Mexico stock of Bryde's whale was proposed for listing under the ESA as endangered on December 8, 2016 (Table 6).

Table 6: Gulf of Mexico Bryde's whale summary information.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Balaenoptera edeni	**Gulf of Mexico Bryde's whale**	**N/A**	**Endangered (Proposed)**	2016	81 FR 88639 (Proposed)	N/A	N/A

Information available from the status review (Rosel 2016a), the proposed listing (81 FR 88639), and available literature were used to summarize the life history, population dynamics, and status of the species as follows.

Life History

Little is known about the Gulf of Mexico Bryde's whale subspecies' life history compared to Bryde's whales more generally and worldwide. The life expectancy of Bryde's whales is unknown. Other stocks of this species have a gestation period of 11 to 12 months, and give birth to a single calf, which is nursed for six to 12 months. Age of sexual maturity is not known for Gulf of Mexico Bryde's whales specifically, but Bryde's whales are thought to be sexually mature at eight to 13 years. Peak breeding and calving probably occurs in the fall. Females breed every second year. Bryde's whales exhibit a typical diel dive pattern, with deep dives in the daytime and shallow dives at night. Bryde's whales generally feed on schooling fishes (e.g., anchovy, sardine, mackerel, and herring) and small crustaceans (Rosel 2016b).

Bryde's whales, unlike other baleen whales, are not known to make long foraging migrations (Figueiredo et al. 2014). The Gulf of Mexico subspecies is a year-round resident of the Gulf of Mexico. Bryde's whales are known to dive to over 200 meters depth to feed on small fish or crustaceans and their occurrence is thought to be determined by prey abundance (Kerosky et al. 2012). They are observed in small groups, pairs or solitary and reportedly seem curious about ships (Lodi et al. 2015; Rosel 2016b; Tershy 1992).

According to Rice (1998), adult *B. e. edeni* rarely exceed 37 feet (11.5 meters) total length and adult *B. e. brydei* reach approximately 46 to 49 feet (14 to15 meters). Rosel and Wilcox (2014) summarized body length information in the Gulf of Mexico from strandings and concluded that they may have a size range intermediate to the currently recognized subspecies. This is similar to Bryde's whales off the coast of South Africa where inshore males are estimated to attain maturity at 40 to 41 feet (12.2 to 12.5 meters) compared to 42 to 45 feet (12.8 to 13.7 meters) for offshore males, while inshore females reach sexual maturity at 39 to 41 feet (11.9 to 12.5 meters) compared to 42 to 43 feet (12.8 to 13.1 meters) for offshore females (Best 2001).

Population Dynamics

The following is a discussion of the species' population and its variance over time. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the Gulf of Mexico Bryde's whale.

The Gulf of Mexico Bryde's whale population is very small; the most recent estimate from 2009 places the population size at 33 individuals. A second habitat-based density estimate by Roberts et al. (2016) that incorporated visual survey data from 1992 to 2009 estimated 44 individuals (Rosel 2016b). Given the best available scientific information and allowing for the uncertainty of Bryde's whale occurrence in non-U.S. waters of the Gulf of Mexico, most likely less than 100 individuals exist (Rosel 2016b). There is no population trend information available for the Gulf of Mexico Bryde's whale.

Genetic diversity within the Gulf of Mexico Bryde's whale population is very low, with genetic analyses indicating only two mitochondrial DNA haplotypes (compared to five haplotypes for North Atlantic right whales and 51 in fin whales across the same control region sequence) (Rosel and Wilcox 2014). Examination of 42 nuclear microsatellite loci found that 25 loci (60 percent) were monomorphic, meaning no genetic variability was seen for the 21 Gulf of Mexico Bryde's whales sampled (Rosel 2016a).

Phylogenetic reconstruction using the control region and all published Bryde's whale sequences reveal that the Gulf of Mexico Bryde's whale's haplotypes are evolutionarily distinct from the other two recognized subspecies of Bryde's whale as the two subspecies are from each other. In addition, the Gulf of Mexico Bryde's whale is more genetically differentiated from the two recognized subspecies than is the sei whale, which is an entirely different species (Rosel and Wilcox 2014).

The range of Gulf of Mexico Bryde's whales is primarily in a small, biologically important area in the northeastern Gulf of Mexico near De Soto Canyon, in waters 100 to 400 meters deep along the continental shelf break (Figure 2). It inhabits the Gulf of Mexico year round, but its distribution outside of this biologically important area is unknown.

Status

Historically, commercial whaling did occur in the Gulf of Mexico, but the area was not considered prime whaling grounds. Bryde's whales were not specifically targeted by commercial whalers, but the "finback whales" which were caught between the mid-1700s and late 1800s were likely Bryde's whales (Reeves et al. 2011). The Bryde's whale status review identified 27 possible threats to Gulf of Mexico Bryde's whales, with the following four being the most significant: (1) sound, (2) vessel collisions; (3) energy exploration; (4) oil spills and oil spill response. Noise from shipping traffic and seismic surveys in the region may impact Gulf of Mexico Bryde's whales' ability to communicate. Vessel traffic from commercial shipping and the oil and gas industry also poses a risk of vessel strike for Gulf of Mexico Bryde's whales. Entanglement from fishing gear is also a threat, and several fisheries operate within the range of the species. The *Deepwater Horizon* oil spill severely impacted Bryde's whales in the Gulf of Mexico, with an estimated 17 percent of the population killed, 22 percent of females exhibiting reproductive failure, and 18 percent of the population suffering adverse health effects (DWHTrustees 2016). Because the Gulf of Mexico Bryde's whale population is so small size and has low genetic diversity, it is highly susceptible to further perturbations.

Critical Habitat

No critical habitat has been designated for Gulf of Mexico Bryde's whales as the species is currently proposed for listing under the ESA.

Recovery Plan

No Recovery Plan has been prepared for Gulf of Mexico Bryde's whales as the species is currently proposed for listing under the ESA.

9.2 Loggerhead Turtle Northwest Atlantic Ocean Distinct Population Segment

Loggerhead sea turtles are circumglobal, and are found in the temperate and tropical regions of the Indian, Pacific and Atlantic Oceans. Northwest Atlantic Ocean DPS loggerheads are found along eastern North America, Central America, and northern South America (Figure 3).

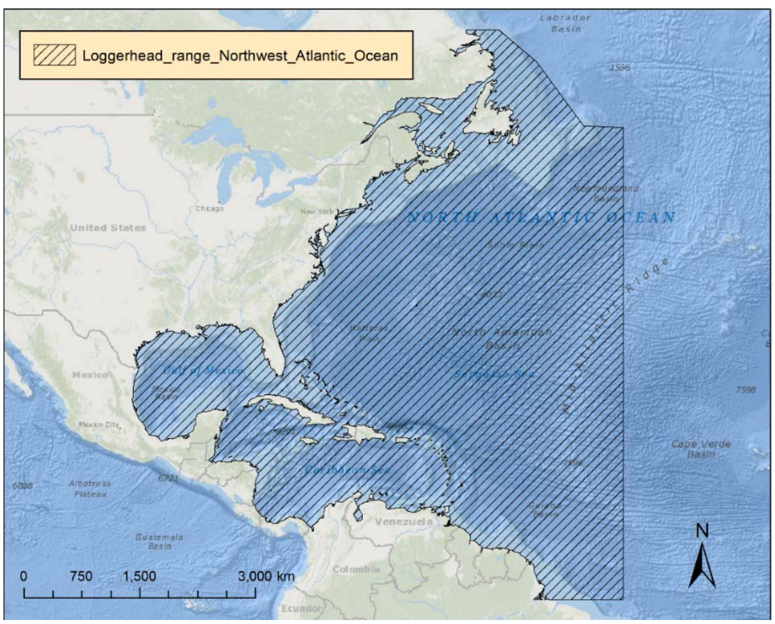


Figure 3. Map identifying the range of the Northwest Atlantic Ocean distinct population segment loggerhead sea turtle.

The loggerhead sea turtle is distinguished from other turtles by its reddish-brown carapace, large head and powerful jaws. The species was first listed as threatened under the Endangered Species Act in 1978 (43 FR 32800). On September 22, 2011, the NMFS designated nine distinct population segments of loggerhead sea turtles, with the Northwest Atlantic Ocean DPS listed as threatened (75 FR 12598) (Table 7).

Table 7. Loggerhead sea turtle Northwest Atlantic Ocean distinct population segment summary information.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Caretta caretta	**Loggerhead turtle**	**Northwest Atlantic Ocean**	**Threatened**	2009	76 FR 58868	2009	79 FR 39855

We used information available in the 2009 Status Review (Conant et al. 2009b) and the final listing rule (76 FR 58868) to summarize the life history, population dynamics, and status of the species, as follows.

Life History

Mean age at first reproduction for female loggerhead sea turtles is thirty years. Females lay an average of three clutches per season. The annual average clutch size is 112 eggs per nest. The average remigration interval is 2.7 years. Nesting occurs on beaches, where warm, humid sand temperatures incubate the eggs. Temperature determines the sex of the turtle during the middle of the incubation period. Turtles spend the post-hatchling stage in pelagic waters. As post-hatchlings, loggerheads enter the "oceanic juvenile" life stage, migrating offshore and becoming associated with *Sargassum* habitats, driftlines, and other convergence zones (Carr 1986; Conant et al. 2009a; Witherington 2002). Oceanic juveniles grow at rates of one to two inches (2.9 to 5.4 cm) per year (Bjorndal et al. 2003; Snover 2002) over a period as long as seven to 12 years (Bolten et al. 1998) before moving to more coastal habitats. The juvenile stage is spent first in the oceanic zone and later in the neritic zone (i.e., coastal waters). Coastal waters provide important foraging habitat, inter-nesting habitat, and migratory habitat for adult loggerheads.

Population Dynamics

The following is a discussion of the species' population and its variance over time. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the Northwest Atlantic Ocean DPS loggerhead sea turtle.

There is general agreement that the number of nesting females provides a useful index of the species' population size and stability at this life stage, even though there are doubts about the ability to estimate the overall population size. Adult nesting females often account for less than one percent of total population numbers (Bjorndal et al. 2005).

Using a stage/age demographic model, the adult female population size of the DPS is estimated at 20,000 to 40,000 females, and 53,000 to 92,000 nests annually (NMFS-SEFSC 2009). Based on genetic information, the Northwest Atlantic Ocean DPS is further categorized into five recovery units corresponding to nesting beaches. These are Northern Recovery Unit, Peninsular Florida Recovery Unit, Dry Tortugas Recovery Unit, Northern Gulf of Mexico Recovery Unit, and the Greater Caribbean Recovery Unit.

The Northern Recovery Unit, from North Carolina to northeastern Florida, and is the second largest nesting aggregation in the DPS, with an average of 5,215 nests from 1989 to 2008, and approximately 1,272 nesting females (NMFS and USFWS 2008).

The Peninsular Florida Recovery Unit hosts more than 10,000 females nesting annually, which constitutes eighty-seven percent of all nesting effort in the DPS (Ehrhart et al. 2003).

The Greater Caribbean Recovery Unit encompasses nesting subpopulations in Mexico to French Guiana, the Bahamas, and the Lesser and Greater Antilles. The majority of nesting for this recovery unit occurs on the Yucatán peninsula, in Quintana Roo, Mexico, with 903 to 2,331 nests annually (Zurita et al. 2003). Other significant nesting sites are found throughout the Caribbean, and including Cuba, with approximately 250 to 300 nests annually (Ehrhart et al. 2003), and over one hundred nests annually in Cay Sal in the Bahamas (NMFS and USFWS 2008).

The Dry Tortugas Recovery Unit includes all islands west of Key West, Florida. The only available data for the nesting subpopulation on Key West comes from a census conducted from 1995 to 2004 (excluding 2002), which provided a mean of 246 nests per year, or about sixty nesting females (NMFS and USFWS 2007b).

The Gulf of Mexico Recovery Unit has between one hundred to 999 nesting females annually, and a mean of 910 nests per year.

Nest counts taken at index beaches in Peninsular Florida show a significant decline in loggerhead nesting from 1989 to 2006, most likely attributed to mortality of oceanic-stage loggerheads caused by fisheries bycatch (Witherington et al. 2009). Loggerhead nesting on the Archie Carr National Wildlife Refuge (representing individuals of the Peninsular Florida subpopulation) has fluctuated over the past few decades. There was an average of 9,300 nests throughout the 1980s, with the number of nests increasing into the 1990s until it reached an all-time high in 1998, with 17,629 nests. From that point, the number of loggerhead nests at the Refuge have declined steeply to a low of 6,405 in 2007, increasing again to 15,539, still a lower number of nests than in 1998 (Bagley et al. 2013).

For the Northern recovery unit, nest counts at loggerhead nesting beaches in North Carolina, South Carolina and Georgia declined at 1.9 percent annually from 1983 to 2005 (NMFS and USFWS 2007b).

The nesting subpopulation in the Florida panhandle has exhibited a significant declining trend from 1995 to 2005 (Conant et al. 2009b; NMFS and USFWS 2007b). Recent model estimates predict an overall population decline of seventeen percent for the St. Joseph Peninsula, Florida subpopulation of the Northern Gulf of Mexico recovery unit (Lamont et al. 2014).

Loggerhead hatchlings from the western Atlantic disperse widely, most likely using the Gulf Stream to drift throughout the Atlantic Ocean. Mitochondrial DNA evidence demonstrates that juvenile loggerheads from southern Florida nesting beaches comprise the vast majority (71 to 88 percent) of individuals found in foraging grounds throughout the western and eastern Atlantic: Nicaragua, Panama, Azores and Madeira, Canary Islands and Andalusia, Gulf of Mexico and Brazil (Masuda 2010).

Status

Due to declines in nest counts at index beaches in the United States and Mexico, and continued mortality of juveniles and adults from fishery bycatch, the Northwest Atlantic Ocean DPS is at risk and likely to decline in the foreseeable future (Conant et al. 2009b).

Recovery Goals

See the 2009 Final Recovery Plan for the Northwest Atlantic Population of Loggerheads for complete down listing/delisting criteria for each of the following recovery objectives.

1. Ensure that the number of nests in each recovery unit is increasing and that this increase corresponds to an increase in the number of nesting females.
2. Ensure the in-water abundance of juveniles in both neritic and oceanic habitats is increasing and is increasing at a greater rate than strandings of similar age classes.
3. Manage sufficient nesting beach habitat to ensure successful nesting.
4. Manage sufficient feeding, migratory and inter-nesting marine habitats to ensure successful growth and reproduction.
5. Eliminate legal harvest.
6. Implement scientifically based nest management plans.
7. Minimize nest predation.
8. Recognize and respond to mass/unusual mortality or disease events appropriately.
9. Develop and implement local, state, Federal and international legislation to ensure long-term protection of loggerheads and their terrestrial and marine habitats.
10. Minimize bycatch in domestic and international commercial and artisanal fisheries.
11. Minimize trophic changes from fishery harvest and habitat alteration.
12. Minimize marine debris ingestion and entanglement.
13. Minimize vessel strike mortality.

9.3 Kemp's Ridley Turtle

The Kemp's ridley turtle is considered the most endangered sea turtle, internationally (Groombridge 1982; Zwinenberg 1977). Its range extends from the Gulf of Mexico to the Atlantic coast, with nesting beaches limited to a few sites in Mexico and Texas (Figure 4).

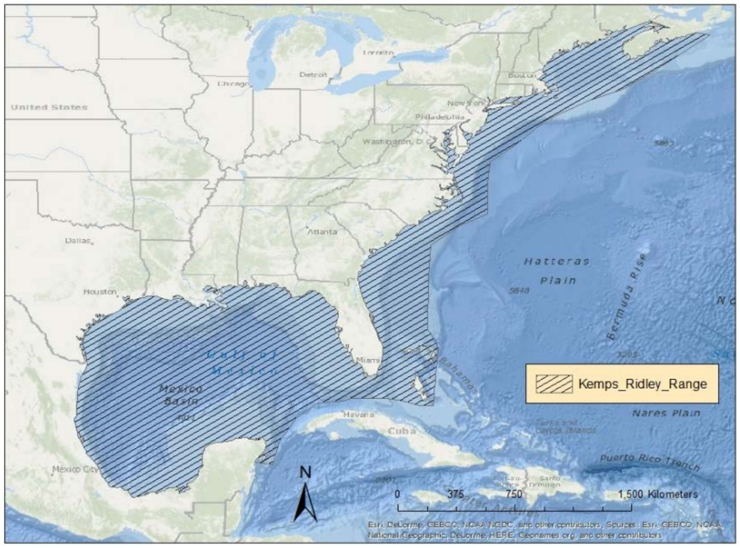


Figure 4. Map identifying the range of the Kemp's ridley sea turtle.

Kemp's ridley sea turtles are the smallest of all sea turtle species, with a nearly circular top shell and a pale yellowish bottom shell. The species was first listed under the Endangered Species Conservation Act (35 FR 8491) and listed as endangered under the ESA since 1973 (Table 8).

Table 8. Kemp's ridley turtle summary information.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Lepidochelys kempii	**Kemp's ridley turtle**	**None**	**Endangered** range wide	2015	35 FR 18319	75 FR 12496 U.S. Caribbean, Atlantic, and Gulf of Mexico (draft)	None Designated

We used information available in the revised recovery plan (NMFS 2011) and the Five-Year Review (NMFS 2015c) to summarize the life history, population dynamics and status of the species, as follows.

Life History

Females mature at twelve years of age. The average remigration is two years. Nesting occurs from April to July in large arribadas, primarily at Rancho Nuevo, Mexico. Females lay an average of 2.5 clutches per season. The annual average clutch size is ninety-seven to one hundred eggs per nest. The nesting location may be particularly important because hatchlings can more easily migrate to foraging grounds in deeper oceanic waters, where they remain for approximately two years before returning to nearshore coastal habitats. Juvenile Kemp's ridley sea turtles use these nearshore coastal habitats from April through November, but move towards more suitable overwintering habitat in deeper offshore waters (or more southern waters along the Atlantic coast) as water temperature drops. Adult habitat largely consists of sandy and muddy areas in shallow, nearshore waters less than 120 feet (37 meters) deep, although they can also be found in deeper offshore waters. As adults, Kemp's ridleys forage on swimming crabs, fish, jellyfish, mollusks, and tunicates (NMFS 2011).

Population Dynamics

The following is a discussion of the species' population and its variance over time. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the Kemp's ridley sea turtle.

Of the sea turtles species in the world, the Kemp's ridley has declined to the lowest population level. Nesting aggregations at a single location (Rancho Nuevo, Mexico) were estimated at 40,000 females in 1947. By the mid-1980s, the population had declined to an estimated 300 nesting females. In 2014, there were an estimated 10,987 nests and 519,000 hatchlings released from three primary nesting beaches in Mexico (NMFS 2015c). The number of nests in Padre Island, Texas has increased over the past two decades, with one nest observed in 1985, four in 1995, fifty in 2005, 197 in 2009, and 119 in 2014 (NMFS 2015c).

From 1980 to 2003, the number of nests at three primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) increased fifteen percent annually (Heppell et al. 2005); however, due to recent declines in nest counts, decreased survival at other life stages, and updated population modeling, this rate is not expected to continue (NMFS 2015c).

Genetic variability in Kemp's ridley turtles is considered to be high, as measured by heterozygosis at microsatellite loci (NMFS 2011). Additional analysis of the mitochondrial DNA taken from samples of Kemp's ridley turtles at Padre Island, Texas, showed six distinct haplotypes, with one found at both Padre Island and Rancho Nuevo (Dutton et al. 2006).

The Kemp's ridley occurs from the Gulf of Mexico and along the Atlantic coast of the U.S. (TEWG 2000). The vast majority of individuals stem from breeding beaches at Rancho Nuevo on the Gulf of Mexico coast of Mexico. During spring and summer, juvenile Kemp's ridleys occur in the shallow coastal waters of the northern Gulf of Mexico from south Texas to north Florida. In the fall, most Kemp's ridleys migrate to deeper or more southern, warmer waters and remain there through the winter (Schmid 1998). As adults, many turtles remain in the Gulf of Mexico, with only occasional occurrence in the Atlantic Ocean (NMFS et al. 2010).

Status

The Kemp's ridley was listed as endangered in response to a severe population decline, primarily the result of egg collection. In 1973, legal ordinances prohibited the harvest of sea turtles from May to August, and in 1990, the harvest of all sea turtles was prohibited by presidential decree. In 2002, Rancho Nuevo was declared a Sanctuary. A successful head-start program has resulted in the reestablishment of nesting at Texan beaches. While fisheries bycatch remains a threat, the use of turtle excluder devices mitigates take. Fishery interactions and strandings, possibly due to forced submergence, appear to be the main threats to the species. It is clear that the species is steadily increasing; however, the species' limited range and low global abundance make it vulnerable to new sources of mortality as well as demographic and environmental randomness, all of which are often difficult to predict with any certainty. Therefore, its resilience to future perturbation is low.

Recovery Goals

See the 2011 Final Bi-National (U.S. and Mexico) Revised Recovery Plan for Kemp's ridley sea turtles for complete down listing/delisting criteria for each of their respective recovery goals. The following items were identified as priorities to recover Kemp's ridley sea turtles:

1. Protect and manage nesting and marine habitats.
2. Protect and manage populations on the nesting beaches and in the marine environment.
3. Maintain a stranding network.
4. Manage captive stocks.
5. Sustain education and partnership programs.
6. Maintain, promote awareness of and expand U.S. and Mexican laws.
7. Implement international agreements.
8. Enforce laws.

9.4 Hawksbill Turtle

The hawksbill turtle has a circumglobal distribution throughout tropical and, to a lesser extent, subtropical oceans (Figure 5).

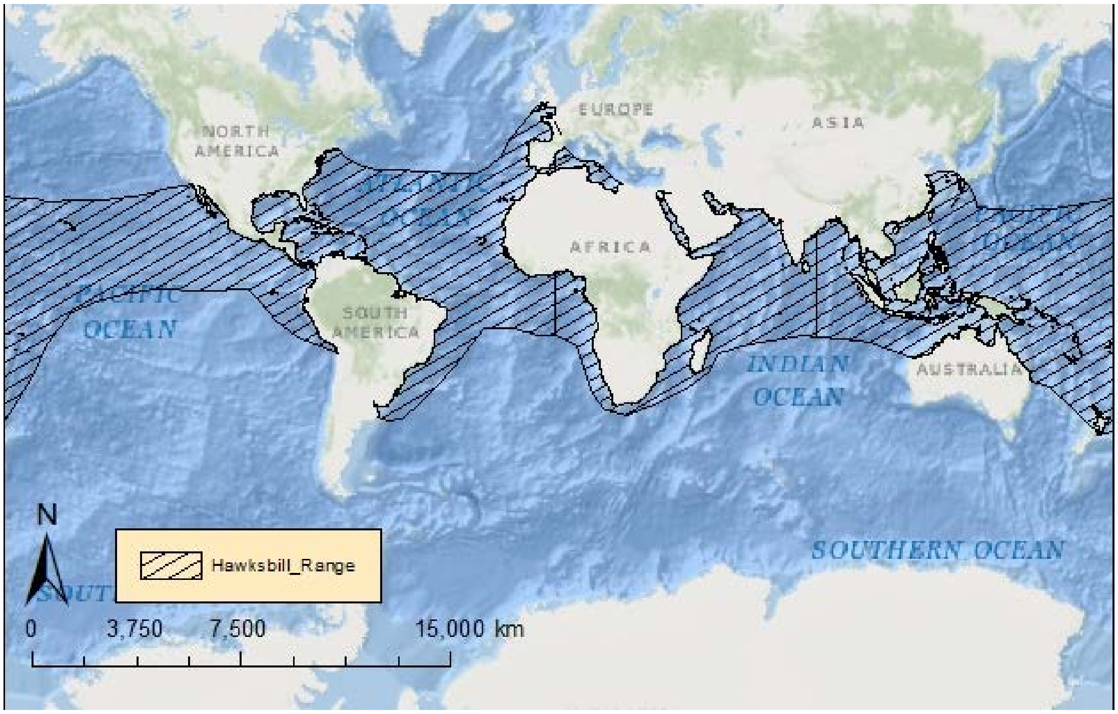


Figure 5. Map identifying the range of the hawksbill turtle.

The hawksbill sea turtle has a sharp, curved, beak-like mouth and a "tortoiseshell" pattern on its carapace, with radiating streaks of brown, black, and amber. The species was first listed under the Endangered Species Conservation Act (35 FR 8491) and listed as endangered under the ESA since 1973 (Table 9).

Table 9. Hawksbill turtle summary information

Species	Common	Distinct		Recent			
Eretmochelys imbricata	**Hawksbill turtle**	**None**	**Endangered** range wide	2013	35 FR 8491	57 FR 38818 Atlantic	63 FR 46693 Atlantic

We used information available in the five year reviews (NMFS 2013b; NMFS and USFWS 2007a) to summarize the life history, population dynamics and status of the species, as follows.

Life History

Hawksbill sea turtles reach sexual maturity at twenty to forty years of age. Hawksbill sea turtles nest on sandy beaches throughout the tropics and subtropics. Females return to their natal beaches every two to five years and nest an average of three to five times per season. Clutch sizes are large (up to 250 eggs). Sex determination is temperature dependent, with warmer incubation producing more females. Hatchlings migrate to and remain in pelagic habitats until they reach approximately twenty two to twenty five centimeters in straight carapace length. As juveniles, they take up residency in coastal waters to forage and grow. As adults, hawksbills use their sharp beak-like mouths to feed on sponges and corals. Hawksbill sea turtles are highly migratory and use a wide range of habitats during their lifetimes (Musick and Limpus 1997b; Plotkin 2003). Satellite tagged turtles have shown significant variation in movement and migration patterns. Distance traveled between nesting and foraging locations ranges from a few hundred to a few thousand kilometers (Horrocks et al. 2001; Miller et al. 1998).

Population Dynamics

The following is a discussion of the species' population and its variance over time. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the hawksbill sea turtle.

Surveys at eighty eight nesting sites worldwide indicate that 22,004 to 29,035 females nest annually (NMFS 2013b). In general, hawksbills are doing better in the Atlantic and Indian Ocean than in the Pacific Ocean, where despite greater overall abundance, a greater proportion of the nesting sites are declining. In the United States, hawksbills typically laid about 500 to 1,000 nests on Mona Island, Puerto Rico in the past (Diez and Van Dam 2007), but the numbers appear to be increasing, as the Puerto Rico Department of Natural and Environmental Resources (PRDNER) counted nearly 1,600 nests in 2010 (PRDNER nesting data). Another 56 to 150 nests are typically laid on Buck Island off St. Croix (Meylan 1999; Mortimer and Donnelly 2008). Nesting also occurs to a lesser extent on beaches on Culebra Island and Vieques Island in Puerto Rico, the mainland of Puerto Rico, and additional beaches on St. Croix, St. John, and St. Thomas, U.S. Virgin Islands.

From 1980 to 2003, the number of nests at three primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos, Mexico) increased fifteen percent annually (Heppell et al. 2005); however, due to recent declines in nest counts, decreased survival at other life stages, and updated population modeling, this rate is not expected to continue (NMFS 2013b). Nesting populations in nine out of ten nesting sites in the Caribbean have shown a recent increase, attributed to the implementation of conservation measures.

Populations are distinguished generally by ocean basin and more specifically by nesting location. Our understanding of population structure is relatively poor. Genetic analysis of hawksbill sea turtles foraging off the Cape Verde Islands identified three closely-related haplotypes in a large majority of individuals sampled that did not match those of any known nesting population in the western Atlantic, where the vast majority of nesting has been documented (Mcclellan et al. 2010; Monzon-Arguello et al. 2010). Hawksbills in the Caribbean seem to have dispersed into separate populations (rookeries) after a bottleneck roughly 100,000 to 300,000 years ago (Leroux et al. 2012).

The hawksbill has a circumglobal distribution throughout tropical and, to a lesser extent, subtropical waters of the Atlantic, Indian, and Pacific Oceans. In their oceanic phase, juvenile hawksbills can be found in *Sargassum* mats; post-oceanic hawksbills may occupy a range of habitats that include coral reefs or other hard-bottom habitats, sea grass, algal beds, mangrove bays and creeks (Bjorndal and Bolten 2010; Musick and Limpus 1997b).

Status

Long-term data on the hawksbill sea turtle indicate that sixty-three sites have declined over the past twenty to one hundred years (historic trends are unknown for the remaining twenty-five sites). Recently, twenty-eight sites (sixty-eight percent) have experienced nesting declines, ten have experienced increases, three have remained stable, and forty-seven have unknown trends. The greatest threats to hawksbill sea turtles are overharvesting of turtles and eggs, degradation of nesting habitat, and fisheries interactions. Adult hawksbills are harvested for their meat and carapace, which is sold as tortoiseshell. Eggs are taken at high levels, especially in Southeast Asia where collection approaches one hundred percent in some areas. In addition, lights on or adjacent to nesting beaches are often fatal to emerging hatchlings and alters the behavior of nesting adults. The species' resilience to additional perturbation is low.

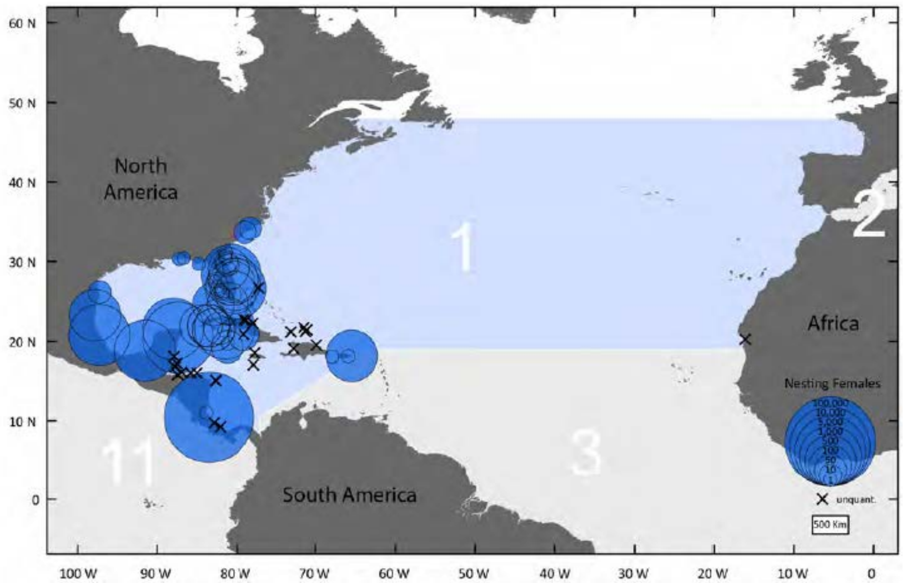
Recovery Goals

See the 1992 and 1998 Recovery Plans for the U.S. Caribbean, Atlantic and Gulf of Mexico and U.S. Pacific populations of hawksbill sea turtles, respectively, for complete down listing/delisting criteria for each of their respective recovery goals. The following items were the top recovery actions identified to support in the Recovery Plans:

1. Identify important nesting beaches.
2. Ensure long-term protection and management of important nesting beaches.
3. Protect and manage nesting habitat; prevent the degradation of nesting habitat caused by seawalls, revetments, sand bags, other erosion-control measures, jetties and breakwaters.
4. Identify important marine habitats; protect and manage populations in marine habitat.
5. Protect and manage marine habitat; prevent the degradation or destruction of important [marine] habitats caused by upland and coastal erosion.
6. Prevent the degradation of reef habitat caused by sewage and other pollutants.
7. Monitor nesting activity on important nesting beaches with standardized index surveys.
8. Evaluate nest success and implement appropriate nest-protection on important nesting beaches.
9. Ensure that law-enforcement activities prevent the illegal exploitation and harassment of sea turtles and increase law-enforcement efforts to reduce illegal exploitation.
10. Determine nesting beach origins for juveniles and sub-adult populations.

9.5 Green Turtle North Atlantic Distinct Population Segment

The green sea turtle is globally distributed and commonly inhabits nearshore and inshore waters.



The North Atlantic DPS green turtle is found in the North Atlantic Ocean and Gulf of Mexico (Figure 6).

The green sea turtle is the largest of the hardshell marine turtles, growing to a weight of 350 pounds (159 kilograms) and a straight carapace length of greater than 3.3 feet (1 meter). The species was listed under the ESA on July 28, 1978 (43 FR 32800). The species was separated into two listing designations: endangered for breeding populations in Florida and the Pacific coast of Mexico and threatened in all other areas throughout its range. On April 6, 2016, NMFS listed eleven DPSs of green sea turtles as threatened or endangered under the ESA (81 FR 20057) (Table 10). The North Atlantic DPS is listed as threatened.

Table 10. Green sea turtle North Atlantic distinct population segment information.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Chelonia mydas	**Green Turtle**	**North Atlantic**	**Threatened**	2015	81 FR 20057	1991	63 FR 46693

We used information available in the 2007 Five Year Review (NMFS 2007) and 2015 Status Review (Seminoff et al. 2015) to summarize the life history, population dynamics and status of the species, as follows.

Life history

Age at first reproduction for females is twenty to forty years. Green sea turtles lay an average of three nests per season with an average of one hundred eggs per nest. The remigration interval (i.e., return to natal beaches) is two to five years. Nesting occurs primarily on beaches with intact dune structure, native vegetation and appropriate incubation temperatures during summer months. After emerging from the nest, hatchlings swim to offshore areas and go through a post-hatchling pelagic stage where they are believed to live for several years. During this life stage, green sea turtles feed close to the surface on a variety of marine algae and other life associated with drift lines and debris. Adult turtles exhibit site fidelity and migrate hundreds to thousands of kilometers from nesting beaches to foraging areas. Green sea turtles spend the majority of their lives in coastal foraging grounds, which include open coastlines and protected bays and lagoons. Adult green turtles feed primarily on seagrasses and algae, although they also eat jellyfish, sponges and other invertebrate prey.

Population dynamics

The following is a discussion of the species' population and its variance over time. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the North Atlantic DPS green sea turtle.

Worldwide, nesting data at 464 sites indicate that 563,826 to 564,464 females nest each year (Seminoff et al. 2015). Compared to other DPSs, the North Atlantic DPS exhibits the highest nester abundance, with approximately 167,424 females at seventy-three nesting sites, and available data indicate an increasing trend in nesting. The largest nesting site in the North Atlantic DPS is in Tortuguero, Costa Rica, which hosts seventy-nine percent of nesting females for the DPS (Seminoff et al. 2015). Occasional nesting has also been documented along the Gulf Coast of Florida (Meylan et al. 1995).

For the North Atlantic DPS, the available data indicate an increasing trend in nesting. There are no reliable estimates of population growth rate for the DPS as a whole, but estimates have been developed at a localized level. Modeling by Chaloupka et al. (2008) using data sets of twenty-five years or more show the Florida nesting stock at the Archie Carr National Wildlife Refuge growing at an annual rate of 13.9 percent, and the Tortuguero, Costa Rica, population growing at 4.9 percent.

The North Atlantic DPS has a distinct haplotype from other green turtles around the world, which was a factor in defining the discreteness of the population for the DPS. Evidence from mitochondrial DNA studies indicates that there are at least four independent nesting subpopulations in Florida, Cuba, Mexico and Costa Rica (Seminoff et al. 2015)(Shamblin et al. 2016).

Green turtles from the North Atlantic DPS range from the boundary of South and Central America (7.5°N, 77°W) in the south, throughout the Caribbean, the Gulf of Mexico, and the U.S. Atlantic coast to New Brunswick, Canada (48°N, 77°W) in the north. The range of the DPS then extends due east along latitudes 48°N and 19°N to the western coasts of Europe and Africa. Nesting occurs primarily in Costa Rica, Mexico, Florida and Cuba.

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

Status

Historically, green turtles in the North Atlantic DPS were hunted for food, which was the principal cause of the population's decline. Apparent increases in nester abundance for the North Atlantic DPS in recent years are encouraging but must be viewed cautiously, as the datasets represent a fraction of a green sea turtle generation, up to fifty years. While the threats of pollution, habitat loss through coastal development, beachfront lighting, and fisheries bycatch continue, the North Atlantic DPS appears to be somewhat resilient to future perturbations.

Recovery Goals

See the 1998 and 1991 recovery plans for the Pacific, East Pacific and Atlantic populations of green turtles for complete down-listing/delisting criteria for recovery goals for the species. Broadly, recovery plan goals emphasize the need to protect and manage nesting and marine habitat, protect and manage populations on nesting beaches and in the marine environment, increase public education, and promote international cooperation on sea turtle conservation topics.

9.6 Leatherback sea turtle

The leatherback sea turtle is unique among sea turtles for its large size, wide distribution (due to thermoregulatory systems and behavior), and lack of a hard, bony carapace. It ranges from tropical to subpolar latitudes, worldwide (Figure 7).

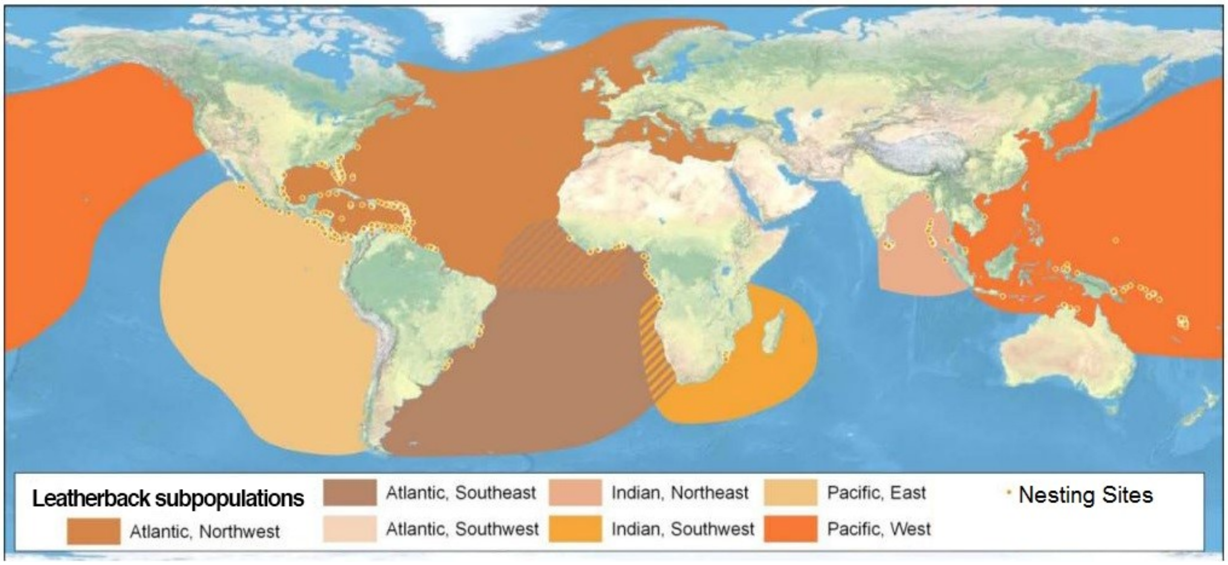


Figure 7. Map of leatherback sea turtle range. From Wallace et al. 2010.

Leatherbacks are the largest living turtle, reaching lengths of six feet long, and weighing up to one ton. Leatherback sea turtles have a distinct black leathery skin covering their carapace with pinkish white skin on their belly.

The species was first listed under the Endangered Species Conservation Act (35 FR 8491) and listed as endangered under the ESA since 1973 (Table 11).

Table 11. Leatherback turtle summary information.

Species	Common Name	Distinct Population Segment	ESA Status	Recent Review Year	Listing	Recovery Plan	Critical Habitat
Dermochelys coriacea	**Leatherback sea turtle**	**None**	**Endangered** range wide	2013	E – 35 FR 8491	U.S. Caribbean, Atlantic and Gulf of Mexico	44 FR 17710 and 77 FR 4170

We used information available in the five year review (NMFS 2013d) and the critical habitat designation (77 FR 61573) to summarize the life history, population dynamics and status of the species, as follows.

Life History

Age at maturity has been difficult to ascertain, with estimates ranging from five to twenty-nine years (Avens et al. 2009; Spotila et al. 1996). Females lay up to seven clutches per season, with more than sixty-five eggs per clutch and eggs weighing greater than 80 grams (Reina et al. 2002;

Wallace et al. 2007). The number of leatherback hatchlings that make it out of the nest on to the beach (i.e., emergent success) is approximately fifty percent worldwide (Eckert et al. 2012). Females nest every one to seven years. Natal homing, at least within an ocean basin, results in reproductive isolation between five broad geographic regions: eastern and western Pacific, eastern and western Atlantic, and Indian Ocean. Leatherback sea turtles migrate long, transoceanic distances between their tropical nesting beaches and the highly productive temperate waters where they forage, primarily on jellyfish and tunicates. These gelatinous prey are relatively nutrient-poor, such that leatherbacks must consume large quantities to support their body weight. Leatherbacks weigh about thirty-three percent more on their foraging grounds than at nesting, indicating that they probably catabolize fat reserves to fuel migration and subsequent reproduction (James et al. 2005; Wallace et al. 2006). Sea turtles must meet an energy threshold before returning to nesting beaches. Therefore, their remigration intervals (the time between nesting) are dependent upon foraging success and duration (Hays 2000; Price et al. 2004).

Population Dynamics

The following is a discussion of the species' population and its variance over time. This section includes abundance, population growth rate, genetic diversity, and spatial distribution as it relates to the leatherback sea turtle.

Leatherbacks are globally distributed, with nesting beaches in the Pacific, Atlantic, and Indian oceans. Detailed population structure is unknown, but is likely dependent upon nesting beach location. Based on estimates calculated from nest count data, there are between 34,000 and 94,000 adult leatherbacks in the North Atlantic (TEWG 2007a). In contrast, leatherback populations in the Pacific are much lower. Overall, Pacific populations have declined from an estimated 81,000 individuals to less than 3,000 total adults and sub-adults (Spotila et al. 2000). Population abundance in the Indian Ocean is difficult to assess due to lack of data and inconsistent reporting. Available data from southern Mozambique show that approximately ten females nest per year from 1994 to 2004, and about 296 nests per year counted in South Africa (NMFS 2013d).

Population growth rates for leatherback sea turtles vary by ocean basin. Counts of leatherbacks at nesting beaches in the western Pacific indicate that the subpopulation has been declining at a rate of almost six percent per year since 1984 (Tapilatu et al. 2013). Leatherback subpopulations in the Atlantic Ocean, however, are showing signs of improvement. Nesting females in South Africa are increasing at an annual rate of four to 5.6 percent, and from nine to thirteen percent in Florida and the U.S. Virgin Islands (TEWG 2007a), believed to be a result of conservation efforts.

Analyses of mitochondrial DNA from leatherback sea turtles indicates a low level of genetic diversity, pointing to possible difficulties in the future if current population declines continue (Dutton et al. 1999). Further analysis of samples taken from individuals from rookeries in the Atlantic and Indian oceans suggest that each of the rookeries represent demographically independent populations (NMFS 2013d). Genetic analyses using microsatellite markers along with mitochondrial DNA and tagging data indicate there are seven groups or breeding populations in the Atlantic Ocean: Florida, Northern Caribbean, Western Caribbean, Southern Caribbean/Guianas, West Africa, South Africa, and Brazil (TEWG 2007b).

Leatherback sea turtles are distributed in oceans throughout the world. Leatherbacks occur throughout marine waters, from nearshore habitats to oceanic environments (Shoop and Kenney 1992). Movements are largely dependent upon reproductive and feeding cycles and the oceanographic features that concentrate prey, such as frontal systems, eddy features, current boundaries, and coastal retention areas (Benson et al. 2011).

Status

The leatherback sea turtle is an endangered species whose once large nesting populations have experienced steep declines in recent decades. The primary threats to leatherback sea turtles include fisheries bycatch, harvest of nesting females, and egg harvesting. Because of these threats, once large rookeries are now functionally extinct, and there have been range-wide reductions in population abundance. Other threats include loss of nesting habitat due to development, tourism, and sand extraction. Lights on or adjacent to nesting beaches alter nesting adult behavior and are often fatal to emerging hatchlings as they are drawn to light sources and away from the sea. Plastic ingestion is common in leatherbacks and can block gastrointestinal tracts leading to death. Climate change may alter sex ratios (as temperature determines hatchling sex), range (through expansion of foraging habitat), and habitat (through the loss of nesting beaches, because of sea-level rise. The species' resilience to additional perturbation is low.

Recovery Goals

See the 1998 and 1991 Recovery Plans for the U.S. Pacific and U.S Caribbean, Gulf of Mexico and Atlantic leatherback sea turtles for complete down listing/delisting criteria for each of their respective recovery goals. The following items were the top five recovery actions identified to support in the Leatherback Five Year Action Plan:

1. Reduce fisheries interactions.
2. Improve nesting beach protection and increase reproductive output.
3. International cooperation.
4. Monitoring and research.
5. Public engagement.

10 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 C.F.R. §402.02).

10.1 Habitat Degradation

Habitat degradation impacts whales on a broad scale through impaired water quality and exposure to contaminants, oil spills, and run-off from coastal areas. Contaminants cause adverse health effects in whales. Contaminants may be introduced by rivers, coastal runoff, wind, ocean dumping, dumping of raw sewage by boats and various industrial activities, including offshore oil and gas or mineral exploitation (Garrett 2004; Grant and Ross 2002; Hartwell 2004). The accumulation of persistent pollutants through trophic transfer may cause mortality and sub-lethal effects in long-lived higher trophic level animals (Waring et al. 2008), including immune system abnormalities, endocrine disruption, and reproductive effects (Krahn et al. 2007). Recent efforts have led to improvements in regional water quality and monitored pesticide levels have declined, although the more persistent chemicals are still detected and are expected to endure for years (Grant and Ross 2002; Mearns 2001).

Marine debris is a significant concern for listed species and their habitats. Marine debris has been discovered to be accumulating in gyres throughout the oceans. The input of plastics into the marine environment also constitutes a significant degradation to the marine environment. In 2010, an estimated 4.8 to 12.7 million metric tons of plastic entered the ocean globally (Baulch and Simmonds 2015). Law et al. (2010) presented a time series of plastic content at the surface of the western North Atlantic Ocean and Caribbean Sea from 1986 to 2008. More than 60% of 6,136 surface plankton net tows collected small, buoyant plastic pieces. The data identified an accumulation zone east of Bermuda that is similar in size to the accumulation zone in the Pacific Ocean. Over half of cetacean species (including humpback, fin, sei, and sperm whales) are known to ingest marine debris (mostly plastic), with up to 31% of individuals in some populations containing marine debris in their guts and being the cause of death for up to 22% of individuals found stranded on shorelines (Baulch and Perry 2014). Microplastics have been detected in whale feeding grounds in the Mediterranean, placing baleen whales at risk of ingesting microplastics; the impacts of ingestion remain unknown (Deudero and Alomar 2015; Fossi 2015).

Ingestion of marine debris can have fatal consequences for large whales. In 1989, a stranded sperm whale along the Mediterranean was found to have died from ingesting plastic that blocked its' digestive tract. A sperm whale examined in Iceland had a lethal disease thought to have been caused by the complete obstruction of the gut with plastic marine debris (Lambertsen 1990). Further incidents may occur but remain undocumented when carcasses do not strand. While marine debris and plastics are a concern for Gulf of Mexico Bryde's whales, the Status Review Team did not rank these threats very high for the species, believing that other more immediate threats like oil spills, vessel strikes, and anthropogenic noise were more significant.

For sea turtles, marine debris is a problem due primarily to individuals ingesting debris and blocking the digestive tract, causing death or serious injury (Laist et al. 1999; Lutcavage et al. 1997). Schuyler et al. (2015) estimated that, globally, 52 percent of individual sea turtles have ingested marine debris. Of Pacific green sea turtles, 91 percent had marine debris (mostly plastics) in their guts (Wedemeyer-Strombel et al. 2015). Gulko and Eckert (2003) estimated that between one-third and one-half of all sea turtles ingest plastic at some point in their lives; this figure is supported by data from Lazar and Gracan (2010), who found 35 percent of loggerheads had plastic in their gut. Over 50 percent of loggerheads had marine debris in their guts (greater than 96 percent of which was plastic) in the Indian Ocean (Hoarau et al. 2014). One study found 37 percent of dead leatherback turtles had ingested various types of plastic (Mrosovsky et al. 2009). A Brazilian study found that 60 percent of stranded green sea turtles had ingested marine debris (primarily plastic and oil; Bugoni et al. 2001), 70 percent of stranded green turtles in Uruguay presented plastic debris in their guts (Vélez-Rubio et al. 2018). Loggerhead sea turtles had a lesser frequency of marine debris ingestion. Plastic is possibly ingested out of curiosity or due to confusion with prey items; for example, plastic bags can resemble jellyfish (Milton and Lutz 2003). Marine debris consumption has been shown to depress growth rates in post-hatchling loggerhead sea turtles, elongating the time required to reach sexual maturity and increasing predation risk (McCauley and Bjorndal 1999). Sea turtles can also become entangled and die in marine debris, such as discarded nets and monofilament line (Laist et al. 1999; Lutcavage et al. 1997; NRC 1990; O'Hara et al. 1988). Studies of shore cleanups have found that marine debris washing up along the northern Gulf of Mexico shoreline amounts to about 100 kilogram/km (ACC 2010; LADEQ 2010; MASGC 2010; TGLO 2010). Sea turtles can also become entangled and die in marine debris, such as discarded nets and monofilament line (Laist et al. 1999; Lutcavage et al. 1997; NRC 1990; O'Hara et al. 1988).

10.2 Entrapment and Entanglement in Fishing Gear

Globally, 6.4 million tons of fishing gear is lost in the oceans every year (Wilcox et al. 2015). Fishery interaction remains a major limit on sea turtle recovery. NMFS (2002) estimated that 62,000 loggerhead sea turtles have been killed as a result of incidental capture and drowning in shrimp trawl gear. Although turtle excluder devices and other bycatch reduction devices have significantly reduced the level of bycatch to sea turtles and other marine species in U.S. waters, mortality still occurs in Gulf of Mexico waters.

In addition to commercial bycatch, recreational hook-and-line interaction also occurs. Cannon and Flanagan (1996) reported that from 1993 to 1995, at least 170 Kemp's ridley sea turtles were hooked or tangled by recreational hook-and-line gear in the northern Gulf of Mexico. Of these, 18 were dead stranded turtles, 51 were rehabilitated turtles, five died during rehabilitation, and 96 were reported as released by fishermen.

Fisheries interactions represent a significant threat to whales throughout their range, and Gulf of Mexico Bryde's whales are at risk from entanglement in fishing gear as well. Whales are often killed or injured during interactions with commercial fishing gear. Along the Atlantic coast of the U.S. and the Maritime Provinces of Canada, there were 160 reports of humpback whales being entangled in fishing gear between 1999 and 2005 (Cole et al. 2005; Nelson et al. 2007). Of these, 95 entangled humpback whales were confirmed, with 11 whales sustaining injuries and nine dying of their wounds. Several humpback whales are also known to have become entangled in the North Pacific (Angliss and Outlaw 2007; Hill et al. 1997). Sperm whales are also known to have become entangled in commercial fishing gear and 17 individuals are known to have been struck by vessels (Jensen and Silber 2004). Sperm whales are also killed incidentally by gill nets at a rate of roughly nine per year (data from 1991 to 1995) in U.S. Pacific waters (Barlow et al. 1997). Sperm whales interact with (i.e., remove fish from) longline fisheries in the Gulf of Alaska and entanglement has rarely been recorded (Hill and DeMaster 1999; Rice 1989; Sigler et al. 2008). Bryde's whales range wide are infrequently reported by fisheries observer programs in U.S. waters, with four entanglement cases documented from 1994 to the publication of the status review (Rosel 2016a). There were no serious injury or mortality reported for Gulf of Mexico Bryde's whales from 2011 to 2015 (Henry et al. 2017).

10.3 Dredging

Marine dredging vessels are common within U.S. coastal waters. Construction and maintenance of federal navigation channels and dredging in sand mining sites have been identified as sources of sea turtle mortality and are currently being undertaken along the U.S. East Coast, such as in Port Everglades, Florida. Hopper dredges in the dredging mode are capable of moving relatively quickly compared to sea turtle swimming speed and can thus overtake, entrain, and kill sea turtles as the suction drag head(s) of the advancing dredge catch up to resting or swimming turtles. Entrained sea turtles rarely survive. Relocation trawling frequently occurs in association with dredging projects to reduce the potential for dredging to injure or kill sea turtles (Dickerson et al. 2007). Dredging has been documented to capture or kill 168 sea turtles from 1995 to 2009 in the Gulf of Mexico, including 97 loggerheads, 35 Kemp's ridleys, 32 greens, and three unidentified sea turtles (USACOE 2010). Dredging was not considered as a threat to Gulf of Mexico Bryde's whales in the status review.

10.4 Military Training and Testing Activities

Military testing and training may also affect listed species in the Gulf of Mexico. The air space over the Gulf of Mexico is used extensively by the Department of Defense for conducting various air-to-air and air-to-surface operations. Nine military warning areas and five water test areas are located within the Gulf of Mexico. The western Gulf of Mexico has four warning areas that are used for military operations. The areas total approximately 21 million acres or 58 percent of the area. In addition, six blocks in the western Gulf of Mexico are used by the Navy for mine warfare testing and training. The central Gulf of Mexico has five designated military warning areas that are used for military operations. These areas total approximately 11.3 million acres.

Naval activities conducted during training exercises in designated naval operating areas and training ranges have the potential to adversely harm Gulf of Mexico Bryde's whales and sea turtles because of the active sonar sources and explosives used. Species occurring in the action area could experience stressors from several naval training ranges or facilities listed below. Listed individuals travel widely in the North Atlantic and could be exposed to naval activities in several ranges.

- The Virginia Capes, Cherry Point, and Jacksonville-Charleston Operating Areas, which are situated consecutively along the migratory corridor for sea turtles, and
- The Key West, Gulf of Mexico, Bermuda, and Puerto Rican Complexes have the potential to overlap the range of ESA-listed sea turtles and the Gulf of Mexico Bryde's whale.

Naval activities to which individuals could be exposed include, among others, vessel and aircraft transects, munition detonations, and sonar use.

From 2009 to 2012, NMFS issued a series of biological opinions to the U.S. Navy for training activities occurring within their Virginia Capes, Cherry Point, and Jacksonville Range Complexes that anticipated annual levels of take of listed species incidental to those training activities through 2014. During the proposed activities 344 hardshell sea turtles (any combination of green, hawksbill, Kemp's ridley, or northwest Atlantic loggerhead sea turtles) per year were expected to be harassed as a result of their behavioral responses to mid- and high-frequency active sonar transmissions.

In 2014, NMFS issued a biological opinion to the U.S. Navy on all testing and training activities in the Atlantic basin. These actions would include the same behavioral and hearing loss effects as described above, but would also include other sub-lethal injuries that lead to fitness consequences and mortality that can lead to the loss of individuals from their populations.

NMFS has completed consultations on Eglin Air Force Base testing and training activities in the Gulf of Mexico. These consultations concluded that the incidental take of sea turtles is likely to occur. These opinions have issued incidental take for these actions: Eglin Gulf Test and Training Range (NMFS 2004b), the Precision Strike Weapons Tests (NMFS 2005a), the Santa Rosa Island Mission Utilization Plan (NMFS 2005b), Naval Explosive Ordnance Disposal School (NMFS 2004a), Eglin Maritime Strike Operations Tactics Development and Evaluation (NMFS 2013a), and Ongoing Eglin Gulf Testing and Training Activities (NMFS 2017c). These consultations determined the training operations would adversely affect sea turtles but would not jeopardize their continued existence. They further determined that because the activities were to be completed over shallow shelf waters (less than 100 meters), that they were not likely to adversely affect sperm whales or Bryde's whales.

Anticipated impacts from harassment include changes from foraging, resting, and other behavioral states that require lower energy expenditures to traveling, avoidance, and behavioral states that require higher energy expenditures and, therefore, would represent significant disruptions of the normal behavioral patterns of the animals that have been exposed. Behavioral responses that result from stressors associated with these training activities are expected to be temporary and would not affect the reproduction, survival, or recovery of these species.

10.5 Pollutants

The Gulf of Mexico is a sink for massive levels of pollution from a variety of marine and terrestrial sources, which ultimately can interfere with ecosystem health and particularly that of sea turtles and Gulf of Mexico Bryde's whales. Sources include the petrochemical industry in and along the Gulf of Mexico, wastewater treatment plants, septic systems, industrial facilities, agriculture, animal feeding operations, and improper refuse disposal. The Mississippi River drains 80 percent of United States cropland (including the fertilizers, pesticides, herbicides, and other contaminants that are applied to it) and discharges into the Gulf of Mexico (MMS 1998). Agricultural discharges and discharges from large urban centers (e.g., Tampa) contribute contaminants as well as coliform bacteria to Gulf of Mexico habitats (Garbarino et al. 1995). These contaminants can be carried long distances from terrestrial or nearshore sources and ultimately accumulate in offshore pelagic environments (USCOP 2004). The ultimate impacts of this pollution are poorly understood.

Significant attention has been paid to nutrient enrichment of Gulf of Mexico waters, which leads to algal blooms (including harmful algal blooms), oxygen depletion, loss of seagrass and coral reef habitat, and the formation of a hypoxic "dead zone" (USCOP 2004). This hypoxic event occurs annually from as early as February to as late as October, spanning roughly 12,700 square kilometers (although in 2005 the "dead zone" grew to a record size of 22,000 square kilometers) from the Mississippi River Delta to Galveston, Texas (LUMCON 2005; MMS 1998; Rabalais et al. 2002; USGS 2010). Although sea turtles do not extract oxygen from sea water, numerous staple prey items of sea turtles, such as fish, shrimp, and crabs, do and are killed by the hypoxic conditions (Craig et al. 2001). More generally, the "dead zone" decreases biodiversity, alters marine food webs, and destroys habitat (Craig et al. 2001; Rabalais et al. 2002). High nitrogen loads entering the Gulf of Mexico from the Mississippi River is the likely culprit; nitrogen concentrations entering the Gulf of Mexico have increased three fold over within 60 years (Rabalais et al. 2002).

10.6 Oil Spills and Releases

Exposure to hydrocarbons released into the environment via oil spills and other discharges pose risks to marine species. Hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability.

Oil pollution has been a significant concern in the Gulf of Mexico for several decades due to the large amount of extraction and refining activity in the region. Routine discharges into the northern Gulf of Mexico (not including oil spills) include roughly 88,200 barrels of petroleum per year from municipal and industrial wastewater treatment plants and roughly 19,250 barrels from produced water discharged overboard during oil and gas operations (MMS 2007b; USN 2008). These sources amount to over 100,000 barrels of petroleum discharged into the northern Gulf of Mexico annually. Although this is only 10 percent of the amount discharged in a major oil spill, such as the Exxon *Valdez* spill (roughly one million barrels), this represents a significant and "unseen" threat to Gulf of Mexico wildlife and habitats. Generally, accidental oil spills may amount to less than 24,000 barrels of oil discharged annually in the northern Gulf of Mexico, making non-spilled oil normally one of the leading sources of oil discharge into the Gulf of Mexico, although incidents such as the 2010 *Deepwater Horizon* incident are exceptional (MMS 2007a). The other major source from year to year is oil naturally seeping into the northern Gulf of Mexico. Although exact figures are unknown, natural seepage is estimated at between 120,000 and 980,000 barrels of oil annually (MacDonald et al. 1993; MMS 2007b).

Although non-spilled oil is the primary contributor to oil introduced into the Gulf of Mexico, concern over accidental oil spills is well-founded (Campagna et al. 2011). Over five million barrels of oil and one million barrels of refined petroleum products are transported in the northern Gulf of Mexico daily (MMS 2007b); worldwide, it is estimated that 900,000 barrels of oil are released into the environment as a result of oil and gas activities (Epstein and (Eds.). 2002). Even if a small fraction of the annual oil and gas extraction is released into the marine environment, major, concentrated releases can result in significant environmental impacts. Because of the density of oil extraction, transport, and refining facilities in the Houston/Galveston and Mississippi Delta areas (and the extensive activities taking place at these facilities), these locations have the greatest probability of experiencing oil spills. Oil released into the marine environment contains aromatic organic chemicals known to be toxic to a variety of marine life; these chemicals tend to dissolve into the air to a greater or lesser extent, depending on oil type and composition (Yender et al. 2002). Solubility of toxic components is generally low, but does vary and can be relatively high (0.5 to 167 parts per billion) (Yender et al. 2002).

Several oil spills have affected the northern Gulf of Mexico over the past few years, largely due to hurricanes. The impacts of Hurricane Ivan in 2004 on the Gulf Coast included pipeline damage causing 16,000 barrels of oil to be released and roughly 4,500 barrels of petroleum products from other sources (BOEMRE 2010; USN 2008). The next year, Hurricane Katrina caused widespread damage to onshore oil storage facilities, releasing 191,000 barrels of oil (LHR 2010). Another 4,530 barrels of oil were released from 70 other smaller spills associated with hurricane damage. Shortly thereafter, Hurricane Rita damaged offshore facilities resulting in 8,429 barrels of oil released (USN 2008).

Major oil spills have impacted the Gulf of Mexico for decades (NMFS 2010). Until 2010, the largest oil spill in North America (Ixtoc oil spill) occurred in the Bay of Campeche (1979), when a well "blew out," allowing oil to flow into the marine environment for nine months, releasing 2.8 to 7.5 million barrels of oil. Oil from this release eventually reached the Texas coast, including the Kemp's ridley sea turtle nesting beach at Rancho Nuevo, where 9,000 hatchlings were airlifted and released offshore (NOAA 2003). Over 7,600 cubic meters of oiled sand was eventually removed from Texas beaches, and 200 gallons of oil were removed from the area around Rancho Nuevo (NOAA 2003). Eight dead and five live sea turtles were recovered during the oil spill event; although cause of deaths were not determined, oiling was suspected to play a part (NOAA 2003). Also in 1979, the oil tanker *Burmah Agate* collided with another vessel near

Galveston, Texas, causing an oil spill and fire that ultimately released 65,000 barrels of oil into estuaries, beachfronts, and marshland along the northern and central Texas coastline (NMFS 2010). Clean up of these areas was not attempted due to the environmental damage such efforts would have caused. Another 195,000 barrels of oil are estimated to have been burned in a multi-month-long fire aboard the *Burmah Agate* (NMFS 2010). The tanker *Alvenus* grounded in 1984 near Cameron, Louisiana, spilling 65,500 barrels of oil, which spread west along the shoreline to Galveston (NMFS 2010). One oiled sea turtle was recovered and released (NOAA 2003). In 1990, the oil tanker *Megaborg* experienced an accident near Galveston during the lightering process and released 127,500 barrels of oil, most of which burned off in the ensuing fire (NMFS 2010).

On April 20 2010, a fire and explosion occurred aboard the semisubmersible drilling platform *Deepwater Horizon* roughly 80 kilometers southeast of the Mississippi Delta (NOAA 2010a). The platform had 17,500 barrels of fuel aboard, which likely burned, escaped, or sank with the platform (NOAA 2010a). However, once the platform sank, the riser pipe connecting the platform to the wellhead on the seafloor broke in multiple locations, initiating an uncontrolled release of oil from the exploratory well. Over the next three months, oil was released into the Gulf of Mexico, resulting in oiled regions of Texas, Louisiana, Mississippi, Alabama, and Florida and widespread oil slicks throughout the northern Gulf of Mexico that closed more than one-third of the US Gulf of Mexico Exclusive Economic Zone to fishing due to contamination concerns. Apart from the widespread surface slick, massive undersea oil plumes formed, possibly through the widespread use of dispersants and reports of tarballs washing ashore throughout the region were common. Although estimates vary, roughly 4.1 million barrels of oil were released directly into the Gulf of Mexico (USDOI 2012).

During surveys in offshore oiled areas, 1,050 sea turtles were seen and about half of these were captured. Of the 520 sea turtles captured, 394 showed signs of being oiled. A large majority of these were juveniles, mostly green (311) and Kemp's ridley sea turtles (451). An additional 78 adult or sub adult loggerheads were observed (Witherington et al. 2012). Captures of sea turtles along the Louisiana's Chandeleur Islands in association with emergency sand berm construction resulted in 185 loggerheads, eight Kemp's ridley, and a single green sea turtle being captured and relocated (Dickerson and Bargo 2012). In addition, 274 nests along the Florida panhandle were relocated that ultimately produced 14,700 hatchlings, but also had roughly two percent mortality associated with the translocation (MacPherson et al. 2012). Females that laid these nests continued to forage in the area, which was exposed to the footprint of the oil spill (Hart et al. 2014). Large areas of *Sargassum* were affected, with some heavily oiled or dispersant-coated *Sargassum* sinking and other areas accumulating oil where sea turtles could inhale, ingest, or contact it (Powers et al. 2013; USDOI 2012). Of 574 sea turtles observed in these *Sargassum* areas, 464 were oiled (USDOI 2012).

The *Deepwater Horizon* oil spill was severely damaging to the Gulf of Mexico Bryde's whale population. The Deepwater Horizon Oil Spill Final Programmatic Damage Assessment ranked

Bryde's whales as the most impacted marine mammal species. Nearly half of the population was estimated to have been exposed to the oil spill, with 17 percent of the population having died because of the spill. In addition to the mortalities, other sub-lethal effect were estimated, with 22 percent excess failed pregnancies and 18 percent higher likelihood of adverse health effects (DWHTrustees 2016).

Specific causes of injury or death have not yet been established for many of these individuals as investigations into the role of oil in these animals' health status continue. Above average fisheries bycatch may also have played a role in the large numbers of strandings observed in the central northern Gulf of Mexico. Large numbers of sea turtles also stranded in the region in 2011. Investigations, including necropsies, were undertaken by NMFS to attempt to determine the cause of those strandings. Based on the findings, the two primary considerations for the cause of death of the turtles that were necropsied are forced submergence or acute toxicosis. With regard to acute toxicosis, sea turtle tissue samples were tested for biotoxins of concern in the northern Gulf of Mexico. Environmental information did not indicate a harmful algal bloom of threat to marine animal health was present in the area. With regard to forced submergence, the only known plausible cause of forced submergence that could explain this event is incidental capture in fishing gear.

Use of dispersants can increase oil dispersion, raising the levels of toxic constituents in the water column, but speeding chemical degradation overall (Yender et al. 2002). Although the effects of dispersant chemicals on sea turtles is unknown, testing on other organisms have found currently used dispersants to be less toxic than those used in the past (NOAA 2003). It is possible that dispersants can interfere with surfactants in the lungs (surfactants prevent the small spaces in the lungs from adhering together due to surface tension, facilitating large surface areas for gas exchange), as well as interfere with digestion, excretion, and salt gland function (NOAA 2003). After dispersion, the remaining oil becomes tar, which forms floating balls that can be transported thousands of kilometers into the North Atlantic. The most toxic chemicals associated with oil can enter marine food chains and bioaccumulate in invertebrates such as crabs and shrimp to a small degree (prey of some sea turtles; Law and Hellou 1999; Marsh et al. 1992), but generally do not bioaccumulate or biomagnify in finfish (Baussant et al. 2001; Meador et al. 1995; Varanasi et al. 1989; Yender et al. 2002). Sea turtles are known to ingest and attempt to ingest tar balls, which can block their digestive systems, impairing foraging or digestion and potentially causing death (NOAA 2003), ultimately reducing growth, reproductive success, as well as increasing mortality and predation risk (Fraser 2014). Tarballs were found in the digestive tracts of 63 percent of post hatchling loggerheads in 1993 following an oil spill and 20 percent of the same species and age class in 1997 (Fraser 2014). Oil exposure can also cause acute damage on direct exposure to oil, including skin, eye, and respiratory irritation, reduced respiration, burns to mucous membranes such as the mouth and eyes, diarrhea, gastrointestinal ulcers and bleeding, poor digestion, anemia, reduced immune response, damage to kidneys or liver, cessation of salt gland function, reproductive failure, and death (NOAA 2003; NOAA 2010b; Vargo et al. 1986c; Vargo et al. 1986b; Vargo et al. 1986a). Nearshore spills or large offshore spills can oil beaches on which sea turtles lay their eggs, causing birth defects or mortality in the nests (NOAA 2003; NOAA 2010b).

Oil can also cause indirect effects to sea turtles through impacts to habitat and prey organisms. Seagrass beds may be particularly susceptible to oiling as oil contacts grass blades and sticks to them, hampering photosynthesis and gas exchange (Wolfe et al. 1988). If spill cleanup is attempted, mechanical damage to seagrass can result in further injury and long-term scarring. Loss of seagrass due to oiling would be important to green sea turtles, as this is a significant component of their diets (NOAA 2003). The loss of invertebrate communities due to oiling or oil toxicity would also decrease prey availability for hawksbill, Kemp's ridley, and loggerhead sea turtles (NOAA 2003). Furthermore, Kemp's ridley and loggerhead sea turtles, which commonly forage on crustaceans and mollusks, may ingest large amounts of oil due oil adhering to the shells of these prey and the tendency for these organisms to bioaccumulate the toxins found in oil (NOAA 2003). It is suspected that oil adversely affected the symbiotic bacteria in the gut of herbivorous marine iguanas when the Galapagos Islands experienced an oil spill, contributing to a more than 60 percent decline in local populations the following year. The potential exists for green sea turtles to experience similar impacts, as they also harbor symbiotic bacteria to aid in their digestion of plant material (NOAA 2003). Dispersants are believed to be as toxic to marine organisms as oil itself.

10.7 Entrainment, Entrapment, and Impingement in Power Plants

Power plants withdraw millions of gallons of water per day from rivers, bays, or other water bodies to cool the nuclear reactor. The cooling water intake structure can impinge, entrap, or entrain aquatic organisms that are caught in the intake as the water is drawn into the cooling water intake structure. Aquatic organisms can be killed or injured as a result. There are numerous power plants in coastal areas of the action area, from Florida to Texas (Muyskens et al. 2015).

Sea turtles have been affected by entrainment, entrapment, and impingement in the cooling-water systems of electrical generating plants. We do not have data for many of these, but have reason to believe that impacts top particularly loggerhead and green sea turtles may be important. Over 40 years of operation at the St. Lucie Nuclear Power Plant in Florida, 16,600 sea turtles have been captured to avoid being drawn into cooling structures (which likely would kill sea turtles that enter), and 297 have died (NMFS 2016b). These included: 9552 loggerheads (including 180 mortalities), 6886 green (including 112 mortalities), 42 leatherback (no mortalities), 67 Kemp's ridley (including four mortalities), and 65 hawksbill sea turtles (including one mortality) (NMFS 2016b). Only since 2001 have the mortalities been classified as causally (or non-causally) related to operation of St. Lucie Nuclear Power Plant, and not all mortalities were causal to St. Lucie Nuclear Power Plant operations: 59 percent of dead loggerheads were causal to St. Lucie Nuclear Power Plant operation, 46 percent of greens, and none of hawksbills (no leatherback or Kemp's ridley mortalities occurred since 2001) (NMFS 2016b).

Because of their size and distribution, Gulf of Mexico Bryde's whales are not susceptible to the risks of entrainment or entrapment on cooling water intake structures.

A comprehensive biological opinion that covers all power plant cooling water intakes was issued by the USFWS and NMFS in May 2014. Effects would generally involve stress, injury, and mortality from being captured, entrained, or impinged by cooling water intake systems. Cooling water discharge (which is warmer than the surrounding water temperature) can alter habitat around the outflow pipe. This can present advantages (such as shelter from cold water temperatures that may stun sea turtles and allow for unseasonal growth of marine plants that green sea turtles may forage upon) and disadvantages (such as altering normal ecology sea turtles rely upon and result in individuals depending on unnatural conditions that can be problematic if a plant is decommissioned or goes offline) for ESA-listed species.

10.8 Anthropogenic Noise: Seismic Surveys and Oil and Gas Development

Destruction of habitat is considered one of the greatest threats to Gulf of Mexico Bryde's whales, including habitat degradation during energy exploration and production and anthropogenic noise during seismic surveys (Rosel 2016a).

Anthropogenic sources of ambient noise include transportation and shipping traffic, dredging, construction activities, geophysical surveys, and sonars. In general, it has been asserted that ocean background noise levels have doubled every decade for the last six decades in some areas, primarily due to shipping traffic (IWC 2004). The acoustic noise that commercial traffic contributes to the marine environment is a concern for listed species because it may impair communication between individuals (Hatch et al. 2008), among other effects (Eriksen and Pakkenberg 2013; Francis and Barber 2013).

A number of factors may be directly or indirectly affecting listed species in the action area by degrading habitat. In-water construction activities (e.g., pile driving associated with shoreline projects) in both inland waters as well as coastal waters in the action area can produce sound levels sufficient to disturb sea turtles under some conditions. Pressure levels from 190 to 220 decibels re 1 micro Pascal were reported for piles of different sizes in a number of studies (NMFS 2006a). The majority of the sound energy associated with pile driving is in the low frequency range (less than 1,000 Hertz; Illingworth and Rodkin Inc. 2001; Illingworth and Rodkin Inc. 2004; Reyff 2003), which is the frequency range at which sea turtles hear best. Dredging operations also have the potential to emit sounds at levels that could disturb sea turtles. Depending on the type of dredge, peak sound pressure levels from 100 to 140 decibels re 1 micro Pascal were reported in one study (Clarke et al. 2003). As with pile driving, most of the sound energy associated with dredging is in the low-frequency range, less than 1,000 Hertz (Clarke et al. 2003), which is within the hearing range of baleen whales like the Gulf of Mexico Bryde's whale (NMFS 2016i).

Seismic surveys using towed air guns occur within the action area and are the primary exploration technique to locate oil and gas deposits, fault structure, and other geological hazards. Air guns generate intense low-frequency sound pressure waves capable of penetrating the seafloor and are fired repetitively at intervals of 10 to 20 seconds for extended periods (NRC 2003). Most of the energy from the guns is directed vertically downward, but significant sound emission also extends horizontally. Peak sound pressure levels from air guns usually reach 235 to 240 decibels at dominant frequencies of 5 to 300 hertz (NRC 2003). Most of the sound energy is at frequencies below 500 hertz.

Several measures have been adopted to reduce the sound pressure levels associated with in-water construction activities or prevent exposure of sea turtles and whales to sound. For example, a six-inch block of wood placed between the pile and the impact hammer used in combination with a bubble curtain can reduce sound pressure levels by about 20 decibels (NMFS 2008). Alternatively, pile driving with vibratory hammers produces peak pressures that are about 17 decibels lower than those generated by impact hammers (Nedwell and Edwards 2002). Other measures used in the action area to reduce the risk of disturbance from these activities include avoidance of in-water construction activities during times of year when sea turtles may be present; monitoring for sea turtles during construction activities; and maintenance of a buffer zone around the project area, within which sound-producing activities would be halted when whales or sea turtles enter the zone (NMFS 2008).

The northern Gulf of Mexico is the location of massive industrial activity associated with oil and gas extraction and processing. Over 4,000 oil and gas structures are located outside of state waters in the northern Gulf of Mexico; 90 percent of these occur off Louisiana and Texas (USN 2009). This is both detrimental and beneficial for sea turtles. These structures appreciably increase the amount of hard substrate in the marine environment and provide shelter and foraging opportunities for species like loggerhead sea turtles (Parker et al. 1983; Stanley and Wilson 2003). However, the Bureau of Ocean Energy Management requires that structures must be removed within one year of lease termination. Many of these structures are removed by explosively severing the underwater supportive elements, which produces a shock wave that kills, injures, or disrupts marine life in the blast radius (Gitschlag et al. 1997). For sea turtles, this means death or serious injury for individuals within a few hundred meters of the structure and overt behavioral (potentially physiological) impacts for individuals further away from the structure (Duronslet et al. 1986; Klima et al. 1988). Although observers and procedures are in place to mitigate impacts to sea turtles (i.e., not blasting when sea turtles are present), not all sea turtles are observed all the time, and low-level sea turtle injury and mortality still occurs (Gitschlag and Herczeg 1994; Gitschlag et al. 1997). Two loggerheads were killed in August 2010, and one Kemp's ridley was killed in July 2013, along with several additional stunning or sub-lethal injuries reported over the past five years (Gitschlag 2015). In an August 28, 2006 opinion, NMFS issued incidental take for Bureau of Ocean Energy Management-permitted explosive structure removals (NMFS 2006b). These levels were far surpassed by the *Deepwater Horizon* incident.

10.9 Cold Stunning

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

10.10 Vessel Strikes

Vessel strikes pose a significant threat to several whale species throughout their range. The vast majority of vessel strike mortalities are never identified, and actual mortality is higher than currently documented. More humpback whales are killed in collisions with ships than any other whale species except fin whales (Jensen and Silber 2003). Vessel strike is presently a concern for blue whale recovery. Dive data support a surface-oriented behavior during nighttime that would make blue whales particularly vulnerable to vessel strikes. There are concerns that, like right whales, blue whales may surface when approached by large vessels, a behavior that would increase their likelihood of being struck.

The northern Gulf of Mexico hosts a significant amount of shipping traffic, with billions of tons of tonnage and thousands of vessel calls annually. Shipping lanes transverse the Gulf of Mexico Bryde's whale's biologically important area near De Soto Canyon, which is also the proposed action area (Rosel 2016a). The species' dive pattern puts them at risk; one tagged individual spent 88 percent of its time within 15 meters of the surface at night (NMFS unpublished data). Spending so much time under water at night reduces the likelihood that a whale could be seen and avoided by a vessel operator (Rosel 2016a). Since Gulf of Mexico Bryde's whales have such a small population size, the impact of a mortality from even one vessel strike could be severe.

The impacts of vessel strikes to sea turtles are a poorly-studied threat, but have the potential to be an important source of mortality to sea turtle populations (Work et al. 2010). All sea turtles must surface to breathe, and several species are known to bask at the surface for long periods. Although sea turtles can move rapidly, sea turtles apparently are not able to avoid vessels moving at more than four kilometers per hour; most vessels move faster than this in open water (Hazel et al. 2007; Work et al. 2010). Given the high level of vessel traffic in the Gulf of Mexico, frequent injury and mortality could affect sea turtles in the region (MMS 2007b). Hazel et al. (2007) suggested that green sea turtles may use auditory cues to react to approaching vessels rather than visual cues, making them more susceptible to strike as vessel speed increases. Each state along the Gulf of Mexico has several hundred thousand recreational vessels registered, including Florida with nearly one million—the highest number of registered boats in the United States—and Texas with over 600,000 (ranked sixth nationally; NMMA 2007; USCG 2003; USCG 2005). Commercial vessel operations are also extensive. Vessels servicing the offshore oil and gas industry are estimated to make 115,675 to 147,175 trips annually, and many commercial vessels travel to and from some of the largest ports in the United States (such as New Orleans and Houston; MMS 2007a; USN 2008).

10.11 Disease

Disease is generally considered a minor threat to baleen whales (Clapham et al. 1999), and there is little information on the effects of disease or parasitism in Gulf of Mexico Bryde's whales. Both have been observed in Gulf of Mexico Bryde's whales (Paterson 1984; Priddel and Wheeler 1998; Pinto et al. 2004). Although there have been no known previous cases of morbillivirus in Gulf of Mexico Bryde's whales or other large cetaceans in the Gulf of Mexico, because of the critically small population size, such an outbreak would be catastrophic for the species (Rosel 2016a).

Green sea turtles are susceptible to natural mortality from fibropapillomatosis disease. Fibropapillomatosis results in the growth of tumors on soft external tissues (flippers, neck, tail, etc.), the carapace, the eyes, the mouth, and internal organs (gastrointestinal tract, heart, lungs, etc.) of turtles (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). These tumors range in size from 0.04 inches (0.1 centimeters) to greater than 11.81 inches (30 centimeters) in diameter and may affect swimming, vision, feeding, and organ function (Aguirre et al. 2002; Herbst 1994; Jacobson et al. 1989). Presently, scientists are unsure of the exact mechanism causing this disease, though it is believed to be related to both an infectious agent, such as a virus (Herbst et al. 1995), and environmental conditions (e.g., habitat degradation, pollution, low wave energy, and shallow water (Foley et al. 2005). Fibropapillomatosis is cosmopolitan, but it has been found to affect large numbers of animals in specific areas, including Hawaii and Florida (Herbst 1994; Jacobson 1990; Jacobson et al. 1991).

10.12 Climate Change

We discuss climate change as a threat common to all species addressed in this opinion, rather than in each of the species-specific narratives.

The 2014 Assessment Synthesis Report from the Working Groups on the Intergovernmental Panel on Climate Change concluded climate change is unequivocal (IPCC 2014). The report concludes oceans have warmed, with ocean warming the greatest near the surface (e.g., the upper 75 meters (246 feet) have warmed by 0.11° Celsius per decade over the period 1971 to 2010) (IPCC 2014). Global mean sea level rose by 0.19 meters (0.62 feet) between 1901 and 2010, and the rate of sea-level rise since the mid-19th century has been greater than the mean rate during the previous two millennia (IPCC 2014). Additional consequences of climate change include increased ocean stratification, decreased sea-ice extent, altered patterns of ocean circulation, and decreased ocean oxygen levels (Doney et al. 2012). Further, ocean acidity has increased by 26 percent since the beginning of the industrial era (IPCC 2014) and this rise has been linked to climate change. Climate change is also expected to increase the frequency of extreme weather and climate events including, but not limited to, cyclones, heat waves, and droughts (IPCC 2014). Climate change has the potential to impact species abundance, geographic distribution, migration patterns, timing of seasonal activities (IPCC 2014), and species viability into the future. Though predicting the precise consequences of climate change on highly mobile marine species, such as many of those considered in this opinion, is difficult (Simmonds and Isaac 2007), recent research has indicated a range of consequences already occurring.

Marine species ranges are expected to shift as they align their distributions to match their physiological tolerances under changing environmental conditions (Doney et al. 2012). Hazen et al. (2012) examined top predator distribution and diversity in the Pacific Ocean in light of rising sea surface temperatures using a database of electronic tags and output from a global climate model. He predicted up to a 35 percent change in core habitat area for some key marine predators in the Pacific Ocean, with some species predicted to experience gains in available core habitat and some predicted to experience losses. Notably, leatherback sea turtles were predicted to gain core habitat area, whereas loggerhead sea turtles are predicted to experience losses in available core habitat. McMahon and Hays (2006) predicted increased ocean temperatures would expand the distribution of leatherback sea turtles into more northern latitudes. The authors noted this is already occurring in the Atlantic Ocean. MacLeod (2009) estimated, based upon expected shifts in water temperature, 88 percent of cetaceans would be affected by climate change, with 47 percent likely to be negatively affected. Since Gulf of Mexico Bryde's whales have such a restricted range and little room to move northward into cooler waters, climate change was ranked as a serious threat to the survival of the species (Rosel 2016a).

The indirect effects of climate change would result from changes in the distribution of temperatures suitable for whale calving and rearing, the distribution and abundance of prey and abundance of competitors or predators. For species that undergo long migrations, individual movements are usually associated to prey availability or habitat suitability. If either is disrupted by changing ocean temperature regimes, the timing of migration can change or negatively impact population sustainability (Simmonds and Eliott. 2009). Higher water temperatures brought on by climate change can influence reproductive success by altering prey availability, as evidenced by low success of northern elephant seals during El Niño periods and the associated warmer waters; cooler, more productive waters are associated with higher first year pup survival (McMahon and Burton. 2005).

Sperm whale females were observed to have lower rates of conception following unusually warm sea surface temperature periods (Whitehead 1997). Marine mammals with restricted distributions linked to water temperature may be particularly exposed to range restriction (Issac 2009; Learmonth et al. 2006). MacLeod (2009) estimated that, based upon expected shifts in water temperature, 88 percent of cetaceans would be affected by climate change, 47 percent would be negatively affected, and 21 percent would be put at risk of extinction. Of greatest concern are cetaceans with ranges limited to non-tropical waters and preferences for shelf habitats (Macleod 2009). Kaschner et al. (2011) modeled marine mammal species richness, overlaid with projections of climate change and found that species in lower-latitude areas would likely be more affected than those in higher-latitude regions. Variations in the recruitment of krill and the reproductive success of krill predators correlate to variations in sea-surface temperatures and the extent of sea-ice cover age during winter months.

Changes in global climatic patterns are expected to have profound effects on coastlines worldwide, potentially having significant consequences for the ESA-listed species considered in this opinion that are partially dependent on terrestrial habitat areas (i.e., sea turtles). For example, rising sea levels are projected to inundate some sea turtle nesting beaches (Caut et al. 2009; Wilkinson and Souter 2008), change patterns of coastal erosion and sand accretion that are necessary to maintain those beaches, and increase the number of sea turtle nests destroyed by tropical storms and hurricanes (Wilkinson and Souter 2008). The loss of nesting beaches may have catastrophic effects on global sea turtle populations if they are unable to colonize new beaches, or if new beaches do not provide the habitat attributes (e.g., sand depth, temperature regimes, and refuge) necessary for egg survival. Additionally, increasing temperatures in sea turtle nests, as is expected with climate change, alters sex ratios, reduces incubation times (producing smaller hatchlings), and reduces nesting success due to exceeded thermal tolerances (Fuentes et al. 2009a; Fuentes et al. 2010; Fuentes et al. 2009b; Glen et al. 2003). All of these temperature related impacts have the potential to significantly impact sea turtle reproductive success and ultimately, long-term species viability. Poloczanska et al. (2009b) noted that extant sea turtle species have survived past climatic shifts, including glacial periods and warm events, and therefore may have the ability to adapt to ongoing climate change (e.g., by finding new nesting beaches). However, the authors also suggested since the current rate of warming is very rapid, expected change might outpace sea turtles' ability to adapt.

Previous warming events (e.g., El Niño, the 1977 through 1998 warm phase of the Pacific Decadal Oscillation) may illustrate the potential consequences of climate change. Off the U.S. west coast, past warming events have reduced nutrient input and primary productivity in the California Current, which also reduced productivity of zooplankton through upper-trophic level consumers (Doney et al. 2012; Sydeman et al. 2009; Veit et al. 1996).

This is not an exhaustive review of all available literature regarding the potential impacts of climate change to the species considered in this opinion. However, this review provides some examples of impacts that may occur. While it is difficult to accurately predict the consequences of climate change to the species considered in this opinion, a range of consequences are expected, ranging from beneficial to catastrophic.

10.13 Scientific Research and Permits

Scientific research permits issued by the NMFS currently authorize studies of ESA-listed species in the North Atlantic Ocean and the Gulf of Mexico, some of which extend into portions of the action area for the proposed project. The primary objective of these studies is generally to monitor populations or gather data for behavioral and ecological studies. For sea turtles, authorized research on ESA-listed sea turtles includes capture, handling, and restraint; satellite, sonic, and passive integrated transponder (PIT) tagging; blood and tissue collection; lavage; ultrasound; captive experiments; laparoscopy; and imaging.

Research activities involve "takes" by harassment, harm, pursuit, wound, entrapment, capture, and some mortality. There are numerous permits issued since 2009 under the provisions of the ESA authorizing scientific research on sea turtles. The consultations, which took place on the issuance of these ESA scientific research permits, each found that the authorized activities would not result in jeopardy to the species or adverse modification of designated critical habitat.

Currently, there are two scientific research permits that authorize take of Gulf of Mexico Bryde's whales: Permit No. 18786-01, held by the Marine Mammal Health and Stranding Network, and Permit No. 20605, held by Robin Baird. Permit No. 18786-01 authorizes takes of ESA-listed species as warranted (whales, pinnipeds, and sea turtles, including the proposed Gulf of Mexico Bryde's whale) in order to carry out response, rescue, and rehabilitation activities, including research activities (e.g., biopsy sampling, satellite tagging, etc.) related to emergency response. Permit No. 20605 authorizes takes of ESA-listed and proposed cetaceans and pinnipeds during research activities (e.g., biopsy sampling, satellite tagging, etc.). Specifically, Permit No. 20605 authorizes take for Gulf of Mexico Bryde's whales as shown in Table 12.

Table 12. Summary of currently authorized takes for research on Gulf of Mexico Bryde's Whales.

Permit	Applicant	Take Activities	Currently Authorized Takes	Life Stage
20605	Robin Baird	Acoustic, passive recording; Collect, remains for predation study; Collect, sloughed skin; Count/survey; Imaging, thermal; Import/export/receive, parts; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	60	Adult/juvenile
		Above activities + Sample, skin and blubber biopsy	5	Adult/juvenile
		Above activities + Instrument, suction-cup (e.g., VHF, TDR) OR Instrument, dart/barb tag	10	Adult/juvenile

Each of the conference opinions conducted for these consultations reached a no jeopardy and no adverse modification conclusion. The Permits Division will apply the same permit requirements to these permit holders as put forth in their current proposed action.

10.14 Impact of Environmental Baseline on ESA-Listed and Proposed Species

Listed resources are exposed to a wide variety of past and present state, Federal or private actions and other human activities that have already occurred or continue to occur in the action area. Any federal projects in the action area that have already undergone formal or early section 7 consultation, and state or private actions that are contemporaneous with this consultation also impact listed resources. However, the impact of those activities on the status, trend, or the demographic processes of threatened and endangered species remains largely unknown. To the best of our ability, we summarize the effects we can determine based upon the information available to us in this section.

Several of the activities described in this *Environmental Baseline* have significant and adverse consequences for nesting sea turtle aggregations whose individuals occur in the action area. In particular, the commercial fisheries annually capture substantial numbers of leatherback sea turtles.

10.14.1 Gulf of Mexico Bryde's Whales

Climate change has wide-ranging impacts, some of which can be experienced by Gulf of Mexico Bryde's whales in the action area. Climate change has been demonstrated to alter major current regimes and may alter those in the action area as they are studied further (Johnson et al. 2011; Poloczanska et al. 2009a). The availability and quality of prey in feeding areas can also influence the body condition of individuals.

Effects from anthropogenic acoustic sources, whether they are vessel noise, seismic sound, military activities, oil and gas activities, construction, or wind energy, could also have biologically significant impacts to Gulf of Mexico Bryde's whales in the action area. These activities increase the level of background noise in the marine environment, making communication more difficult over a variety of ranges. We expect that this increased collective sound level also reduce the sensory information that individuals can gather from their environment, an important consideration for species that gather information about their environment primarily through sound. At closer ranges to some of anthropogenic sound sources, behavioral responses also occur, including deflecting off migratory paths and changing vocalization, diving, and swimming patterns. At even higher received sound levels, physiological changes are likely to occur, including temporary or permanent loss of hearing and potential trauma of other tissues. Although this exposure is a small fraction of the total exposure individuals receive, it is believed expected to occur in rare instances.

For other species of ESA-listed whales (e.g., North Atlantic right whales), high levels of morbidity and mortality occur as a result of ship strike and entanglement in fishing gear. In all probability, Gulf of Mexico Bryde's whales are also at risk of these same threats as well. Shipstrike and entanglement for other whale species occur broadly elsewhere in U.S. waters, including (in all likelihood) in the action area itself.

Authorized research on Gulf of Mexico Bryde's whales can have significant consequences for the species, particularly when viewed in the collective body of work that has been authorized. Researchers have noted changes in respiration, diving, swimming speed, social exchanges, and other behavior correlated with the number, speed, direction, and proximity of vessels. Responses were different depending on the age, life stage, social status of the whales being observed (i.e., males, cows with calves) and context (feeding, migrating, etc.). Beale and Monaghan (2004b) concluded that the significance of disturbance was a function of the distance of humans to the animals, the number of humans making the close approach, and the frequency of the approaches. These results would suggest that the cumulative effects of the various human activities in the action area would be greater than the effects of the individual activity.

Several investigators reported behavioral responses to close approaches to other species of whales that suggest that individual whales might experience stress responses. Baker et al. (1983) described two responses of whales to vessels, including: (1) "horizontal avoidance" of vessels 2,000 to 4,000 meters away characterized by faster swimming and fewer long dives; and (2) "vertical avoidance" of vessels from 0 to 2,000 meters away during which whales swam more slowly, but spent more time submerged. Watkins et al. (1981b) found that both fin and humpback whales appeared to react to vessel approach by increasing swim speed, exhibiting a startled reaction, and moving away from the vessel with strong fluke motions.

Other researchers have noted changes in respiration, diving, swimming speed, social exchanges, and other behavior correlated with the number, speed, direction, and proximity of vessels. Results were different depending on the social status of the whales being observed (single males when compared with cows and calves), but humpback whales generally tried to avoid vessels when the vessels were 0.5 to 1.0 kilometer from the whale. Smaller pods of whales and pods with calves seemed more responsive to approaching vessels (Bauer 1986; Bauer and Herman 1986). These stimuli are probably stressful to the humpback whales in the action area, but the consequences of this stress on the individual whales remains unknown (Baker and Herman 1987; Baker et al. 1983). Studies of other baleen whales, specifically bowhead and gray whales, document similar patterns of behavioral disturbance in response to a variety of actual and simulated vessel activity and noise (Malme et al. 1983b; Richardson et al. 1985a). For example, studies of bowhead whales revealed that these whales oriented themselves in relation to a vessel when the engine was on, and exhibited significant avoidance responses when the vessel's engine was turned on even at a distance of about 900 meters (3,000 feet). Jahoda et al. (2003b) studied the response of 25 fin whales in feeding areas in the Ligurian Sea to close approaches by inflatable vessels and to biopsy samples. They concluded that close vessel approaches caused these whales to stop feeding and swim away from the approaching vessel. The whales also tended to reduce the time they spent at surface and increase their blow rates, suggesting an increase in metabolic rates that might indicate a stress response to the approach. In their study, whales that had been disturbed while feeding remained disturbed for hours after the exposure ended. They recommended keeping vessels more than 200 meters from whales and having approaching vessels move at low speeds to reduce visible reactions in these whales.

Although these responses from anthropogenic noise sources and other activities are generally ephemeral and behavioral in nature, Gulf of Mexico Bryde's whales within the action area can be exposed to several thousand instances of these activities per year, with some species having so many authorized activities that if they were all conducted, every individual in the population would experience multiple events. This can collectively alter the habitat use of individuals, or make what would normally be rare, unexpected effects (such as severe behavioral responses or infection from satellite or biopsy work) occur on a regular basis.

10.14.2 Sea Turtles

Climate change has and will continue to impact sea turtles throughout the action area as well as throughout the range of the populations. Sex ratios of several species are showing a bias, sometimes very strongly, towards females due to higher incubation temperatures in nests. We expect this trend will continue and possibly may be exacerbated to the point that nests may become entirely feminized, resulting in severe demographic issues for affected populations in the future. Hurricanes may become more intense and/or frequent, impacting the nesting beaches of sea turtles and resulting in increased loss of nests over wide areas. Disease and prey distributions may well shift in response to changing ocean temperatures or current patterns, altering the morbidity and mortality regime faced by sea turtles and the availability of prey.

Although only small percentages of these sea turtles are estimated to have died because of their capture during research or incidental to fisheries, the actual number could be substantial if considered over the past five to 10 years. When we add the percentage of sea turtles that have suffered injuries or handling stress sufficient to have caused them to delay the age at which they reach maturity or the frequency at which they return to nesting beaches, the consequences of these fisheries on nesting aggregations of sea turtles would be greater than we have estimated.

Even with turtle excluder device measures in place, in 2002, NMFS (2002) expected these fisheries to capture about 323,600 sea turtles each year and kill about 5,600 (approximately 1.7 percent) of the turtles captured. Since 2002, however, effort in the Atlantic shrimp fisheries has declined from a high of 25,320 trips in 2002 to approximately 13,464 trips in 2009, roughly 47 percent less effort. Since sea turtle takes are directly linked to fishery effort, these takes are expected to decrease proportionately. However, hundreds to a possible few thousand sea turtle interactions are expected annually, with hundreds of deaths (NMFS 2012).

11 Effects of the Action

Section 7 regulations define "effects of the action" as the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 C.F.R.

§402.02). Indirect effects are those that are caused by the proposed action and are later in time, but are reasonably certain to occur. This effects analyses section is organized following the stressor, mitigation to minimize or avoid exposure, exposure, response, risk assessment framework.

The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 C.F.R. §402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

The destruction and adverse modification analysis considers whether the action produces "a direct or indirect alteration that appreciably diminished the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features." 50 C.F.R. §402.02.

11.1 Stressors Associated with the Proposed Action

The potential stressors we expect to result from the proposed action are listed below.

- Stressors specific to Gulf of Mexico Bryde's whales:
  - Close approach by research vessels (for research activities, photography, and observation);
  - Close approach by unmanned aerial surveys (for exhaled breath sampling);
  - Sloughed skin and feces collection;
  - Skin and blubber biopsy and
  - Tagging with suction-cup, or dart/barb/LIMPET.

Given their non-invasive nature, fecal sampling, sloughed skin sampling, exhaled breath sampling, and most documentation (e.g., for photography and observation) are not expected to produce any stressors aside from those associated with vessel surveys and close approaches. Biopsy sampling carries the stressor of a closer vessel approach than is typical for other vessel survey activities (except tagging), a minor puncture wound, and tissue collection. Tagging presents the additional stressors of a very close approach to apply tags, direct physical contact in the case of suction-cup tags or puncture wounds in the case of dart/barb/LIMPET tags.

- Stressors specific to sea turtles:
  - Incidental capture in trawl net.

Given the directed nature of the proposed Bryde's whale research, all research activities directed as the Gulf of Mexico Bryde's whales are not expected to present any stressors to ESA-listed sea turtles. The proposed trawling (part of the National Centers for Coastal Ocean Science action), may present the stressor of incidental capture to ESA-listed sea turtles.

11.2 Mitigation to Minimize or Avoid Exposure

The NMFS Permits and Conservation Division's proposed action includes the use of vetted research techniques, qualified and trained researchers, and best practices when approaching, handling, tagging and sampling ESA-listed species. We anticipate that requiring that the research be conducted by experienced personnel would further minimize impacts to the ESA-listed species that may be exposed to the stressors, as these individuals should be able to recognize adverse responses and cease or modify their research activities accordingly. The National Centers for Coastal Ocean Science's proposed action includes the use of protected species observers and measures to minimize effects from vessel activity and the in water research activities. These measures are described in the description of the action, and are considered throughout the exposure and response analysis.

11.3 Exposure

Exposure analyses identify the ESA-listed species that are likely to co-occur with the actions' effects on the environment in space and time, and identify the nature of that co-occurrence. The *Exposure Analysis* identifies, as possible, the number, age or life stage, and gender of the individuals likely to be exposed to the actions' effects and the population(s) or subpopulation(s) those individuals represent.

Table 3 specifies the Permits Division's proposed exposure to the proposed Gulf of Mexico Bryde's whales associated with vessel surveys, close approaches, documentation, biological sampling, and tagging. This section will also assess the exposure of sea turtles because of the National Centers for Coastal Ocean Science's action involving trawling. In accordance with our regulations (50 C.F.R. §402), here we evaluate whether or not this proposed level of exposure is reasonably certain to occur.

11.3.1 Exposure Analysis: Gulf of Mexico Bryde's Whales

Under the ESA take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct." Harm is defined by regulation (50 C.F.R. §222.102) as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including, breeding, spawning, rearing, migrating, feeding or sheltering." NMFS does not have a regulatory definition of "harass." However, on December 21, 2016, NMFS issued interim guidance on the term "harass," defining it as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering." NMFS' interim ESA harass definition does not perfectly equate to MMPA Level A or Level B harassment, but shares some similarities with both in the use of the terms "injury/injure" and a focus on a disruption of behavior patterns.

For ESA-listed marine mammal species, consultations that involve the Permits Division's authorization under the MMPA have historically relied on the MMPA definition of harassment.

As a result, Level B harassment has been used in estimating the number of instances of harassment of ESA-listed marine mammals, whereas estimates of Level A harassment have been considered instances of harm and/or injury under the ESA depending on the nature of the effects.

The Permits Division is proposing to authorize take of Gulf of Mexico Bryde's whales on an annual, conditional basis. Each Permit Holder will only be permitted to carry out the authorized research upon annual authorization by the Permits Division. Each year, the Permits Division, with the Southeast Regional Office and the Southeast Fisheries Science Center, will meet with the Permit Holders at the annual meeting, establish research priorities, and determine funding status for each of the Permit Holders. At that point, the Permit Division will authorize take.

Using this framework, the Permits Division has placed a limit on the number of Level A takes that will be issued annually. No more than 66 Level A takes—specifically, satellite tagging and biopsy sampling—will be issued to Permit Holders each year. This means that each of the 33 individual whales currently believed to be in the population can potentially be taken a maximum of two times per year. The Southeast Fisheries Science Center has requested authorization to take up to two biopsy samples from an individual per year for its genetic mark-recapture study. Other takes that do not result in physical contact (e.g., vessel close approaches, exhaled breath sampling, UAS, etc.) would not limited in such a way. The Permits Division does not place the same priority on limiting these takes as it does for Level A takes.

Individual researchers have requested more than the 66 Level A takes, as shown in Table 3. The Permits Division will only issue those Level A takes to Permit Holders based on coordination with the Southeast Regional Office, after assessing research needs and population status that year, and determining which Permit Holders have the funding and resources to conduct the research. It is possible that in a given year, only a single Permit Holder will have available funding to carry out the research on Gulf of Mexico Bryde's whales. In that case, that Permit Holder would likely be granted all the Level A takes for the year, which is why the Permits Division is proposing to allow each researcher more take than the maximum amount they will actually issue. It would not be practical to simply divide the Level A takes evenly among the Permit Holders. In that scenario, a Permit Holder who had funding to conduct research would be constrained by having Level A takes already allocated to other researchers who may not be able to conduct research that year. This would represent a lost research opportunity, as the Permit Holder with resources to carry out an amount of takes that would yield the most robust scientific data possible would not be able to do so (e.g., leading to an insufficient sample size). It is also possible that more than one Permit Holder is able to conduct research in a year, and the Permits Division would divide the Level A takes accordingly. This highlights the importance of the annual meetings between the Permit Holders, the Permits Division, and the Southeast Regional Office, to regularly discuss and coordinate the research needs. Since the Permits Division would allocate the Level A takes annually, based on research needs and available funding, they can effectively issue takes to gather much-needed information on this endangered species.

Level B takes of marine mammals as applied in this consultation may involve a wide range of behavioral responses including but not limited to avoidance, changes in vocalizations or dive patterns, or disruption of feeding, migrating, or reproductive behaviors. The Level B harassment take estimates do not differentiate between the types of potential behavioral responses, nor do they provide information regarding the potential fitness or other biological consequences of the responses on the affected individuals. Therefore, we consider the available scientific evidence to determine the likely nature of the behavioral responses and their potential fitness consequences.

Level B harassment takes are, in this context, those that do not result in physical contact with the whale. Research activities like photo-identification, collecting sloughed skin or fecal samples, passive acoustic recording, surveys, and behavioral monitoring would expose the Bryde's whales to the stressors associated with vessel activity and close approach. These takes are expected to result in short-term behavioral responses such as avoidance. Level A takes like tag attachment and biopsy sampling carry a risk of harm or infection because the techniques involve piercing the skin of the whale.

Each of the applicants requesting modifications to their existing research permits already have take authorization for Bryde's whales in the Gulf of Mexico under the Marine Mammal Protection Act. Looking at their annual reports for the last few years gives us an idea of how much take has occurred under those permits (Table 13).

Table 13. Summary of Bryde's whale takes under current research permits, 2014 to 2016.

Permit	Holder	Currently Authorized Take Activities	Currently Authorized Take Numbers	2014 Actual Takes	2015 Actual Takes	2016 Actual Takes	Total Takes
14450	NMFS Southeast Fisheries Science Center (Responsible Party: Theophilus Brainerd)	Survey, vessel. Photo-ID; sample, skin and blubber biopsy	150	0	6	0	6
		Acoustic, passive recording; Incidental harassment; Observation, monitoring; Observation, behavioral; Photo-ID	300	0	38	4	42
		Above activities + Instrument, dart/barb tag; Instrument suction-cup	40	N/A	0	0	0

Permit	Holder	Currently Authorized Take Activities	Currently Authorized Take Numbers	2014 Actual Takes	2015 Actual Takes	2016 Actual Takes	Total Takes
14856	Bruce Mate	Acoustic, passive recording; Import/export/receive parts; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, behavioral; Photo-ID; Photograph/Video; Sample, skin and blubber biopsy	150	0	1	0	1
		Acoustic, passive recording; Incidental harassment; Observation, monitoring; Observation, behavioral; Photo-ID; Photograph/Video	1000	0	4	0	4
16239	HDR (Responsible Party: Dan Englehaupt)	Collect, sloughed skin; Count/survey; Incidental harassment; Observations, monitoring; Observations, behavioral; Photo-ID; Photogrammetry; Photograph/Video; Sample, fecal; Underwater photo/videography	97	0	N/A	N/A	0
17312	Scripps (Responsible Party: John Hildebrand)	Acoustic, passive recording; Count/survey; Incidental harassment; Observations, behavioral; Photo-id; Sample, fecal	20	0	0	2	2
		Acoustic, passive recording; Count/survey; Observations, behavioral; Photo-ID;	5	0	0	1	1

Permit	Holder	Currently Authorized Take Activities	Currently Authorized Take Numbers	2014 Actual Takes	2015 Actual Takes	2016 Actual Takes	Total Takes
		Sample, fecal; Sample, skin and blubber biopsy					
		Acoustic, passive recording; Count/survey; Instrument, suction-cup (e.g., VHF, TDR); Observations, behavioral; Photo-ID; Sample, fecal; Sample, skin and blubber biopsy; Tracking	5	0	0	1	1
18636	Ocean Alliance (Responsible Party: Iain Kerr)	Acoustic, passive recording; Collect, sloughed skin; Incidental harassment; Observations, behavior; Other; Photo-ID; Photograph/Video; Remote vehicle, aerial; Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Tracking	80	N/A	N/A	0	0

A total of 57 takes have occurred for Bryde's whales over five permits during the last one to three years. Most of these (48) have been Level B takes, with nine Level A takes. Of the five authorized Permit Holders, only three actually conducted research activities that resulted in take—Permit Nos. 14450, 14856, and 17312. It should be noted that the Permit Holder for Permit No. 14856 conducted research on Bryde's whales in the Pacific Ocean, and those takes were not on the proposed Gulf of Mexico Bryde's whale.

As of this consultation, only four Permit Holders or applicants currently have funding to conduct research on Gulf of Mexico Bryde's whales (Nos. 14450, 17312, 18786, and 20605). Permit applicants for Permit Nos. 14856 (Bruce Mate), 16239 (HDR), and 18636 (Ocean Alliance) do not have funding but are applying for it (or plan to in the near future). The Marine Mammal Health and Stranding Network permit (No. 18786) and Robin Baird's permit (No. 20605) are currently authorized under the MMPA and have conferenced under the ESA for Gulf of Mexico

Bryde's whale takes. The conference opinions both resulted in a no jeopardy conclusion (see Section 10.13).

That the majority of the research effort is going to occur in an area known for Gulf of Mexico Bryde's whales increases the likelihood of exposure. Survey effort from 1992 to 2015 in the area surrounding the De Soto Canyon had 47 Bryde's whale sightings (104 individuals), compared to 50 sightings (112 individuals) for the US exclusive economic zone as a whole (Soldevilla et al. 2017). To maximize their chances of encountering a Gulf of Mexico Bryde's whale, researchers will focus their effort in this biologically important area.

Despite its name, the column title *No. Animals* in Table 3 indicates the maximum number of *takes* that would be authorized under the permits, not necessarily the exposure of individual whales (as further detailed below). Researchers would be authorized to attempt each procedure in Table 3 on an animal up to three times per day, or the number of attempts as prescribed in their permit. The researchers on the Southeast Fisheries Science Center's Permit No. 14450 are the only exception. They are permitted to attempt to tag an animal up to four times. This exposure could occur year-round, with the duration of each exposure ranging from a few seconds to no more than 45 minutes.

Given the Permits Division's issuance and counting of takes[5] and the fact that researchers may often not be able to identify individual whales in the field, the number specified in *No. Animals* in Table 3 does not necessarily reflect the number of animals that would be exposed to the research activities under the permits. For example, if a researcher takes a whale on one day it would count as one individual taken. If the same individual were taken on another day that same year without realizing it, it would be counted as a different individual taken. This would result in the total annual number of individuals taken being less than in Table 3. This scenario also illustrates that researchers may unintentionally take the same whale more than once in a single year. This excludes the Southeast Fisheries Science Center (Permit No. 14450), who has specifically requested authorizations to purposely biopsy sample the same individual whale. However, fieldwork can be unpredictable, and there is uncertainty in a variety of factors (reliance on equipment, personnel availability, weather conditions). A priority goal of the Permits Division, Southeast Fisheries Science Center, and Southeast Regional Office is to use this research to develop of photo-identification catalog for Gulf of Mexico Bryde's whales. There is not currently a well-established photo-identification catalog for the species and researchers may not always be able to identify an individual while in the field. The Gulf of Mexico Bryde's whale is known to occupy the biologically important area around De Soto Canyon, and researchers intend to target that area. In addition, as noted before, the Gulf of Mexico Bryde's whale population size is very small. Considering all this, it is likely that many, if not all, Gulf of Mexico Bryde's whales would be taken once, and possibly two or more times.

[5] The Permits Division directs researchers to count and report one take per cetacean per day including all approaches and procedure attempts, regardless of whether a behavioral response to the permitted activity is observed.

With this explanation of take number estimates, our own evaluation of these take numbers as required under the ESA, in comparison to the researchers' annual reports for similar activities (Table 13), exposure analysis for similar activities (NMFS 2012), and the conservative assumption that all take that the Permit Division authorized annually *could* occur, we adopt the exposure of Gulf of Mexico Bryde's whales that is reasonably certain to occur.

11.3.1.1 Exposure Analysis: Sea Turtles

Densities of sea turtles within the Gulf of Mexico vary by species and life stage. Adult sea turtles are generally more abundant on the continental shelf (in water depths less than 200 meters), while oceanic juveniles can be found on both the shelf and in more pelagic environments. Epperly et al. (2002) conducted aerial surveys along the continental shelf to estimate the density of adult sea turtle species within the Gulf of Mexico. These estimates do not represent absolute abundance but rather minimum population sizes as sea turtles are easily missed during aerial surveys. Using more recent data, estimates of Kemp's ridley and loggerhead sea turtle densities were updated by the Southeast Fisheries Science Center in 2014[6] to account for changes in population growth since the 2002 study. Such updates were not completed for the other three species, as no additional data were available, though models show that green sea turtles warrant an updated analysis given the steady increase in the population since the work by Epperly et al. (2002). To account for the population increase of green sea turtles, we applied a scalar to the survey data in Epperly et al. (2002). The scalar was calculated by considering the 4.9 percent annual population increase estimated for the Tortuguero rookery (the largest rookery in the Atlantic with the slowest rate of increase) described by Chaloupka et al. (2008a) and applying it over the 18 years since the last aerial survey was conducted in Epperly et al. (2002) (i.e., $1.049^{18} = 2.4$).

In order to estimate the amount of sea turtles in the action area, we relied on density estimates from the U.S. Navy (Roberts et al. 2016). For the adult sea turtles in greater than 200 meters water depth, we used data from Navy Phase III modeling (Roberts et al. 2016). While we recognize that these sea turtle density data are outdated, to our knowledge they represent the best available data within the action area and are being used by the U.S. Navy in consultation with NMFS on Phase III of the Navy's Atlantic Fleet Training and Testing Area activities, which includes the Gulf of Mexico. That said, we consider these density estimates to only represent sea turtles greater than 30 centimeters in size since they are based on aerial surveys, corrected for sighting availability, which can only detect these larger sea turtles (Epperly et al. 1995; NMFS 2011d). We consider the sea turtle densities presented here to be the best available data.

Trawling will occur in the biologically important area for Gulf of Mexico Bryde's whales. Two density zones are within the biologically important area. The area covers water depths from 100 to 500 meters, and is split by the 200 meter depth contour. This 200 meter depth contour was

[6] L. Garrison, NMFS Southeast Fisheries Science Center, pers. comm. to K. Baker, NMFS PRD, September 11, 2014; data from 2011-2012 aerial surveys.

used as a dividing line in the modeling between the continental shelf and the pelagic environment, and different sea turtle densities were calculated for each area. We calculated the total area of the action area (29,629 square kilometers), as well as the two parts of the action area in waters greater than and less than 200 meters deep (16,908 and 12,721 square kilometers, respectively). The densities represent the estimated average annual density for each species; since the action will only take place in 2019 for 30 days, we also calculated the density of individuals in a month.

Table 14. Sea turtle densities in the Gulf of Mexico and estimated number of individuals in the study area less than 200 meters deep (Continental Shelf).

Species	Area less than			n Animals in
Kemp's Ridley	1.623	12,721	20,646	1,721
Loggerhead	1.136	12,721	14,451	1,204
Green	0.336	12,721	4,274	356
Leatherback	0.03	12,721	382	32
Hawksbill	0.57	12,721	7,251	604

Table 15.Sea turtle densities in the Gulf of Mexico and estimated number of individuals in the study area greater than 200 meters deep (Pelagic).

Species	Area greater			
Kemp's Ridley	n/a	16,908	n/a	n/a
Loggerhead	0.016960221	16,908	287	24
Green	n/a	16,908	n/a	n/a
Leatherback	0.000900636	16,908	15	0
Hawksbill	n/a	16,908	n/a	n/a
Hardshell	0.029727935	16,908	503	42

Because of the paucity of data, sea turtles in the pelagic environment were grouped; "hardshell" sea turtles refers to Kemp's ridley, green, and hawksbill sea turtles. In comparing the density estimates presented in Table 14 and Table 15, we expect that more sea turtles are likely to occur in the continental shelf area (less than 200 meters deep), and that it is more likely that sea turtles will be exposed during trawling in that area (Figure 8).

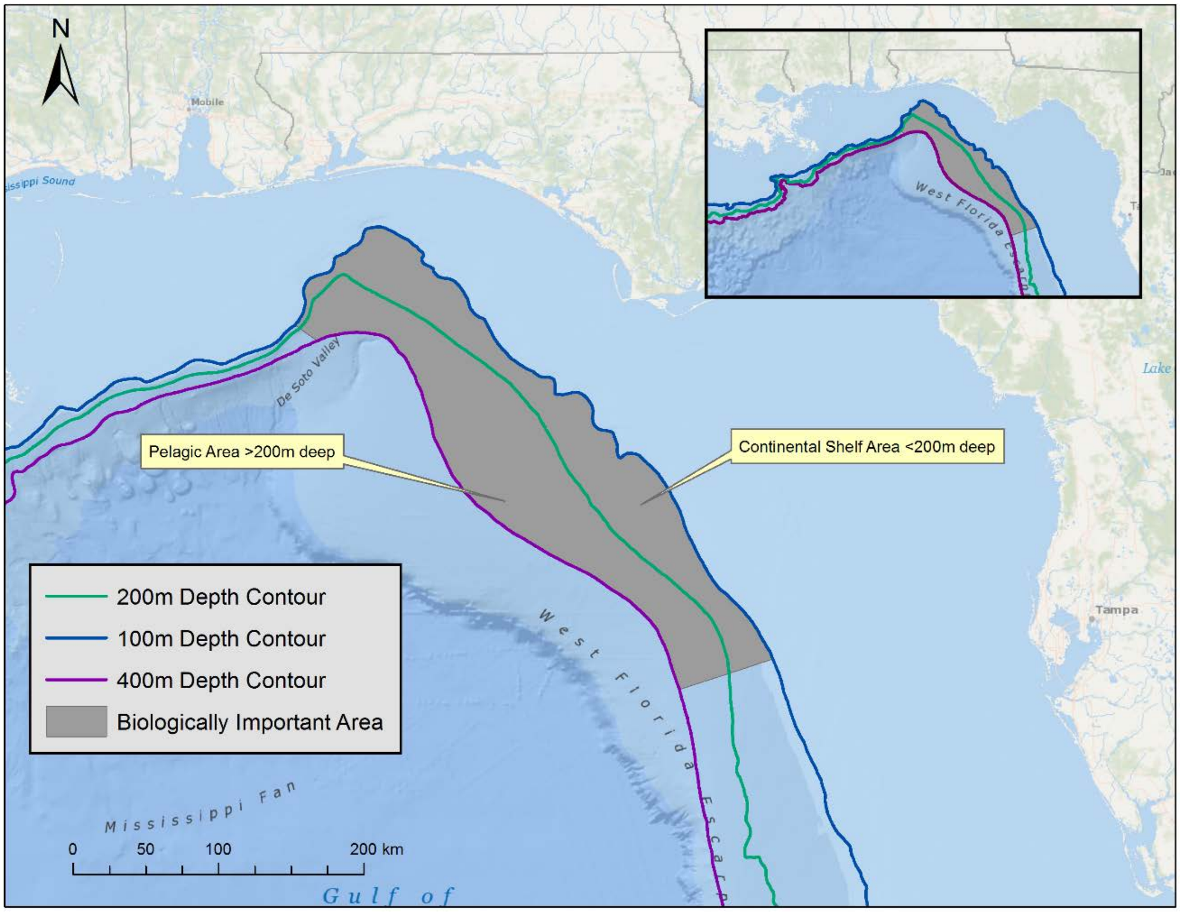


Figure 8. Map depicting the biologically important area where trawling will occur, with 200 meter depth contour.

Simply because sea turtles are present in the action area does not mean they are at risk of incidental capture. The season the trawling will take place, the amount of trawling that would occur, sea turtle behavior, and the duration of the tows all factor into the likelihood of sea turtle capture.

Sea turtle depth distribution in the water column varies by species (Table 16). The trawl will be fished at near-bottom in waters 100 to 500 meters deep. Sea turtles are not found in waters this deep (expect for leatherbacks, who are found at depths 52 to greater than 150 meters 12 percent of the time). We do not expect sea turtles to be captured while the trawl is being towed, at depths greater than we expect turtles to be found, but it is possible that a turtle could be captured as it is being set out or hauled back in. Protected species observers will monitor for sea turtles before the trawl is set, and if a turtle is sighted, the trawl will not be deployed. However, given that sea turtles are not always at the surface visible to observers, it is possible that a turtle could be underwater at the time the trawl is set, making it vulnerable to capture.

Table 16. Sea turtle depth distribution by species.

Species	Depth Distribution	Reference
Loggerhead Sea Turtle	33% at <1 m, 15% at 1-3 m, 12% at 4-6 m, 8% at 7-10 m, 25% at 11-25 m, and 7% at >25 m	Dellinger and Freitas (2000)
Kemp's Ridley and Green Sea Turtle	33% at <1 m, 15% at 1-3 m, 12% at 4-6 m, 8% at 7-10 m, 25% at 11-25 m, and 7% at >25 m	Dellinger and Freitas (2000)
Leatherback Sea Turtle	28% at <6 m, 36% at 6-12 m, 24% at 13-51 m, 7% at 52-102 m, 3% at 103-150 m, and 2% at >150 m	Eckert (2006)

As was discussed in the *Environmental Baseline*, incidental capture of sea turtles in fisheries in the Gulf of Mexico has been a source significant mortality. There has been a lot of effort devoted to researching ways to reduce bycatch in trawls (e.g., turtle excluder devices), as well as limiting tow times to reduce mortality of captured turtles. Sasso and Epperly (2006) reported that in summer, observed mortality was less than one percent until 50 minutes; two turtles were reported dead in tows as short as fifteen minutes. The National Centers for Coastal Ocean Science would limit tow times to 40 minutes. The researchers on board protected species observers would be instructed to follow the sea turtle handling protocol (50 CFR 223.206(d)(1)(B)) in the event a sea turtle was captured, increasing its chances that it would recover and be released alive.

It is possible that an individual turtle could experience multiple interactions with the trawl, being captured more than once. In a study on fisheries interactions, sea turtles tended to stay in the same areas, and fishermen tended to fish in the same areas, leading to an estimated 20 percent of turtles recaptured by fishing activities (Epperly et al. 2002). Since the trawling in the proposed action will take place at stations throughout the biologically important area (Figure 8), we do not think it is likely that an individual turtle will be captured more than once.

To calculate the actual number of sea turtles we expect to be exposed to trawling activities, we relied on sea turtle catch rates in shrimp trawl nets in the Gulf of Mexico, as presented in the NMFS 2014 Biological Opinion on the Shrimp Fisheries in the Southeast Atlantic (Table 26 of that document). From that table, catch rates in the sub-region, season, and environment were chosen that most closely matched the biologically important area where trawling would occur in the proposed action. Namely, catch rates in the Eastern Gulf, from March to November, in the offshore environment. (Offshore here having the meaning of greater than ten fathoms (18 meters) deep.) We then applied these catch rates to the amount of trawling effort we expected to occur during the proposed action (individuals exposed = catch rate x effort).

Table 17. Catch rates of sea turtles in the Eastern Gulf of Mexico, March through November, in the offshore environment. From NMFS (2014b).

Species	Loggerhead	Leatherback	Green	Kemp's Ridley
Catch Rate	0.01	0.00112	0.00440	0.00165

In their application, the National Centers for Coastal Ocean Science stated that the trawling would only occur during the 30-day cruise in 2019, and that tows would be 40 minutes. They are not able to specify the exact number of tows that will occur, since tows would occur adaptively at stations based on data collected during the cruise—depth, acoustic backscatter from echosounders, oceanographic features, and presence (or history of presence) of Bryde's whales feeding in the area. (Net tows will not be conducted near actively feeding Bryde's whales.) The purpose of the trawling is to collect prey species of Bryde's whales to assess prey species composition and distribution. If we assume that, a trawl event—setting the trawl, towing it, hauling it in, and sorting the catch—takes one hour, and that trawling takes place from 0700 to 1900 during the day, which would be 12 tows per day. By multiplying the catch rates for each species (Table 17) by 12 tows per day by 30 days (the length of the cruise), we can estimate the number of individuals we expect to be exposed to the trawling activity (rounded up to the nearest whole number). As such, we estimate that four loggerheads, one leatherback, two green, and one Kemp's ridley sea turtles will be exposed to the trawling. Catch rates for hawksbill sea turtles were not calculated in NMFS (2014b); however, based on the density estimates presented in Table 14 and Table 15, we still think it is possible that hawksbills could be exposed to the proposed trawling. Since the density estimates for hawksbills are roughly twice that for green turtles, we estimate that four hawksbill sea turtles could be exposed.

11.4 Response Analysis

Given the exposure detailed above, in this section we describe the range of responses among ESA-listed sea turtles and the proposed Gulf of Mexico Bryde's whale that may result from the stressors associated with the research activities that would be authorized and funded by the Permits Division and the National Centers for Coastal Ocean Science's actions. These include stressors associated with the following activities: unmanned aerial surveys, close approaches, biopsy sampling, tagging, and trawling. As discussed in Section 11.1, fecal, sloughed skin, and exhaled breath sampling, as well as photography/photogrammetry and observation, are not expected to produce any stressors themselves. Thus, no response to these activities is expected beyond the response to the vessel surveys and close approaches needed to perform these activities. We assess potential lethal, sub-lethal (or physiological), or behavioral responses that might reduce the fitness of individuals. Our response analysis considers and weighs evidence of adverse consequences, as well as evidence suggesting the absence of such consequences.

In general, all the research activities described in Section 3 have the potential to cause some sort of disturbance. Responses by animals to human disturbance are similar to their responses to potential predators (Beale and Monaghan 2004a; Frid 2003; Frid and Dill 2002; Gill et al. 2001; Harrington and Veitch 1992; Lima 1998; Romero 2004). These responses manifest themselves as stress responses in which an animal perceives human activity as a potential threat and undergoes physiological changes to prepare for a flight or fight response or more serious physiological changes with chronic exposure to stressors. They can also lead to interruptions of essential behavioral or physiological events, alteration of an animal's time budget, or some combinations of these responses (Frid and Dill 2002; Romero 2004; Sapolsky et al. 2000; Walker et al. 2005). Further, these responses have been associated with abandonment of sites (Sutherland and Crockford 1993), reduced reproductive success (Giese 1996; Mullner et al. 2004), and the death of individual animals (Bearzi 2000; Daan 1996; Feare 1976).

The mammalian stress response involves the hypothalamic-pituitary-adrenal axis being stimulated by a stressor, causing a cascade of physiological responses, such as the release of the stress hormones adrenaline (epinephrine), glucocorticosteroids, and others (Busch and Hayward 2009; Gulland et al. 1999; St. Aubin and Geraci 1988; St. Aubin et al. 1996; Thomson and Geraci 1986). These hormones can subsequently cause short-term weight loss, the liberation of glucose into the blood stream, impairment of the immune and nervous systems, elevated heart rate, body temperature, blood pressure, and alertness, and other responses (Busch and Hayward 2009; Cattet et al. 2003; Dickens et al. 2010; Dierauf and Gulland 2001a; Dierauf and Gulland 2001b; Elftman et al. 2007; Fonfara et al. 2007; Kaufman and Kaufman 1994; Mancia et al. 2008; Noda et al. 2007; Thomson and Geraci 1986). In some species, stress can also increase an individual's susceptibility to gastrointestinal parasitism (Greer 2008). In highly stressful circumstances, or in species prone to strong "fight-or-flight" responses, more extreme consequences can result, including muscle damage and death (Cowan and Curry 1998; Cowan and Curry 2002; Cowan and Curry 2008; Herraez et al. 2007). The most widely recognized hormonal indicator of vertebrate stress, cortisol, normally takes hours to days to return to baseline levels following a significantly stressful event, but other hormones of the hypothalamic-pituitary-adrenal axis may persist for weeks (Dierauf and Gulland 2001b). Mammalian stress levels can vary by age, sex, season, and health status (Hunt et al. 2006; Keay et al. 2006; Peters 1983). In addition, smaller mammals tend to react more strongly to stress than larger mammals (Hunt et al. 2006; Keay et al. 2006; Peters 1983).

In sum, the common underlying stressor of a human disturbance caused by the research activities that would occur under the proposed permits and the National Centers for Coastal Ocean Science's research activities may lead to a variety of different stress related responses. In addition to possibly causing a stress related response, each research activity is likely to produce unique responses as detailed further below. For incidental harassment that may result when animals are associated with individuals targeted for directed research, we expect responses to be similar to, or in most cases less than, those described below for each research activity, and above for general human disturbances.

11.4.1.1 Vessel Surveys and Close Approach

Vessel surveys and close approaches conducted under the proposed permits would expose Gulf of Mexico Bryde's whales within the action area to vessel traffic and visual and auditory disturbances. As noted previously, most documentation does not present any stressors outside of those associated with vessel surveys and close approaches. The purpose of vessel surveys and close approaches is to allow researchers to conduct other activities, responses to which are described below in individual sections.

Close approaches by research vessels may cause visual or auditory disturbances to cetaceans and more generally disrupt their behavior, which may negatively influence essential functions such as breeding, feeding, and sheltering. Cetaceans react in a variety of ways to close vessel approaches. Responses range from little to no observable change in behavior to momentary changes in swimming speed and orientation, diving, surface and foraging behavior, and respiratory patterns, (Au and Green. 2000; Baker et al. 1983; Baumgartner and Mate 2003; Hall 1982; Isojunno and Miller 2015; Jahoda et al. 2003a; Koehler 2006; Malme et al. 1983a; Richardson et al. 1985b; Scheidat et al. 2006; Watkins et al. 1981a). Changes in cetacean behavior can correspond to vessel speed, size, and distance from the whale, as well as the number and frequency of vessels approaches (Baker et al. 1988; Beale and Monaghan 2004a). Characteristics of the individual and/or the context of the approach, including age, sex, the presence of offspring, whether or not habituation to vessels has occurred, individual differences in reactions to stressors, and the behavioral state of the whales can also influence the responses to close vessel approaches (Baker et al. 1988; Gauthier and Sears 1999; Hooker et al. 2001; Koehler 2006; Lusseau 2004; Richter et al. 2006; Weilgart 2007; Wursig et al. 1998).

Observations of large whales indicate that cow-calf pairs, smaller groups, and groups with calves appear to be more responsive to close vessel approaches (Bauer 1986; Bauer and Herman 1986; Clapham and Mattila 1993; Hall 1982; Williamson et al. 2016). Cetaceans may become sensitized or habituated to vessels as the result of multiple approaches (Constantine 2001), which could increase or decrease stress levels associated with additional approaches and or research activities following an approach. Reactions to vessel noise by bowhead and gray whales have been observed when engines are started at distances of 3,000 feet (Malme et al. 1983a; Richardson et al. 1985b), suggesting that some level of disturbance may result even if the vessel does not closely approach. It should be noted that human observations of a whale's behavioral response may not reflect a whale's actual experience; thus our use of behavioral observations as indicators of a whale's response to research may or may not be correct (Clapham and Mattila 1993).

Despite the varied observed responses to vessel approaches documented in the literature, and the multitude of factors that may affect an individual whale's response, we expect affects from close vessel approaches that would be authorized under Permit Nos. 14450, 14856, 16239, 17312, and 18636 to be minimal for several reasons. First, the permitted researchers have years of experience approaching cetaceans in a way that is designed to minimize disturbance and associated responses. Second, the source levels of sounds that would be generated by research vessels are below that which could cause physical injury or temporary hearing threshold shifts, and they are unlikely to mask cetaceans ability to hear mates and other conspecifics for any significant amount of time (Hildebrand 2009; NOAA 2016). Finally, no long-term effects on behavior or fitness from disturbances caused by close vessel approaches for research have been documented, by the permitted researchers and more generally in the literature.

Based on accounts from reports submitted by the permit holders for past research, responses documented in the literature, and the proposed method for closely approaching whales by vessel, we expect the proposed close approaches may produce short- to mid-term behavioral and stress responses, but would not significantly disrupt the normal behavioral patterns of whales to an extent that they would create the likelihood of injury or impact fitness. As a result, we do not expect close approaches to have fitness consequences for individual Gulf of Mexico Bryde's whales. This conclusion is based on close vessel approaches made during most research activities. The anticipated response from the close approaches that would be required for tagging, which occur at much close distances (within a few meters) are further discussed below.

11.4.1.2 Unmanned Aerial Surveys

Unmanned aerial surveys that would be authorized under Permit Nos. 14450, 16239, and 18636 may also cause visual or auditory disturbances to Gulf of Mexico Bryde's whales. Despite being conducted at much lower altitudes than manned aerial surveys, the aircraft used to conduct unmanned aerial surveys would be much smaller and quieter, indicating less of a behavioral response might be expected. While the use of UAS to study cetaceans is in its infancy, current data suggest that cetaceans exhibit no behavioral response to UAS. For example Acevedo-Whitehouse et al. (2010) used a UAS at 13 meters over blue, gray (*Eschrichtius robustus*), humpback, and sperm whales, and observed no avoidance behaviors. Koski et al. (2015) used UAS over bowhead whales at 120 meters with no behavioral responses noted. NMFS' Southwest Fisheries Science Center used UAS over killer whales (*Orcinus orca*) and found that at 35 meters, there were no behavioral reactions (Durban et al. 2015). Three recent reviews covering the potential impacts of UAS on marine mammals found no data to indicate that ESA-listed cetaceans behaviorally respond to UAS (Christie et al. 2016; Marine Mammal Commission 2016; Smith et al. 2016). However, in a recent report submitted to NMFS for Permit No. 18636, researchers documented behavioral responses by large whales when UAS were flown at a height of approximately 12 feet (NMFS 2017e). These responses consisted of mild, short-term change in behavior such as whales rolling over to view the UAS, or "bucking" before returning to pre-exposure behavior. Given the available information, we anticipate that in most cases, there would be no response to unmanned aerial surveys, but in some cases, mild short-term behavioral responses could occur.

11.4.1.3 Biopsy Sampling

In cetaceans, healing rates from biopsy techniques vary by species, and are difficult to quantify in wild marine mammals. Estimates of healing rates are generally confined to observations and re-sightings of previously sampled individuals. A thorough review of biopsy techniques and impacts on marine mammals reports that biopsy sample collection is relatively benign and that biopsied sites heal quickly, becoming barely visible in most species studied within a month or two (Noren and Mocklin 2012). Wounds caused by surgical incisions in captive bottlenose dolphins were histologically repaired after seven days, with white linear scars visible (Bruce-Allen and Geraci 1985). In southern right whales (*Eubalaena australis*) (Reeb and Best 2006), the biopsy sites were hardly visible after sampling, and biopsy dart sites in killer whales shrank within one day of darting (Noren and Mocklin 2012). The relatively smaller impact of a standard (0.25 centimeter diameter) biopsy dart is not considered to pose a significant trauma risk (Aguilar and Borrell 1994; IWC 1991; Noren and Mocklin 2012).

The SEFSC (Permit No. 14450) proposes to collect two biopsy samples from individual Gulf of Mexico Bryde's whales up to twice in a year for the purposes of collecting data for a mark-recapture study. Based on the available information, we expect that the wounds from the biopsy sampling to be minor and that healing would occur rapidly. The SEFSC stated in their permit application and the Permits Division would require in the permit, that the researchers will use techniques to minimize the risk of infection (i.e., sterile equipment) and protocol that prohibits collecting samples from areas near the face and head of the whale. The researchers would be restricted by the permit conditions to only taking samples posterior to the pectoral fins (in order to protect the face and head of the whale). The permit will contain conditions that require the research to be carried out in this same safe and protective manner. Furthermore, the researchers will be photographing individual Gulf of Mexico Bryde's whales to create a photograph catalog accessible to all permitted researchers. Ideally, this photo-id catalog will allow researchers to identify individuals that have been previously sampled. This will 1) enable the SEFSC to positively identify previously sampled individuals so that they can achieve their research goals, and 2) enable other researchers to avoid taking repeated samples from the same individual so that they are not duplicating genetic analyses from individuals already sampled. Based on the above information, we do not expect biopsy sampling to result in serious injury or result in a reduction of individual fitness for a whale.

11.4.1.4 Tagging

Tagging presents a variety of stressors including a very close approach (to within a few meters) and physical contact if a suction-cup tag is used or puncture wounds if dart/barb tags are used. Responses to these stressors may be physiological and/or behavioral in nature and likely differ depending on the tag attachment type. Below we detail the range of physiological and behavioral responses to tags based the timing of the response, from the initial tag deployment until the tag detaches.

Cetaceans are likely to respond behaviorally to very close approaches for tag attachment in a similar way as previously described above for other close approaches. However, given the closer proximity of these approaches (one to 30 meters) we anticipate these responses would consist of the greater responses noted above such as momentary changes in swimming speed and orientation, diving, surface and foraging behavior and respiratory patterns.

Concurrent with this response would be a response to the physical application of the suction-cup tag, or in the case of dart/barb tags, tag penetration and puncture wounds. However, current research examining how cetaceans respond to tag attachments, regardless of type, does not usually distinguish between a whale's response to a very close approach and the tag attachment. Possible reasons for this include: (1) such responses are indistinguishable to researchers, (2) no proper controls exist to make such a distinction given that researcher generally do not approach very close unless they are also tagging, and (3) such a distinction is not warranted as cetaceans themselves may not differentiate between the two stressors. As such, below we describe what is known about how cetaceans respond behaviorally to the initial tag deployment, which includes the response to both the very close approach and the attachment of tags.

Previous studies have found that cetaceans respond to suction-cup tag deployment (and missed attempts) in a variety of ways. In humpback whales, Goodyear (1989a; 1989b) observed quickened dives, high back arches, tail swishes (31 percent) or no reaction (69 percent) to suction-cup deployments. One breach was observed in roughly 100 taggings and no damage to skin was found (Goodyear 1989a; 1989b). Baird et al. (2000) observed only low (e.g., tail arch or rapid dive) to medium (e.g., tail flick) level reactions by humpbacks in response to suction-cup tag deployments. Baumgartner and Mate (2003) reported that strong reactions of North Atlantic right whales to suction-cup tag deployments were uncommon, and that 71 percent of the 42 whales closely approached for suction-cup tagging showed no observable reaction (22 of 28 that were successfully tagged and 8 of 14 that were unsuccessfully tagged). The remaining whales reacted by lifting their heads or flukes, rolling, back arching, beating their flukes, or performing head lunges. In a review on the effects of marking and tagging on marine mammals, Walker et al. (2012) found that cetaceans exhibited short-term behavioral responses to suction-cup tag deployments including changes in frequency of leaps and group speed, flinching, tail slapping, rapid swimming, and rapid surfacing attempts, but no long term fitness consequences. To our knowledge, there are no studies indicating a physiological response to the attachment of suction-cup tags, but we believe a short-term, minor stress response is possible.

The behavioral responses cetaceans exhibit to the application of invasive tags, such as dart/barb, are similar to those described for suction-cup tags and very close vessel approaches (Walker et al. 2012). Furthermore, behavioral responses to dart/barb tags, as proposed here, to not appear to drastically differ from those noted for deeper penetrating implantable tags, which are not proposed as part of these permit modifications (Mate et al. 2007; Mate et al. 2016; Robbins et al. 2016; Szesciorka et al. 2016; Walker et al. 2012). These responses include head lifts, fluke lifts, exaggerated fluke beats on diving, quick dives, or increased swimming speeds. Less frequent behavioral responses include fluke slaps, head lunges, fluke swishes, defecation, decreased surfacing rates, disaffiliation with a group of whales, evasive swimming behavior, cessation of singing, breaching, bubble blowing, or rapid acceleration (Mate et al. 2007; Mate et al. 2016; Szesciorka et al. 2016; Walker et al. 2012).

Given that dart/barb tags penetrate the animal's tissue, a physiological response is expected. Anticipated reactions to these puncture wounds include minor pain, cell damage, and possibly local inflammation, swelling, bleeding, blood clotting, hemorrhage, and bruising (Mate et al. 2016; NMFS 2017a; Robbins et al. 2016; Szesciorka et al. 2016; Walker et al. 2012; Weller 2008a). However, since barb/darts would be designed to not penetrate beyond the blubber layer or entirely through the dorsal, and the size of the puncture wounds would be small relative to the size of the animal (the anchors on the dart/barb tags can be about 45 millimeters long by 22 millimeters wide, depending), very little bleeding, and no hemorrhage, blood clotting, or bruising is expected to occur from these types of tags. Furthermore, current evidence suggest such responses are rare, even for deeper penetrating implantable tags, which are not proposed here (Mate et al. 2016; NMFS 2017a; NMFS 2017b; Robbins et al. 2016; Szesciorka et al. 2016; Walker et al. 2012; Weller 2008a). In addition, a stress response to the deployment of invasive tags is possible, but the available data indicates such a response would be short-term and minimal (Eskesen et al. 2009). If the penetrating tips of tags were contaminated, a viral, fungal, or bacterial infection is possible (Haulena 2016; NMFS 2016g; Weller 2008a). However, given that, all researchers would be required to would thoroughly sterilize all tags prior to deployment, infection is unlikely. That said, tag sterilization does not preclude the possibility that a pathogen on the whales skin enters the body upon tag insertion (Weller 2008a).

There is also a possibility that some dart/barb tags may break upon impact or soon after, leaving parts of these tags (e.g., petals) in the animal with no tag attached. For one current permit holder (Permit No. 20605; Dr. Robin Baird), out of approximately 500 dart/barb tag deployments, there have been approximately 8 instances of dart/barb tag breakage (NMFS 2016h). Furthermore, future tag breakage is even less unlikely given that recent tag modifications made by researchers have greatly reduced or eliminated tag breakage (Robbins et al. 2016; Szesciorka et al. 2016). In fact, in his past research Dr. Baird has noted such tag breakage, and has always consulted with tag manufactures to modify future tags in an effort to reduce and hopefully eliminate such tag breakage (NMFS 2016e; NMFS 2016f). Furthermore, even if such an event were to occur, we do not anticipate the response to this initial tag breakage to be any different from that described above. However, as discussed below, such tag breakage may have adverse impacts beyond the initial tagging event. In permit reports, researchers (e.g., the SEFSC and Dr. Mate) have noted no response or minor responses to tag attachment from Bryde's whales.

Based on this and the information presented above, we expect behavioral responses to initial tag deployments (including unsuccessful attempts) to consist of brief, low-level to moderate behavioral responses. We do not anticipate any physiological responses to the initial attachment of suction-cup tags other than those associated with a minor stress response. For dart/barb tags, a range of physiological responses is possible, but the initial deployment of tags is not expected to result in serious injury. Based on all of these responses, we do not anticipate that the initial tag deployment would affect the fitness of individual whales.

Once tagged, Gulf of Mexico Bryde's whales may respond both behavioral and physiologically to the continued attachment of tags. For all types of tags, current studies suggest little to no measurable impact on whale behavior. In suction-cup tagging humpback whales, Baird et al. (2000) observed pre-tagging behavior within minutes and no long term or strong reactions. Baumgartner and Mate (2003) reported that suction-cup tagged North Atlantic right whales resumed normal foraging dives within two dives post tag attachment, indicating that the continued attachment of the tag had little effect on their behavior. For most species and circumstances, behavioral response to continued attachment of tags is expected to be mild and short-term. These behavioral responses are in line with those described by the permit holders requesting permit modifications in their applications and annual reports from previous research.

While similar long-term behavioral responses are expected for the different tag types, they differ in the long-term physiological responses they are likely to elicit. For suction-cup tags, almost no physiological response is expected. While the continued attachment of suction-cup tags could cause inflammation and hyperemia at the attachment site, such responses would be short term and minimal (NMFS 2017a). In contrast, dart/barb tags maintain long-term (months) penetration within the animal, which may lead to a variety of short-term or chronic responses including pain, tissue damage, inflammation, swelling, and/or depression, change in skin pigmentation and/or skin loss, tissue extrusion, exudate, serious injury, infection, changes in reproduction, or even death.

The available data on the physiological responses of cetaceans to the continued attachment of invasive tags are primarily limited to short-term effects, as few studies have attempted to follow up on tagged individuals weeks, months, or years after tagging. In general, wounds from invasive tags heal with only minor scaring and indentation (Best et al. 2015; Calambokidis 2015; Hanson et al. 2008; NMFS 2016a; Norman et al. in review; Robbins et al. 2016; Szesciorka et al. 2016). Long-term impacts, however, remain difficult to gauge (Mate et al. 2007), and attempts to assess long-term impacts have yielded some mixed results. Several studies have examined long-term impacts of invasive tags and have not found any. In a study on false killer and pilot whales, researchers found no significant difference in survival (Baird et al. 2013). One recent study investigating long-term impacts from dart/barb tags on cetaceans in Hawaii found little evidence of any impacts on survival or reproduction (Andrews et al. 2015), although the power to detect significant differences was very low. In studying the effects of implantable tags, which are more invasive than the dart/barb tags proposed here, on southern right whales, Best et al. (2015) found similar calving rates between tagged and un-tagged females. Thus, in most instances where researchers have attempted to document long-term impacts of invasive tagging on fitness, they have failed to detect any negative effects. However, we are aware of three recent studies that suggests at least older tag designs may result in negative long-term fitness consequences.

Gendron et al. (2014) monitored the wound site of a broken subdermal attachment from an invasive satellite tag somewhat similar to the dart/barb tags being proposed here, on an adult female blue whale over a period of 16 years (1995 to 2011). In 2005, ten years after tag deployment, the tag attachment remained embedded in the whale, with swelling less than 60 centimeters in diameter observed at the site of the attachment. In 2006, 11 years after tag deployment, the sub-dermal attachment had been expelled, leaving an open wound with blubber tissue apparently visible at the center of the swelling, which appeared to have decreased in size compared to two years before. The whale was last seen in 2011 with a scar (closed wound) present at the tag site. The whale's calving history showed three calves; two were observed prior to, and one after, the swelling period (1999 to 2007). Though there was not definitive evidence of the tag attachment's effect on reproduction, the authors suggested that it may have affected the female's reproductive success during this period (Gendron et al. 2014).

In recent years, many advances in tag technology have been made both to improve data collection and to minimize and avoid adverse impacts to tagged animals (NMFS 2016h). These include smaller tag designs, stronger materials, fully integrated designs, improved sterilization techniques, and better tag application methods, all of which are incorporated in tags that would be used under the proposed permits. With these improvements, the chances of long-term adverse effects are greatly reduced (Mate et al. 2007; NMFS 2016a; Robbins et al. 2016; Szesciorka et al. 2016). However, even with these advances impacts to fitness can still occur, as exemplified by the recent death of a Southern Resident DPS killer whale, as described below.

In 2016, the death of a Southern resident killer whale, L95, was reported following attachment of a dart/barb tag under Permit No. 16163. An expert veterinary panel concluded that a fungal infection developed at the tag site, as determined by gross dissection, radiographs, magnetic resonance imaging and histopathology, though the killer whale presented in moderate to advanced decomposition at the time of necropsy (Haulena 2016; NMFS 2016g). This fungal infection contributed to illness in the whale and most likely contributed to its death. There were several factors in this case that may have predisposed this whale to a fungal infection at the tagging site including: incomplete disinfection of the tag after seawater contamination, retention of the tag petals which may have allowed for formation of a biofilm or direct pathogen implantation, placement of the tag lower on the body and near large bore vessels which increased the chance of fungal dissemination through the blood system, poor body condition, and possible immunosuppression.

The case of L95 is important evidence that invasive tags carry some risk of death. However, the circumstances that lead to L95's death are extremely unlikely to occur under the permits presented in this action for several reasons. First, researchers would not attempt to tag any individual that appears to be in poor health. Second, researchers would follow stringent sterilization methods as described in their applications and as required in the permit terms and conditions. Third, researchers would use the latest tag technologies to minimize chances of tag breakage. Given these measures, we find it highly unlikely that the use of invasive tags would result in the death of any individual cetacean.

In summary, we expect Gulf of Mexico Bryde's whales to show minor to no behavioral response to the continued attachment of tags. For suction-cup tags, we also anticipate little to no physiological response to the continued attachment of the tag. For dart/barb tags, we anticipate most wounds would heal with little to no complication and minimal scaring, with only a few animals exhibiting prolonged healing and scaring. Given recent advances in tagging technologies and the mitigation measures proposed by the Permits Division, we find it unlikely that mortality or a reduction in fitness would result from invasive tagging. However, as indicated by the above review, mortality and fitness impacts have been documented in the literature for older tag designs or under extenuating circumstances (e.g., L95). Thus, while we find that effects to fitness from the invasive tags proposed here are not likely to occur, invasive tagging is not without risk.

11.4.1.5 Trawling and Incidental Capture of Sea Turtles

In this section, we describe the range of responses among ESA-listed sea turtles that may result from the stressors associated with incidental capture that could occur as part of the trawling in the National Centers for Coastal Ocean Science's proposed action.

Capture can cause stress responses in sea turtles (Gregory 1994; Gregory and Schmid 2001; Hoopes et al. 1998; Jessop et al. 2003; Jessop et al. 2004; Thomson and Heithaus 2014). We also expect behavioral responses (attempts to break away via rapid swimming and biting) as well as physiological responses such as the release of stress hormones (Gregory et al. 1996; Gregory and Schmid 2001; Harms et al. 2003; Hoopes et al. 2000; Stabenau et al. 1991).

If incidental capture does occur, we would expect it to be brief. The turtles would be located and released quickly to minimize the stress to them. The short tow times (30 minutes) reduce the likelihood of mortality (Sasso and Epperly 2006), and the presence of protected species observers and researchers capable of performing recovery protocols on captured turtles minimizes the effects of incidental capture. If done correctly, the effects of incidental capture would be expected to be minimal. NMFS expects that individual turtles would experience no more than short-term stresses during these types of capture activities and that these stresses would dissipate within a short period. NMFS expects no mortalities or serious injuries from these capture activities.

Handling and restraint activities may markedly affect metabolic rate (St. Aubin and Geraci 1988), reproduction (Mahmoud and Licht 1997), and hormone levels (Gregory et al. 1996). Handling has been shown to result in progressive changes in blood chemistry indicative of a continued stress response (Gregory and Schmid 2001; Hoopes et al. 2000). The additional on-board holding time imposes an additional stressor on these already acidotic turtles (Hoopes et al. 2000). It has been suggested that the muscles used by sea turtles for swimming might also be used during lung ventilation (Butler et al. 1984). Thus, an increase in breathing effort in negatively buoyant animals may have heightened lactate production. Understanding the physiological effects of capture and handling methodology is essential to conducting research on endangered sea turtles, since safe return to their natural habitat is required. However, literature pertaining to the physiological effects of capture and handling on sea turtles is scarce. No mortalities or injuries are expected because of this research.

11.5 Risk Analysis

In this section we assess the consequences of the responses to the individuals that have been exposed, the populations those individuals represent, and the species those populations comprise. Whereas the *Response Analysis* (Section 11.4) identified the potential responses of ESA-listed species to the proposed action, this section summarizes our analysis of the expected risk to individuals, populations, and species given the expected exposure to those stressors (as described in Section 6) and the expected responses to those stressors (as described in Section 11.4).

We measure risks to individuals of endangered or threatened species using changes in the individuals' "fitness," which may be indicated by changes the individual's growth, survival, annual reproductive success, and lifetime reproductive success. When we do not expect ESA-listed animals or those proposed for listing that are exposed to an action's effects to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise. As a result, if we conclude that ESA-listed or proposed animals are *not* likely to experience reductions in their fitness, we would conclude our assessment. If, however, we conclude that individual animals are likely to experience reductions in fitness, we would assess the consequences of those fitness reductions on the population(s) those individuals belong to.

As noted in the *Response Analysis*, none of the research activities as proposed with the mitigation measures to minimize exposure and associated responses, are expected reduce the long-term fitness of any individual ESA-listed sea turtle or an ESA-proposed Gulf of Mexico Bryde's whale. As such, the issuance of modifications to Permit Nos. 14450, 14856, 16239, 17312, and 18636 and the funding of research under the RESTORE Act are not expected to present any risk to populations, DPSs, or species listed under the ESA.

We expect up to one Kemp's ridley, two North Atlantic DPS green, four Northwest Atlantic Ocean DPS loggerhead, one leatherback and four hawksbill sea turtles to be captured and subsequently released during each research cruise. Because of the short tow times, minimal handling, and mitigation measures, we do not expect any mortality to occur from the harassment or incidental capture that may occur because of the proposed action. The proposed action will result in temporary stress to the exposed sea turtles that is not expected to have more than short-term effects on individual North Atlantic green, hawksbill, Kemp's ridley, and Northwest Atlantic loggerhead sea turtles.

12 INTEGRATION AND SYNTHESIS

The *Integration and Synthesis* section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the *Effects of the Action* (Section 11) to the *Environmental Baseline* (Section 10) and the *Cumulative Effects* (Section 13) to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a ESA-listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the *Status of the Species* (Section 9).

The following discussions separately summarize the probable risks the proposed action poses to threatened and endangered species and critical habitat that are likely to be exposed. These summaries integrate the exposure profiles presented previously with the results of our response analyses for each of the actions considered in this opinion.

As explained in the *Approach to the Assessment* section, risks to listed individuals are measured using changes to an individual's "fitness" – i.e., the individual's growth, survival, annual reproductive success, and lifetime reproductive success. When listed plants or animals exposed to an action's effects are not expected to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the population(s) those individuals represent or the species those populations comprise (Anderson 2000; Brandon 1978; Mills and Beatty 1979; Stearns 1992). As a result, if the assessment indicates that listed plants or animals are not likely to experience reductions in their fitness, we conclude our assessment.

NMFS Office of Protected Resources, Permits and Conservation Division proposes to issue modifications to permit Nos. 14450, 14856, 16239, 17312, and 18636 for research on Gulf of Mexico Bryde's whales, proposed for listing as endangered under the ESA, pursuant to section 10(a)(1) of the Endangered Species Act. The NOS National Centers for Coastal Ocean Science proposes to fund a research project focusing on the Gulf of Mexico Bryde's whales and their habitat.

The *Status of Listed Resources* described the factors that have contributed to the reduction in population size for the species considered in this opinion. Threats to the survival and recovery of these species include fisheries interactions, ship strikes, and anthropogenic sound. Scientific research is ongoing in the action area, but based on numerous ESA section 7 consultations has been determined to not pose jeopardy to the species evaluated in this consultation. NMFS expects that the current natural and anthropogenic threats described in the *Environmental Baseline* will continue. We did not find any likely future actions that could affect the species considered in this opinion beyond those described in the *Environmental Baseline*.

Based on the evidence available, including the *Environmental Baseline* and *Cumulative Effects*, stressors resulting from the issuance of modifications to Permit Nos. 14450, 14856, 16239, 17312, and 18636 for research on Gulf of Mexico Bryde's whales would not be expected to appreciably reduce the likelihood of the survival or recovery of the species in the wild by reducing the reproduction, numbers, or distribution of those species. As described in Section 6 of this opinion, stressors associated with the proposed action will not affect the population dynamics, behavioral ecology, and social dynamics of individual Gulf of Mexico Bryde's whales in ways or to a degree that would reduce their fitness. Under the proposed permits, the proposed Gulf of Mexico Bryde's whale would be exposed to the following potential stressors:

1) Close approach by research vessels;
2) Close approach by unmanned aerial surveys (for exhaled breath sampling);
3) Sloughed skin and feces collection;
4) Skin and blubber biopsy;
5) Tagging with suction-cup or dart/barb/LIMPET tag.

We determined that vessel close approaches, biopsy, tagging, close approach via small UAS, and collection of exhaled breath condensate were likely to adversely affect ESA-proposed Gulf of Mexico Bryde's whales.

ESA-listed sea turtles (North Atlantic Ocean DPS green, Northwest Atlantic DPS loggerhead, Kemp's ridley, hawksbill, and leatherback) would be exposed to the stressors of vessel close approaches and incidental capture during trawling. Of these potential stressors, we determined that only incidental capture was likely to adversely affect ESA-listed sea turtles.

We believe short-lived behavioral reactions are possible, but we do not expect these responses to lead to reduced opportunities for foraging, reproduction or other essential life functions for target or non-target individuals. Due to the mitigation measures and short tow times, we do not expect mortality of any incidentally captured sea turtles. Overall, no individual Gulf of Mexico Bryde's whale or sea turtle is expected to experience a fitness reduction from the proposed action. An action that is not likely to reduce the fitness of individual whales or sea turtles would not be likely to reduce the viability of the populations those individual whales or sea turtles represent (that is, we would not expect reductions in the reproduction, numbers, or distribution of those populations). We do not anticipate any reductions in survival rate or trajectory of recovery of the species as listed or proposed for listing pursuant to the ESA that would be sufficient to be readily perceived or estimated.

13 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 C.F.R. §402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

During this consultation, NMFS searched for information on future state, tribal, local, or private actions reasonably certain to occur in the action area. We did not find any information about non-Federal actions other than what has already been described in the Environmental Baseline, which we expect will continue into the future. Anthropogenic effects include commercial fishing, vessel traffic, ocean noise, pollution, discharged contaminants, and coastal development. An increase in these activities could result in an increased effect on ESA-listed species; however, the magnitude and significance of any anticipated effects remain unknown at this time.

14 Conclusion

After reviewing the current status of the ESA-listed species and those proposed for ESA-listing, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent actions, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of Gulf of Mexico Bryde's whales, Northwest Atlantic DPS loggerhead, North Atlantic DPS green, Kemp's ridley, hawksbill, or leatherback sea turtles. No designated critical habitat will be affected.

15 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include acts that actually kill or injure fish or wildlife, including significant habitat modification or degradation that results in death or injury to ESA-listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

All activities associated with the issuance of Permit Nos. 14450, 14856, 16239, 17312, and 18636 involve directed take of Gulf of Mexico Bryde's whales for the purposes of scientific research. Therefore, NMFS does not expect the Permits Division's proposed action would incidentally take threatened or endangered species. However, we request that the Permits Division report to us the take as specified in Table 3 that actually occurs at the expiration of the permit, as well as any information on the response animals exhibited to those takes. Such information will be used to inform the *Environmental Baseline* and *Effects of the Action* sections for future consultations for the permitted researchers, and other similar research activities.

As discussed previously, we expect that the trawling to take place during the National Centers for Coastal Ocean Science's proposed action could result in the incidental take of ESA-listed sea turtles.

15.1 Amount or Extent of Take

Section 7 regulations require NMFS to specify the impact of any incidental take of endangered or threatened species; that is, the amount or extent, of such incidental taking on the species (50

C.F.R. §402.14(i)(1)(i)). The amount of take represents the number of individuals that are expected to be taken by actions.

Based on the calculated exposure estimates, we expect that up to four Northwest Atlantic DPS loggerhead, two North Atlantic DPS green, four hawksbill, one leatherback, and one Kemp's ridley sea turtle may be captured while trawling conducted during the 2019 cruise in the proposed action. We anticipate that all sea turtles expected to be incidentally captured over the life of the permit will undergo short-term harassment and/or minimal injury from being captured and released from nets.

15.2 Effects of the Take

In this opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

15.3 Reasonable and Prudent Measures

The measures described below are nondiscretionary, and must be undertaken by the National Centers for Coastal Ocean Science. They are binding conditions for the exemption in section 7(o)(2) to apply. Section 7(b)(4) of the ESA requires that when a proposed agency action is found to be consistent with section 7(a)(2) of the ESA and the proposed action may incidentally take individuals of ESA-listed species, NMFS will issue a statement that specifies the impact of any incidental taking of endangered or threatened species. To minimize such impacts, reasonable and prudent measures, and term and conditions to implement the measures, must be provided. Only incidental take resulting from the agency actions and any specified reasonable and prudent measures and terms and conditions identified in the incidental take statement are exempt from the taking prohibition of section 9(a), pursuant to section 7(o) of the ESA.

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 C.F.R. §402.02). NMFS believes the reasonable and prudent measures described below are necessary and appropriate to minimize the impacts of incidental take on threatened and endangered species:

1) The National Centers for Coastal Ocean Science must ensure that all personnel keep a vigilant watch for sea turtles during trawling, and implement the sea turtle handling protocol specified in 50 CFR 223.206(d)(1)(B) to minimize the possibility of injury.
2) The National Centers for Coastal Ocean Science must monitor and report on all incidental takes of ESA-listed turtles.

15.4 Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the National Centers for Coastal Ocean Science must comply with the following terms and conditions, which implement the Reasonable and Prudent Measures described above. These include the take minimization, monitoring and reporting measures required by the section 7 regulations (50 C.F.R. §402.14(i)).

These terms and conditions are non-discretionary. If National Centers for Coastal Ocean Science fail to ensure compliance with these terms and conditions and their implementing reasonable and prudent measures, the protective coverage of section 7(o)(2) may lapse.

The following terms and conditions implement reasonable and prudent measure 1:

1. The National Centers for Coastal Ocean Science will require that the protected species observers and the researchers observe the nets for sea turtles before setting the trawl and while the catch is being sorted. The National Centers for Coastal Ocean Science will require that sea turtles be returned to the water, to the maximum extent practicable and with vigilant consideration of safety, any live sea turtles that are found in nets during research.
2. The National Centers for Coastal Ocean Science will require that, in the event of an incidental capture of a live sea turtle, the following handling and resuscitation requirements (taken from 50 CFR 223.206) are implemented:
    - Resuscitation must be attempted on sea turtles that are comatose, or inactive, as determined in paragraph (d)(1) of this section (223.206), by:
    - Placing the turtle on its bottom shell (plastron) so that the turtle is right side up and elevating its hindquarters at least 6 inches (15.2 centimeters) for a period of 4 up to 24 hours. The amount of the elevation depends on the size of the turtle; greater elevations are needed for larger turtles. Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches (7.6 centimeters) then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response.
    - Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method in keeping a turtle moist.
    - Sea turtles that revive and become active must be released over the stern of the boat only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) must be returned to the water in the same manner as that for actively moving turtles.

The following terms and conditions implement reasonable and prudent measure 2:

3. The National Centers for Coastal Ocean Science will require the researcher to report any sea turtle interactions to NMFS within 14 days of the incident. This report must contain

the description of the take, species of sea turtle, a description of the sea turtle (e.g., size, markings), a photograph of the sea turtle, and release condition.

4. These reports must be forwarded to the ESA Interagency Cooperation Division of the Office of Protected Resources, National Marine Fisheries Service 1315 East-West Highway, Silver Spring, Maryland, 20910.

16 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on ESA-listed species or critical habitat, to help implement recovery plans or develop information (50 C.F.R. §402.02).

Adaptive Management

The Permits and Conservation Division should compile data from the annual permit holders meeting and annual reports on Gulf of Mexico Bryde's whale responses to research procedures and on developments in research techniques or technologies that minimize impacts of research on the species. This information should be used to inform the development of future guidance documents and best management practices related to marine mammal research, and should be used to inform the authorization process for future research permits.

Information Sharing

Furthermore, the Permits and Conservation Division should provide this information to the ESA Interagency Cooperation Division to enable the best possible effects and response analyses in consultations concerning Gulf of Mexico Bryde's whales.

In order for NMFS' Office of Protected Resources Endangered Species Act Interagency Cooperation Division to be kept informed of actions minimizing or avoiding adverse effects on, or benefiting, ESA-listed species or their critical habitat, the Permits and Conservation Division should notify the Endangered Species Act Interagency Cooperation Division of any conservation recommendations they implement in their final action.

17 Reinitiation Notice

This concludes formal consultation and conference for the NMFS Permit and Conservation Division and the NOS National Centers for Coastal Ocean Science's action to authorize research on Gulf of Mexico Bryde's whales and to fund research activities under the RESTORE Act.

If the ESA listing of Gulf of Mexico Bryde's whale is finalized as proposed, the Permits Division may ask NMFS to confirm the conference opinion as a biological opinion through formal consultation. The request must be in writing. If NMFS reviews the propose action and finds that there have been no significant changes in the action as planned or in the information used during the conference, NMFS will confirm the conference opinion as the biological opinion on the action and no further ESA section 7 consultation will be necessary.

As 50 C.F.R. §402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

(1) The amount or extent of taking specified in the incidental take statement is exceeded.
(2) New information reveals effects of the agency action that may affect ESA-listed species or critical habitat in a manner or to an extent not previously considered.
(3) The identified action is subsequently modified in a manner that causes an effect to ESA-listed species or designated critical habitat that was not considered in this opinion.
(4) A new species is listed or critical habitat designated under the ESA that may be affected by the action.

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