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

Title:	Biological and Conference Opinion on the Issuance of Scientific Research Permit Nos. 20648 to Dr. Heidi Pearson for Research on Marine Mammals in the Gulf of Alaska and Southeast Alaska, 21482 to Dr. Dan Engelhaupt, HDR, Inc. for Research on Marine Mammals in the Arctic, Atlantic, Indian, Pacific, and Southern Oceans, and 21938 to the Southeast Fisheries Science Center for Research on Marine Mammals in the Western North Atlantic Ocean, Gulf of Mexico, and Caribbean Sea
Consultation Conducted By:	Endangered Species Act Interagency Cooperation Division, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce
Action Agency:	Permits and Conservation Division, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce
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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 concurs 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 NMFS on any action which is likely to jeopardize the continued existence of any species proposed for listing or result in the destruction or adverse modification of proposed critical habitat under NMFS jurisdiction (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 50 C.F.R. §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 reasonable and prudent alternatives that can be taken by the Federal agency or the applicant and allow the action to proceed in compliance with section 7(a)(2) of the ESA. If incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement that specifies the impact of any incidental taking on the species and includes reasonable and prudent measures NMFS considers necessary or appropriate to minimize such impacts and terms and conditions to implement the reasonable and prudent measures.

The action agency for this consultation is the NMFS, Office of Protected Resources, Permits and Conservation Division (hereafter the Permits and Conservation Division). The Permits and Conservation Division proposes to issue three scientific research permits (Section 3) pursuant to section 10(a)(1)(A) of the ESA and section 104 of the Marine Mammal Protection Act (MMPA) of the 1972, as amended (16 U.S.C. 1361 et seq.). Permit No. 20648 will be issued to Heidi Pearson, Ph.D., University of Alaska Southeast, 11120 Glacier Highway, Juneau, Alaska 99801. Permit No. 21482 will be issued to Dan Engelhaupt, Ph.D., HDR, Inc., 4173 Ewell Road, Virginia Beach, Virginia 23455. Permit No. 21938 will be issued to the Southeast Fisheries Science Center (SEFSC), Keith Mullin, Ph.D., 3209 Fredreric Street, Pascagoula, Mississippi

39567. The purpose of the proposed permit is to allow an exception to the moratorium and prohibition on takes established under the ESA and MMPA in order to allow Dr. Heidi Pearson, HDR, Inc. (Dr. Dan Engelhaupt) and the SEFSC (Dr. Keith Mullin) to conduct scientific research on marine mammals in the Gulf of Alaska and Southeast Alaska or Arctic, Atlantic, Indian, Pacific, and Southern Oceans (worldwide), or the Western North Atlantic Ocean, Gulf of Mexico, and Caribbean Sea.

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 further 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.” While the U.S. Fish and Wildlife Service further defines harass by regulation (50 C.F.R. §17.3), until NMFS promulgates a regulatory definition, we rely on NMFS’ interim guidance, which defines harass as an act that creates 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, the two levels of harassment are further defined under the MMPA as any act or 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.

NMFS' interim ESA harass definition does not specifically equate 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. Since the proposed permits will authorize take under both the ESA and MMPA, our ESA analysis, which relies on NMFS' interim guidance on the ESA term harass, may result in different conclusions than those reached by the Permits and Conservation Division in their MMPA analysis. Given that the MMPA takes a more conservative approach in considering any act that has the potential to disrupt behavioral patterns as harassment, while under the ESA such acts must significantly disrupt normal behavioral patterns, there may be circumstances in which an act is considered harassment, and thus take, under the MMPA but not the ESA.

This consultation, biological and conference opinion (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. §§402.01-402.16), 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 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. Part 402.

This document represents the NMFS ESA Interagency Cooperation Division's opinion on the effects of the proposed action under Permit No. 20648 on blue whales, North Pacific right whales, sei whales, fin whales, the Western North Pacific population of gray whales, Western North Pacific distinct population segment (DPS) of humpback whales, Mexico DPS of humpback whales, sperm whales, the Western DPS of Steller sea lions, East Pacific DPS of green turtles, leatherback turtles, and North Pacific Ocean DPS of loggerhead turtles, as well as designated critical habitat for the North Pacific right whale and Western DPS of Steller sea lions.

This document represents the NMFS ESA Interagency Cooperation Division's opinion on the effects of the proposed action under Permit No. 21482 on the Cook Inlet DPS of beluga whales, blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whales, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whale, Western North Pacific DPS of humpback whales, Southern Resident DPS of killer whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, sperm whales, Gulf of California harbor porpoise/vaquita, Maui's dolphin, South Island Hector's dolphin, Taiwanese humpback dolphin, Beringia DPS of bearded seals, Okhotsk DPS of bearded seals, Guadalupe fur seals, Hawaiian monk seals, Mediterranean monk seals, Arctic subspecies of ringed seals, Baltic subspecies of ringed seal, Okhotsk subspecies of ringed seal, Southern DPS of spotted seal, Western DPS of Steller sea lions, Central North Pacific DPS of green turtles, Central South

Pacific DPS of green turtles, Central West Pacific DPS of green turtles, East Pacific DPS of green turtles, North Atlantic DPS of green turtles, South Atlantic DPS of green turtles, East Indian-West Pacific DPS of green turtles, Mediterranean DPS of green turtles, North Indian DPS of green turtles, Southwest Indian DPS of green turtles, Southwest Pacific DPS of green turtles, hawksbill turtles, Kemp's ridley turtles, leatherback turtles, North Pacific Ocean DPS of loggerhead turtles, Northwest Atlantic Ocean DPS of loggerhead turtles, Northeast Atlantic Ocean DPS of loggerhead turtles, Mediterranean Sea DPS of loggerhead turtles, North Indian Ocean DPS of loggerhead turtles, South Atlantic Ocean DPS of loggerhead turtles, South Pacific Ocean DPS of loggerhead turtles, Southeast Indo-Pacific Ocean DPS of loggerhead turtles, Southwest Indian Ocean DPS of loggerhead turtles, and Mexico's Pacific Coast Breeding Colonies and All Other Areas of olive ridley turtles as well as designated critical habitat for Cook Inlet DPS of beluga whales, Main Hawaiian Islands insular DPS of false killer whales, Hawaiian monk seal, Southern Resident DPS of killer whales, North Atlantic right whales, North Pacific right whales, North Atlantic DPS of green turtles, hawksbill turtles, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles.

This document also represents the NMFS ESA Interagency Cooperation Division's opinion on the effects of the proposed action under Permit No. 21938 on blue whales, Gulf of Mexico subspecies of Bryde's whales, fin whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, North Atlantic right whales, sei whales, sperm whales, North Atlantic DPS of green turtles, South Atlantic DPS of green turtles, hawksbill turtles, Kemp's ridley turtles, leatherback turtles, Northwest Atlantic Ocean DPS of loggerhead turtles, South Atlantic Ocean DPS of loggerhead turtles, and olive ridley turtles as well as designated critical habitat for North Atlantic right whales, North Atlantic DPS of green turtles, hawksbill turtles, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles. A complete record of this consultation is on file at the NMFS Office of Protected Resources in Silver Spring, Maryland.

1.1 Background

Scientists at the University of Alaska Southeast (Dr. Heidi Pearson), HDR, Inc. (Dr. Dan Engelhaupt), and SEFSC (Dr. Keith Mullin) are long-term marine mammal researchers, and we have previously conducted ESA section 7 consultations on research permits for Dr. Dan Engelhaupt and Dr. Keith Mullin. The applicant (Dr. Heidi Pearson) has not held a scientific research permit to study cetaceans.

ESA section 7 consultations have been completed for previous research permits issued to the University of Alaska Southeast. The proposed research activities under Permit No. 20648 would occur concurrently with work conducted under Permit No. 18529 (2016 through 2021), issued to Jan Straley (University of Alaska Southeast). The applicant is currently a co-investigator on this latter permit. Permit No. 18529 has a similar action area (all waters of Alaska) and scope to the current permit application and is a continuation of work conducted under Permit No. 14122 (2010 through 2016) and 473-1700 (2004 through 2010). The previous opinions for Permit Nos.

18529, 14122, and 473-1700 determined that the authorized research activities were not likely to jeopardize the continued existence of ESA-listed species and no destruction or adverse modification of designated critical habitat was anticipated.

The applicant (Dr. Dan Engelhaupt) has held scientific research permits to study cetaceans since 1999 (Permit No. 0909-1465). ESA section 7 consultations have been completed for previous research permits issued to this applicant. The proposed research activities under Permit No. 21482 are a continuation of work conducted under Permit No. 16239 (2013 through 2018) and 909-1726 (2005 through 2011) as such have similar action areas and scope to the current permit application. The previous opinions for Permit Nos. 16239 and 909-1726 determined that the authorized research activities were not likely to jeopardize the continued existence of ESA-listed species and no destruction or adverse modification of designated critical habitat was anticipated.

The applicant (SEFSC; Dr. Keith Mullin) has conducted MMPA-authorized research since the mid-1970s to study marine mammals in the western North Atlantic Ocean, Gulf of Mexico, and the Caribbean Sea. ESA section 7 consultations have been completed for previous research permits issued to this applicant. The proposed research activities for Permit 21938 is a continuation of those conducted under Permit Nos. 779-1339 (1986 through 1990), 779-1633 (1999 through 2005), and 14450-04 (2014 through 2019).

These research activities continue long-term marine mammal research that is designed to meet the specific or implied mandates of the MMPA and the ESA. The MMPA stipulates that marine mammal species in U.S. waters be protected on a stock basis. The previous opinions for Permit No. 16111 and Permit No. 540-1811 determined that the authorized research activities were not likely to jeopardize the continued existence of ESA-listed species and no destruction or adverse modification of designated critical habitat was anticipated. The previous opinion for Permit No. 779-1339, 779-1633, and 14450 all determined that the authorized research activities were not likely to jeopardize the continued existence of ESA-listed species and no designated critical habitat was likely to be adversely affected. This consultation for Permit No. 21938 is for research activities similar to the research activities described in the consultations for Permit Nos. 779-1339, 779-1633, and 14450.

In this consultation, we build upon our evaluation of Dr. Heidi Pearson and long-term evaluation of the HDR, Inc. and SEFSC's research activities from previous consultations, considering these previous research permits as part of the *Environmental Baseline* (Section 10) and evaluating the effects of authorizing Dr. Dan Engelhaupt of HDR, Inc. and the SEFSC to continue to conduct research activities under Permit Nos. 21482 and 21938, respectively, over the next five years.

The Permits and Conservation Division requested separate consultations for the proposed actions under Permit Nos. 20648, 21482, and 21938. All three will study cetacean species. The ESA Interagency Cooperation Division suggested and the Permits and Conservation Division agreed to batch the consultations for Permit Nos. 20648, 21482, and 21938 for streamlining, efficiency, and workload purposes, as they have similar research methodologies targeting many of the same ESA-listed species, have similar action areas, and have similar due dates.

1.2 Consultation History

This opinion is based on information provided in the applicants' permit application, correspondence and discussions with the Permits and Conservation Division and the applicants, previous biological opinions for research permits on which researchers at the University of Alaska Southeast, HDR, Inc., and SEFSC were Principal Investigators or Co-Investigators, annual reports from previous research activities on which researchers at the University of Alaska Southeast, HDR, Inc., and SEFSC were Primary Investigators or Co-Investigators, other similar research activities for which we have conducted ESA section 7 consultations, and the best scientific and commercial data available from the literature.

On July 27, 2018, we suggested and the Permits and Conservation Division agreed to batch the consultations for Permit Nos. 21482 and 21585 for streamlining, efficiency, and workload purposes as they have similar research methodologies targeting many of the same ESA-listed species, and have similar due dates. After the Permits and Conservation Division agreed to our suggestion, on August 15, 2018, we sent the Permits and Conservation Division a memorandum informing them that we had initiated consultation on the issuance of Permit Nos. 21482 and 21585 as of June 26, 2018 and June 22, 2018, respectively. On November 6, 2018, the ESA Interagency Cooperation decided to separate the consultations for the issuances of Permit Nos. 21482 and 21585 due to the changes in the due date for Permit No. 21482. On February 28, 2019, we suggested and the Permits and Conservation Division agreed to batch the consultations for Permit Nos. 21482 and 21938 for streamlining, efficiency, and workload purposes as they have similar research methodologies targeting many of the same ESA-listed species, and have similar due dates. On March 6, 2019, we suggested and the Permits and Conservation agreed to batch the consultation for Permit No. 20648 with Permit Nos. 21482 and 21938 for streamlining, efficiency, and workload purposes as they have similar research methodologies targeting many of the same ESA-listed species, and have similar due dates.

Our communication with the Permits and Conservation Division regarding each permit is summarized as follows:

1.2.1 Permit No. 20648

- On September 24, 2018, the Permits and Conservation Division sent ESA Interagency Cooperation Division a memorandum and initiation package requesting formal consultation on the proposed issuance of Permit No. 20648. The Permits and Conservation Division requested review of the initiation package and additional information requests be submitted by October 15, 2018. The Permits and Conservation Division requested that formal consultation be concluded and the signed opinion received one week prior to the proposed target issuance date of February 15, 2019, meaning the opinion was requested by February 8, 2019.

- On October 17, 2018, the ESA Interagency Cooperation Division sent comments and questions to the Permits and Conservation Division regarding the applicant's proposed action and research methods.
- On October 24, 2018, the ESA Interagency Cooperation Division and the Permits and Conservation Division held a conference call with the applicant, who provided requested information.
- On November 2, 2018, the applicant provided additional information to the ESA Interagency Cooperation Division and the Permits and Conservation Division that was not available during the previous conference call.
- On December 22, 2018, consultation was held in abeyance for 38 days due to a lapse on appropriations and resulting partial government shutdown. Consultation resumed on January 28, 2019.
- On January 31, 2019, the ESA Interagency Cooperation Division and the applicant agreed to the Permits and Conservation Division's proposed extension of the target permit issuance date from March 1, 2019 to May 1, 2019.
- On March 11, 2019, the Permits and Conservation Division agreed with the ESA Interagency Cooperation Division's request to batch the consultations for the issuances of Permit Nos. 20648, 21482, and 21938.
- On March 18, 2019, the ESA Interagency Cooperation Division determined there is sufficient information to initiate formal consultation. The ESA Interagency Cooperation Division provided the Permits and Conservation Division with an initiation letter on March 22, 2019.

1.2.2 Permit No. 21482

- On September 21, 2017, the Permits and Conservation Division requested early technical assistance and review of the permit application by the ESA Interagency Cooperation Division.
- On November 18, 2017, the ESA Interagency Cooperation Division notified the Permits and Conservation Division that they had reviewed the permit application and did not have any comments.
- On December 27, 2017, the Permits and Conservation Division provided comments to the applicant and requested additional information.
- On February 26, 2018, the Permits and Conservation Division received responses to comments and an updated application from HDR, Inc.
- On June 25, 2018, the Permits and Conservation Division sent us a memorandum and initiation package requesting formal consultation on the proposed issuance of Permit No. 21482. The memorandum and initiation package was received on June 26, 2018. The Permits and Conservation Division requested review of the initiation package and additional information requests be submitted by July 15, 2018. The Permits and Conservation Division requested that formal consultation be concluded and the signed

opinion received one week prior to the proposed target issuance date of November 1, 2018, meaning the opinion was requested by October 25, 2018.

- On July 16, 2018, the ESA Interagency Cooperation Division discussed a proposed permit modification with the Permits and Conservation Division, which will allow the researchers to conduct behavioral observation audiometry on humpback whales around Hawaii during the winter months of 2019 and 2020, and will be considered in this consultation. On July 18, 2018, the Permits and Conservation Division provided supplementary materials and sent comments to the applicant.
- On July 27, 2018, the ESA Interagency Cooperation Division decided to batch the consultations for the issuances of Permit Nos. 21482 and 21585.
- On August 15, 2018, the ESA Interagency Cooperation Division determined there is sufficient information to initiate formal consultation. The ESA Interagency Cooperation Division provided the Permits and Conservation Division with an initiation letter on August 17, 2018.
- On October 23, 2018, the Permits and Conservation Division notified the ESA Interagency Cooperation Division that the target issuance date for Permit No. 21482 will likely be delayed until January 2019.
- On November 6, 2018, the ESA Interagency Cooperation decided to separate the previously batched consultations for the issuances of Permit Nos. 21482 and 21585 due to the changes in the due date for Permit No. 21482.
- On December 13, 2018, the Permits and Conservation Division notified the ESA Interagency Cooperation Division that the target issuance date for Permit No. 21482 will likely be delayed until mid-February or early-March 2019.
- On December 18, 2018, the Permits and Conservation Division sent the ESA Interagency Cooperation Division the most recent version of the application and notified us that they will not be allowing deep-implantable tags to be deployed on the Gulf of Mexico subspecies of Bryde's whales and sei whales.
- On December 22, 2018, consultation was held in abeyance for 38 days due to a lapse on appropriations and resulting partial government shutdown. Consultation resumed on January 28, 2019.
- On February 28, 2019, the Permits and Conservation Division notified the ESA Interagency Cooperation Division that the target issuance date for Permit No. 21482 would be in May 2019.
- On March 25, 2019, the Permits and Conservation Division sent the ESA Interagency Cooperation Division a revised version of the application and associated documents. The updated application has revised the project description, refined the definition of types of tags. Dr. Dan Engelhaupt removed two types of tags from the original application.
- On April 15, 2019, the Permits and Conservation Division sent the ESA Interagency Cooperation Division a revised version of the application with the updated project description.

1.2.3 Permit No. 21938

- On April 2, 2018, the Permits and Conservation Division requested technical assistance and review of the application and supplementary documents for Permit No. 21938 from the ESA Interagency Cooperation Division by February 1, 2019.
- On May 2, 2018, the ESA Interagency Cooperation Division provided comments on the application to the Permits and Conservation Division.
- On May 3, 2018, the Permits and Conservation Division requested additional information from the applicant.
- On June 28, 2018, the applicant submitted a revised application to the Permits and Conservation Division.
- On July 16, 2018, the ESA Interagency Cooperation Division provided a species and designated critical habitat list to the Permits and Conservation Division.
- On August 3, 2018, the applicant submitted another revised application to the Permits and Conservation Division.
- The Permits and Conservation Division sent the ESA Interagency Cooperation Division a memorandum and initiation package dated August 6, 2018 requesting formal consultation on the proposed issuance of Permit No. 21938. The memorandum and initiation package was received by the ESA Interagency Cooperation Division on August 23, 2018. The Permits and Conservation Division requested review of the initiation package and additional information requests be submitted by September 5, 2018. The Permits and Conservation Division requested that formal consultation be concluded and the biological opinion signed by February 1, 2019.
- On December 10, 2018, the Permits and Conservation Division sent a letter requesting the inclusion of the Cape Verde Islands/Northwest Africa humpback whale DPS be included in the formal consultation process.
- On December 11, 2018, the ESA Interagency Cooperation Division officially initiated consultation.
- On December 18, 2018, the Permits and Conservation Division sent the ESA Interagency Cooperation Division the most recent version of the application and notified us that they will not be allowing deep-implantable tags to be deployed on the Gulf of Mexico subspecies of Bryde’s whales and sei whales.
- On December 22, 2018, consultation was held in abeyance for 38 days due to a lapse on appropriations and resulting partial government shutdown. Consultation resumed on January 28, 2019.
- On February 28, 2019, the Permits and Conservation Division and the ESA Interagency Cooperation Division agreed to batch the consultations for the issuances of Permit Nos. 21482 and 21938.

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): We describe the proposed action and those aspects (or stressors) of the proposed action that may have direct or indirect effects on the physical, chemical, and biotic environment.

Action Area (Section 4): We describe the action area with the spatial extent of those stressors.

Interrelated and Interdependent Actions (Section 5): We identify 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 use, apart from the action under consideration.

Potential Stressors (Section 6): We identify the stressors that could occur as a result of the proposed action and affect ESA-listed species and designated critical habitat.

Species and Critical Habitat Not Likely to be Adversely Affected (Section 7): We identify the ESA-listed species and designated critical habitat that are not likely to be adversely affected by the stressors.

Species Likely to be Adversely Affected (Section 8): We identify the ESA-listed species and designated critical habitat that are likely to co-occur with the stressors produced by the proposed action in space and time and evaluate the status of those species and habitat.

Status of Species Likely to be Adversely Affected (Section 9): We examine the status of each species that may be adversely affected by the proposed action as well as the condition of designated critical habitat throughout the action area and discuss the condition and current function of designated critical 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, and impacts of state or private actions that are contemporaneous with the consultation in process.

Effects of the Action (Section 11): We identify the number, age (or life stage), and gender of ESA-listed individuals that are likely to be exposed to the stressors and the populations or sub-populations 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 analyses. 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.

Cumulative Effects (Section 12): 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.

Integration and Synthesis (Section 13): 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.

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 (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* (See Section 16) that may be implemented by the action agencies (Section 16) (50 C.F.R. §402.14(j)). Finally, we identify the circumstances in which reinitiation of consultation is required (Section 17) (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 and Conservation Division and the applicant;
- Government reports (including NMFS' biological opinions and stock assessment reports);
- NOAA technical memorandums; and
- Peer-reviewed scientific literature.

These resources were used to identify information relevant to the potential stressors and responses of ESA-listed species and designated critical habitat 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. The proposed action for this consultation is the Permits and Conservation Division's issuance of a scientific research permit pursuant to the requirements of the MMPA to Dr. Heidi Pearson (University of Alaska Southeast), Dr. Dan Engelhaupt (HDR, Inc.), and the SEFSC (Dr. Keith Mullin).

The Permits and Conservation Division proposes to issue scientific research Permit No. 20648 to Dr. Heidi Pearson, Assistant Professor at University of Alaska Southeast, to study nearshore cetaceans in the Gulf of Alaska and Southeast Alaska. The majority of the research activities will occur around Juneau, Alaska. The ESA-listed cetaceans that will be targeted in the proposed studies include fin, Western North Pacific population of gray, Western North Pacific DPS of humpback, Mexico DPS of humpback, and sperm whales, as well as Western DPS of Steller sea lion. Research methods include vessel surveys, photographic identification, pole cam underwater photo/videography, behavioral observations, unmanned aircraft system-based videography, photography, and breath sampling, passive acoustics, active acoustics (prey mapping), sloughed skin and fecal sampling, pole-based breath-sampling, suction cup tagging, and remote biopsy sampling. The purpose of the research activities is to increase knowledge about the behavior, ecology, and movement patterns of cetaceans inhabiting the Gulf of Alaska, particularly around Southeast Alaska. This knowledge could be applied to the development of conservation and management strategies for these species. The applicant's objectives are to: (1) contribute to the ongoing long-term studies of humpback whales in Southeast Alaska by examining parameters such as population trends, health, foraging ecology, and social strategies; (2) provide baseline data on the behavior and ecology of sperm whales; and (3) assess behavioral and physiological baselines and responses of humpback whales to anthropogenic factors such as vessel traffic and environmental factors such as prey availability and climate change. The research activities will occur throughout the year (weather permitting), and when logistically feasible for the duration of the five-year permit.

The Permits and Conservation Division proposes to issue scientific research Permit No. 21482 to Dr. Dan Engelhaupt, Program Manager at HDR Inc., to study marine mammals in all U.S., International, and foreign waters worldwide including the Arctic, Atlantic, Indian, Pacific, and Southern Oceans. This includes the focal areas of the Western Atlantic Ocean, Gulf of Mexico, Caribbean Sea, Sargasso Sea, Pacific Ocean (including Australia and Japan), and the Gulf of Alaska within U.S. Navy training and testing areas. The ESA-listed marine mammals that will be targeted in the proposed studies include Cook Inlet DPS of beluga, blue, bowhead, Gulf of Mexico sub-species of Bryde's, Main Hawaiian Islands insular DPS of false killer, fin, Western North Pacific population of gray, Central America DPS of humpback, Mexico DPS of humpback, Western North Pacific DPS of humpback, Cape Verde Islands/Northwest Africa DPS of humpback, Arabian Sea DPS of humpback, Southern Resident DPS of killer, North Atlantic right, North Pacific right, sei, and sperm whales and Beringia DPS of bearded seals, Guadalupe fur seals, Hawaiian monk seals, Arctic DPS of ringed seals, and Western DPS of Steller sea lions. Research methods include aerial surveys (using manned and unmanned aircraft systems), vessel surveys, active acoustics (playbacks), passive acoustic monitoring, photographic identification, photogrammetry, in-air and underwater photography and videography, behavioral observations, focal follows, biological sampling (biopsy, breath, fecal, and sloughed skin samples), tagging (suction-cup, dart/barb, and deep-implantable tags) (see Table 1). The purpose of the research activities is to further the understanding of how marine mammals may respond to anthropogenic activities (particularly U.S. Navy's testing and training activities), while contributing to marine mammal conservation by collecting critical baseline and exposure data required to inform long-term management. The goal of the research activities are (1) to collect and assimilate relevant data across U.S. Navy range complexes to address questions pertaining to whether sonar and explosive exposure levels may have an impact on marine mammals during U.S. Navy testing and training activities; and (2) collect pre-, during, and post-construction data on marine mammals that utilize waters where potential offshore energy (i.e., tidal, wave, wind, oil and gas, etc.) installations and wharf or pier refurbishment/replacement using vibratory and impact hammer techniques may occur. The research activities will determine (1) presence/absence of marine mammals in U.S. Navy testing and training activity areas as well as proposed and existing energy and construction areas; (2) movement patterns of at-risk species; (3) population structure based on a variety of parameters for marine mammals occupying waters shared with the U.S. Navy, renewable energy industry, and pier-based industry requiring construction activities. Biopsy sampling and tagging will address population structure, indications of "stress" via testing cortisol measures, reproductive status from measures of sex steroids (progesterone and testosterone, and/or alterations in gene expression by evaluating the skin transcriptome, which will help both the U.S. Navy and others better understand how acoustic disturbances may lead to population level consequences); diet patterns via stable isotope and fatty acid analysis; distribution of marine mammals in areas of interest; determination of risk for animal exposure to U.S. Navy's testing and training activities and energy development and production; movement patterns (including potential responses) on U.S. Navy's testing and training activities; baseline dive behavior; and fine and large-scale habitat use patterns.

HDR, Inc. has been contracted by the Naval Facilities Engineering Command to carry out the U.S. Navy's Integrated Comprehensive Monitoring Plan. The Integrated Comprehensive Plan assesses the long-term and population-level effects to marine species from the U.S. Navy's testing and training activities and includes research on the distribution, abundance, and habitat use throughout the U.S. Navy's range complexes and other locations. The Integrated Comprehensive Plan focuses on the effects from mid-frequency sonar and explosives. Dr. Dan Engelhaupt has teamed with several leading researchers under the U.S. Navy's Marine Species Monitoring Program in order to facilitate a more well-managed process of collecting and synthesizing data. Researchers at HDR, Inc. as well as the U.S. Navy and NMFS will use the collected information to help with analysis of distribution patterns, developing predictive habitat and density models, and understanding general habitat use as required by annual reports under the MMPA and/or ESA. The data may be used in adaptive management decisions and inform moniotoring and mitigation measures.. The research activities will occur throughout the year (weather permitting), and when logistically feasible for the duration of the five-year permit.

The Permits and Conservation Division proposes to issue scientific research Permit No. 21938 to SEFSC to study marine mammals in the western North Atlantic Ocean, Gulf of Mexico. The ESA-listed cetaceans targeted by the proposed research activities include the blue, Gulf of Mexico sub-species of Bryde's, Cape Verde Islands/Northwest Africa DPS of humpback, North Atlantic right, sei, and sperm whales. Research methods include aerial surveys (using manned and unmanned aircraft systems), vessel surveys, passive acoustic monitoring, active acoustics (prey mapping), photographic identification, photogrammetry, in-air and underwater photography and videography, behavioral observations, focal follows, biological sampling (biopsy, sloughed skin, fecal, and prey samples), tagging (suction-cup, dart/barb, and deep-implantable tags) (see Table 1). The purpose of the research activities is to meet the mandates of the MMPA and ESA primarily within the framework of the information requirements of the U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments (SAR) (e.g., Waring et al. 2016; Hayes et al. 2017).

This report, which includes the Caribbean Sea, is mandated by the MMPA and is updated annually. The SAR elements that the proposed research will address include: Stock Definition and Geographic Range, Population Size (Minimum Population Estimate, Current Population Trend), Current and Maximum Net Productivity Rates, and Potential Biological Removal. Assessments of these SAR elements are used in conjunction with additional SAR elements, Annual Human-caused Mortality and Serious Injury, and Habitat Issues, to ultimately assess the Status of Stock. The SARs are refined by the Guidelines for Assessing Marine Mammal Stocks (e.g., Moore and Merrick 2011) which are periodically revised to reflect up to date advances in methods, quantitative analysis, and technology. The Guidelines for Assessing Marine Mammal Stocks is also a driver for the research proposed. Finally in addition to the SARs and Guidelines for Assessing Marine Mammal Stocks, the goal of NMFS "Stock Assessment Improvement Plan" (NMFS 2001) is to improve stock assessments in a systematic manner to ultimately understand how stocks function in their respective ecosystems.

A "population stock" as defined in the MMPA, or a "vertebrate species" as defined in the ESA, is a group of animals that share a common space and interbreed. The concept is central to the environmental acts of the U.S. Congress and the management efforts directed by such legislation in that it recognizes the importance of preserving populations uniquely adapted to a local area, that is, reservoirs of unique genetic variability.

The intent of the MMPA is to provide protection for marine mammal stocks such that each stock remains at or above its Optimal Sustainable Population level. Therefore in addition to defining stock structure and geographic range, the SEFSC is required, on a timely basis, to assess the size of each marine mammal stock in its areas of responsibility relative to Optimal Sustainable Population level and provide an estimate of each stock's Potential Biological Removal (see Barlow et al. 1995; Wade and Angliss 1997; Moore and Merrick 2011). Therefore, assessment surveys must be conducted to collect data to make estimates of both stock size and potential biological removal.

Broad objectives of SEFSC research for each species are 1) define its stock structure in the North Atlantic Ocean; 2) define its geographic range; 3) make timely estimates of the size (the number of individual animals) of each stock of each species; 4) describe the habitat of each stock in terms of biological and oceanographic variables; 5) for select species/stocks, study movement and ranging patterns, diving behavior, and habitat use of individuals, and their the association patterns; 6) for select species/stocks, study their vocalization patterns and the ambient acoustic environment; 7) for select species/stocks, assess reproductive status, types and origin of prey, and levels of anthropogenic chemical contaminants; and 8) study or observe the behavior and presence/absence of select species/stocks under natural conditions and relative to certain human activities.

The research activities will occur throughout the year (weather permitting), and when logistically feasible for the duration of the five-year permit.

The proposed duration of the scientific research permits are five years. In accordance with Federal regulations (50 C.F.R. §216.39), the duration of a permit may be extended for up to one year via a minor amendment to allow uninterrupted continuation of research if a new five-year permit application has been received and is in-process. In such cases, no additional takes will be authorized during the extension; any takes that were allocated for the fifth year of the permit that were not used may be used during the extension. Thus, the annual takes proposed in the draft permit may be extended for use over a six-year period.

Table 1. Summary of research methods for Permit Nos. 20648, 21482, and 21938.

Proposed Research Method	Permit No. 20648 (Dr. Heidi Pearson)	Permit No. 21482 (Dr. Dan Engelhaupt)	Permit No. 21398 (SEFSC)
Aerial Surveys – Manned Aerial Surveys	No	Yes	Yes
Aerial Surveys – Unmanned Aircraft Systems	Yes	Yes	Yes
Vessel Surveys	Yes	Yes	Yes
Photographic-Identification	Yes	Yes	Yes
Photogrammetry	Yes	Yes	Yes
Underwater Photography and Videography	Yes	Yes	Yes
Behavioral Observations	Yes	Yes	Yes
Focal Follows	Yes	Yes	Yes
Active Acoustics – Playbacks	No	Yes	No
Active Acoustics – Prey Mapping	Yes	No	Yes
Passive Acoustic Monitoring	Yes	Yes	Yes
Biopsy Sampling	Yes	Yes	Yes
Breath Sampling	Yes	Yes	Yes
Fecal Sampling	Yes	Yes	Yes
Prey Sampling	No	No	Yes

Sloughed Skin Sampling	Yes	Yes	Yes
Suction-Cup Tagging	Yes	Yes	Yes
Dart/Barb Tagging	No	Yes	Yes
Deep-Implantable Tagging	No	Yes	Yes
Export/Import	No	Yes	Yes

Table 2. Proposed permitted annual take for Endangered Species Act-listed species under Permit No. 20648.

Species	Listing Unit/Stock	Life Stage	Number of Takes[1]	Takes Per Animal Per Year	Take Action	Observe/Collect Method	Procedures	Details
Sea lion, Steller	Range-wide (Eastern U.S. DPS and NMFS Endangered Western U.S. DPS)	All	500	10	Harass	Survey, vessel	Incidental disturbance	
Whale, fin	Northeast Pacific stock (NMFS Endangered)	All	500	50	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	
Whale, gray	Range-wide (Eastern North Pacific and NMFS Endangered	All	500	50	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring;	

[1] Takes = the **maximum** number of animals, not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

Species	Listing Unit/Stock	Life Stage	Number of Takes[1]	Takes Per Animal Per Year	Take Action	Observe/Collect Method	Procedures	Details
	Western North Pacific stocks)						Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	
Whale, humpback	Range-wide (NMFS Endangered)	All	5000	100	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	Survey activities, excluding biopsy and tagging

Species	Listing Unit/Stock	Life Stage	Number of Takes[1]	Takes Per Animal Per Year	Take Action	Observe/Collect Method	Procedures	Details
Whale, humpback	Range-wide (NMFS Endangered/ Threatened)	All	50	10	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Tracking; Underwater photo/videography	Survey activities with biopsy, excluding tagging
		All	450	10			Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	Survey activities with tagging, excluding biopsy

Species	Listing Unit/Stock	Life Stage	Number of Takes[1]	Takes Per Animal Per Year	Take Action	Observe/Collect Method	Procedures	Details
Whale, sperm	North Pacific stock (NMFS Endangered)	All	500	50	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	

*Takes=maximum number of animals not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

Table 3: Proposed permitted annual take for Endangered Species Act-listed species in the Gulf of Mexico, Western Atlantic Ocean, Caribbean Sea, and Sargasso Sea throughout U.S., international, and foreign waters under Permit No. 21482.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
Whale, blue; Range-wide (NMFS Endangered)	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	All	150	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging. No more than 5 individuals per year would be tagged with both an implantable tag and suction cup tag at the same time.
	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
Whale, Bryde's; Gulf of Mexico subspecies (NMFS Endangered)	All	200	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
	Adult/ Juvenile	20	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal;	Biopsy sampling.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
					Sample, skin and blubber biopsy; Underwater photo/videography	
	Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time
Whale, fin; Range-wide (NMFS Endangered)	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tags. No more than 5 individuals per year would be tagged with both an implantable tag and suction cup tag at the same time.
	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	All	797	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle,	Level B surveys.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
					aerial (VTOL); Sample, fecal; Underwater photo/videography	
Whale, humpback; Cape Verde / Northwest Africa DPS (NMFS Endangered)	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	All	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal;	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
					Sample, skin and blubber biopsy; Underwater photo/videography	suction cup tag at the same time.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging, No more than 5 individuals per year would be tagged with both an implantable tag and suction cup tag at the same time.
Whale, humpback; West Indes DPS	All	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys. US East coast work.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
						time. US East coast work.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging. US East coast work.
	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. US East coast work.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging, No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
						time. US East coast work.
Whale, humpback; West Indes DPS; and Cape Verde Islands DPS (NMFS Endangered)	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. Caribbean.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging. Caribbean.
	All	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys. Caribbean.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time. Caribbean.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging, No more than 5 individuals per year would be tagged with both an implantable tag and suction cup tag at the same time.
Whale, right, North Atlantic; Range-wide	Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Suction cup tagging.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
(NMFS Endangered)	All	150	1	Harass	Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
	Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
Whale, sei; Range-wide (NMFS Endangered)	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
	All	78	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
Whale, sperm; Range-wide (NMFS Endangered)	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
	All	1394	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

*Takes=maximum number of animals not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

Table 4: Proposed permitted annual take for Endangered Species Act-listed species in the Pacific Ocean and Gulf of Alaska throughout U.S., international, and foreign waters including Japan and Australia under Permit No. 21482.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
Sea lion, Steller; Western Stock (NMFS Endangered)	All	8473	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	Incidental disturbance during vessel and aerial surveys.
Seal, bearded; Range-wide	All	250	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	Incidental disturbance during vessel and aerial surveys.
Seal, Guadalupe fur; Range-wide	All	1482	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	Incidental disturbance during vessel and aerial surveys.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
Seal, Hawaiian monk; Hawaiian Islands (NMFS Endangered)	All	233	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	Incidental disturbance during vessel and aerial surveys.
Seal, ringed; Range-wide	All	250	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	Incidental disturbance during vessel and aerial surveys.
Seal, spotted; Range-wide	All	250	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	Incidental disturbance during vessel and aerial surveys.
Whale, beluga; Cook Inlet Stock (NMFS Endangered)	All	62	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
Whale, blue; Range-wide (NMFS Endangered)	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.
	All	600	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
Whale, bowhead; Range-wide (NMFS Endangered)	All	2109	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
Whale, false killer; Hawaii Insular (NMFS Endangered)	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
	All	170	2	Harass	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
Whale, fin; Range-wide (NMFS Endangered)	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.
	All	1784	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
Whale, gray; Western North Pacific (Korean)	All	3000	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Level B surveys.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	20	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.
Whale, humpback; Arabian Sea DPS (NMFS Endangered)	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	International waters. Level B surveys.
	Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
Whale, humpback; Central America DPS (NMFS Endangered)	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	International waters. Level B surveys.
	Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
Whale, humpback;	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	International waters. Level B surveys.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
Mexico DPS (NMFS Threatened)	Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
Whale, humpback; Mexico DPS (NMFS Threatened); and Central America DPS (NMFS Endangered)	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Research in CA and OR. Level B surveys.
	Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
Whale, humpback; Mexico DPS (NMFS Threatened);	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Research in WA and Canada. Level B surveys.
	Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
Central America DPS (NMFS Endangered) ; and Hawaii DPS	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
Whale, humpback;	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Research in AK. Level B surveys.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
Mexico DPS (NMFS Threatened); Central America DPS (NMFS Endangered); Western North Pacific DPS (NMFS Endangered); and Hawaii DPS	Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
Whale, humpback; Range-wide Non-listed DPSs	Adult/ Juvenile	700	1	Harass	Acoustic, active playback/broadcast; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Worldwide. Level B surveys and audiometry experiments in Hawaii
	Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
Whale, humpback; Western North Pacific DPS (NMFS Endangered)	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	International waters. Level B surveys.
	Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
Whale, killer; Southern Resident Stock (NMFS Endangered)	All	75	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
Whale, killer; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	All	692	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
Whale, right, North Pacific; Range-wide (NMFS Endangered)	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
	All	150	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
Whale, right, southern; Range-wide (NMFS Endangered)	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
Whale, sei; Range-wide (NMFS Endangered)	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart and suction cup tag at the same time.
	All	300	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
Whale, sperm; Range-wide (NMFS Endangered)	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
	All	1729	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Species; Stock/ Listing Unit	Life stage	Number of Takes*	Takes Per Animal Per Year	Take Action	Procedures	Details
	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.
Whale, unidentified bowhead or right; N/A (NMFS Endangered)	All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
Whale, unidentified fin/sei; N/A (NMFS Endangered)	All	100	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

*Takes=maximum number of animals not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

Table 5: Proposed permitted annual take for Endangered Species Act-listed species under Permit No. 21938.

Species	Life Stage	Number of Takes*	Takes Per Animal Per Year	Observe/ Collect Method	Procedures	Details
Blue whale	Adult/ Juvenile	10	2	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. 2 biopsy samples may be collected per event for a total of 2 biopsy samples per individual per year.
Blue whale	All	20	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
Blue whale	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb or implantable tag and 1 suction-cup tag).

Species	Life Stage	Number of Takes*	Takes Per Animal Per Year	Observe/ Collect Method	Procedures	Details
Bryde's whale Gulf of Mexico subspecies	Adult/ Juvenile	Up to 40	2	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. 20 individual animals may be biopsy sampled twice per year. Two samples per event for a total of four biopsy samples per individual per year. Maximum of 3 attempts to biopsy sample per day.
Bryde's whale Gulf of Mexico subspecies	All	Up to 300	5	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Vessel and aerial surveys.
Bryde's whale Gulf of Mexico subspecies	Adult/ Juvenile	Up to 40	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Suction-cup and dart tagging. 20 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag) attached at one time. Maximum of 3 attempts to tag per day.

Species	Life Stage	Number of Takes*	Takes Per Animal Per Year	Observe/ Collect Method	Procedures	Details
Fin whale	Adult/ Juvenile	15	2	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. 2 biopsy samples may be collected per event for a total of 2 biopsy samples per individual per year.
Fin whale	All	500	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
Fin whale	Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 10 successfully tagged animals with up to 2 tags maximum (1 dart/barb or implantable tag and 1 suction-cup tag).
Humpback whale; Cape Verde/ Northwest Africa DPS	Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 10 successfully tagged animals with up to 2 tags maximum (1 dart/barb or implantable tag and 1 suction-cup tag).

Species	Life Stage	Number of Takes*	Takes Per Animal Per Year	Observe/ Collect Method	Procedures	Details
Humpback whale; Cape Verde/ Northwest Africa DPS	Adult/ Juvenile	75	2	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. 2 biopsy samples may be collected per event for a total of 2 biopsy samples per individual per year
Humpback whale; Cape Verde/ Northwest Africa DPS	All	1,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
North Atlantic right whale	Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Dart/barb and suction-cup tagging. 10 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
North Atlantic right whale	All	50	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Species	Life Stage	Number of Takes*	Takes Per Animal Per Year	Observe/ Collect Method	Procedures	Details
Sei whale	Adult/ Juvenile	15	2	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. 2 biopsy samples may be collected per event for a total of 2 biopsy samples per individual per year
Sei whale	All	10	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys
Sei whale	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag)
Sperm whale	Adult/ Juvenile	60	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 20 successfully tagged animals with up to 2 tags maximum (1 dart/barb or implantable tag and 1 suction-cup tag).

Species	Life Stage	Number of Takes*	Takes Per Animal Per Year	Observe/ Collect Method	Procedures	Details
Sperm whale	Adult/ Juvenile	150	2	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. 2 biopsy samples may be collected per event for a total of 2 biopsy samples per individual per year.
Sperm whale	All	4,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

*Takes=the maximum number of animals, not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

The information presented here is based primarily upon the applications, annual reports, environmental assessment, and draft permits provided by the Permits and Conservation Division as part of the initiation packages, and previous opinions form similar consultations.

3.1 Proposed Activities

The proposed research activities will include a variety of research methodologies that will take place in all U.S., International, and foreign waters worldwide (including the Arctic, Atlantic, Indian, Pacific, and Southern Oceans) with some differences between permit applications (see Table 1), including aerial surveys (using manned and unmanned aircraft systems), vessel surveys, active acoustics (playbacks and prey mapping), passive acoustic monitoring, photographic identification, photogrammetry, in-air and underwater photography and videography, behavioral observations, focal follows, biological sampling (biopsy, breath, fecal, prey, and sloughed skin), and tagging (suction-cup, dart/barb, and deep-implantable tags). Due to the nature of field work, multiple objectives can be achieved at the same time using a combination of research methods. These research activities will be directed towards a particular target animal or group of animals and are described in more detail below. In addition, non-target animals in the action areas may be unintentionally disturbed during these research activities. The combination of aerial surveys, vessel surveys, biological sampling (e.g., genetic analysis of tissue samples), and tagging studies (analysis of movement patterns) will add important depth and breadth to the understanding of impacts from anthropogenic activities and other aspects of cetacean life history.

3.2 Aerial Surveys

The proposed research activities will include aerial surveys using unmanned aircraft systems under Permit No. 20648 and manned aircraft and unmanned aircraft systems under Permit Nos. 21482 and 21938. Aerial surveys will take place year-round as needed for all cetacean species, subject to aircraft and funding availability.

3.2.1 Aerial Surveys – Manned Aerial Surveys

Under Permit No. 21482, Dr. Dan Engelhaupt will use aerial surveys to assess abundance of marine mammals. Aerial surveys will be conducted using fixed-wing aircraft (e.g., Partenavia P68-C or Cessna Skymaster T337) and rotary-wing aircraft (i.e., helicopters). Aerial surveys will use basic data collection procedures and equipment outlined in (Smultea, Mobley Jr. et al. 2009), but the aircraft type, computer, camera, and other details may vary. Aerial surveys using conventional line-transect methodology will typically be conducted at an altitude of 213.4 to 304.8 meters (700 to 1,000 feet) depending on objectives and target species. Aerial surveys will be conducted at a speed of approximately 185.2 kilometers per hour (100 knots). Flight patterns will typically consist of a grid perpendicular to coastal and bathymetric features.

Focal follows will be conducted with approximately 0.5 to 1 kilometer (0.2 to 0.5 nautical mile) radial distance. Flying at the lower altitude of 213.4 meters (700 feet) will allow photography for species identification for cetaceans and pinnipeds at haul-outs (other than Hawaiian monk seals), but flights will not be conducted directly over hauled-out pinnipeds. Aerial surveys along the shoreline, which are flown at a altitude of 121.9 meters (400 feet) will use a helicopter and are specifically designed to target pinnipeds (e.g., Hawaiian monk seals) and their haul-out areas. Flying at the lower altitude of 121.9 to 213.4 meters (400 to 700 feet) will allows for species identification, assess group dynamics, estimate group size, and search for injured/dead animals (following U.S. Navy testing and training activities). Aerial surveys at lower altitudes will reduce the effective strip width and improve the quality and accuracy of the data collected. The number of times (as few as two) circling during a focal follow depends on the animal's activity and the quality of data collected. Extended focal follows may last up to 60 minutes and at higher altitudes from 304.8 to 457.2 meters (1,000 to 1,500 feet), which are outside of the Snell's cone in order to minimize disturbance to animals. Drops in altitude for purposes of species identification will be less than ten minutes.

Aerial surveys will consist of a pilot, back-up pilot, an optional designated data recorder, and two observers. The pilot will communicate with air traffic control to request local weather information, a summary of active areas to be avoided, and to avoid potential conflict with other aircraft. Observers will collect data such as behavioral state, heading, and spacing between individuals when animals are first sighted. During focal follows, observers will collect photographs to identify species, estimate group size, calf presence, behavioral variables using continuous or scan sampling, and videos. Basic sighting and environmental data will be collected and recorded. High-definition digital cameras will be used during focal follows to record behavior. Additional data, such as declination angles to sightings will be collected using a clinometer. Global positioning system locations will be automatically recorded at ten second intervals on hand-held devices to calculate, classify, and summarize survey effort and sightings to calculate sighting rates.

Under Permit No. 21938, the SEFSC will use aerial surveys to assess the abundance of marine mammals including the Gulf of Mexico subspecies of Bryde's whale. Aerial surveys for abundance of marine mammals will be conducted primarily using NOAA De Havilland Twin Otter aircraft modified for surveys of marine mammals (bubble windows, belly windows). Aerial surveys will be conducted at a speed of 185 to 200 kilometers per hour (100 to 110 knots) at an altitude of 183 to 305 meters (600 to 1,000 feet). Aerial survey flights will only be conducted when flying conditions are safe and there are no to few whitecaps (Beaufort sea state 0 to 3). Survey flights will typically begin at around 0800 hours and will be of 4.5 to 6.5 hours in duration. In order to facilitate identifications and for photography purposes, the animals may be approached at a minimum altitude of 92 meters (300 feet) for short periods of time.

For the one-team approach a pilot, co-pilot, and three or four observers will participate in each flight. The observers will be stationed at each of the two bubble windows and at a computer (data entry) station, and possibly also at the "belly" window. Observers will search waters primarily on and near the transect line and scan periodically out to the horizon. To avoid fatigue, observers will rotate positions about every 30 minutes. Pilots and observers will communicate through headsets with voice-activated microphones.

Data will be entered on a computer interfaced with a Global Positioning System (GPS) navigation receiver via a custom data acquisition program. A suit of data characterizing survey conditions (e.g., sea state and weather), effort status, and observer locations will be updated throughout the day. The date, latitude, longitude, and aircraft heading and speed will be recorded automatically with each data record. For cetacean sightings, the angle between the cetacean group and the transect line will be measured with an inclinometer.

When a cetacean group is sighted, the aircraft will be diverted to circle the group. Before continuing the transect, the group will be identified, the group size estimated independently by each of the observers, and the number of calf animals noted. The identifying characteristics of each species and any anecdotal information will be noted on a standardized form. Typical circle time for a group will be less than five minutes, but if it is particularly difficult to make a species identification, the aircraft may circle the group for ten to 15 minutes. In a rare instance the aircraft might circle the group for up to 30 minutes to acquire photographs and video.

At least one observer on each flight will have experience conducting aerial surveys of marine life in the Gulf of Mexico and Atlantic Ocean. Inexperienced observers will be trained to spot and identify cetaceans from aircraft using slides and videotape of tropical cetaceans from previous surveys and other published material. Experienced observers will be responsible for confirming all identifications. Cetaceans will be identified to the lowest taxonomic level possible based on descriptions in field guides and scientific literature (e.g., Jefferson et al. 2015). The ability to make an identification will be dependent on water clarity, sea state, and animal behavior.

Identifications to species will not be possible for some genera or groups of species. In some cases, cetaceans will only be identified as large whales greater than 7 meters [23 feet] long), small whales (non-dolphin, less than 7 meters [23 feet]), dolphins, or odontocetes.

When the two-team approach is used to estimate the probability of that animals will be sighted, g(0), the survey will employ two independent observer teams on the NOAA Twin Otter aircraft. The first team will consist of observers placed in the large side bubble windows in the forward portion of the aircraft. The second team will consist of two individuals looking outward from the small bubble windows in the rear of the aircraft and an observer placed in the belly window. The team composition should be balanced between experienced and inexperienced observers and should remain constant throughout the survey leg. Each team will have a lap-top computer with an operating data entry program to record sighting information. There is no dedicated recorder or rest position for either team. The observer on each team near the lap-top station will be responsible for recording sighting information in addition to significant visibility, sea state, or weather changes. Observers will rotate positions frequently to avoid fatigue, and rest breaks should be taken during off-effort periods between transects.

Once both teams have had the opportunity to sight a marine mammal group, the airplane will break track and circle back over the group for species identification and group size estimation. This is necessary in the mid-Atlantic due to the relatively large number of dolphin species and difficulty in separating them visually during a short observation period. In addition, group size is likely to be underestimated with a single, short duration pass over the group as more individuals will become apparent as they surface during a more extended observation period. The two independent teams will also be able to estimate variability and potential biases in species identifications and group-size estimates. Group-size estimates should be made separately by each team, if possible, and entered into their respective data entry programs.

Small Aicraft Surveys

A light NOAA aircraft may be used to study the distribution and abundance of dolphins in inshore and coastal waters using line-transect methods similar to those outlined for large aircraft. Two observers will participate in each flight and search for dolphins on each side of the aircraft. Surveys will be conducted from an altitude of 183 to 305 meters (600 to 1,000 feet at a speed of 179 kilometers per hour (97 knots) on days with good visibility and Beaufort sea states of 0 to 2. The aircraft will be equipped with a GPS. Group sizes of dolphins will be estimated.

3.2.2 Aerial Surveys – Unmanned Aircraft Systems

Unmanned aircraft systems are small platforms used to complement research objectives. Aerial surveys using unmanned aircraft systems provide a small scale, low altitude aerial resource at a very low cost when compared to traditional aerial survey options. The low cost and ability to launch the platform from a research vessel or land provide increased survey time that can enhance health and population assessments of cetaceans.

Under Permit No. 20648, Dr. Heidi Pearson will use unmanned aircraft systems, specifically a recreational grade quadcopter (e.g. DJI Phantom 3, Inspire, Mavic Pro, or similar system generally under 4.5 kilograms [10 pounds] and with approximate dimensions of 45 centimeters (17.7 inches) [length] by 35 centimeters (13.8 inches) [height] by 45 centimeters (17.7 inches) [width]) with vertical takeoff and landing (VTOL) capabilities, to carry out research activities. The typical payload for these quadcopters is 300 grams (0.7 pounds) which is sufficient for carrying a GoPro-type camera weighing approximately 150 to 200 grams (0.3 to 0.4 pounds). The unmanned aircraft system will be operated from the research vessel with a minimum of three observers on board. The unmanned aircraft system will be flown within line of sight of the operator and below the 121.9 meters (400 feet) altitude as mandated by the FAA. The battery life of the unmanned aircraft system for one deployment is approximately 30 minutes and thus the maximum duration of continual observation or breath sampling via unmanned aircraft system will be 30 minutes. The total flight time above an individual animal will be 60 minutes per survey. An FAA Certificate of Authorization is pending and will be in hand before research commences.

Unmanned aircraft systems will be used for aerial photography and videography. Photos and videos will be collected to examine body condition, body size, and group dynamics (e.g., behavior, group size, group spread, spatial positioning) of fin, gray, humpback, and sperm whales. Photography and videography via unmanned aircraft system will be used in conjunction with other project activities on a total of 50 surveys. The minimum altitude flown for photography and videography will be 30 meters (98 feet). Activities will cease if an individual shows strong or repeated adverse reactions (e.g., marked change in travel direction or speed, sudden dives, or surface active behaviors).

Unmanned aircraft systems will also be used to conduct breath sampling for genetics and detection of stress, sex, and pregnancy hormones in humpback whales. The unmanned aircraft system will be deployed from the research vessel at the maximum distance possible from the whale while still maintain accurate control over the unmanned aircraft system but at least 100 meters (328.1 feet) from the whale. Fifty humpback whales will be sampled each year during one or more of the following time points: prior to the arrival of whale watch vessel(s), in the presence of whale watch vessel(s), and/or after the departure of whale watch vessels(s). Of these, 30 individuals of each species will be sampled three times in one day at each of the aforementioned time points. The minimum time interval between sampling would be 60 minutes. This will allow each individual to serve as its own control to examine changes in stress hormone levels due to whale watch vessel presence. Breath samples will be collected in petri dishes attached to the body of the unmanned aircraft system, which will be flown over the blowholes or into the exhaled cloud. The minimum altitude flown for breath sampling will be 3 meters (10 feet). All samples will be frozen until they are analysed in the lab.

Under Permit No. 21482, Dr. Dan Engelhaupt will use unmanned aircraft systems to complement their manned aerial surveys. Unmanned aerial surveys be used to (1) expand the search area available to the research vessel or shore-based station in order to locate marine mammals; (2) collect detailed behavioral information for marine mammals at or just under the water's surface including body condition, species identification, group size, and social activity; (3) determine body length using photogrammetry; and (4) collect exhaled breath samples to examine health of free-raning cetaceans. Researchers will use small VTOL multicopters (i.e., quadrocopter or hexacopter). The current models that may be used are the DJI Phantom 4 Pro with high-definition video or DJI Inspire 2. The technology and commercial availability of unmanned aircraft systems is rapidly changing. The model of unmanned aircraft system and associated camera system will depend on a variety of factors, including timing of field projects, availability of the system, cost, research goals, and available funding.

The umanned aircraft systems will be launched from a research vessel or ground-based site. Researchers will fly the unmanned aircraft systems within line-of sight of the pilot and at altitudes lower than 121.9 meters (400 feet). The unmanned aircraft systems will generally fly at altitudes of 15.2 to 91.4 meters (50 to 300 feet) for cetaceans and pinnipeds, but may drop to altitudes of 6.1 meters (20 feet) to conduct health assessments, photo-identification (to document specifici markings otherwise not visible at higher altitudes), photogrammetry measurements of cetaceans and 1.8 meters (6 feet) to collect exhaled breath samples. Breath samples will be collected from mysticetes, sperm whales, and beaked whales. The internal high-definition camera will relay imagery to the pilot in real time. Endurance of unmanned aircraft systems is typically 15 to 30 minutes, depending on battery life and model used. Additional flights of the umanned aircraft system over an individual or group of animals may occur to collect data for specific sightings after it is rebatteried. The unmanned aircraft system may be sent back multiple times per day (no more than a maximum of three) if no avoidance or disturbance occurs. If avoidance or disturbance behavior occurs, then the unmanned aircraft system will either climb to a higher altitude or disengage altogether.

If pinniped haul-outs are targeted, researchers will avoid disturbance of animals and will adjust altitude to minimize potential impacts. Researchers will approach haul-outs at an altitude greater than 30.5 meters (100 feet) and descend to a minimum altitude of 15.2 meters (50 feet). If any animals react to the presence of the unmanned aircraft system, then it will either immediately climb in altitude or climb in altitude as well as increase the distance away from the animals to avoid further disturbance.

Research activities will be conducted in full compliance with NMFS policy using unmanned aircraft systems and Federal Aviation Administration regulations. All unmanned aerial survey missions will be flown under the NOAA/FAA Memorandum of Agreement and policy (https://www.omao.noaa.gov/sites/default/files/documents/220-1-5%20AOC%20UAS%20Policy.pdf) and reported to a designated contact at the aircraft operations center as required. All unmanned aerial survey missions will be flown under the NOAA/FAA Memorandum of Agreement in Class G uncontrolled airspace under certain circumstances, as well as visual flight rules and weather conditions, utilizing unmanned aircraft systems that have received NOAA airworthiness certification, using pilots and crew members that have been certified by the FAA and comply fully with NOAA Aircraft Operations' unmanned aircraft systems policies. The unmanned aircraft systems will only be operated in suitable environmental and weather conditions such as daylight hours, winds less than 22.2 kilometers per hour (12 knots), and no rain.

Under Permit No. 21938, the SEFSC may use unmanned aircraft systems to assist in accomplishing research objectives. Aerial surveys using unmanned aircraft systems provide a small scale, low altitude aerial resource at a very low cost when compared to traditional aerial survey options. The low cost and ability to launch the platform from a research vessel or land provides increased survey time that can enhance health and population assessments of cetaceans.

The unmanned aircraft systems are capable of collecting photos, video, and biological samples (e.g., breath sample). It is likely a multi-engine vertical take-off and landing (VTOL) hexacopter would be used. The hexacopter contains a high-resolution digital camera and can be used for photogrammetry. A hexacopter could be used in conjunction with vessel surveys or independently, but likely would be used and launched from a vessel. Any hexicopter or unmanned aircraft system would generally be flown at an altitude of 30 to 61 meters (100 to 200 feet) but this could vary depending on the species of interest or type of data collection (e.g., photograph vs. breath sample). The hexacopters typically weigh 2 kilograms (4.5 pounds) with a camera and battery included and can fly for approximately 35 minutes, though most flight times tend to be much shorter. Multiple passes over a target individual could be made to ensure adequate and high quality images are collected. The hexacopter will be equipped with a 'Return to Home' function (auto-return), an important safety feature to assist the hexacopter return to its launch site/pilot. The unmanned aircraft systems will only be operated in suitable environmental and weather conditions such as daylight hours, winds less than 22.2 kilometers per hour (12 knots), and no rain.

A two-person team is required for unmanned aircraft system operations: (1) a pilot to operate the unmanned aircraft system via a radio control unit, and (2) an observer to monitor the aircraft, surrounding environment, and the live camera feed, including telemetry data (e.g., altitude, orientation, position, battery amount).

In addition to collecting photos and video, it is possible the SEFSC could collect breath samples from large whales (e.g., Bryde's whale, sperm whale) in order to obtain DNA samples for assessing health condition and/or reproductive condition of individual whales. Sample collection would be accomplished via a hexacopter pass over the animal at an altitude of 6–8 feet through the whale's exhalant blow.

Any unmanned aircraft system flights and pilots would meet FAA requirements and certifications. All flights would involve negligible risk as a 2 kilogram (4.5 pounds) hexacopter can do little damage to a large whale in the very unlikely event of instrument failure (a whale being hit by a falling hexacopter). (Durban, Fearnbach et al. 2015) found the stable and quiet nature of hexacopters allow them to be flown at low altitudes without disturbing whales. In addition, our colleagues at other science centers have reported seeing no behavioral reactions to these small, non-invasive instruments.

3.3 Vessel Surveys, Close Approaches, and Documentation

Vessel surveys are the primary means by which cetacean researchers collect data on cetacean species as they provide a platform for researchers to collect a wealth of information on cetacean biology. Here we describe the proposed vessel surveys and associated close approaches more generally and then in each section below, detail the individual research activities that will follow close approaches.

Under Permit No. 20648, Dr. Heidi Pearson will receive animal sighting information from local whale-watch operators and conduct opportunistic vessel surveys to locate study animals. These surveys will be conducted mostly in coastal waters near Juneau, Alaska and will occur year-round but mostly from May through September. The primary research vessel will be a 6 meter (21 feet) Boston Whaler with 250 horsepower four-stroke engine. The vessel will travel at a speed of approximately 28 kilometers per hour (15 knots) while searching for animals. The vessel will slow down to a no-wake speed when animals are approached. Every effort will be made to avoid approaching animals head-on. For all methods, activities will cease if an animal exhibits repeated or strong, adverse reactions to the research vessel or procedure. In addition, the photo-identification record will be used to make every attempt to avoid unintentional repeated sampling of the same individual.

Under Permit No. 21482 , Dr. Dan Engelhaupt will conduct vessel surveys based on guidelines (methodology, data collection, and data analysis) established by NMFS Southwest Fisheries Science Center (Kinzey, Olson et al. 2000). Vessel surveys may follow standard line-transect protocols (Buckland, Anderson et al. 2001) or may deviate from tracklines during focal follows for behavioral observations and/or other research activities (e.g., biological sampling, tagging, etc.). Large-scale and small-scale surveys may occur in different parts of the oceans in different years. Vessel surveys on larger research vessels will have a crew stationed on the flying bridge. Researchers will rotate between “Big-Eye” (25 by 150 Fujinon) binoculars on the port and starboard sive of the platform and use smaller hand-held reticled (7 by 50) binoculars. Visual sighting data will be collected using specialty software on tablet-style devices or laptop computers.

Vessel surveys may be based on a variety of platforms ranging from large research vessels (100 meters [328.1 feet]), medium research vessel (16.8 to 22.9 meters [55 to 75 feet]), and small research vessels 4.6 to 9.1 meters [15 to 30 feet]). Vessel surveys on smaller research vessels will generally consist of rigid hull inflatable boats (less than 9.1 meters [30 feet]). Smaller research vessels will operate in a random search pattern looking for animals where they are known to frequently occur. A crew of three to five researchers will search for animals using the naked eye and hand-held binoculars and collect data using specialty software on tablet-style devices. Smaller research vessels (5 to 18 meters [16.4 to 59.1 feet]) will be used to approach animals for biopsy sampling and tagging as they are very responsive and have good maneuverability. Close approaches will be conducted by large research vessels when feasible. Research vessels will maintain a reasonable distance from animals to avoid disturbance and potential harm. During vessel surveys, large research vessels may closely approach animals within a distance of 50 meters (164 feet) during non-tagging activities. Small research vessels may closely approach animals within a distance of 1 to 2 meters (3.3 to 6.6 feet) during tagging activities.

The vessel surveys will be conducted at speeds of 14.8 to 18.5 kilometers (8 to 10 knots) while on tracklines. Vessel surveys will opportunistically leave tracklines to conduct focal follows and other research activities (e.g., photography, videography, photo-identification, behavioral observations, passive acoustic monitoring, biological sampling, and tagging).

Under Permit No. 21938, the SEFSC will conduct vessel surveys every year (funding permitting) to estimate abundance of marine mammals. The vessel surveys are typically conducted from large, oceanographic or fishery research vessels such as the NOAA ship *Gordon Gunter* (68 meters [223 feet]), *Pisces* (64 meters [210 feet]), *Oregon II* (53 meters [174 feet]), or a similar research vessel along pre-determined transect lines. The study areas will include the western Atlantic Ocean, Gulf of Mexico, and Caribbean Sea waters deeper than 10 meters to the EEZ.

Large Vessel Survey Methods – Visual Surveys

Large vessel survey transects will generally be perpendicular to the depth gradient. In some cases surveys will be similar to those cetacean surveys in the Gulf of Mexico, and Atlantic ((Fulling, Mullin et al. 2003); (Mullin and Fulling 2003); (Mullin and Fulling 2004) which are generally a one-team approach and estimating g(0) is not the focus of the survey. For these surveys one team of visual observers will collect data during daylight hours when there is no rain and the Beaufort sea state is 0 to 5. The observers will stand rotating 1.5 to two-hour watches, and observers will rotate every 30 to 40 minutes between two binocular positions and a data recorder position. Two observers will search for cetaceans using 25 times "bigeye" binoculars, mounted on pedestals on the ship's flying bridge, located about 10 meters (33 feet) above the water's surface. The binoculars will be used to search for cetaceans in an arc from each beam (90 degrees) to about ten degrees past the opposite side of the transect line (0 degrees). The third observer will search the area near the transect line with unaided-eye and with handheld 7 times binoculars and record data. Data will be recorded via a custom data acquisition program on a laptop computer interfaced with a GPS receiver. The time, speed, heading, and position of the ship will be included in each data record and will be automatically recorded every two minutes. Information on sighting conditions (e.g., Beaufort sea state, weather, sun position) and observer positions will be updated whenever a change occurs or at least every 30 to 40 minutes.

Data for each cetacean sighting will include species, group size, and bearing and reticle (a measure of radial distance). In most cases when a sighting is made, the ship will leave the transect line and approach the group to facilitate species identification and group-size estimation. The visual observers may request the ship reduce speed from survey speed (18.5 kilometers per hour [10 knots]) to half speed or quarter speed to make an approach, depending on species. Many dolphin species tend to approach the ship to bowride and will porpoise towards the ship to meet it (e.g., common dolphins, bottlenose dolphins, Atlantic spotted dolphins, spinner dolphins, Clymene dolphins), so the ship will maintain survey speed. For other species, like Risso's dolphins, pilot whales, sperm whales, Bryde's whales, *Kogia* spp., and beaked whales, the animals will generally not approach the vessel and observers will likely request a reduction in speed to attempt a closer approach to within 400 to 1,000 meters (1,312 to 3,281 feet), depending on species. After observers have had an opportunity to make group-size estimates, the ship will return to its original course and speed if any alterations were made. In some instances photographs will also be taken from the bow to confirm species identification and biopsy samples may be attempted on bowriding dolphins. The ship will spend from 5 to 30 minutes with a group, depending on whether biopsy sampling from the bow is attempted. As needed, the ship will circle and approach the dolphins multiple times so that dolphins will bowride again and another biopsy attempt can be made. Sometimes when sperm whales are sighted, 90-minute counts will be initiated. Ninety-minute counts will be discussed in detail at the end of this section.

Cetaceans will be identified to the lowest taxonomic group possible based on materials in (Jefferson, Webber et al. 2015). Identifications will sometimes be hindered by weather and/or evasive behavior of the animals. For each sighting, a best, high, and low estimate of group size will be made independently by each observer on watch and recorded in his/her notebook for later data entry. The bearing of a sighting relative to the transect line will be measured using a 360 degrees graduated scale attached to the base of each of the binoculars. The reticle relative to a sighting will be measured with a graduated scale in the binoculars. Ancillary data also will be collected, including sea surface temperature, water depth, behavior, and associated organisms (e.g., fish and birds). Data analyses will be similar to that of prior surveys ((Fulling, Mullin et al. 2003); (Mullin and Fulling 2003); (Mullin and Fulling 2004)). For example, the cetacean density will be estimated as the product of the estimate of group density and the estimate of mean group size adjusted for size-bias. The precision of each estimate for the more common species, expressed as a coefficient of variation (CV), should be similar to those from previous surveys, 20 to 35 percent.

When overall cruise objectives and resources allow, a two-team sampling approach will be used to estimate the parameter g(0) (e.g., (Garrison, Martinez et al. 2010)). The two observer teams will be stationed on the flying bridge (height above water approximately 14 meters [46 feet]) and the bridge wings (height above water approximately 11 meters [36 feet]). The two teams will be isolated from one another to avoid “cueing” each other to the presence of marine mammals. The flying bridge team will consist of five observers rotating through three positions at 30-minute intervals, while the bridge wing team will consist of four observers rotating through two positions at 30-minute intervals. A recorder position stationed on the bridge will maintain communication with both teams and record data on sightings by each team using a data entry program interfaced with a global positioning system (GPS) receiver. For each team, at least one observer experienced in ship-based, line-transect methods and identification of cetaceans will be present on the flying bridge and bridge wing at all times. The left and right side observers will search to the horizon in the arc from 10 degrees right and left of the ship’s bow to the left and right beams (90 degrees), respectively, using 25x “bigeye” binoculars. The third observer on the flying bridge will search using unaided eye or 7x hand-held binoculars.

Ninety-Minute Counts of Sperm Whales

Relatively accurate and unbiased group size estimates are required to calculate abundance of sperm whales. Unfortunately, sperm whales spend most of their time underwater making their detection and enumeration a difficult task. Added to this is the fact that while many cetacean species surface and dive in rough unison, sperm whales can at times, surface and dive asynchronously. Combine this with the tendency of groups to spread out over areas that are measured in square miles at times, and the likelihood of sperm whale abundance estimates being accurate may be reduced unacceptably if methods specific to sperm whales are not employed during surveys. Accurate estimation of sperm whale group sizes requires procedures that are quite different from those employed for other species of marine mammals. Both passive acoustics and species-specific visual procedures will help tighten the precision of sperm whale group size estimates. A 90-minute count will be used to more accurately estimate the size of a sperm whale group (Barlow and Taylor 2005). There will be a minimum of five people observing and one data recorder for this period.

In many instances, sperm whales dive for periods of time that can exceed 45 minutes. Assuming that no sperm whale will dive for more than 75 minutes, a period of 90 minutes should provide adequate opportunity for all whales present in an area to have made themselves available for detection and enumeration. Once the 90-minute count begins, the observers will spread out so that whales surfacing anywhere around the ship will be sighted. Handheld binoculars will be utilized in addition to the naked eye by all observers not located at the bigeye stations. All sightings and dives will be reported to the recorder. Observers will attempt to establish group direction and group center as soon as possible. This will likely not be apparent until the 90-minute count is underway. Experience will help in deciding what the proper course and speed will be for the ship to follow along. Ideally, we want to follow along about a half mile to one mile behind the center of the group at an equal speed. At the end of the 90 minutes, all personnel will register an independent estimate of the group size. All estimates consist of a high, a low, and a best count. No small boat will interact with the group during the 90-minute count.

Small Vessel Survey Methods – Visual Surveys

The sampling design, data collection, and data analyses will be similar to those from small boat-based studies in Mississippi Sound and elsewhere ((Hubard, Maze-Foley et al. 2004); (Miller, Mackey et al. 2013)). Line-transect data will be collected by three observers aboard small boats (e.g., 6 to 7 meters [20 to 23 feet]). Observers will rotate between two observer positions and the boat operator position. The survey speed will be 35 kilometers per hour (19 knots) or less. A GPS will be used to navigate transect lines, document starting and ending points of the transects, and determine the positions of dolphin groups that are sighted. Surveys will only be conducted along predetermined transect lines when skies are clear to partly cloudy and the Beaufort sea state is 2 or less. One observer will search for dolphin groups with unaided eye in an arc extending from the right beam (90 degrees) to about 20 degrees to the left of transect line (0 degrees). The other observer will search in similar pattern from the left. If the boat operator sights dolphins, she/he will remain silent until the dolphins pass the beam. This will allow for an estimate of the number of dolphin groups missed by the primary observers. After the observers reach a consensus, the number of adult and calf dolphins will be recorded. The water depth, sea surface temperature, and salinity will be recorded for each group sighting. The dolphin density will be estimated as the product of the estimate of group density and the estimate of mean group size adjusted for size-bias. The precision of each estimate, expressed as a coefficient of variation, should be similar to those from previous surveys, 16 to 35 percent.

Observers will remain with groups only long enough to collect pertinent data and they will approach all groups cautiously and carefully. The approach distance to dolphin groups will typically be greater than 20 meters (66 feet). Observers will attempt to parallel the group's direction of movement and travel at the same speed as the group. Sudden changes in speed or direction will be avoided. Observers will terminate efforts to approach a particular animal if signs of distress are observed (e.g., tail-slapping, forceful exhalations, sustained evasive behavior).

3.3.1 Photography, Videography, and Photogrammetry

The proposed research activities will include photographic identification and photogrammetry under Permit Nos. 20648, 21482, and 21938; unmanned aircraft system-based photography and videography under Permit No. 20648; photography and videography, videogrammetry under Permit No. 21482; and underwater photography and videogaphy under Permit Nos. 20648, 21482, and 21938.

Under Permit No. 20648, a pole cam will be used for underwater photography and videography of all species. The pole cam will be deployed from the side of the research vessel to a maximum depth of 3 meters (10 feet). The pole cam will be deployed in conjunction with photo-identification activities.

Under Permit No. 21482, when photography and videography are taken from research vessels, target animals will be closely approached to optimize photographic quality (i.e., well-focused images from video, or film or digital cameras). Photographs will be collected following protocols described in Wursig and Jefferson (1990) using high-resolution 35 millimeter (1.4 inches) digital cameras with wide aperture, 300 millimeter (11.8 inches) or larger telephoto lenses, and date and time stamps on each frame. Researchers will use a camera with a 400 millimeter (15.7 inches) telephoto lens during aerial surveys. During vessel surveys, videography will occur using GoPro-style high-definition cameras mounted to various locations on the research vessel and/or crew. Underwater photography and videography will be opportunistically conducted using GoPro-style high-definition cameras mounted to a hand-held pole and dipped into the water from the research vessel or from swimmers (e.g., snorkelers) in the water using a hand-held camera in waterproof housing. Camera systems used by researchers will change as new and improved technological options and funding become available.

Distances for optimal photography, videography, and photogrammetry will vary by species. Generally, research vessels and swimmers will approach animals to within approximately 10 meters (32.8 feet) during underwater photography and videography. The research vessel will stay with the target animal(s) for enough time to photograph as many individuals as possible and the total time will vary depending on group size.

Under Permit No. 21938, photography, videography, photoidentification, photogrammetry, and underwater photography may be utilized to confirm or document individual whales. Many whales can be uniquely identified by the pigment pattern on their bodies (e.g., *Balaenoptera* spp.), the pigment pattern on the ventral side of the flukes (humpback whales), the pattern of notches and nicks in the trailing edge of the flukes (sperm whales), and the pattern of notches and nicks in the trailing edge of the dorsal fin and presence of saddle patches (killer whales and pilot whales). Under Permit No. 21938, photo-identification samples will be collected using techniques that have been successful for sperm whales (e.g., (Arnbom 1987); Coakes and Whitehead 2004; Gero et al. 2014), Bryde's whales (e.g., Figueiredo et al. 2014; Lodi et al. 2015), and opportunistically sighted humpback whales (e.g., Katona and Beard 1990; Smith et al. 1999; Calambokidis and Barlow 2004; Gabriele et al. 2017). The animals to be taken will either be approached by the research vessel during the survey operations, will approach the vessel on their own, or in most cases, will be approached by a 4–7 meter auxiliary vessel. The SEFSC already has NMFS sperm whale and Bryde's whale catalogs for the Gulf of Mexico.

Photo-identification may also be used for follow-up monitoring of species that have been tagged under other permits and for stranded animals that have been tagged and released (also under other permits).

Photogrammetry

Gordon (1990) developed a technique for measuring the length of whales at sea. This technique requires a photograph or video image of the individual taken at a known height with the horizon in the background. Length of animals can then be converted to age using growth charts, and can provide useful information on population structure. This technique is particularly suited to sperm whales, but may be used for other species as well. This technique may be employed to estimate the size of sperm whales and Bryde's whales. Additionally, Jaquet (2006) developed a separate technique to measure sperm whales at sea. This technique requires simultaneous use of a digital camera and a laser range finder to measure distance to the fluke at the time the photo-identification shot is taken. The camera, lens, and laser range finder must be calibrated on objects of known length. This technique may also be employed to estimate the size of sperm whales. Both techniques may be used to compare the size of animals from the Gulf of Mexico to those from other areas in order to gain a better understanding of sperm whale population structure.

Length measurements may also be made during aerial surveys or from unmanned aircraft systems. Aerial photogrammetry has been used on a variety of species to examine characteristics such as length frequency, school size and structure, growth rates, and calf production (e.g., Best and Ruther 1992; Perryman and Lynn 1994; Ratnaswamy and Winn 1993; Withrow and Angliss 1992). Vertical aerial photographs taken during surveys conducted from large or small aircraft will be used to gather length data from whale species.

Underwater photography and videography

Underwater photography may be conducted using two methods: a camera on a pole from a small boat and with two snorkelers in the water (one for photography and the other watching from a distance for safety). The purpose is to video behavior and capture whole body images as a step in assessing the condition of the animals. The pole camera would be used for all species. Snorkelers get in the water primarily with baleen species and sperm whales. The snorkelers will remain near the boat and remain greater than 10 meters from the animals for periods of time less than 20 minutes.

3.3.2 Photographic-Identification

Photographic identification (photo-identification) is a widely used method for identifying individual cetaceans, allowing researchers to track individuals, monitor reproduction and mortality, identify migrations, follow age and sex-dependent behavior and habitat use patterns, and monitor health (Hammond et al. 1990). Photo-identification also allows researchers to determine if anthropogenic risk varies by age and/or reproductive class (van der Hoop et al. 2013), which helps inform protected species management.

Under Permit No. 20648, target animals will be approached at the maximum distance required to obtain usable photo-identification images. Researchers will not approach large cetaceans within 20 meters (66 feet). Standard photo-identification techniques (e.g., Bigg 1982; Wursig and Jefferson 1990) will be used for all species.

Under Permit No. 21482, Dr. Dan Engelhaupt will conduct photo-identification during research activities. Photo-identification will be conducted during aerial and vessel surveys to contribute knowledge on the movement patterns and stock structure of animals, which will help address potential population-level consequences from anthropogenic activities. Photo-identification will be conducted year-round in the action area and primarily from small research vessels using digital single-lens reflex cameras. High-resolution photographs of individuals will be managed and matched with those in existing databases using a variety of software products or shared catalogs in order to estimate population size, survivorship, and recruitment using mark-recapture techniques.

Distances for optimal photo-identification will vary by species. Generally, research vessels will approach animals to within approximately 10 meters (32.8 feet) to obtain high-quality photographs usable for photo-identification. The research vessel will stay with the target animal(s) for enough time to photograph as many individuals as possible and the total time will vary depending on group size. Any close approach in either a large or small research vessel will be aborted if any difficulties arise that will prevent a safe attempt at photo-identification.

Under Permit No. 21938, the SEFSC will conduct photo-identification during research activities. Photo-identification will be conducted year-round in the action area and primarily from small research vessels using digital single-lens reflex cameras. Photo-identification will mainly be used for individual identification for abundance and stock assessments, as well as behavioral observations and health assessments of animals that appear to be sick, injured or are supporting dead conspecifics. Adult and juvenile females and males will be photo-identified. Mother/calf pairs will also be opportunistically identified by photography and videography. If research activities interfere with pair bonding, nursing, reproduction, feeding, or other vital functions, then photo-identification will cease immediately. Individuals will be approached within 100 meters (328.1 feet) up to 25 times per year. Additional approaches to an individual may be needed to assess condition of animals that are sick, injured, or tagged.

Photo-identification may also be used for follow-up monitoring of species that have been tagged under other permits and for stranded animals that have been tagged and released (also under other permits).

Under Permit No. 21938, the SEFSC will conduct photo-identification during research activities. Photo-identification activities will generally be conducted from small (5 to 10 meters [16.4 to 32.8 feet]) NOAA rigid-hull inflatable boats with four-stroke outboard engines during abundance and non-abundance vessel surveys. Photographs will be taken with digital single-lens reflex cameras with telephoto zoom lenses to optimize photographic quality and obtain well-focused images for identification. Photographs will be taken by approaching the animals from behind, alongside, or at an angle at a consistent speed using research vessels.

Generally, larger animals (e.g., mysticetes) will be approached to within approximately 15 to 20 meters (49.2 to 65.6 feet); and smaller animals (e.g., delphinids) will be approached to within approximately 5 to 10 meters (16.4 to 32.8 feet). Photographs will be used to estimate abundance, document movements, entanglement and scarring rates, and for health assessment.

Researchers will conduct up to ten close approaches per individual per day to ensure there are sufficient close approaches to obtain the necessary data while maintaining safety standards for staff in the field and the study animals. Research activities will cease when clear photographs have been obtained of all individuals present, or when substantive avoidance behavioral reactions are displayed by the group in response to the close approach. Females with calves will opportunistically be approached for photo-identification, but research activities will cease immediately if pair-bonding, nursing, reproduction, feeding or other vital functions are interfered with in response to the close approach.

Photo-identification will be conducted at a distance of 50 to 100 meters (164 to 328 feet).

3.3.3 Behavioral Observations

Direct behavioral observations of cetaceans provide a wealth of information on their biology and important information needed by managers to effectively conserve and protect these species (see Mann 1999; Nowacek et al. 2016 for reviews). When combined with tagging data, these observations provide detailed information on both the surface and underwater behavior of cetaceans (Nowacek et al. 2016).

Under Permit No. 20648, Dr. Heidi Pearson will collect behavioral observations during research activities. Observations will occur from a research vessel within sight of the animals. The following data will be collected: group size, group composition (e.g., no. adults, juveniles, calves, males/females, mothers/non-mothers), group spread, behavioral state (e.g., forage, rest, socialize, travel, surface active), and behavioral events (e.g., blows, leaps/breaches, flipper slaps, tail slaps), and group heading. GPS location will be recorded from the unit on-board the research vessel. Whenever possible, GPS locations of individual humpback whales will be recorded by driving the research vessel over the flukeprint after the animal dives. At other times, the GPS location of the individual or group will be approximated from the GPS position of the research vessel. Behavioral observations of individuals or groups will typically occur for durations less than four hours; however, longer observations up to 16 hours may occur during tagging activities.

Under Permit No. 21482, Dr. Dan Engelhaupt will collect behavioral observations during research activities. Behavioral observations will be conducted at a distance of 50 to 100 meters (164 to 328.1 feet). Behavioral observations will increase the understanding of cetacean ecology and behavior as well as provide insight on the effects of anthropogenic disturbance on cetaceans. Researchers will conduct behavioral observations of feeding, socializing, traveling, resting, interspecies interactions, and responses to anthropogenic activities. Behavioral observations will occur concurrently with other research activities including active acoustics, biological sampling, and tagging.

Under Permit No. 21938, the SEFSC will collect behavioral observations during all encounters with cetaceans including delphinds and blue whale, Gulf of Mexico subspecies of Bryde's whale, fin whale, Cape Verde Islands/Northwest Africa DPS humpback whale, North Atlantic right whale mother/calf pairs, sei whale, and sperm whales in the action area. Behavioral observations will be collected to assess time budgets allocated to different behavioral states as they pertain to management concerns and general understanding of a cetacean species' behavioral ecology. During behavioral observations, researchers will collect data that includes photo-identification of individuals, time visible at the surface, group configuration, general behavior, dive durations, and blow intervals. Laser rangefinders may be used to obtain fixed positions of animals at the water's surface to track horizontal movement patterns.

3.3.4 Focal Follows

Under Permit No. 20648, focal individual and group sampling will occur. Individuals will be approached at the distance necessary for accurately recording behavior while not disrupting the normal activities of the animal or group and may be within 50 meters (164 feet) for large cetaceans.

Under Permit No. 21482, focal follows will be conducted with the objective to obtain data on the undisturbed behavior of cetaceans.

Under Permit No. 21938, focal follows of tagged individual and group sampling may occur. Individuals will be approached at the distance necessary for accurately recording behavior while not disrupting the normal activities of the animal or group and may be within 50 meters (164 feet) for large cetaceans.

3.4 Acoustics

The proposed research activities will include prey mapping and passive acoustic monitoring under Permit No. 20648; will include active acoustic playbacks, and passive acoustic monitoring under Permit No. 21482; and will include prey mapping and passive acoustic monitoring under Permit No. 21938.

3.4.1 Active Acoustics – Playbacks

Under Permit No. 21482, Dr. Dan Engelhaupt will conduct active acoustic playbacks using an underwater sound projector to measure the hearing range in a representative large mysticete species. Dr. Mark Deakos and Dr. Brian Branstetter will also be part of the team of researchers for this study. Dr. Mark Deakos has been conducting research on humpback whales in the Hawaiian Islands for over 20 years and Dr. Brian Branstetter specializes in marine mammal bioacoustics and auditory processes. The two objectives of the active acoustic playbacks are to: (1) estimate the hearing range of humpback whales in the field using behavioral observation audiometry, which relies on an unconditioned response to sound; and (2) examine how size, age, and sex may affect the response of individual humpback whales exposed to a disruptive, anthropogenic sound. The study is expected to produce empirical measurements of the hearing range of a species of mysticete, which can be used to verify the accuracy of anatomical modeling-based auditory weighting functions, specifically in terms of defining high- and low-frequency cutoff parameters. The results from the experiment will fill a long-standing gap in mysticete hearing allowing for a better determination of the potential impacts of anthropogenic sounds. The results from the study will be used for understanding the general behavioral ecology of cetaceans as well as future mitigation purposes and environmental compliance documents for U.S. Navy military readiness activities.

The researchers will conduct the playbacks off of the coasts of Maui, Kahoolawe, Molokai, Lanai, and Kauai in the waters of Hawaii. Minke whales (*Balaenoptera acutrostrata*), which is a non-ESA-listed species, may also be used as an alternative mysticete species targeted during playbacks. Spinner dolphins (*Stenella longirostris*), pantropical spotted dolphins (*Stenella attenuata*), bottlenose dolphins (*Tursiops truncatus*), false killer whales (*Pseudorca crassidens*), melon headed whales (*Peponocephala electra*), pygmy killer whales (*Feresa attenuata*), and short-finned pilot whales (*Globicephala macrorhynchus*) are non-ESA-listed odontocete species that occasionally associated with humpback whales off Hawaii and may be exposed during playbacks. Opportunistic playbacks will be carried out on groups of odontocetes further improve understanding intraspecific differences in response to anthropogenic noise such as mid-frequency active sonar. Underwater visual and acoustic recordings can be collected before, during, and after the exposure of the playbacks. The playbacks will occur during the winter breeding/calving season for humpback whales (January to April). Differentiated responses in humpback whales will also be assessed according to gender and body size (photogrammetry). Comparing data between locations can help determine how much sensitization to anthropogenic sound disturbance can play a role in behavioral responses. Funding for these research activities may be provided by the U.S. Navy Fleet Force Command Space and Naval Warfare Systems Command Center Pacific and U.S. Navy Living Marine Resources.

Hypotheses to be tested include:

- A humpback whale will have a motor response when exposed to an unexpected or novel sound that it can hear.
- A disruption of humpback whale song pattern (e.g., unit sequence within a phrase) or a change metrics related to song (i.e., level, frequency, duration) will occur in response to the playback.
- Larger humpback whale singers produce louder song.
- Larger humpback whale singers will respond to playback sound exposure less often than smaller humpback whale singers.

Approach – A proof-of-concept playback study was conducted in the Maui Nui region of Hawaii during March 2018. The current approach in the proposed research activities is based on that study, but will include lessons learned to improve upon the methodology. The high density of humpback whales in conjunction with excellent underwater visibility and ideal weather conditions, makes the Maui Nui region an ideal natural laboratory for a behavioral observation audiometry study.

Animals will be visually located and closely approached to within one body length by a small research vessel. Researchers will focus on animals that are stationary, which typically consists of single male singers and dyads. Stationary singers are ideal subjects for the playbacks due to no motor behavior coupled to the production of complex and predictable song. They are often near the water surface (approximately 30 meters [98.4 feet] in depth) and easily observable. Stationary dyads will be opportunistically targeted as well. Singing animals will be located using a two-element, directional, hydrophone array to determine if they are stationary or traveling. A researcher ("swimmer") will immediately enter the water to get a visual on the target animal immediately after a "fluke-up" dive. The swimming researcher will deploy within 30 seconds of a dive, directly on the slick or "fluke print" produced by the diving animal. The research vessel will be no closer than one research vessel length from the animal. If the researcher in the water confirms that the animal is stationary, a playback trial sequence will begin, consisting of pre-exposure, exposure, and post-exposure. Changes in motor and acoustic behavior due to stimuli from the sound source will be easier to detect and document by researchers. Researchers will avoid mother-calf pairs as well as competitive groups. Researchers will also avoid humpback whales associated with odontocetes. While searching for humpback whales, if researchers opportunistically encounter a group of odontocetes that are resting or slowly milling, the animals will be targeted for an exposure to the sound source.

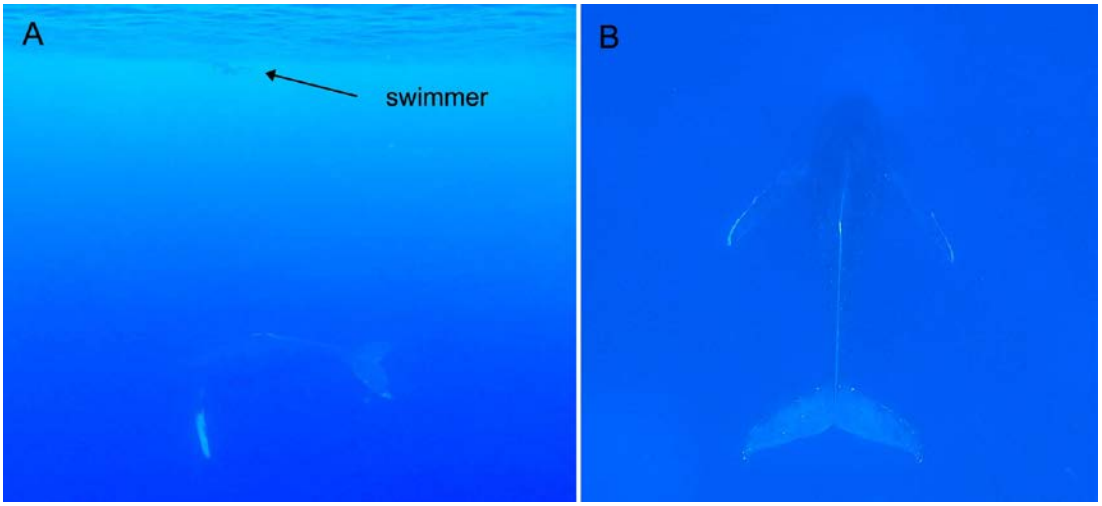


Figure 1. (A) Swimmer positioned above stationary singer acquiring both video and acoustic data. (B) Video footage from swimmer looking down a singer. Motor movements are easily observed and recorded.

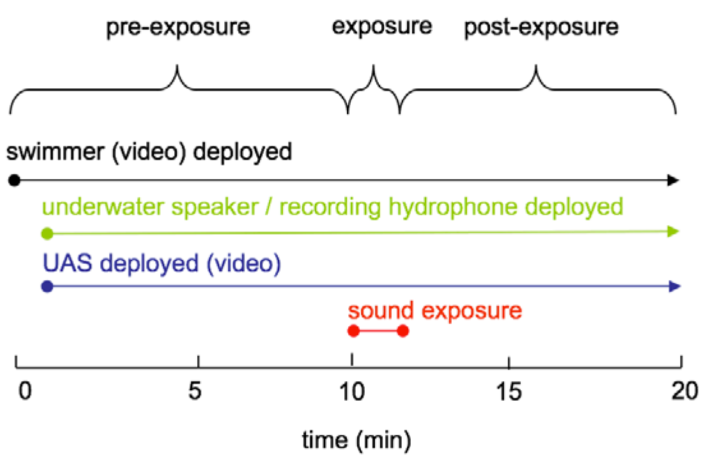


Figure 2. Timeline of experimental trial scenario.

Pre-Exposure Period - When target animals are identified, a swimmer equipped with an underwater video camera will be deployed (typically within 30 seconds of a "fluke-up" dive) from the research vessel and approach no closer than one whale's body length to determine if the whale or dolphins are stationary and good candidates for exposure to a playback. Upon confirmation by the swimmer that the subjects are suitable, the swimmer will begin video recording and the research vessel will be positioned no closer than 25 meters (82 feet) to the swimmer who is directly above the animal. The swimmer is used to mark the location of the target animal(s). An underwater speaker and recording hydrophone will be deployed over the side of the research vessel.

A pre-exposure period will last approximately five to ten minutes. At the onset of the pre-exposure period, the underwater hydrophone will begin acoustic acquisition, and the unmanned aircraft system will be deployed and begin video recording of the target animal(s). The unmanned aircraft system will be positioned approximately 30 meters (98.4 feet) above the swimmer and target animal(s). The goal of the pre-exposure period is to record baseline behavioral data when no playback sound is present. The five to ten minute window allows this goal to be achieved.

Exposure Period – The goal of the exposure is to record a change in acoustic and/or motor behavior in response to the sound from the playback. A "silent" exposure will be used as a control. During the exposure period, the playback sound (or silent control) will be presented to the target animal(s). The sound source level will be similar in amplitude to vocalizations of humpback whales (170 dB re: 1 μPa [rms]). Sound will be presented within one continuous, 60-second window. Each animal will only receive one exposure for the duration of the experiment. Details of the stimuli can be found below. The animal's behavior will continue to be recorded with underwater video, hydrophone, and video from the unmanned aircraft system.

Typical motor responses include, but are not limited to: (1) swimming away from the sound source, (2) startle-like fluke or pectoral fin movement, and (3) subtle fluke movements. Typical acoustic responses include, but are not limited to: (1) termination of song, (2) change in predicted pattern of song, and (3) Lombard effects (i.e., change in dB level or frequency of song units).

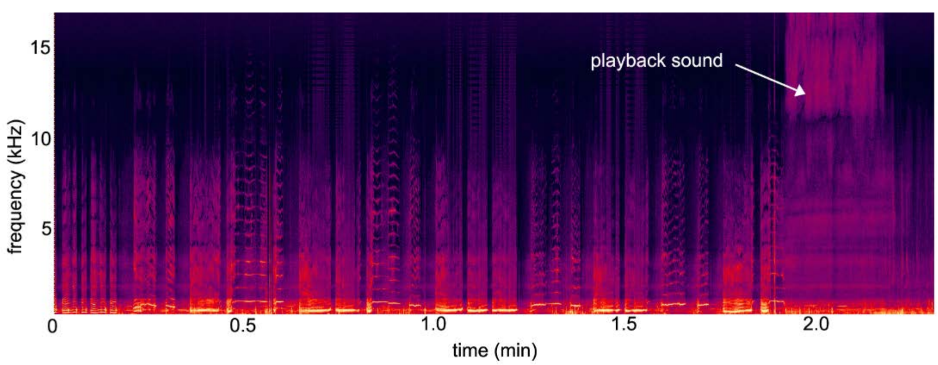


Figure 3. Example of a broadband amplitude modulated noise playback to a stationary singer. In this example, the singer abruptly terminates song production

and swims away from the research vessel. Latencies for motor and acoustic responses during this trial were 0.95 seconds and 1.00 seconds, respectively.

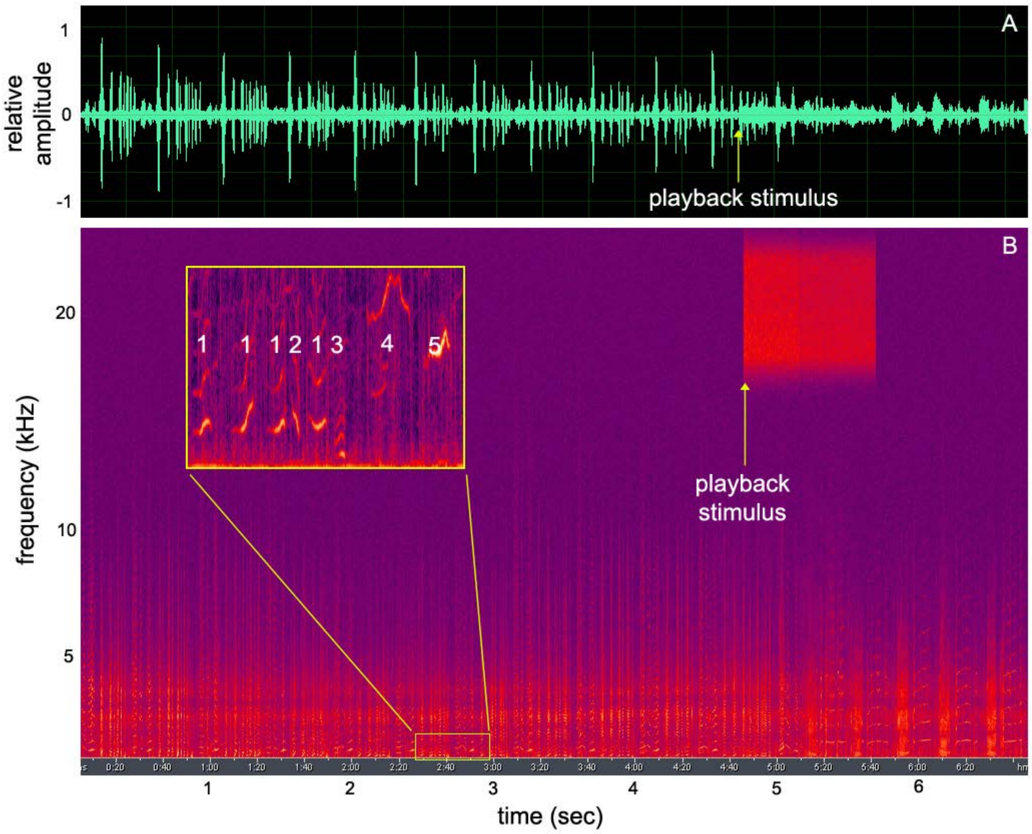


Figure 4. Example of 1/3 octave amplitude modulated noise (centered at 20 kiloHertz) playback.

Note: An obvious theme change occurs 31 seconds after the playback onset. However, a change in the expected serial pattern of the song units (phrase) occurs at 1.51 seconds after playbacks. The inset box displays a typical unit sequence for this phrase, where each number represents a specific unit type. The phrase is repeated ten times before playback onset. After the playback onset, unit one is repeated six times (instead of three), the expected location of unit two was delayed and unit three was missing. This is not unlike a pianist playing the wrong notes then skipping to a different part of the song after an acoustic distraction occurs.

A maximum of 200 exposure events will occur during the research activities. Their behavioral response will be measured through videogrammetry and acoustic recordings. After the five minute exposure period, the unmanned aircraft system will end video recording and return to the research vessel and all acoustic equipment will be recovered from the water. Any target animal(s) that produce an observable response will not be intentionally exposed a second time. Photo-identification of the tail fluke and/or dorsal fin will be used to avoid repeat exposures to the same individuals.

Independent variables include center frequency of the signal, and estimated received level of the signal. The center frequency is the only independent variable that will be systematically manipulated. Received levels will not be systematically manipulated, but will be estimated during the analysis phase of the research activities by measuring the distance of the sound source to the swimming researcher (situated above the animal) using range finders. Dependent variables include all animal behaviors. Researchers will conduct analysis of video conducted by blind observers who will not have knowledge of the exposure condition or when (on the video) the exposure to the playbacks occurs.

Playbacks and Data Acquisition – The sounds for the playbacks will be generated from a laptop computer (or other portable digital to analog device), amplified, and projected into the water column from an underwater speaker (e.g., Lubell LL9162T ITC1001) suspended at a depth of approximately two to ten meters (6.6 to 32.8 feet) below the research vessel. Received levels of playback sounds will be monitored in real time (to ensure consistent source lvels and record target animal[s] vocalizations) with custom software.

The playbacks will be conducted at a maximum sound source level of 170 dB re: 1 μPa (rms) and the estimated received levels of the animal will be within 120 to 160 dB re: 1 μPa (rms). The maximum duration of the acoustic signal during the playback will be 60 seconds. Received levels assume spherical spreading and transmission loss (see Figure 5) and are in the range of what humpback whales naturally produce and receive from conspecifics. The frequency of the sound will be between 10 Hertz and 100 kiloHertz. Signals may potentially include broadband noise, narrow band noise, 1/3 octave band noise, pure tones, frequency modulated tones, and amplitude modulated tones. The playbacks will be conducted on a maximum of 100 humpback whales.

The sound will be recorded with a low-noise hydrophone (Reson TC4032), coupled to a preamp (Reson VP1000), and digitized with a National Instruments data acquisition device (NI-USB 6251). Custom Labview software will be used to record and measure the acoustic source level of the playback stimuli in real-time, ensuring levels do not exceed 170 dB re: 1 μPa (rms). All of the acoustic sound sources will be calibrated at the Space and Naval Warfare System Center Pacific prior to implementation in the field. Calibrating the equipment will consist of measuring the relationship between the outgoing voltage at the data acquisition device (NI-USB 6251) and the resulting sound pressure level from the sound source projector. The data acquisition software has been rigorously tested to be accurate with a calibrated sound source (B&K hydrophone calibrator – type 4223, piston sound source).

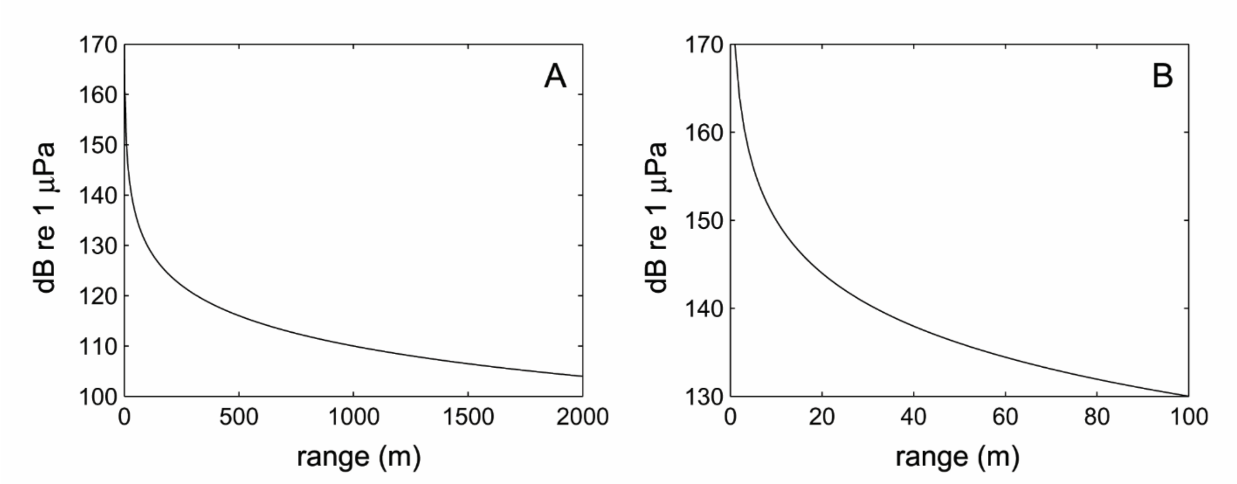


Figure 5. Estimated received levels during the playbacks with a 170 dB re: 1 Pa (rms) sound source.

Note: Curves represent transmission loss, where it equals $20\log_{10}(r)$, where r is the range in meters. (A) Received levels out to 2 kilometers (1.1 nautical miles). (B) Received levels that the target animal will be exposed.

Table 6. Average ambient noise levels (dB re: 1 µPa [rms]) in Hawaiian waters by month, with the estimated range in which 170 dB re: 1 µPa (rms) signals fall below ambient noise levels due to spherical spreading and transmission loss.

month	ambient noise (dB), Au et al. (2000)	range (m) signal below ambient
Jan	105	1778
Feb	115	562
Mar	117	447
Apr	113	708

The playbacks will be opportunistically conducted on odontocete species as well. A simulated mid-frequency active sonar sound source used in previous playback studies will be played to animals exhibiting resting and/or logging behavior and underwater video will be analyzed for differences in behavioral responses based on gender, age, social role, and the level of exposure to the sound source.

A swimmer equipped with a snorkel, fins, and mask will approach no closer than one body length from the target animal(s) to collect high-resolution underwater video and audio using a GoPro Hero 6 camera (or equivalent). Unmanned aircraft systems will be coupled with high-definition video cameras to collect detailed videogrammetry of a target animal's anatomy and behavior from an aerial view. This research method will be used to collect data on the animal's size and behavior. The estimated distance between the sound source and the target animal(s) will be collected with a handheld rangefinder (e.g., Nikon Prostaff 3i). The swimmer will be deployed on the onset of the pre-exposure period to reduce the probability of a behavioral response to the presence of the swimmer. The swimmer’s presence will be constant during the pre-exposure period, and exposure period.

The goal of the proposed research activities is to induce a behavioral response to the stimulus from the active acoustic playbacks. The estimated received levels will be within the range of 142 dB re: 1 µPa at 25 meters (82 feet) to 130 dB re: 1 µPa at 100 meters (328.1 feet). The maximum duration of the acoustic signal will be approximately 60 seconds.

Researchers will continuously visually monitor a 2,000 meter (6,561.7 feet) area around the target animal(s) for non-target marine mammal species during playbacks. The dedicated observers will use the naked eye and handheld binoculars. The hydrophone/speaker configuration used for data collection on humpback whales, will be monitored for odontocete vocalizations (e.g., whistles, burst-pulse, clicks). If odontocete vocalizations are detected, playbacks will not occur until the animals are visually located and their distance can be estimated. The playbacks will not occur if other non-target species of marine mammals and/or sea turtles are visually observed within the audible perimeter specified in Table 6.

The playbacks will be immediately terminated if an extreme response (i.e., a behavior not in the animals natural repertoire, which can cause physical harm to the animal) is observed. Researchers will share photographs that identify individuals with other researchers in the action area to ensure animals are not exposed to multiple sound sources. However, due to the relatively low sound pressure levels (lower than the species vocalizations) an extreme response is not anticipated. Researchers will share photo-identification (photographs of the animal’s dorsal and fluke) on a daily basis to prevent multiple exposures to the same animal.

Post-Exposure Period – During the post-exposure period, researchers will record video and acoustic data until the animal surfaces or swims out of range. Post-exposure data will be compared to pre-exposure and exposure data to determine possible effects from the playbacks (e.g., termination of Lombard effects).

Table 7 displays the results from a power analysis comparing the proportion of responses between the pre-exposure and post-exposure periods, on a hypothetical behavioral response variable (e.g., change vocalization, change in stationary behavior). An attempt is made to limit the number of exposures at each frequency tested. The first row represents the number of responses to the pre-exposure period (no exposure to the sound source). The second row represents the number of responses to the exposure and the third row represents the exposure period assuming power equal to 0.8, α equal to 0.05. For example the first column states that the exposure to sound, if no animals respond to the pre-exposure period, and half of the animals respond to the exposure of sound, a minimum of nine animals are required to achieve a significant different between the pre-exposure and exposure conditions as an alpha level of 0.05. An attempt will be made to maximize data collection at the upper and lower limits of the animal’s hearing ranges.

Table 7. Power analysis.

Pre-Exposure Period Proportion Response	0	0.1	0.2	0.3	0.4
Required Post-Exposure Period Proportion Response	0.5	0.7	0.8	0.9	1.0
Number	8.2	7.1	7.4	7.1	6.1

3.4.2 Active Acoustics – Prey Mapping

Recent advances in cetacean tagging technologies, combined with scientific echosounders used to map prey abundance, have provided unprecedented data on predator-prey relationships among large whale species (e.g., Friedlaender et al. 2009; Hazen et al. 2009).

Under Permit No. 20648, Dr. Heidi Pearson will use active acoustics to collect data on the preyfield of ESA-listed cetaceans. The echosounders are commercial off the shelf products manufactured by SIMRAD/Kongsberg (e.g., EK60). The source level of the EK60 echosounder is 230 dB re: 1 µPa at 1 meter. The echosounder is narrow-beam (-3 dB beamwidths between 7 degrees and 23 degrees) and oriented vertically downward. Echosounders will operate at frequencies (and transmitted power) at: 38 kiloHertz (100 Watts), 120 kiloHertz (250 Watts), and 200 kiloHertz (125 Watts). Received levels will depend on distance (range) and position (directly under the echosounder versus off to the side) of the receiver and environmental conditions. The systems used in this research are all operating at lower power settings than the systems that are operated on the NOAA NMFS Fishery Acoustic Survey vessels (i.e. *Oscar Dyson, Henry Bigelow*). Source depth in the water column will be less than 2 meters (7 feet). The distance to target (i.e., prey) and non-target (i.e., cetaceans) will be less than 500 meters (1,640 feet) and more than 25 meters (82 feet), respectively. Duration of exposure will vary depending on cetacean activity but will typically be less than four hours. Acoustic surveys to map the preyfield will be conducted over a small area (several square kilometers) using a regular grid/transect pattern to examine the variability in prey at horizontal and vertical spatial scales relevant to that of feeding cetaceans. During tag deployments (see Section 3.6.1), prey surveys will be conducted over a small area (hundreds to thousands of square meters) using both regular grid and animal-specific patterns to examine the variability in prey at horizontal and vertical spatial scales. When a tag is not deployed, prey surveys will be conducted over a larger area (1 to 10 square kilometers [0.4 to 4 square nautical miles]) to measure overall prey availability. Acoustic backscatter measurements will have sub-meter vertical resolution and horizontal resolution on the order of 10 meters (33 feet). Acoustic surveys will occur during all surveys.

Under Permit No. 21938, the SEFSC will conduct active acoustic prey mapping using single, split, or multi-beam signals (from one or more transducers) from an echosounder (see section 3.5.4**Error! Reference source not found.**). The main goal of the prey mapping is to image prey fields, including while marine mammals are utilizing habitats for foraging. A goal of the prey mapping is to determine what signal characteristics provide the best combination of a good signal for active acoustic monitoring while reducing potential active acoustic disturbance to exposed marine mammals.

3.4.3 Passive Acoustics – Acoustic Monitoring

Passive acoustic monitoring is used to detect, localize, identify, and track animals. Passive acoustic monitoring equipment may include the use of autonomous acoustic recorders, high frequency acoustic recording packages, sonobuoys, shipboard passive sonar, and U.S. Navy instrumented acoustic ranges.

Under Permit No. 20648, hydrophones will be used to listen for cetacean feeding and social noises. A standard portable drop hydrophone such as a Model SQ26-H1 from Cetacean Research Technology would be used. This hydrophone operates at a frequency range of 0.020 to 45 kiloHertz with a transducer sensitivity of -194 dB, re: 1V/μPa. The hydrophone would be deployed from the side of the research vessel at a depth of 5 meters (16 feet) or less during photo-identification and behavioral observations. During hydrophone deployment, the vessel would be traveling at speeds slower than 9 kilometers per hour (5 knots). In addition, a mounted hydrophone system (e.g., RUDAR from Cetacean Research Technology) would be used for long-term listening and recording. This hydrophone system would be moored to the seafloor with no tethers dangling in the water column.

Under Permit No. 21482, HDR Inc. will collect passive acoustic recordings generally using towed hydrophone arrays and autonomous recording devices. Passive acoustic monitoring may also include the use of autonomous acoustic recorders, high frequency acoustic recording packages, gliders, sonobuoys, towed hydrophone arrays, shipboard passive sonar, Navy instrumented acoustic ranges, and directional or omni-directional hydrophones. Passive acoustic monitoring is a component of the U.S. Navy's marine species monitoring program that addressed questions of presence or occurrence throughout testing and training areas as well as assisting researchers in terms of detection, localization, identification, and tracking of a variety of marine mammals. Baseline occurrence data includes species distribution, abundance, density estimates, and seasonal movement and habitat usage patterns. The use of passive acoustic monitoring provides an uninvasive means to capture critical data related to baseline occurrence. Instruments will generally be deployed as fixed-anchored recoverable devices, slow-moving devices (e.g., autonomous Slocum glider), or from small research vessels.

Under Permit No. 21938, the SEFSC will conduct passive acoustic recordings using towed hydrophone arrays. The hydrophone arrays will be towed behind a moving research vessel that may range in size from a small rigid hull inflatable boat to a large NOAA research vessel. The solid or oil-filled hydrophone array will be towed up to approximately 300 meters (984.3 feet) behind the research vessel to collect passive acoustic data. Acousticians on large research vessels will use the towed hydrophone array to localize vocally active cetacean groups in real-time and coordinate communications with visual observers to collect information on and identify cetacean species. Passive acoustic monitoring may also occur during focal follows. A small hydrophone array will be deployed to record vocalizations of cetaceans being observed. North Atlantic right whale vocalizations will be recorded during behavioral observation and focal follows.

Passive acoustic detection of marine mammals can be a valuable supplement to visual line-transect surveys since it allows for the detection of submerged cetaceans, and acoustic surveys can be conducted at night or during poor weather conditions. Integrated visual and acoustic line-transect approaches will be used from large vessels to improve abundance estimates, particularly for sperm whales and beaked whales. Barlow and Taylor (2005) demonstrated significant improvements in abundance estimates for sperm whales by combining visual and acoustic detections. For example, sperm whales and beaked whales may spend only ten minutes at the surface followed by dives that may last 40 to 60 minutes. They consistently echolocate through these dives and therefore are available for acoustic detections during these extended periods when they are not available to visual observers on a moving platform. However, sperm whales and beaked whales generally do not vocalize while at the surface, and visual methods may be the only way to detect them at these times. Further, concurrent visual and acoustic surveys provide ground-truth data to determine species' acoustic repertoires and develop acoustic classifiers needed for autonomous passive acoustic monitoring.

Towed Arrays

Acoustic surveys will be generally incorporated into visual line-transect surveys by towing a hydrophone array behind the vessel (primarily the *Gordon Gunter* and *Pisces*). During the survey, acoustic signals from the array will be monitored by technicians, and marine mammal sounds will be recorded to Serial Advanced Technology Attachment (SATA) hard drives. The primary array is a 10 meters (32.8 feet) long oil-filled array with five high-gain hydrophones typically towed at 300 to 350 meters (984.3 to 1,148.3 feet) behind the vessel. The array is modular and may alternatively be towed as a combination of a four-hydrophone oil-filled in-line array, 30 meters (98.4 feet) of Kevlar reinforced cable and the five-hydrophone array at the end. A smaller, two-element array may also be deployed as an alternative during focused sperm whale cruises.

In addition, the hydrophone array may be deployed at night or during other periods when visual surveys cannot be conducted to collect additional data on marine mammal occurrence. These data can be compared to those from visual surveys and will provide additional data on cetacean vocalizations, relative ambient noise, and correlations between vocalizations and distribution and relative ambient noise.

Sonobuoys

Baleen whales produce low-frequency sounds that cannot be detected by the towed array, which is designed to filter out low-frequency flow noise during towing, so other instruments are needed to monitor their vocalizations. To acoustically detect, localize, and record low-frequency calls of baleen whales in real-time during surveys, Navy-donated Directional Frequency Analysis and Ranging (DIFAR) sonobuoys may be deployed at pre-determined stations along transects, opportunistically in the presence of baleen whales, or following adaptive sampling methods to aid in localization of groups of baleen whales. The expendable DIFAR sonobuoys are typically programmed for DIFAR mode, a hydrophone depth of 122 to 350 meters (400.3 to 1,148.3 feet), and a broadcast duration of eight hours. After the programmed transmission duration, sonobuoys scuttle and sink to the seafloor. All excess packaging is removed prior to deployment. The sonobuoys contain a compass in the sensor head and transmit three types of continuous signal back to the ship on a VHF radio carrier in an analog multiplexed format. The VHF radio signals transmitted by the sonobuoys are received by antennas mounted on the aft mast of the ship and can be detected out to 25 kilometers (13.5 nautical miles) from the ship. During the survey, the sonobuoy signals are received on WinRadios tuned to the broadcast frequency programmed for the deployed sonobuoys. Analog signals from the WinRadios are digitized and recorded directly to SATA hard drives. Sonobuoy signals may be monitored in real-time by technicians, or recorded for post-processing.

Autonomous Instruments

Finally, autonomous passive acoustic instruments may be deployed, retrieved, or refurbished during large vessel surveys to improve knowledge of spatial and temporal distribution patterns, and in some cases, to estimate density of cetacean species. Acoustic instruments that may be deployed during surveys include: (1) mobile autonomous platforms such as autonomous underwater vehicles (e.g., Slocum glider), unmanned surface vehicles (e.g., SailDrone, Waveglider), and free drifting buoys (e.g., Drifting Acoustic Spar Buoy Recorders) that are equipped with passive acoustic monitoring instrumentation, and (2) moored autonomous seafloor recording packages (e.g., High-frequency Acoustic Recording Packages, Low-frequency Acoustic Recording Packages, Marine Acoustic Recording Units, and Noise Reference Station buoys) that may be deployed for up to one year and then recovered. Free-drifting buoys like Drifting Acoustic Spar Buoy Recorders can be particularly effective for estimating density of deep-diving cryptic species, including dwarf and pygmy sperm whales and beaked whale species that are sensitive to vessel noise. Seafloor moored autonomous recording packages are especially effective for evaluating longer term trends in distribution and temporal variation in occurrence of all species of vocalizing cetaceans and for evaluating ambient noise and ocean soundscapes.

During large vessel surveys, an auxiliary vessel (4 to 7 meters [13.1 to 23.0 feet] in length) will often be launched to approach cetaceans more closely for photo-identification and biopsy sampling. In order to track deep-diving whales, like sperm whales, a directional hydrophone will be deployed from the auxiliary vessel. The vessel will stop, turn off its engines, and then deploy the hydrophone in order to determine direction of the nearest whales. Additionally, a hydrophone may be deployed from small boats to record cetacean vocalizations and ambient sound.

3.5 Biological Sampling

The proposed research activities will include biopsy sampling under Permit Nos. 20648, 21482 and 21938; breath sampling under Permit Nos. 20648 and 21482; fecal sampling under Permit Nos. 20648 and 21482; prey sampling under Permit No. 21938; and sloughed skin sampling under Permit Nos. 20648, 21482 and 21938. Biological samples will be archived at the University of Alaska Southeast or the University of Alaska Fairbanks (Permit No. 20648), NMFS Southwest or NMFS Southeast regions (Permit No. 21482), and at the NMFS SEFSC (Permit No. 21938).

Genetic analysis of tissue samples from biopsy or sloughed skin sampling will be used to examine population dynamics, including structure of sub-populations or stocks. Genetic variability, dispersal patterns, and social structure may indicate if animals may be potentially exposed to anthropogenic activities. Other molecular techniques can assess reproductive status, physiological stress, exposure to toxins, or prey consumption. They can also reveal if animals are more susceptible to, or directly impacted by short-term or long-term exposure to anthropogenic activities (e.g., cortisol levels suggestive of a stress response).

3.5.1 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 (reviewed in Noren and Mocklin 2012).

Under Permit No. 20648, biopsy samples will be obtained from all age-sex classes of humpback whales, except neonates. Standard, established protocols for large whales will be used (e.g., (Lambertsen 1987; Weinrich et al. 1992; Barrett-Lennard et al. 1996; Wenzel et al. 2009; Reisinger et al. 2014). Skin and blubber samples will be obtained from the individual's lateral flank by shooting a 25 to 40 millimeters by 9 millimeters (1.0 to 1.6 by 0.4 inches) lightweight stainless-steel dart from a modified pneumatic rifle or crossbow (Wenzel et al. 2009; Reisinger, et al. 2014). Healing time for biopsy sampling is expected to be less than one year (Barrett-Lennard et al. 1996).

All biopsy tips will be stored in sterile plastic containers and disinfected with ethanol prior to each use (Clapham and Mattila 1993). Reactions of individual animals to biopsy sampling will be recorded as none, low, moderate, or strong (e.g., Weinrich et al. 1992). Biopsy samples will be placed in a plastic bag, wrapped in sterile aluminum foil, placed on ice, placed in dimethyl sulfoxide (DMSO), or frozen. After each research cruise, samples will be extracted and transferred to a -80 degrees Celsius (-112.0 degrees Fahrenheit) freezer for storage until analysis. Analysis will include genetics, reproductive hormones, and stress hormones.

For each species, biopsy samples will be obtained for 50 individuals. Animals would be approached to a minimum distance of 5 meters. An individual will be successfully biopsied no more than one time per day. To obtain a successful biopsy sample, three biopsy attempts per day may be conducted on a single individual. Every attempt will be made to use the photo-identification record to ensure that a single individual is successfully biopsied a maximum of one time per day and contacted no more than three times per day for biopsy attempts. An individual may be resampled up to three times during a given year to assess seasonal changes in stress hormones. The minimum time interval between samples would be 30 days.

Under Permit No. 21482, researchers will opportunistically conduct biopsy sampling to collect skin and blubber samples from cetaceans. The biopsy samples will be collected with a projectile dart from a crossbow, Paxarms rifle system, or other type of pneumatic rifle system. The projectile dart tips will be cylindrical and made of sterilized stainless steel. For smaller cetaceans, dart tips will be 8 millimeters (0.3 inches) in diameter and 25 millimeters (1 inch) in length. For larger cetaceans (e.g., mysticetes, sperm whales, beaked whales, pilot whales, and killer whales), dart tips will be 8 millimeters (0.3 inches) in diameter and 40 millimeters (1.6 inches) in length. The projectile dart tips used with the Paxarms rifle system will be 6 millimeters (0.2 inches) in diameter and 20 millimeters (0.8 inches) in length for larger cetaceans and 4 millimeters (0.2 inches) in diameter and 7 millimeters (0.3 inches) for smaller cetaceans. The projectile dart tips will be thoroughly cleaned and sterilized with bleach and alcohol prior to use in the field. When available, corer tips will additionally be sterilized using a steam autoclave or gas method to ensure maximum sterizilization.

Research vessels will be operated by experienced drivers and approach animals in a manner that minimized vessel noise, does not involve any sudden changes in speed or course, and approach an animal from behind and at an angle and speed similar to the animal's travel. The researchers will conduct biopsy sampling within 3 to 50 meters (9.8 to 164 feet) of the bow of the research vessel. Bowriding animals will be sampled from the bow of the research vessel using a smaller Paxarms rifle system. Biopsy samples will be collected from areas of the body that will not pose a significant risk of injury such as the sides of the animal, close behind the dorsal fin, and bottoms of the flukes for larger cetaceans. Researchers will primarily target the area just in front of, next to, on, below, or behind the dorsal fin or hump. If populations are well sampled, additional biopsy sampling will not be emphasized unless particular analyses are deemed essential for assessing population-related concerns.

Skin and blubber samples will be stored in a preservative and/or frozen for later genetic, hormone, or toxicology analysis. The blubber portion of the biopsy sample will be kept on ice until it is sectioned and then frozen. The skin portion of the biopsy sample will be put in 20 percent dimethylsulfoxide solution saturated with salt or stored in 70 percent ethanol. DNA will then be extracted using standard methods and analyzed (Hoelzel 1992). Skin and blubber samples may be provided to researchers already working on particular species to expedite processing and integration of species information into existing results. Genetic analysis will be conducted by researchers at NMFS SEFSC (Patricia Rosel), Oregon State University (Scott Baker), and University of Groningen (Per Palsboll). Stress hormone analysis will be conducted at NMFS SEFSC (Nick Kellar). Stable isotope analysis will be conducted at Duke University (Danielle Waples). NMFS Southwest Fisheries Science Center and SEFSC will have long-term storage of the biopsy samples. Excess portions of biopsy samples will be frozen and stored in Virginia at -15 degrees Celsius (5.0 degrees Fahrenheit) or provided to the National Marine Mammal Tissue Bank and made available to other researchers.

Biopsy sampling may occur on animals of both sexes, including adults and juveniles that are at least one year old. No calves will be biopsy sampled. Mothers with calves (less than one year old) that are within a separation distance of 5 meters (16.4 feet) or closer will not be biopsy sampled to avoid interrupting nursing behavior. Individuals within a group of animals that contain a neonate (where the fetal folds are clearly evident) will be approached if the target animal does not appear to be the neonate's mother based on nursing behavior and immediate proximity. The target animal should be separated by a minimum distance of approximately 5 meters (16.4 feet) between the neonate or calf less than one year of age and itself. Tagged animals will be biopsy sampled when possible. Researchers will attempt biopsy sampling of all tagged individuals at the same time as tagging or immediately after tagging to keep the period of disturbance to a minimum. All personnel deemed qualified to conduct biopsy sampling and tagging will also have experience to assess the age of calves. Researchers will not biopsy Southern Resident DPS of killer whales or North Atlantic right whales.

Researchers will take up to 50 biopsy samples for most species per year (less for species with smaller population sizes) as this has been determined to be the minimum number of samples needed to meet sample size requirements for research studies. Researchers will take up to 20 biopsy samples of Gulf of Mexico subspecies of Bryde's whales per year, up to 20 biopsy samples of Western North Pacific population of gray whales per year, and 30 biopsy samples of North Pacific right whales per year. To conduct genetic stock structure analysis, a sample size of about 50 samples per stratum is preferred. Genetic distribution will be sampled for large or widely distributed stocks. An entire group of animals may be biopsy sampled to determine social structure. Researchers will only obtain a single biopsy sample from an individual, and limit biopsy sampling to no more than three attempts per encounter. Known individuals will not be purposely biopsy sampled more than once per year. Additional biopsy sampling of known individuals will only occur in rare instances where specific studies aimed at stress hormone analysis, stable isotope analysis, or toxicology loads are required on specific species across multiple years. In those cases, known individuals may be biopsy sampled up to four total times in a five-year period and not more than twice within a single one-year period. If populations of animals are well biopsy sampled, additional collection of tissue will not be emphasized unless particular analyses are deemed essential for assessing population related concerns. Researchers with extensive training and experience will conduct biopsy sampling. Researchers without biopsy sampling experience will be trained by expert researchers in the field to ensure safe and successful collection of tissue samples.

Biopsy sampling attempts will immediately cease in the event a close approach by the research vessel or a biopsy shot attempt elicits a strong behavioral reaction (e.g., breaching, high-energy behavior, or rapid evasion) (Clapham and Mattila 1993).

Under Permit No. 21938, the SEFSC will opportunistically conduct biopsy sampling to collect skin and blubber samples from cetaceans. Samples collected will be analyzed to address questions of marine mammal population structure, taxonomy and systematics, genomics, health and reproductive parameters, contaminant loads, and feeding ecology. Biopsies are subsectioned appropriately upon collection to meet these various needs. Biopsy sampling will be conducted from the large research vessels on animals that approach on their own, and small research vessels will approach target animals to collect samples.

Biopsy samples will be collected from animals within approximately 5 to 30 meters (16.4 to 98.4 feet) of the bow of the research vessel or rigid hull inflatable boat (Palsboll and Larsen 1991) using a variety of devices including pole-spears, crossbows, and rifles. The biopsy samples collected from crossbows are 20 by 25 millimeters (0.8 by 1 inches) from dolphins and small whales and 20 by 40 millimeters (0.8 by 1.6 inches) from large whales. Samples may be collected from a modified .22 caliber rifle to sample large cetaceans and non-bowriding smaller species, and used on large research vessels where the pole spear cannot be utilized. The power level of the dart gun can be changed (low, high). Low power is used for small cetaceans and all cetaceans at ranges of 5 to 20 meters (16 to 66 feet). High power is used for large whales at ranges from 20 to 65 meters (66 to 213 feet). When the dart hits the animal’s flank near the dorsal fin, it extracts a small tubular tissue sample and bounces off into the water. The dart floats on the water surface and is retrieved by the researchers.

Biopsy samples may only be collected from non-calf animals (i.e., greater than one year in age), including non-calf animals accompanied by calves, of both sexes, of all reproductive conditions, and from all cetacean species. The SEFSC has no intention to biopsy North Atlantic right whales. The numbers of samples per species are listed in Table 5.

Biopsy sampling of all cetaceans will be conducted by researchers with experience with the target species. Personnel will include a vessel driver with extensive experience around cetaceans, a skilled shooter with extensive experience biopsy sampling, and a photographer with extensive experience for photo-identification. Data recorded for each biopsy sample attempt will include date, time, location, species, group size, age class, sex, and response or behavior (before, during, after).

3.5.2 Breath Sampling

Analysis of the exhaled breath from cetaceans can be used to assess reproductive and stress hormones (Hunt et al. 2014), genetics (Frere et al. 2010), disease (Acevedo-Whitehouse et al. 2010), health status (Apprill et al. 2017), and likely other aspects of cetacean biology (reviewed in Hunt et al. 2013).

Under Permit No. 20648, breath samples would be collected using petri dishes attached to the end of a long pole or to the body of the unmanned aircraft system and moving it over the individual's blowholes or in the breath cloud as the animal exhales. For humpback and sperm whales, the research vessel would approach at a minimum distance of 5 meters (16 feet) from the animal's blowholes for sampling (Hogg et al. 2009). The harvest of breath spray would follow the protocol developed by the Atkinson Lab in 2017. All samples would be frozen until analysis. Reproductive and/or metabolic hormones and genetics would be analyzed from breath samples.

Under Permit No. 21938, the SEFSC would collect breath samples from large whales (e.g., Bryde's whale, sperm whale) in order to obtain DNA samples for assessing health condition and/or reproductive condition of individual whales. Sample collection would be accomplished via a hexacopter pass over the animal at an altitude of 1.8 to 2.4 meters (6 to 8 feet) through the whale's exhalant breath.

3.5.3 Fecal Sampling

Fecal sampling is a well-established non-invasive sample collection method that can be used to assess reproductive hormones, stress, parasites, red tide effects, diet composition, energetics, and nutrition (reviewed in Hunt et al. 2013).

Under Permit No. 20648, fecal samples would be collected whenever possible to obtain information on genetics, reproduction, stress, diet, and nutrient composition. Close approaches to 10 meters (33 feet) for humpback and sperm whales and 3 meters (10 feet) for all other species may occur during sample collection. Fecal samples will be collected using a 30 centimeter (12 inches) in diameter, 150 millimeter (6 inches) mesh plankton net or similar with a plastic jar attached to the end (Roman and Mccarthy 2010). Fecal samples will be separated from fluid as soon as possible after collection and transferred to a sealable bag or vial and frozen until analysis.

Under Permit No. 21482, Dr. Dan Engelhaupt will opportunistically collect fecal samples at the water’s surface using hand-held nets during research activities. Following the detection of fecal material, the research vessel will closely approach the animal’s previous position to within approximately 5 to 10 meters (16.4 to 32.8 feet) to collect fecal samples. Fecal samples will be preserved for later analysis.

Under Permit No. 21938, the SEFSC will opportunistically collect fecal samples at the water’s surface using hand-held nets during research activities. Fecal samples will be collected with a small, fine mesh net on a long handle from a small research vessel. The collection of fecal samples, and chemical analyses of these samples, have the potential to provide important information on a variety of parameters including health assessment, sexual maturity, pregnancy, stress, and genetic information. Researchers will generally not approach animals within 100 meters (328.1 feet) as they will follow behind their fluke prints. Fecal samples will be collected during photo-identification or other biological sampling.

3.5.4 Prey Sampling

Under Permit No. 21938, the SEFSC will utilize various methods to quantify and collect potential prey of cetaceans within the Gulf of Mexico, specifically Bryde's whale.

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 dB re 1 microPascal at 1 meter 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 Gulf of Mexico subspecies of 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 Gulf of Mexico subspecies of 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.

To determine the specificity of Gulf of Mexico subspecies of Bryde's whale prey, trawl surveys will be conducted during the 2019 Gulf of Mexico subspecies of Bryde's whale survey as a part of a larger trophic ecology survey to estimate prey availability. Preliminary data from kinematic tags and echosounders indicate Gulf of Mexico subspecies of Bryde's whales may be foraging on dense daytime aggregations of schooling fish near the seafloor (NMFS SEFSC), (unpublished data). During the trophic ecology survey on the NOAA Ship *Gordon Gunter*, the SEFSC 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 [1,640.4 feet]) Gulf of Mexico waters. The focus of the trawl studies will be limited to within the gray polygon area shown in Figure 6. 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 Gulf of Mexico subspecies of 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 [89.9 feet] length footrope), fished with W-style trawl doors (682 kilograms [1,503.6 pounds] each, 3.5 square meters [37.7 square feet]). The trawl opening is 15.5 meter [50.9 feet] width by 10.0 meters [32.8 feet] height, the cod-end mesh liner is 4.0 millimeters [0.2 inches], 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.

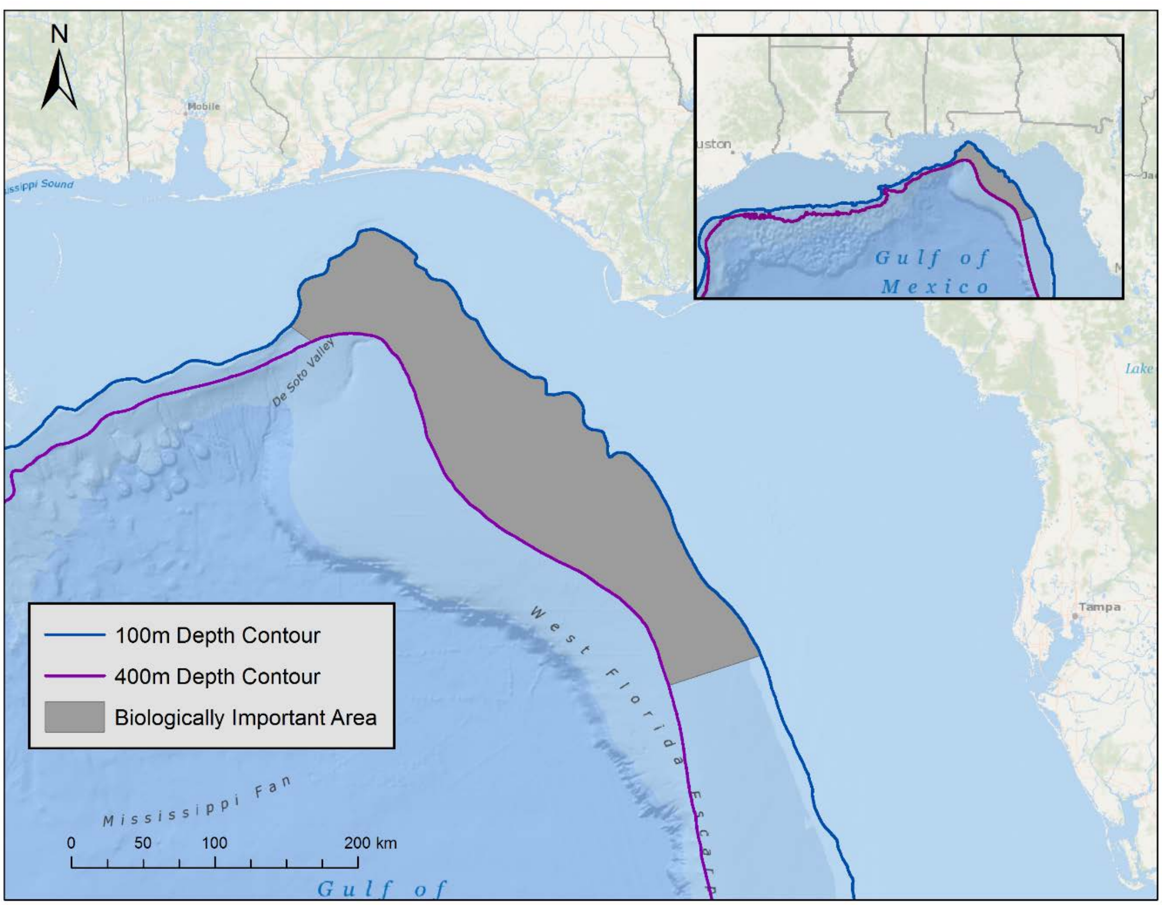


Figure 6. Map of the proposed trophic ecology survey for Gulf of Mexico subspecies of Bryde's whale prey.

3.5.5 Sloughed Skin Sampling

Under Permit No. 20648, sloughed skin samples would be collected whenever possible. A 30-centimeter (11.8 inch) in diameter, 150 millimeter (5.9 inches) mesh plankton net or similar would be used. Samples would be frozen or stored in sterile 30 milliliter vials with 20 percent dimethylsulfoxide in saturated sodium chloride solution or 70 percent ethyl alcohol.

Under Permit No. 21482, Dr. Dan Engelhaupt will opportunistically collect sloughed skin samples at the water's surface using hand-held nets during research activities. Genetic analysis can be used to examine population dynamics, including structure of sub-populations or stocks.

Genetic variability dispersal patterns, and social structure may indicate if animals, or groups of animals, are more readily exposed to potentially harmful underwater noise, construction activities, or vessel traffic. Other molecular techniques can assess reproductive status, physiological stress, exposure to toxins, prey consumption, or can reveal if animals are more susceptible to, or directly impacted by short- or long-term exposure to human activity (cortisol levels suggestive of a stress response).

Under Permit No. 21938, SEFSC will opportunistically collect sloughed skin samples using hand-held nets or sieves at the water's surface during research activities. Sloughed skin samples will be archived at the SEFSC.

3.6 Tagging

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 protect and conserve these species (Nowacek et al. 2016). For example, tagging North Atlantic right whales has provided much needed information on foraging and diving behavior, improving our ability to assess the vulnerability of North Atlantic right whales to ship strikes and entanglement (Nowacek et al. 2004; Parks et al. 2011a). Tagging calves is also important, as little is known about this age group's diving behavior and how it might influence their risk to anthropogenic threats. Given their under-developed diving capabilities, calves likely spend increased time at the surface and in shallower water, but currently few data exist on baleen whale calf behavior (although see Stimpert et al. 2012; Tyson, et al. 2012).

The proposed research activities will include a variety of tags and transmitter attachments under Permit Nos. 20648, 21482, and 21938, depending on the specific objectives of the study and the development of new and improved tagging technology. Research activities will include instruments such as location-only satellite tags, satellite-linked time depth recorders, time depth recorders, digital three-dimensional motion and acoustic tags, video camera tags, and other types of multi-sensor tags that will be attached with suction-cups or implanted anchor (dart/barb and deep-implantable). Tagging technology and design will improve as research needs evolve as well as to streamline in order to reduce drag as much as possible. Researchers will select the type of tag in consideration of the primary research objective and what will have the least impact on animals.

Under Permit No. 20648, short-term (up to 24 hours) archival suction-cup tags such as the D-TAG (Johnson and Tyack 2003), Acousonde (Goldbogen et al. 2006; Burgess 2009), and C-VISS (Pearson et al. 2017) would be deployed to measure diving behavior, vocalizations, and surface and underwater movement patterns. Instruments included in the tag would include any combination of the following: pressure (depth) sensor, temperature sensor, light sensor, accelerometer, hydrophone, camera, video/still camera, VHF transmitter, PTT transmitter, and Fastloc GPS. The sensors would be contained in a floatable housing with VHF and/or PTT transmitters attached to permit recovery after release from the animal. Suction cups may be equipped with corrodible links designed to dissolve in salt water, thus releasing suction, after the desired number of hours. Tags of approximately 250 millimeters x 110 millimeters x 420 millimeters (length x width x height) and 400 grams weight in air will be deployed on large cetaceans. Only one tag will deployed on an animal at a given time.

Under Permit No. 21482, Dr. Dan Engelhaupt will use satellite tags to address the habitat use of cetaceans that occur in and around U.S. Navy's range complexes and other areas of increased anthropogenic activities. Data from satellite tags will provide information on finer-scale distribution patterns, migratory behaviors, and "home ranges" of local species. Researchers will gain information on breeding and feeding grounds, migratory routes, dive behavior, and movement related to prey distribution and oceanographic conditions. Monitoring the short-term and long-term movements of animals with tags will address questions related to distribution, habitat use, foraging ecology, and behavioral ecology. Spatial data from tags may inform behavioral response, potential exposure, and management (e.g., monitoring and mitigation) decisions for anthropogenic activities. On occasion researchers may deploy two tags of various types on the same animal in order to maximize data collection. No more than two tag types, including one suction-cup tag and one dart/barb- or deep-implantable tag will be deployed on the same individual at a given time.

Dart/barb and deep-implantable tags are sub-dermally implanted into target animals to collect data on location and behavior. Ideally these types of tags will continually transmit data for four to eight weeks, but may last longer depending on duty cycle and the amount of data collected. The maximum life expectancy is 12 to 18 months. Dart/barb and deep-implantable tags will be used on most species of large cetaceans with exceptions to certain species due to thinner blubber and muscle layers.

Researchers will minimize disturbance of animals during tagging activities and tracking of tagged animals. Researchers will monitor the behavior of the target animal prior to tagging attempts. Animals that appear to be highly disturbed and agitated will not be considered for tagging. Close approaches will be conducted in a controlled manner at safe speeds to avoid undue alarm to animals and may be aborted at any time. Researchers will halt tagging activities on animals that are continually evasive. The number of tagging attempts for each type of tag will be three where a tagging attempt is considered a hit that resulted in a tag that did not stick or a hit where a tag did stick, each of which will be counted as one of the three attempts. A miss where an animal does not react will be counted as one of the three tagging attempts. If more than one tag is deployed on an animal, then attempts will be counted separately and not exceed a total of six attempts between the two types of tags.

Tag deployments will be orchestrated and/or conducted by experienced researchers with demonstrated ability to successfully deploy tags without harming animals. Experienced researchers will maneuver or direct others to maneuver the research vessel around animals. Researchers may target adults and juveniles of either sex for tagging; however, no attempts of tagging will be made on females with calves estimated to be one year or younger. Researchers will approach animals in a manner that minimizes disturbance. When multiple animals are present, researchers will approach individuals separated from the group or during opportune moments (e.g., other animals are submerged) in order to minimize risk to non-target animals. Researchers will conduct photo-identification of animals prior to tagging, and will compare photographs on short-term and long-term scales. When approaching target animals for tagging, the research vessel will try ot match the speed of the animal and come from behind and ultimately position the research vessel alongside and parallel to the target animal to allow the animal an unimpeded escape route if needed. If an animal makes repeated attempts to evade the research vessel, then researchers will consider abandoning the approach. Researchers will attempt to conduct biopsy sampling of all tagged animals at the same time as tagging or immediately after tagging to keep disturbance to a minimum.

Under Permit Number 21938, the SEFSC will include instruments such as location-only satellite tags, satellite-linked time depth recorders, time depth recorders, digital three-dimensional motion and acoustic tags, video camera tags, and other types of multi-sensor tags that will be attached with suction-cups or implanted anchor (dart/barb). Tagging technology and design will improve as research needs evolve as well as to streamline in order to reduce drag as much as possible. Researchers will select the type of tag in consideration of the primary research objective and what will have the least impact on animals.

Biopsy sampling of tagged animals will occur at the same time as or immediately after tagging. After an animal is tagged, researchers will conduct focal follows with photography and videography to document tag location, behavioral observations, and monitor for tag detachment. Transmitters on the tags will be used to track animal surfacings and locate suction-cup tags after its release from the animal.

Researchers under all three permits will approach target animals with the research vessel in a manner to minimize disturbance. When the researchers are approaching a target animal, the research vessel will match the speed and parallel the individual.

All researchers who will be involved in deploying suction-cup, dart/barb, and deep-implantable tags will have prior experience or undergone thorough training in tagging techniques. Lead researchers with experience tagging will oversee research activities and provide training to inexperienced researchers so that tags will be deployed under direct supervision.

3.6.1 Suction-Cup Tagging

Under Permit No. 20648, candidate humpback whales for tagging would be identified by the relative predictability of their surface timing and behavior, group size, and the behavior and reaction to close (less than 5 meters [16 feet]) approaches with the tagging vessel. Once an individual is identified as a candidate, a 10-min or longer pre-tag observation period would occur to collect the following data: blow frequency, surface behavior (e.g., lunge, breach, lobtail, flipper slap, roll, side fluke, spyhop, defecation; Whitehead 1983), surface duration, dive time, group size and composition, and direction and speed of travel. Tagging would occur at the end of the pre-tag observation period. The tag would be deployed from the research vessel traveling alongside the animal. Suction-cups would be disinfected prior to each use. A long (approximately 5 meters) pole would be used for deployment. The target placement would be on the dorsal surface just forward of the dorsal fin and well behind the blowholes. If a tagging attempt is made on a mother, the tag would be positioned so that it does not interfere with nursing or mother-calf proximity during travel. Whale response to tagging would be classified as none, low, moderate, or strong (Weinrich et al. 1992; Clapham and Mattila 1993).

Under Permit No. 21482, Dr. Dan Engelhaupt will attach recoverable multi-sensor suction-cup tags to a variety of cetacean species. The suction-cup tags are minimally invasive and do not penetrate the animal's skin surface. A 12 meter long (39.4 feet) cantilevered hand-held pole will be the primary deployment method for deploying suction-cup tags. Suction-cup tags will also be secured in a custom built cradle, the tag will detach from the cradle on impact with the body of the animal. Suction-cup tags will be deployed on the dorsal side at distances 2 to 10 meters (6.6 to 32.8 feet) from the animals (depending on course, heading, and speed). The majority of suction-cup tags will be deployed between 2 to 5 meters (6.6 to 16.4 feet) from the target to control the position of the suction-cup tag on the animal as well as remain a safe distance in the case of unexpected behavioral reactions.

Suction-cup tags will include sensors such as VHF radio transmitters, global positioning systems, accelerometers, and sensors to measure light levels, temperature, depth, sound, and/or collect video. The instrument package is typically 25 centimeters in length by 7 centimeters wide by 4 centimeters high (9.8 inches by 2.8 inches by 1.6 inches) and weighs 300 to 500 grams (0.7 to 1.1 pounds) in air. Depending on the type of suction-cup tag, between two to four suction-cups will be used to attach to the animal. Each suction cup is approximately 7.5 centimeters (3 inches) in diameter.

Suction-cup tags will be deployed for short durations (hours to days) to examine foraging ecology, the acoustic environment, and understand received levels of underwater sound to cetaceans. Suction-cup tags are temporary and will eventually break suction and fall off on their own, but a pre-programmed release valve and mechanism may be used to expedite release. A very-high frequency transmitter will be used to track suction-cup tagged animals at the surface and to locate the suction-cup tag after it is released from the animal's body. When the suction-cup tag is recovered, the archived data is downloaded to a computer.

Researchers will not place suction-cup tags on individuals less than one year of age (based on size), or deploy suction-cup tags on females in close proximity (5 meters [16.4 feet]) to calves less than one year of age. Females with calves estimated to be one year of age or older may be tagged. Groups of animals with neonate calves will not be approached unless there is a separation of 5 meters (16.4 feet) from the neonate to the target animal. Researchers will monitor behavior of candidate individuals and not attempt to suction-cup tag animals that are highly disturbed or agitated. Close approaches will be conducted in a controlled manner at safe speeds and tagging activities may be aborted at any time if animals are continually evasive.

Suction-cup tags may be deployed on known individuals up to two times per year if their body condition appears healthy and there appears to be no substantial signs of tissue damage from the first tagging deployment. Known individuals will not be suction-cup tagged more than four times in a five-year priod.

Lead suction-cup taggers include Alison Stimpert, Aran Mooney, Michael Richlen, and Jessica Aschettino, who are trained and experienced, and have conducted suction-cup tagging from research vessels under a variety of research permits. Additional researchers will be trained at suction-cup tagging, and will be requested to be approved for tagging without further supervision after five suction-cup tags have been deployed on animals.

Under Permit No. 21938, the SEFSC will attach recoverable multi-sensor suction-cup tags to a variety of cetacean species. A hand-held pole will be the primary deployment method for deploying suction-cup tags. Hand-held poles will deploy suction-cup tags at distances of 4 to 8 meters (13 to 26 feet) from the animals. The suction-cup is typically formed from rubber or silicon rubber ranging in size from 3 to 30 centimeters (1.2 to 11.8 inches) in diameter. Suction may be generated passively when the suction-cup contacts the animal, actively using a vacuum system or Venturi device, or actively by a system of one-way valves as the animal dives and returns to the water's surface. Suction-cups will eventually break suction and the tags fall off on their own, but a release valve and mechanism may be used to expedite release. The instrument package may be attached directly to the suction-cup or by hinge point, ball joint, universal joint, flexible or elastic cables/straps, or may sit on a platform. The suction-cup may be lubricated with silicon grease or other non-reactive substance to improve the seal between the suction-cup and animal's skin.

Some types of suction-cup tags (mostly multi-sensor versions) will have release devices to ensure that they will release from the animal so that they can be later recovered to download collected data. The release device on the suction-cup tag may be active or passive. Active release devices use a VHF or ultra-high frequency radio signal or an acoustic underwater signal to trigger the release of the suction-cup tag from the animal. Passive release devices use corrodible links or nuts, corrodible or dissolving caps, plugs, or valve covers to break suction, or suction-cups loosen and fall off on their own. Passive release devices may be included as a secondary or primary release device and can be calibrated for attachment periods of a few hours to over a week. When the suction-cup tag is released from the animal, a recovery beacon on the suction-cup tag will activate to indicate the location of the tag. The recovery beacon may include one or a combination of the following: a radio transmitter, acoustic device, and visual light.

Suction-cup tags will include sensors such as VHF radio transmitters, Fastloc global positioning systems, accelerometers, and sensors to measure light levels, temperature, depth, sound, and/or collect video. The instrument package is typically 35 centimeters by 12 centimeters by 3 centimeters (13.8 inches by 4.7 inches by 1.2 inches) and weighs up to 500 grams (1.1 pounds). A flotation unit will be attached to the instrument to facilitate recovery. The instrument package, recovery beacon, and release device are all encased within or attached to a non-compressible foam or other floatation system. The typical tag housing is made of a mixture of glass microspheres and polyethylene resin such that the whole tag package is durable, lightweight, and buoyant.

For suction-cup tags with radio transmitters, the animal's dorsal surface will be the preferred location for placement. The radio transmitter needs to be positioned high on the animal's back to ensure the suction-cup tag is above the water when the animal surfaces and has sufficient exposure for transmissions to reach receivers. Radio transmitters cannot transmit through salt water. Acoustic or video suction-cup tags will be attached in forward-looking positions to record specific behaviors. Suction-cup tags will be placed in locations that will not impair the animal. The area of the blowhole, eyes, mouth, genitals, flippers, and flukes will be avoided.

Animals targeted for suction-cup tagging will include adults, sub-adults, and juveniles greater than one year of age. Prior to suction-cup tagging attempts, researchers will conduct a visual assessment of health condition of the target animals. Animals will be avoided if they are obviously emaciated, have unusual skin conditions or unusual wounds. Animals whose behavior suggests compromised health will be avoided. Crew on research vessels will be briefed on assessment protocol prior to suction-cup tagging to assist researchers and help identify animals that will not be targeted. Individuals will not knowingly be tagged more than once in a given year, but may be tagged in subsequent years. Based on the SEFSC's prior permit application and prior research activities using suction-cup tags, it is their intent that no individual would be intentionally be tagged more than once per year for all species of cetaceans. A sub-set of the individuals tagged may be tagged with two different tags, although only if the individuals show no strong behavioral reaction to tagging, allowing them to be easily approached for a subsequent tagging attempt.

Suction-cup tags will be deployed either when animals approach the research vessel or another platform on their own or during directed approaches by the research vessel. Depending on tag type, approaches by the research vessel will be conducted similarly to photo-identification and biopsy sampling. Adults and juveniles of both sexes over one year of age may be tagged with suction-cup or dart tags. Gulf of Mexico Bryde's whales can be tagged with either suction-cup and/or dart/barb tags for a total of two tags maximum per year (1 suction-cup and 1 dart/barb tag). For all other cetacean species, suction-cup tags may be applied once per year (up to five times over the course of this scientific research permit). The duration of this type of tag is expected to last from hours to days.

Examples of suction-cup tags that will be used include the modified time-depth recorder, digital acoustic recording tag (DTAG), and customized animal tracking solutions tag (CATS). The tagging designs may include a hydrophone, accelerometer, video camera, or pressure sensor. DTAGs or other similar-style tags (e.g., B-prove) will be used to record acoustics. Additional information on these suction-cup tags can be found below.

The modified time-depth recorder is a type of suction-cup tag that does not penetrate the skin. They are 25 by 12.5 centimeters (10 by 5 inches) and weigh less than 300 grams (0.7 pounds) in air. The modified time-depth recorder will collect data that includes time, depth, pitch, roll, acoustic recording, salinity, and temperature to study dive and feeding behavior as well as oceanographic information. Data will be stored in the suction-cup tag and downloaded after retrieval.

The DTAG is a type of digital acoustic suction cup tag that was developed by Johnson and Tyack (Johnson and Tyack 2003) at Woods Hole Oceanographic Institution (http://www.whoi.edu/page.do?pid=39337 and http://soundtags.st-andrews.ac.uk/dtags/) to monitor the behavior of animals and their response to sound, continuously throughout the dive cycle. The DTAG comes in three versions. In their deployment housing, they are approximately 19.6 by 9.7 by 4.6 centimeters (7.7 by 3.8 by 1.8 inches) or smaller, weigh approximately 330 grams (0.7 pounds) or less in air, and are slightly buoyant in water in order to allow retrieval after release from the animal. The housing is hydrodynamic, has low drag, and is equipped with four silicon suction cups for attachment. The DTAG contains a large array of solid-state memory (6.6 gigabyte) and records continuously from a built-in hydrophone and suite of sensors. DTAGs include sensors for acoustic recordings, pressure, pitch, roll, heading, surfacing events, depth, temperature, and global positioning system to sample the orientation of the animal in three dimensions as well as resolution for speed (i..e, capture individual fluke strokes). The acoustic component has a It also has a rechargeable battery and infrared data offload. DTAGs also have very high frequency antenna that transmits radio waves at 148 or 220 MegaHertz to aid in tracking and tag retrieval. DTAGs feature a programmable release mechanism for detachment. The latest version has a memory-limited data collection duration of three days (previous version limitations are shorter), but tags often come off earlier either by design or due to cetacean behavior (Szesciorka et al. 2016). Audio and sensor recording is synchronous so the relative timing of sounds and motion can be determined precisely.

Figure 7. Example of a Digital Acoustic Recording Tag (DTAG) in casing with suction-cups.

The CATS tag is a type of suction-cup tag that includes sensors for light, pressure, acceleration, compass, gyroscope, as well as high-definition video camera. It has a sampling rate of up to 1,600 Hertz. Recording time can last up to 30 hours.

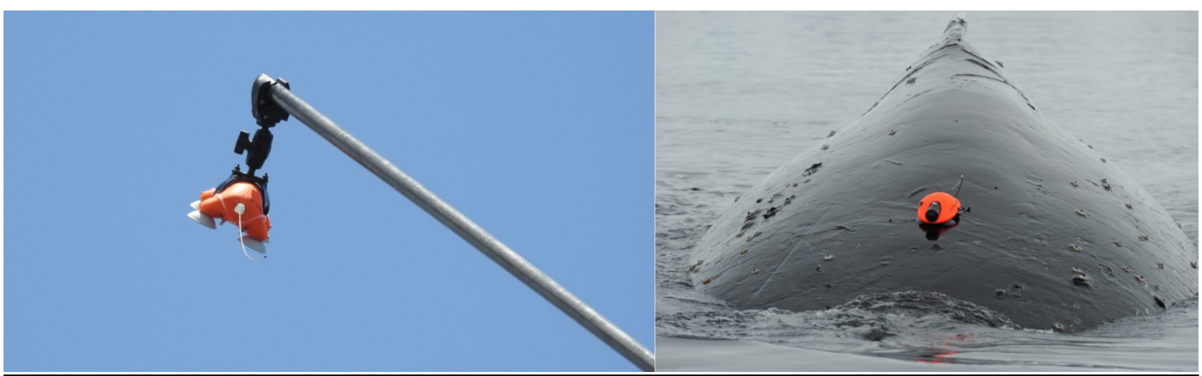


Figure 8. Example of a customized animal tracking solutions suction-cup tag attached to a pole and attached to an animal via suction-cups.

The specifications for the suction-cup tags are detailed above. However, as technologies advance over the course of the proposed permit, the researchers will be authorized to use additional suction-cup tag types as long as they are smaller and/or are expected to have less impact than those described above.

3.6.2 Dart/Barb Tagging

Under Permit No. 21482, Dr. Dan Engelhaupt will deploy non-recoverable dart/barb tags to collect cetacean movement data using satellite technology. Dart/barb tags will be used for shorter durations (days to weeks to months) than deep-implantable tags (several months). Tag retention varies across species. Dart/barb tags are expected to naturally migrate out of the tissue within a year. The data from dart/barb tags will be used to assess behavioral ecology and detailed behavioral resonses to specific anthropogenic activities (e.g., U.S. Navy testing and training exercises). Inter-annual dive behavior patterns are of particular interest to researchers and dart/barb tags will provide insight to how individuals adapt to changing habitats and anthropogenic activities over time. Researchers will remotely deploy dart/barb tags from research vessels using a crossbow, pole, or pneumatic rifle. A pneumatic rifle (e.g., Dan-Inject rifle for Low Impact Minimally Percutaneous Electronic Transmitter [LIMPET] tags) will be the primary deployment method. The dart/barb tags will be secured in a custom built cradle affixed to the pneumatic rifle and water soluble tape will provide additional stabilization. The arrow should immediately break free from the tag on impact with the animal or, in rare cases, detach once submerged in the water.

Figure 9. Dan-Inject pneumatic rifle for LIMPET dart/barb tags.

For deploying dart/barb tags, animals will be approached at distances of 2 to 10 meters (6.6 to 32.8 feet) and deployed on the dorsal side at distances 2 to 5 meters (3.3 to 9.8 feet) from the animals, depending on course, heading, and speed. Dart/barb tags will typically be deployed in the dorsal fin or dorsal ridge area (i.e., immediately below, in front of, or behind the dorsal fin) of the animal. The dorsal fin, which is comprised of dense connective tissue, provides an ideal anchoring system for the dart/barbs. Researchers will approach and deploy at these distances to control the strike angle and position of the tag on the animal, ensure the antenna orientation is vertical, as well as remain a safe distance in the case of unexpected behavioral reactions. The dart/barb tags, which are held in place by small-barbed darts that attach to the subcutaneous tissue, are extremely small (approximately 0.6 centimeters [0.2 inches] in diameter) and can be attached externally to the cetaceans. The darts are made of medical-grade titanium and have backwards-facing petals (generally three or six). Dart length will vary by species, with small species having shorter darts than medium or large species. Generally, shorter darts are 45 millimeters (1.8 inches) long and longer darts are 68 millimeters (2.7 inches) long.

Experienced personnel will maneuver or direct others to maneuver the research vessel around animals. Researchers will monitor behavior of candidate individuals and not attempt to tag animals that are highly disturbed or agitated. Close approaches will be conducted in a controlled manner at safe speeds and tagging activities may be aborted at any time if animals are continually evasive. Prior to tag deployment, photographs will be taken to identify target individuals. Photographs (left and right side of the animal) and video (e.g., GoPro camera) will be used to record tag deployments. After a tag is successfully deployed, researchers will observe the individual using photography and/or videography to document the tag location and orientation, and any immediate behavioral reactions.

No more than two tag types will be deployed on an individual at a given time. The only combinations of tag types will be either a single deep-implantable or dart/barb satellite tag in combination with a suction-cup tag.

Known individuals will not be tagged using dart/barb satellite tags (e.g., LIMPET) more than two times per year, if their body condition appears to be healthy and there are no substantial signs of tissue damage related to the first deployment and attachment of the tag, and not more than four times in a five-year period. Adults and juveniles of either sex may be targeted for tagging. Researchers will not tag animals less than one-year of age or females in close proximity (5 meters [16.4 feet]) to calves less than one-year of age. Females with calves estimated to be one-year of age or older may be tagged. Groups with neonate calves where fetal folds are still clearly visible will not be approached unless there is a separation of 5 meters (16.4 feet) from the neonate to the target individual presumed to not be its mother.

Baseplates will be used as a "stop" component to prevent inward migration of the percutaneously-implanted attachment elements. The baseplate and attachment elements will eventually be lost from water draft and the animal's foreign body response, which is likely to occur within one year of tagging.

Table 8. Species that may be dart/barb tagged, dart length, and target attachment location.

Species	Dart Length for LIMPET tag (Millimeters)	Target Attachment Location
Blue Whale	68	Dorsal Fin/Dorsal Ridge
Bowhead Whale	68	Dorsal Fin/Dorsal Ridge
Bryde's Whale – Gulf of Mexico Subspecies	68	Dorsal Fin/Dorsal Ridge
False Killer Whale – Main Hawaiian Islands Insular DPS	68	Dorsal Fin
Fin Whale	68	Dorsal Fin/Dorsal Ridge
Gray Whale – Western North Pacific Population	68	Dorsal Ridge

Humpback Whale – Multiple DPSs	68	Dorsal Fin/Dorsal Ridge
North Atlantic Right Whale	68	Dorsal Ridge
North Pacific Right Whale	NA	NA
Sourthern Right Whale	68	Dorsal Ridge
Sei Whale	68	Dorsal Fin/Dorsal Ridge
Sperm Whale	68	Dorsal Fin/Dorsal Ridge

NA=Species will not be dart/barb tagged.

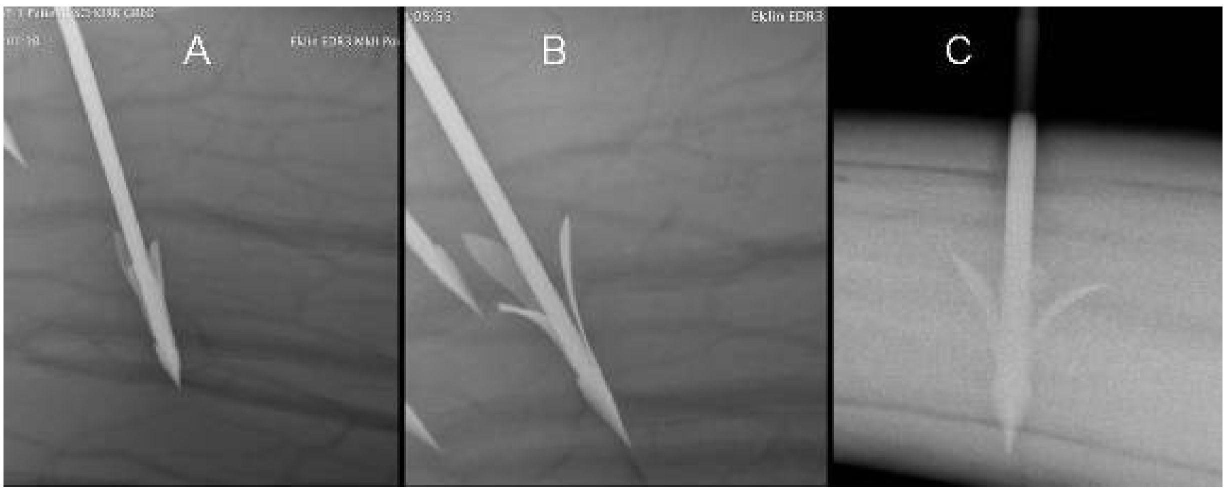


Figure 10. X-ray showing in-situ LIMPET dart/barb tag inside a dorsal fin (Andrews et al. 2014).

Examples of dart/barb tags with stainless steel sterilized dart/barb attachments that will be used include different versions of the low impact minimally percutaneous external electronics transmitter (LIMPET) tag (e.g., Smart Position or Temperature Transmitting [SPOT], SPLASH, and LIMPET-F satellite tags from Wildlife Computers). The LIMPET formation may also be used for deep-implantable tags. Additional information on these dart/barb tags can be found below.

The non-recoverable LIMPET tag is small, lightweight, and has one or more anchors that penetrate the dorsal fin/ridge or the body. The Wildlife Computers' SPOT tag is a small device that transmits locations to the Argos satellites as well as temperature data in the form of histograms. The LIMPET tag for location-only (SPOT6) is approximately 6.3 centimeters (2.5 inches) long by 3 centimeters (1.2 inches) side by 2.2 centimeters (0.9 inches) tall, and has a flexible antenna extending 17 centimeters (6.7 inches) from the top. The total dry weight is 44 to 49 grams (0.09 to 0.11 pounds). The Wildlife Computers' SPLASH tag is a small archival device that transmits locations to the Argos satellites as well as measures depth, temperature, light level, and wet/dry periods to determine surfacings. The LIMPET tag for location-depth (Mk10-A) is approximately 5.3 centimeters (2.1 inches) long by 5.2 centimeters (2 inches) wide by 2.4 centimeters (0.9 inches) tall. The total dry weight is 54 to 59 grams (0.12 to 0.13 pounds). The ventral side of the tag has two medical-grade titanium darts that are approximately 0.6 centimeters (0.2 inches) in diameter and have three backwards facing petals for tag retention in the animal.

The dart/barb length of the LIMPET tag will vary depending on the size of the animal as the dart/barbs will ideally penetrate below the dermis and anchor in the blubber layer of the animal. For example, the two titanimum dart/barbs that comprise the anchor system for LIMPET tags can be engineered to penetrate 4.5 centimeters (1.8 inches) for smaller cetaceans or 6.5 or 7 centimeters (2.6 or 2.8 inches) for larger cetaceans.

Transdermal satellite telemetry tags may also be used in dart/barb or deep-implantable configuration. They are intended for long-term monitoring of large cetaceans. They are deployed using a pneumatic airgun (e.g., ARTS launcher) or pole in the fascia layer of the animal. Sensors collect data on location, temperature, light, and depth. The transdermal tag ranges from approximately 114 millimeters (4.5 inches) long by 20 millimeters wide (0.8 inches) to 300 millimeters (11.8 inches) long by 24 millimeters (0.9 inches) wide. The total dry weight is 185 to 390 grams (0.4 to 0.9 pounds). The tag is retained in the animal through two actively sprung flaps and a circle of passively deployed umbrella-shaped petals. An ultralight aluminum collar is used to fix the tag to the launcher. The collar stays with the tags on deployment and acts as a stopper to ensure the wet/dry sensor and antennal remain external of the animal.

Figure 11. Example of a Wildlife Computers Mk 10-A depth transmitting LIMPET tag with two titanium dart/barbs that penetrate 6.5 centimeters (left), Wildlife Computers SPOT tag with two dart/barbs that penetrate 6.5 centimeters (center), and Wildlife Copmuters LIMPET-F GPS Fastloc location-dive tag deployed on a humpback whale under Permit No. 16239 (right).

tags@wctags.com
WildlifeComputers.com
+1 (425) 881-3048
8345 154th Ave NE
Redmond, WA, 98052 USA

LIMPET SPOT TAG WITH ANCHOR SUITE SPECIFICATIONS

Tag Family	Model	Argos	Temperature	Life (days) [1]	L x W x H (mm)	Weight (g)
SPOT	SPOT-240C	✓	✓	160	54 x 54 x 20	49

1) The above estimated life is calculated assuming 250 transmissions per day. Utilizing the Wet/Dry sensor and duty cycling, the life can be extended.

Accessories	Details	Dimensions
Titanium Dart Anchors	3-petal	45mm L x 22mm W x 4g
	6-petal	68mm L x 24mm W x 6g
Deployment Cup	One size	52 L x 52 W x 40 H (mm)
Airgun Arrow	For use with 13mm bore Dan-Inject CO_2 rifle	35in L
Crossbow Arrow	Flatback nock	20in L

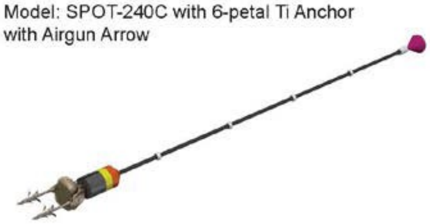
We provide accessories for airgun and crossbow deployment methods.

Arrows include a deployment cup.

Deployment Cup

Model: SPOT-240C

Model: SPOT-240C with 6-petal Ti Anchor with Airgun Arrow



Ti Dart Anchors: 6- and 3-petal

v 14-1

Argos antennas not shown to length.

Tag features and specifications subject to change without notice.

Figure 12. Specifications of the Wildlife Computers' SPOT tag in LIMPET configuration.

WILDLIFE COMPUTERS
Innovative Tags for Innovative Research

tags@wctags.com
WildlifeComputers.com
+1 (425) 881-3048

8345 154th Ave NE
Redmond, WA, 98052 USA

LIMPET SPLASH TAG WITH ANCHOR SUITE SPECIFICATIONS

Tag Family	Model	Argos	Depth	Temperature	Light Level	Life (days) [1]	L x W x H (mm)	Weight (g)
SPLASH	SPLASH10-292A	✓	✓	✓	✓	80	58 x 47 x 25	63

1) The above estimated life is calculated assuming 250 transmissions per day. Utilizing the Wet/Dry sensor and duty cycling, the life can be extended.

Accessories	Details	Dimensions
Titanium Dart Anchors	3-petal	45mm L x 22mm W x 4g
	6-petal	68mm L x 24mm W x 6g
Deployment Cup	One size	52 L x 52 W x 40 H (mm)
Airgun Arrow	For use with 13mm bore Dan-Inject CO_2 rifle	35in L
Crossbow Arrow	Flatback nock	20in L

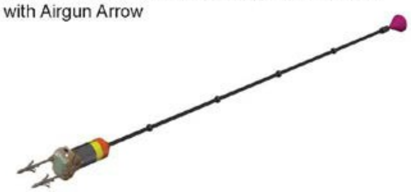
We provide accessories for airgun and crossbow deployment methods.

Arrows include a deployment cup.

Deployment Cup

Model:
SPLASH10-292A

Model: SPLASH10-292A with 6-petal Ti Anchor with Airgun Arrow



Ti Dart Anchors:
6- and 3-petal

v.14-1

Argos antennas not shown to length.

Tag features and specifications subject to change without notice.

Figure 13. Specifications of the Wildlife Computers' SPLASH10 tag in LIMPET configuration.

WILDLIFE COMPUTERS

LIMPET TAG SUITE

SPECIFICATION

Tag Family	Model	Fastloc® GPS	Argos	Depth	Temperature	Life (days)	L x W x H (mm)	Weight (g)
SPOT	SPOT-240		✓		✓	160*	54 x 54 x 20	49
SPLASH	SPLASH10-292		✓	✓	✓	80*	58 x 47 x 25	63
SPLASH	SPLASH10-F-333	✓	✓	✓	✓	90**	56 x 50 x 27	69

* Assuming 250 Argos transmissions per day. ** Assuming 250 Argos transmissions and four Fastloc snapshots per day. Tag life can be extended by duty cycling.

The Low Impact Minimally Percutaneous Electronic Transmitter (LIMPET) is a satellite transmitting tag widely used for cetacean tracking. Its small size allows for deployment high on the dorsal fin to enable frequent transmissions to the Argos satellites. LIMPET tags are designed to be deployed using Dan-Inject CO_2 rifles. Crossbow deployment accessories are also available. Accessories are not included in the price of the tag.

Model: SPOT-240

Model: SPLASH10-292

Model: SPLASH10-F-333

tags@wildlifecomputers.com
WildlifeComputers.com
+1 (425) 881-3048

8310 154th Ave NE, Suite 150
Redmond, WA, 98052 USA

v. 18-06 4.1

To Learn More Call: **+1 (425) 881-3048** or Email: **tags@wildlifecomputers.com**

Figure 14. Comparison of three Wildlife Computers' SPOT and SPLASH tags in LIMPET configuration used by Dr. Dan Engelhaupt.

WILDLIFE COMPUTERS™
Innovative Tags for Innovative Research

tags@wctags.com
WildlifeComputers.com
+1 (425) 881-3048
8345 154th Ave NE
Redmond, WA, 98052 USA

TRANSDERMAL CETACEAN TAG SUITE SPECIFICATIONS PG 1

Tag Family	Model	Argos	Depth	Temperature	Light Level	Life (days) [1]	L x D (mm)	Wall Thickness	Weight (g)
SPOT	SPOT-177-02	✓		✓		220	114 x 20	.020 inches	140
SPOT	SPOT-177I	✓		✓		220	114 x 20	.020 inches	125
SPOT	SPOT-177N	✓		✓		220	114 x 20	.060 inches	185
SPOT	SPOT-177O	✓		✓		220	114 x 20	.060 inches	185

1) The above estimated lives are calculated assuming 250 transmissions per day. Utilizing the Wet/Dry sensor and duty cycling, the life can be extended.

These tags all feature stainless steel housings with a variety of stop plate options and robust nitinol antennas. Etched rings on the housing provide a visual indication of tag ejection.


Model: SPOT-177I


Model: SPOT-177N


Model: SPOT-177-02


Model: SPOT-177O

v 14-1

Comparative scale is approximate. Argos antennas not shown to length.

This is a small representation of our available tags.
Tag features and specifications subject to change without notice.

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tags@wctags.com
WildlifeComputers.com
+1 (425) 881-3048
8345 154th Ave NE
Redmond, WA, 98052 USA

TRANSDERMAL CETACEAN TAG SUITE SPECIFICATIONS PG 2

Tag Family	Model	Argos	Depth	Temperature	Light Level	Life (days) [1]	L x D (mm)	Wall Thickness	Weight (g)
SPOT	SPOT-193H	✓		✓		400	172 x 22	.060 inches	200
SPOT	SPOT-193I	✓		✓		400	172 x 22	.060 inches	200
SPOT	SPOT-193J	✓			✓	400	172 x 22	.060 inches	200
SPOT	SPOT-193M	✓		✓		400	172 x 22	.060 inches	200
SPLASH	SPLASH10-260C	✓	✓	✓	✓	140	155 x 24	.060 inches	220

1) The above estimated lives are calculated assuming 250 transmissions per day. Utilizing the Wet/Dry sensor and duty cycling, the life can be extended.


Model: SPLASH10-260C

These tags all feature stainless steel housings with a variety of stop plate options and robust nitinol antennas. Etched rings on the housing provide a visual indication of tag ejection.


Model: SPOT-193I


Model: SPOT-193H


Model: SPOT-193J


Model: SPOT-193M

v 14-1

Comparative scale is approximate. Argos antennas not shown to length.
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This is a small representation of our available tags.
Tag features and specifications subject to change without notice.

Figure 15. Specifications of the Wildlife Computers' SPOT and SPLASH tags in dart/barb or deep-implantable configuration.

If there is evidence of an adverse reaction or the tag breaks, the researchers will cease tagging activities for that species until further review and consultation with the NMFS Office of Protected Resources.

Researchers will monitor behavior of candidate individuals and not attempt to tag animals that are highly disturbed or agitated. Close approaches will be conducted in a controlled manner at safe speeds and tagging activities may be aborted at any time if animals are continually evasive.

The specifications for the dart/barb tags are detailed above. However, as technologies advance over the course of the proposed permit, the researchers will be authorized to use additional dart/barb tag types as long as they are smaller and/or are expected to have less impact than those described above.

Under Permit No. 21938, researchers will deploy non-recoverable dart/barb tags to collect cetacean movement data using satellite technology. The movement data will provide valuable insights into behavior and habitat use. Researchers will remotely deploy dart/barb tags using bolts fired from crossbows. The dart/barb tags, which are held in place by small-barbed darts that attach to the subcutaneous tissue, are extremely small and can be attached externally to the dorsal fin or dorsal surface of cetaceans. The duration of this type of tag is expected to be from a week to several months. Multi-sensor, multi-dart/barb tags may include global positioning system receivers that allow accurate positioning of the animals and the tag when it releases so that it can be recovered. Baseplates will be used as a "stop" component to prevent inward migration of the percutaneously-implanted attachment elements. The baseplate and attachment elements will eventually be lost from water draft and the animal's foreign body response, which is likely to occur within one year of tagging.

A dart/barb tag will placed in a tag holder at the tip of a bolt, which slides into the flight groove of the crossbow or the barrel of the rifle prior to firing. On contact with an animal, the bolt will fall away and be retrieved after tagging, leaving only the tag attached to the animal. In general, the firing range of dart/barb tags using a crossbow or rifle varies between 5 and 25 meters (16.4 to 82 feet).

For dart/barb tags with radio or satellite transmitters, the animal's dorsal surface will be the preferred location for placement. The radio or satellite transmitter needs to be positioned high on the animal's back to ensure the dart/barb tag is above the water when the animal surfaces and has sufficient exposure for transmissions to reach receivers. Radio transmitters cannot transmit through salt water. Dart/barb tags will be placed in locations that will not impair the animal. The area of the blowhole, eyes, mouth, genitals, flippers, and flukes will be avoided.

Animals targeted for dart/barb tagging will include adults, sub-adults, and juveniles greater than one year of age. Prior to dart/barb tagging attempts, researchers will conduct a visual assessment of health condition of the target animals. Animals will be avoided if they are obviously emaciated, have unusual skin conditions, or unusual wounds. Animals whose behavior suggests compromised health will be avoided. Crew on research vessels will be briefed on assessment protocol prior to dart/barb tagging to assist researchers and help identify animals that will not be targeted. Individuals will not knowingly be tagged more than once in a given year, but may be tagged in subsequent years. Gulf of Mexico Bryde's whales can be tagged with either suction-cup and/or dart/barb tags for a total of two tags maximum per year (1 suction-cup and 1 dart/barb tag). Given the SEFSC's prior research activities using dart/barb tags, it is unlikely that any individual will be tagged more than three times in a five-year period.

Dart/barb tags can have from two to four dart/barbs acting as attachments from the tag to the animal. No animals will receive more than six dart/barbs acting as anchors if two other implantable tags were deployed. A sub-set of the individuals tagged may be tagged with two different tags with a total of no more than six tissue penetration points, although only if the individuals show no strong behavioral reaction to tagging, allowing them to be easily approached for a subsequent tagging attempt. In cases where species are rarely encountered, multiple tags on individuals will allow for simultaneous collection of a broader set of information, such as different temporal/spatial scales and resolution.

Dart/barb tags will be deployed either when animals approach the research vessel or another platform on their own or during directed approaches by a research vessel. Depending on tag type, approaches by the research vessel will be conducted similarly to photo-identification and biopsy sampling. A second research vessel may be used, in addition to the tagging research vessel, to assist with tagging-associated research activities such as focal follows and post-tagging documentation. The two research vessels will be spread at least 100 to 300 meters (328.1 to 984.3 feet) apart. Adults and juveniles of both sexes over one year of age may be tagged with suction-cup or dart/barb tags.

Examples of dart/barb tags that will be used include the low impact minimally percutaneous external electronics transmitter. Additional information on these dart/barb tags can be found below.

The non-recoverable low impact minimally percutaneous external electronics transmitter (LIMPET) tag is small, lightweight, and has one or more anchors that penetrate the dorsal fin/ridge or the body. The three external package LIMPET tag designs include location-only (e.g., SPOT5 or SPOT6), depth-transmitting (e.g., SPLASH10/Mk10-A, Wildlife Computers), and depth-transmitting with addition of global positioning system (e.g., SPLASH10-F, Wildlife Computers). This type of tag has been deployed on a wide variety of cetacean species in areas such as Alaska, Antarctica, Australia, Canada, and Hawaii. They have documented movements for up to three months and over distances of more than 9,400 kilometers (5,075.6 nautical miles). The LIMPET tag for location-only (SPOT6) is made from epoxy and urethane material and the dart shafts and petals are usually made from titanium or stainless steel, but this construction may change to a biocompatible polymer or bioabsorbable material in future years. The electronic components measure 55 millimeters (2.2 inches) by 48 millimeters (1.9 inches) by 21 millimeters (0.8 inches). The dart components measure 65 to 100 millimeters (2.6 to 3.9 inches) and backward-facing retention barbs measure 5 to 30 millimeters (0.2 to 1.2 inches). The total weight of the tag will not exceed 90 grams (0.2 pounds). The average operational lifetime of the LIMPET tag ranges from 35 to 354 days.

All tagged animals will be photo-identified. During and immediately after tagging animals, researchers will take photographs to fully document the initial tag placement and condition of the tag implant site. The researchers will conduct focal follows to assess the response of the animal to the tagging event, whenever possible. Photographs will be taken by digital single-lens reflex cameras and video will be recorded with cameras mounted to personnel (e.g., head-mounted GoPro) or deployment devices, and/or research vessel. Video may also be taken from unmanned aircraft systems. Movement data from the tagged animal will be collected remotely via the Argos satellite system. If there is evidence of an adverse reaction or the tag breaks, the researchers will cease tagging activities for that species until further review and consultation with the NMFS Office of Protected Resources.

3.6.3 Deep-Implantable Tagging

Under Permit No. 21482, Dr. Dan Engelhaupt will attach deep-implantable tags and use satellite-monitored radio telemetry to assess long-term movements of free-ranging cetaceans in a given region. Inter-annual movement and dive behavior patterns of individuals are of particular interest to researchers. These type of tags will provide information on important habitat requirements for cetacean species and how individuals adapt to changing habitats impacted by anthropogenic activities over time. Deep -implantable tags are expected to last several months. Researchers will remotely deploy deep -implantable tags from research vessels using a crossbow, pole, or pneumatic rifle. A pneumatic rifle (e.g., Dan-Inject rifle) will be the primary deployment method. The deep -implantable tags will be secured in a custom built cradle affixed to the pneumatic rifle and water soluble tape will provide additional stabilization. The arrow should immediately break free from the tag on impact with the animal or, in rare cases, detach once submerged in the water.

Deep-implantable tags will be deployed on the dorsal side at distances 1 to 10 meters (3.3 to 9.8 feet) from the animals, depending on course, heading, and speed. Researchers will approach at these distances to control the strike angle and position of the tag on the animal, ensure the antenna orientation is vertical, as well as remain a safe distance in the case of unexpected behavioral reactions. Deep-implantable tags will only be deployed on a few, select species of cetaceans.

Satellite-monitored radio tags contain an Argos transmitter housed in an expoxy-filled stainless steel cylinder that is approximately 2.1 centimetes (0.8 inches) in diameter and no more than 30 centimeters (11.8 inches in length). Deep-implantable tags will be a maximum penetrating length of 30 centimeters (11.8 inches) across all cetacean species, but are likely to vary based on technology-driven designs, species and age-class.

The deep-implantable tag will be centered near or forward of the animal's dorsal fin or hump, and behind the pectoral fins. This area of the animal's body is where maximum barb retention in the muscle layer directly beneath the blubber layer is possible. Blades will direct the deep-implantable tag into the blubber layer and the distal end of the tag will have an antenna and saltwater conductivity switch. Upon impact, retention plates and petals onen in order to keep the deep-implantable tag in place. Two rows of stainless steel petals (0.6 by 3.2 centimeters [0.2 by 1.3 inches]) will prevent outward migration of the deep-implantable tag. The distal end of the deep-implantable tag will have two perpendicular stops (approximately 0.6 centimeters [0.2 inches] in diameter and 1.5 centimeters [0.6 inches] in length) to act as a depth stop and prevent inward migration of the deep-implantable tag.

Examples of deep-implantable tags that will be used include Argos satellite-monitored radio tags from manufacturers Wildlife Computers and/or Telonics. Additional information on these deep-implantable tags can be found below.

After a pre-determined amount of time, an electrical current will be activated that causes oxidation of a corrodible wire and a portion of the deep-implantable tag will be ejected from the housing and float the water's surface where it will be recovered by researchers. The remainder of the deep-implantable tag is expected to work itself free from the animal's body in a matter of weeks to months (usually no longer than 18 months based on previous observations).

Researchers will monitor behavior of candidate individuals and not attempt to tag animals that are highly disturbed or agitated. Close approaches will be conducted in a controlled manner at safe speeds and tagging activities may be aborted at any time if animals are continually evasive.

No more than two tag types will be deployed on an individual at a given time. The only combinations of tag types will be either a single dart/barb or deep-implantable satellite tag in combination with a suction-cup tag. Researchers will not deploy deep-implantable tags on known individuals within the same year. No deep-implantable tags will be used for Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, North Atlantic right whales, North Pacific right whales, and sei whales.

Close approaches will be conducted in a controlled manner at safe speeds and tagging activities may be aborted at any time if animals are continually evasive. Dr. Simon Childerhouse, a researcher with experience deploying deep-implantable tags, will be on the research vessel either directly deploying these type of tags or directing other researchers to ensure maximum safety and success. Other researchers will be trained by researchers with tagging experience and conduct tagging under direct supervision during a minimum of two successful deployments of tags.

Table 9. Species that may be deep-implantable tagged, dart length, and target attachment location.

Species	Dart Length for Deep-Implantable Tag (Millimeters)	Target Attachment Location
Blue Whale	300 to 330	Dorsal Ridge
Bowhead Whale	300 to 330	Dorsal Ridge
Bryde's Whale – Gulf of Mexico Subspecies	NA	NA
False Killer Whale – Main Hawaiian Islands Insular DPS	NA	NA
Fin Whale	300 to 330	Dorsal Ridge
Gray Whale – Western North Pacific Population	300 to 330	Dorsal Ridge
Humpback Whale – Multiple DPSs	300 to 330	Dorsal Ridge
North Atlantic Right Whale	NA	NA
North Pacific Right Whale	NA	NA
Sourthern Right Whale	300 to 330	Dorsal Ridge
Sei Whale	NA	NA
Sperm Whale	300 to 330	NA

NA=Species will not be dart/barb tagged.

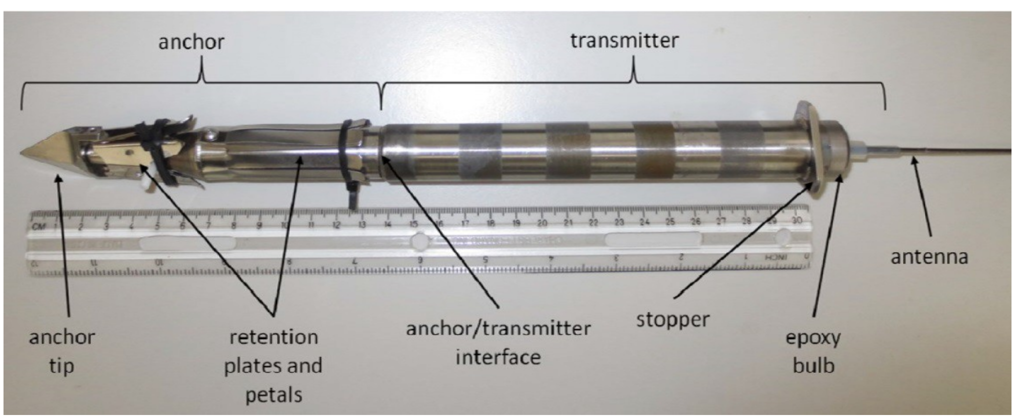


Figure 16. Example of a deep-implantable tag used for large cetaceans. Note: Retention plates and petals are depicted in the "in" position prior to deployment, upon impact the retention plates and petals open in order to keep the tag in place.

Under Permit No. 21938 researchers will use non-recoverable, deep-implantable tags for long-term monitoring of select cetacean species (blue, fin, humpback, and sperm whales). Implantable tags, used for large whales (e.g., Mate et al. 2007), partially or fully penetrate the body of the animal. The total length of these tags (the transmitter plus attachment system) varies according to the target species. Implantable tags can be divided into two major components: the transmitter and the attachment system. The former corresponds to the body of the tag, being the component that carries all the electronics and the battery and the latter corresponds to the part responsible for anchoring the transmitter in the whale's body. Tag placement for implantable tags is on the dorsal surface near the midline of the animal, several meters anterior of the dorsal fin/hump. The placement is important and allows the tag to break the surface of the water during surfacing events to allow transmission of data.

Implantable tag types can measure up to 23–28 cm in length and 2.5 cm in width (or diameter in the case of cylindrical housings) and weigh 225 to 490 grams. Satellite tags may be packaged in an epoxy cylinder, where the entire cylinder or only part of the cylinder is imbedded in the flank of larger whales. Transmitters also have a steel wire rope antenna attached to their body, which can measure up to 200 mm. The housing of implantable transmitters can be equipped with stoppers in the form of stop plates or studs. Stoppers are used to prevent (1) full penetration of the tag upon deployment or (2) post-deployment migration of the tag inside the whale. The battery and electronic components of implantable transmitters are cast with epoxy inside a stainless steel tube or box, which covers almost the whole extension of the transmitter. Only the posterior end of the epoxy, where the salt water switch is located, remains exposed. This portion of the tag does not penetrate the body of the whale. The stainless steel housing can potentially be coated with or inserted in a sleeve made with ultra high molecular weight surgical material to minimize tissue rejection of implantable components of the transmitter.

Implantable transmitters are usually equipped with a single attachment dart. The dart is composed of a cylindrical or rectangular rod with needle or arrow-shaped (bladed) tips and multiple sets of retention barbs. Barbs deploy immediately after the tag is attached to the body of the whale by opening outwards and anchoring in the adjacent tissue. Material used to produce these attachment systems includes stainless steel and titanium and can be coated with other bio-compatible material.

The attachment duration for implantable tags depends on configuration: with a time depth recorder, 30–45 days; and location only, less than 180 days.

The specifications for the deep-implantable tags are detailed above in this section. They will also be similar to dart/barb tags described in the previous section above, but will have a deep-implantable configuration. However, as technologies advance over the course of the proposed permit, the researchers will be authorized to use additional deep-implantable tag types as long as they are smaller and/or are expected to have less impact than those described above.

3.7 Export and Import

Research activities under Permit Nos. 21482 and 21938 may include the biological sampling and tagging of animals in international waters. During the five-year period of these permits, research activities may also be conducted in foreign waters of countries, under authority of foreign permits. Both situations may result in the need to import parts of cetaceans, including skin and blubber from biopsy sampling or sloughed skin sampling, into the U.S. (numbers not to exceed the number of animals biologically sampled or tagged during those research activities, see Table 2, Table 3, Table 4, and Table 5).

Under Permit No. 21482, samples will be hand-carried into the U.S. by research staff at the conclusion of the field season, or will be mailed into the country. If analytical needs cannot be met by a genetics laboratory in the U.S., the researchers will request authorization to export (and re-export samples that will have been imported) biopsy samples to appropriate laboratories in foreign countries. CITES import, export, or introduction from the sea permits will be obtained as required.

Under Permit No. 21938, in addition to samples collected in international waters, biopsy samples collected from waters under the Jurisdiction of Mexico and all countries bordering the Caribbean Sea from all species listed in Table 5 would be imported into the U.S. Research permits to conduct these activities within foreign waters will be obtained. In addition, the appropriate U.S. CITES Permit to Import Appendix I and II species biopsy samples also will be obtained. The appropriate Mexican and other foreign CITES export permits will be obtained. All samples will be collected legally and humanely.

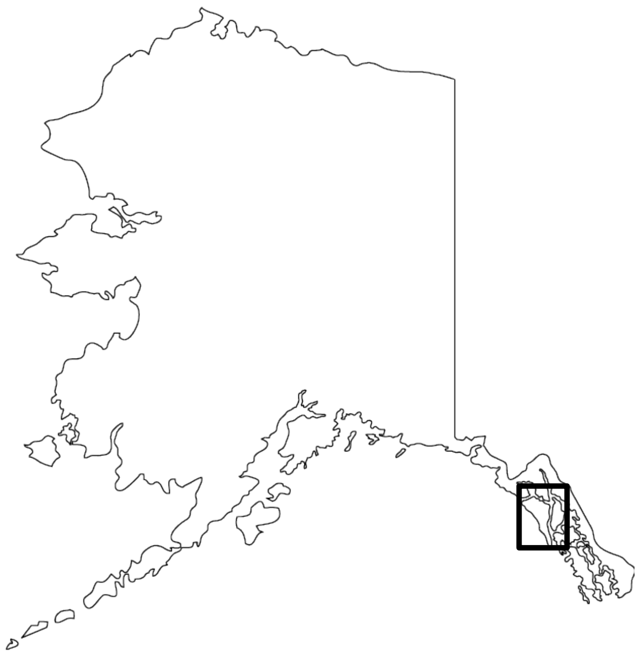
4 ACTION AREA

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 action area for Permit No. 20648 is the Gulf of Alaska and waters along Southeast Alaska, particularly those near Juneau, Alaska (Figure 17). Under Permit No. 20648, research activities within the action area will occur throughout the year, weather permitting and when logistically feasible, for the duration of the five-year permit. The frequency and timing of various research activities will vary depending on funding.

The action area for Permit No. 21482 is throughout the Exclusive Economic Zone of the U.S., international, and foreign waters of the Arctic, Atlantic, Indian, Pacific, and Southern Oceans, can be seen in Figure 18. This includes the focal areas of the Atlantic Ocean (including the Western North Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea), Pacific Ocean (including off of Alaska, Washington, Oregon, California, Hawaii, Guam, Marianas Islands, other U.S. territories, as well as Australia and Japan), within (or outside) U.S. Navy training and testing activity areas. Other focal areas may include offshore energy and construction activity areas. The research activities will be conducted in all locations at distances out to and exceeding 370.4 kilometers (200 nautical miles) from the coastline. Research activities may occur around the globe as part of the U.S. Navy's mitigation measures areas. Under Permit No. 21482, research activities within the action area will occur throughout the year, weather permitting and when logistically feasible, for the duration of the five-year permit. The frequency and timing of various research activities will vary depending on funding.

The action area for Permit No. 21938, which can be seen in Figure 19, includes the western North Atlantic Ocean (south of Long Island, New York), Gulf of Mexico, and Caribbean Sea, including the Exclusive Economic Zone of the U.S., international and foreign waters. Under Permit No. 21983, research activities within the action area will occur throughout the year, weather permitting and when logistically feasible, for the duration of the five-year permit. The frequency and timing of various research activities will vary depending on funding.



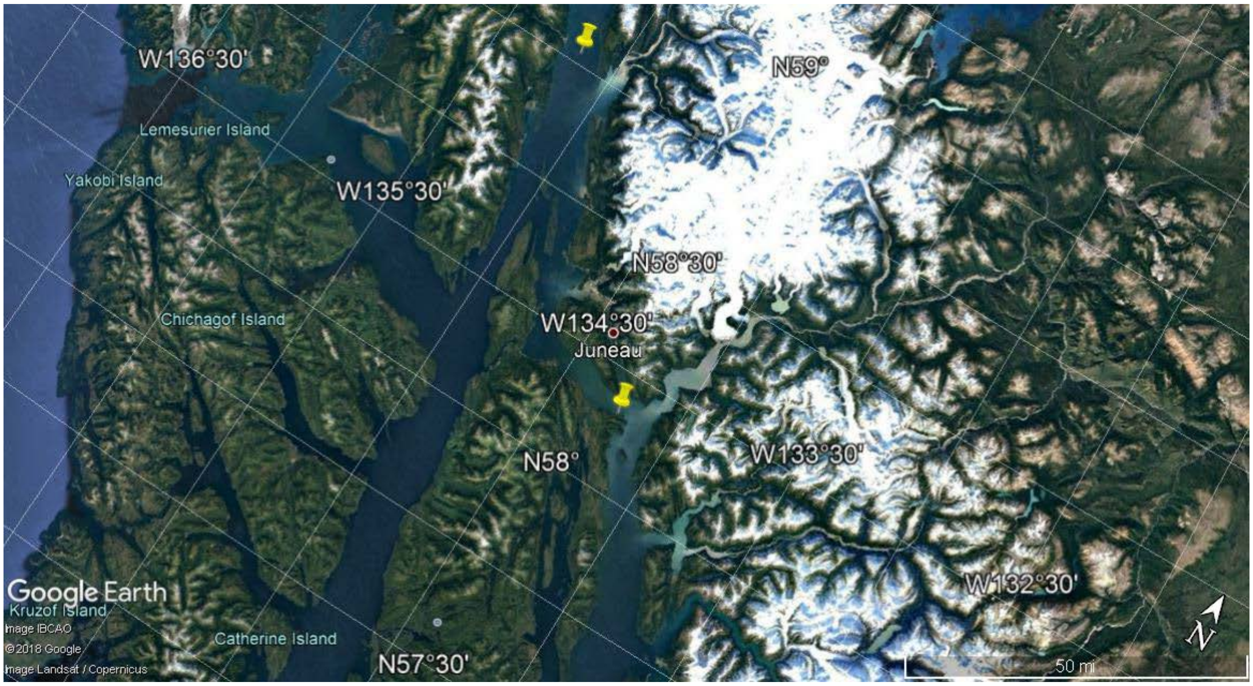


Figure 17. Map of the action area for proposed Permit No. 20648 where most of the research activities would occur. The yellow pins represent the northern- and southern-most bounds of this portion of the action area.

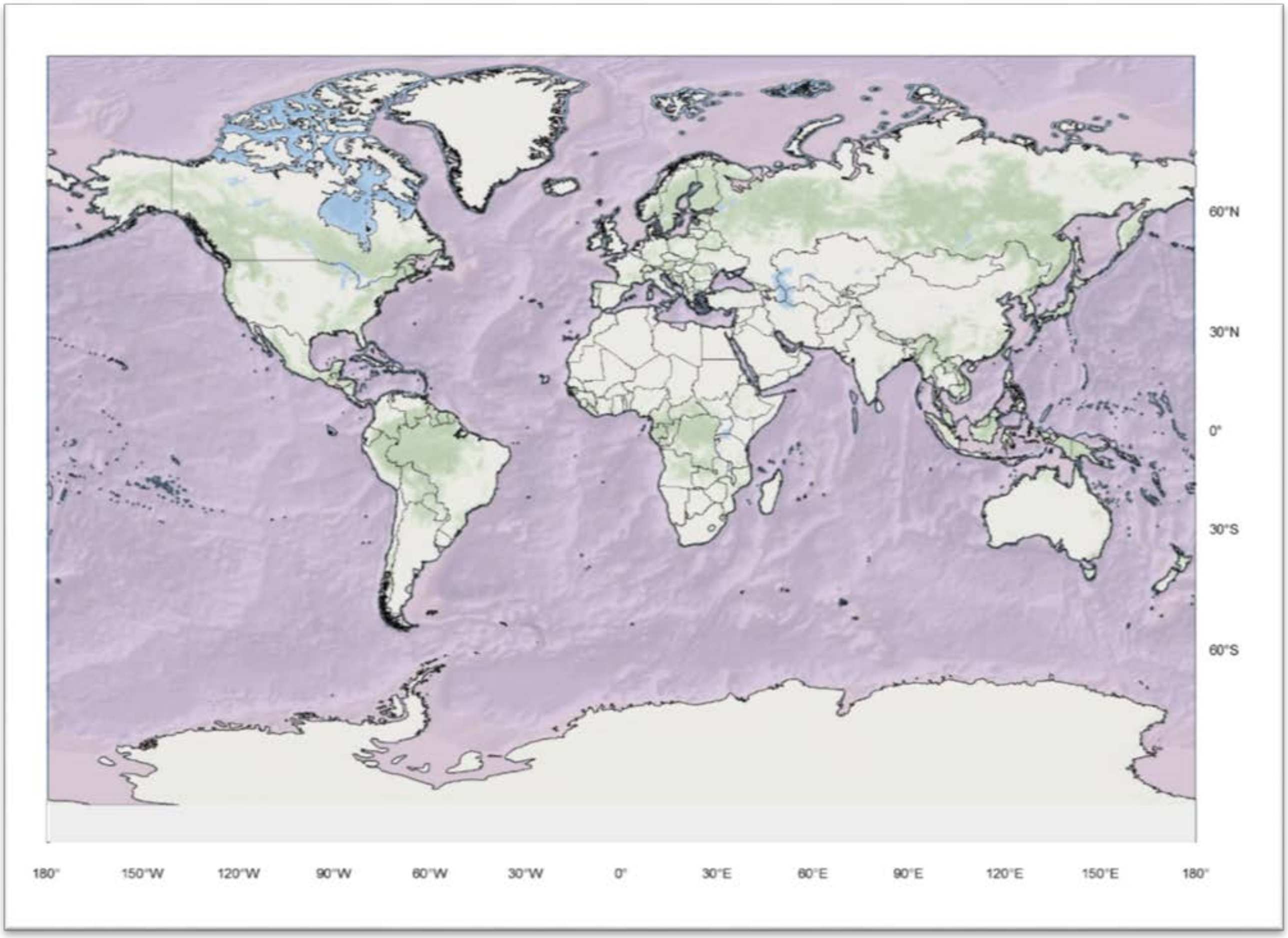


Figure 18: Map of the action area for proposed Permit No. 21482.

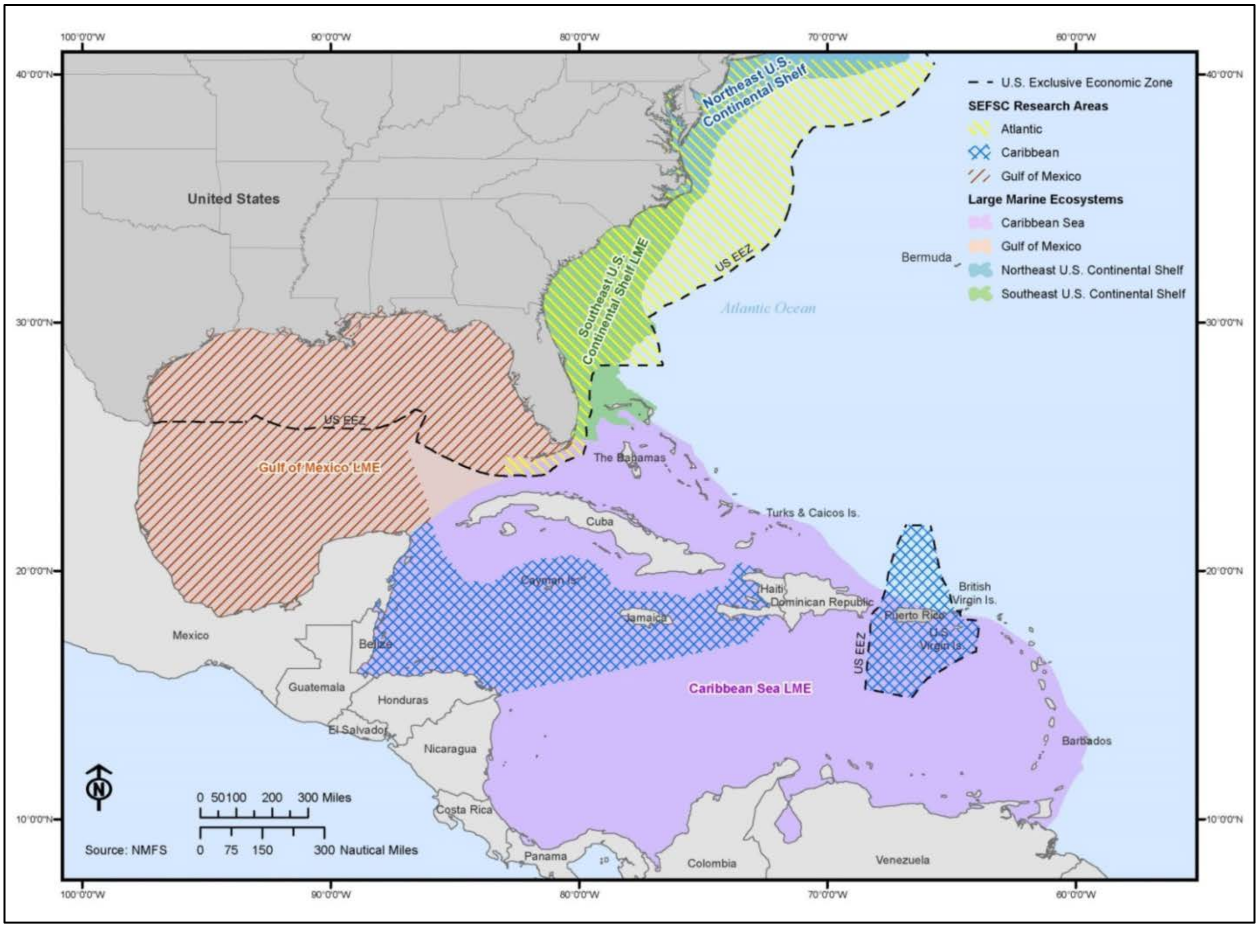


Figure 19. Map of the action area for proposed Permit No. 21938.

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. For this consultation, we consider all vessel transit associated with research activities as interdependent. Thus, we evaluate the effects of vessel transit on ESA-listed species and so include all water traversed during such transits as part of the action area.

6 Potential Stressors

There are several potential stressors that we expect to occur because of the proposed actions. The potential stressors include pollution, vessel strike, vessel noise, gear entanglement, aerial surveys, vessel surveys, active acoustics (i.e., playbacks and prey mapping,), close approaches, biological sampling, and tagging. These potential stressors are evaluated in detail in Section 11.

7 Species and Critical Habitat Not Likely to be Adversely Affected

This section identifies the ESA-listed species under NMFS jurisdiction that may occur within the action areas (as described in Table 10, Table 11, and Table 12) that are not likely to be adversely affected by the proposed action. 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 agency's 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 ESA-listed species in Table 10, Table 11, and Table 12 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.

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 section, we evaluate the effects of the proposed action on several ESA-listed and proposed for ESA-listing species and designated critical habitat that may be affected, but are not likely to be adversely affected. For the ESA-listed species, we focus specifically on stressors associated with the Permits and Conservation Division's proposed issuance of Permit Nos. 20648, 21482, and 21938 and their effects on these species. The effects of other stressors associated with the proposed actions, which are also not likely to adversely affect ESA-listed species, are also evaluated in Section 11. The species potentially occurring within the action areas that may be affected, but are not likely to be adversely affected, are listed in Table 10, Table 11, and Table 12, along with their regulatory status, designated critical habitat, and recovery plan.

Table 10. Endangered Species Act-Listed threatened and endangered species potentially occurring in the action area for Permit No. 20648 that may be affected, but are not likely to be adversely affected.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals - Cetaceans			
Blue Whale (*Balaenoptera musculus)*	E – 35 FR 18319	-- --	07/1998 10/2018
North Pacific Right Whale (*Eubalaena japonica*)	E – 73 FR 12024	73 FR 19000	78 FR 34347 06/2013
Sei Whale (*Balaenoptera borealis*)	E – 35 FR 18319	-- --	12/2011
Marine Mammals - Pinnipeds			
Steller Sea Lion (*Eumetopias jubatus*) – Western DPS	E – 55 FR 49204	58 FR 45269	73 FR 11872 2008
Sea Turtles			
Green Turtle (*Chelonia mydas*) – East Pacific DPS	T – 81 FR 20057	-- --	63 FR 28359 01/1998
Leatherback Turtle (*Dermochelys coriace*)	E – 35 FR 8491	44 FR 17710 and 77 FR 4170	63 FR 28359 and 10/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico 05/1998 – U.S. Pacific
Loggerhead Turtle (*Caretta caretta*) – North Pacific Ocean DPS	E – 76 FR 58868	-- --	63 FR 28359

DPS=Distinct Population Segment
E=Endangered
T=Threatened

Table 11. Endangered Species Act-listed threatened and endangered species or proposed for Endangered Species Act-listing potentially occurring in the action

area for Permit No. 21482 that may be affected, but are not likely to be adversely affected.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Cetaceans			
Gulf of California Harbor Porpoise/Vaquita (*Phocoena sinus*)	E – 50 FR 1056	-- --	-- --
Maui's Dolphin (*Cephalorhynchus hectori maui*)	E - 82 FR 43701	-- --	-- --
South Island Hector's Dolphin (*Cephalorhynchus hectori hectori*)	T – 82 FR 43701	-- --	-- --
Taiwanese Humpback Dolphin (*Sousa chinensis taiwanensis*)	E – 83 FR 21182	-- --	-- --
Marine Mammals – Pinnipeds			
Bearded Seal (*Erignathus barbatus*) – Beringia DPS	T – 77 FR 76739	-- --	-- --
Bearded Seal (*Erignathus barbatus*) – Okhotsk DPS	T – 77 FR 76739	-- --	-- --
Guadalupe Fur Seal (*Arctocephalus townsendi*)	T – 50 FR 51252	-- --	-- --
Hawaiian Monk Seal (*Neomonachus schauinslandi*)	E – 41 FR 51611	80 FR 50925	72 FR 46966 2007
Mediterranean Monk Seal (*Monachus monachus*)	E – 35 FR 8491	-- --	-- --
Ringed Seal (*Phoca hispida hispida*) – Arctic Subspecies	T – 77 FR 76706 Currently vacated, but listing will be reinstated	79 FR 73010 (Proposed	-- --
Ringed Seal (*Phoca hispida botnica*) – Baltic Subspecies	T – 77 FR 76706	-- --	-- --
Ringed Seal (*Phoca hispida ochotensis*) – Okhotsk Subspecies	T – 77 FR 76706	-- --	-- --
Spotted Seal (*Phoca largha*) – Southern DPS	T – 75 FR 65239	-- --	-- --
Steller Sea Lion (*Eumetopias jubatus*) – Western DPS	E – 55 FR 49204	58 FR 45269	73 FR 11872 2008
Sea Turtles			
Green Turtle (*Chelonia mydas*) – Central North Pacific DPS	T – 81 FR 20057	-- --	63 FR 28359 01/1998

Species	ESA Status	Critical Habitat	Recovery Plan
Green Turtle (*Chelonia mydas*) – Central South Pacific DPS	E – 81 FR 20057	-- --	63 FR 28359 01/1998
Green Turtle (*Chelonia mydas*) – Central West Pacific DPS	E – 81 FR 20057	-- --	63 FR 28359 01/1998
Green Turtle (*Chelonia mydas*) – East Indian-West Pacific DPS	T – 81 FR 20057	-- --	-- --
Green Turtle (*Chelonia mydas*) – East Pacific DPS	T – 81 FR 20057	-- --	63 FR 28359 01/1998
Green Turtle (*Chelonia mydas*) – North Atlantic DPS	T – 81 FR 20057	63 FR 46693	FR Not Available 10/1991 – U.S. Atlantic
Green Turtle (*Chelonia mydas*) – South Atlantic DPS	T – 81 FR 20057	-- --	-- --
Green Turtle (*Chelonia mydas*) – Mediterranean DPS	E – 81 FR 20057	-- --	-- --
Green Turtle (*Chelonia mydas*) – North Indian DPS	T – 81 FR 20057	-- --	-- --
Green Turtle (*Chelonia mydas*) – Southwest Indian DPS	T – 81 FR 20057	-- --	-- --
Green Turtle (*Chelonia mydas*) – Southwest Pacific DPS	T – 81 FR 20057	-- --	-- --
Hawksbill Turtle (*Eretmochelys imbricata)*	E – 35 FR 8491	63 FR 46693	57 FR 38818 08/1992 – U.S. Caribbean, Atlantic, and Gulf of Mexico 63 FR 28359 05/1998 – U.S. Pacific
Kemp's Ridley Turtle (*Lepidochelys kempii*)	E – 35 FR 18319	-- --	09/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico 09/2011

Species	ESA Status	Critical Habitat	Recovery Plan
Leatherback Turtle (*Dermochelys coriace*)	E – 35 FR 8491	44 FR 17710 and 77 FR 4170	63 FR 28359 and 10/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico 05/1998 – U.S. Pacific
Loggerhead Turtle (*Caretta caretta*) – Mediterranean Sea DPS	E – 76 FR 58868	-- --	-- --
Loggerhead Turtle (*Caretta caretta*) – Northeast Atlantic Ocean DPS	E – 76 FR 58868	-- --	-- --
Loggerhead Turtle (*Caretta caretta*) – Northwest Atlantic Ocean DPS	T – 76 FR 58868	79 FR 39856	74 FR 2995 10/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico 05/1998 – U.S. Pacific 01/2009 – Northwest Atlantic
Loggerhead Turtle (*Caretta caretta*) – North Indian Ocean DPS	E – 76 FR 58868	-- --	-- --
Loggerhead Turtle (*Caretta caretta*) – North Pacific Ocean DPS	E – 76 FR 58868	-- --	63 FR 28359
Loggerhead Turtle (*Caretta caretta*) – South Atlantic Ocean DPS	T – 76 FR 58868	-- --	-- --
Loggerhead Turtle (*Caretta caretta*) – Southeast Indo-Pacific Ocean DPS	T – 76 FR 58868	-- --	-- --
Loggerhead Turtle (*Caretta caretta*) – Southwest Indian Ocean DPS	T – 76 FR 58868	-- --	-- --
Loggerhead Turtle (*Caretta caretta*) – South Pacific Ocean DPS	E – 76 FR 58868	-- --	-- --
Olive Ridley Turtle (*Lepidochelys olivacea*) – Mexico's Pacific Coast Breeding Colonies	E – 43 FR 32800	-- --	63 FR 28359
Olive Ridley Turtle (*Lepidochelys olivacea*) – All Other Areas/Not Mexico's Pacific Coast Breeding Colonies	T – 43 FR 32800	-- --	-- --

DPS=Distinct Population Segment
E=Endangered
T=Threatened

Table 12. Endangered Species Act-listed threatened and endangered species or proposed for Endangered Species Act-listing potentially occurring in the action area for Permit No. 21938 that may be affected, but are not likely to be adversely affected.

Species	ESA Status	Critical Habitat	Recovery Plan
Sea Turtles			
Green Turtle (*Chelonia mydas*) – North Atlantic DPS	T – 81 FR 20057	63 FR 46693	FR Not Available 10/1991 – U.S. Atlantic
Green Turtle (*Chelonia mydas*) – South Atlantic DPS	T – 81 FR 20057	-- --	-- --
Hawksbill Turtle (*Eretmochelys imbricata)*	E – 35 FR 8491	63 FR 46693	57 FR 38818 08/1992 – U.S. Caribbean, Atlantic, and Gulf of Mexico 63 FR 28359 05/1998 – U.S. Pacific
Kemp's Ridley Turtle (*Lepidochelys kempii*)	E – 35 FR 18319	-- --	09/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico 09/2011
Leatherback Turtle (*Dermochelys coriace*)	E – 35 FR 8491	44 FR 17710 and 77 FR 4170	63 FR 28359 and 10/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico 05/1998 – U.S. Pacific

Species	ESA Status	Critical Habitat	Recovery Plan
Loggerhead Turtle (*Caretta caretta*) – Northwest Atlantic Ocean DPS	T – 76 FR 58868	79 FR 39856	74 FR 2995 10/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico 05/1998 – U.S. Pacific 01/2009 – Northwest Atlantic
Loggerhead Turtle (*Caretta caretta*) – South Atlantic Ocean DPS	T – 76 FR 58868	-- --	-- --
Olive Ridley Turtle (*Lepidochelys olivacea*) – All Other Areas/Not Mexico's Pacific Coast Breeding Colonies	T – 43 FR 32800	-- --	-- --

DPS=Distinct Population Segment
E=Endangered
T=Threatened

7.1 Endangered Species Act-Listed Cetaceans

Blue whales, North Pacific right whales, and sei whales will not spatially overlap with the core action area of Permit No. 20648 but they may occur within the overall action area. However, Dr. Heidi Pearson will not be approaching or targeting these species and she has not requested directed takes for these species. Under Permit No. 20648, ESA-listed blue, North Pacific right, and sei whales will not be directly approached within 50 meters (164 feet) or pursued during research activities. If these species are sighted, researchers will not purposefully approach or pursue this non-target ESA-listed species and will stop research activities and move to another area or wait until it has left the area.

Under Permit No. 21482, survey and passive sampling (sloughed skin and feces) activities would be conducted for the Cook Inlet DPS of beluga whales and the Southern Resident DPS of killer whales. These species will likely exhibit behavioral responses but given the mitigation measures that would be followed during the proposed survey activities (see Section 11.2.2) and the fact that the proposed sampling activities will not involve direct physical contact with the animals, these responses would likely be rare. Therefore we find the effects of disturbance of surveys and sampling of the Cook Inlet DPS of beluga whales and the Southern Resident DPS of killer whales to be insignificant and we will not discuss these species further in this opinion.

The proposed action area of Permit No. 21482 spatially overlaps with several ESA-listed cetacean species or populations including the Gulf of California harbor porpoise/vaquita, Maui's dolphin, South Island Hector's dolphin, and Taiwanese humpback dolphin. These species or populations occur within the large action area for Permit No. 21482, but researchers have stated that they do not plan on conducting research activities on these species in international and/or foreign waters at this time and have not requested directed takes for these species or populations. Under Permit No. 21482, non-target ESA-listed cetaceans may occasionally be present with targeted marine mammals, but will not be directly approached within 50 meters (164 feet) or pursued during research activities. If these species or populations are sighted, researchers will not purposefully approach or pursue these non-target ESA-listed species and will stop research activities and move to another area or wait until they have left the area.

While vessel strikes during research activities are possible, we are aware of only two instances of any research vessel ever striking a whale in thousands of hours at sea (Wiley et al. 2016). Given the rarity of vessel strikes of large whale species during all research activities form historical data, the slow speeds at which researchers will operate, and the extensive experience the researchers have in spotting large cetaceans at sea, we believe the likelihood of a research vessel striking an ESA-listed cetacean is extremely low, and thus discountable.

Discharge from research vessels in the form of leakages of fuel or oil is possible, though effects of any spills would have minimal, if any, effects on the aforementioned ESA-listed cetaceans. Given the experience of the researchers and research vessel operators in conducting research activities in the action area, it is unlikely that spills or discharges would occur. Therefore, the likelihood of these effects occurring are discountable.

Cetaceans would likely to be able to hear the lower 38 kiloHertz and middle 120 kiloHertz frequency components of the echosounder signal that will be used for prey mapping. However, these pulses would be extremely short in duration (usually less than one millisecond), received levels of sound will be less than 180 dB re: 1 µPa at 1 meter (rms), and the animals would have to be located inside the highly directional acoustic beam in order to perceive these sounds. Under Permit No. 20648, the source level of the echosounder would be 230 dB re: 1 µPa at 1 meter (rms) with pulses lasting less than one second. The received level of these pulses would depend on the proximity of the animal to the sound source. However, the echosounders will be operated at lower power settings than those used on NMFS Fishery Acoustic Survey vessels. Cetaceans would be expected to exhibit behavioral responses, but based on the criteria needed for cetaceans to hear the echosounder, these responses would likely be rare. Therefore, we find the effects of disturbance to ESA-listed cetaceans from the echosounder to be insignificant.

In summary, we have determined that the issuance of Permit No. 20648 is not likely to adversely affect the blue whale, North Pacific right whale, and sei whale because the effects of the proposed action are discountable, and we will not discuss these species further in this opinion regarding the issuance of Permit No. 20648. We have determined that the issuance of Permit No. 21482 is not likely to adversely affect the Cook Inlet DPS of beluga whales and the Southern Resident DPS of killer whales and we concur with the Permits and Conservation Division that the issuance of Permit No. 21482 is not likely to adversely affect the Gulf of California harbor porpoise/vaquita, Maui’s dolphin, South Island Hector’s dolphin, and Taiwanese humpback dolphin because the effects of the proposed action are discountable, and we will not discuss these species further in this opinion.

7.2 Endangered Species Act-Listed Pinnipeds

The proposed action for Permit No. 20648 spatially overlaps with the Western DPS of Steller Sea lions. The applicant has requested and the Permits and Conservation Division has proposed unintentional take (by disturbance) under the MMPA for this species during proposed research activities.

The proposed action for Permit No. 21482 spatially overlaps with ESA-listed pinniped species and/or DPSs including the Beringia DPS of bearded seals, Okhotsk DPS of bearded seals, Guadalupe fur seals, Hawaiian monk seals, Mediterranean monk seals, Arctic subspecies of ringed seal, Baltic subspecies of ringed seal, Okhotsk subspecies of ringed seal, Southern DPS of spotted seal, and Western DPS of Steller sea lions. Interactions with ESA-listed pinnipeds could potentially occur during aerial and vessel surveys and vessel transit. Under Permit No. 21482, non-target ESA-listed pinnipeds may occasionally be present with targeted marine mammals, but will not be directly approached within 50 meters (164 feet) or pursued during research activities.

Researchers will conduct non-invasive, opportunistic research activities that will be considered Level B harassment of ESA-listed pinnipeds, including close approaches, photo-identification, and behavioral observation. These research activities will be conducted to enhance photo-identifiation catalogs, collect behavioral and species' range information, and document suspected anthropogenic impacts, such as injuries from entanglements.

Both aerial and vessel surveys targeting cetaceans could disturb ESA-listed pinnipeds. However, researchers will be on constant lookout for cetaceans, and thus, if ESA-listed pinnipeds are spotted, researchers will be able to avoid closely approaching them. In addition, researchers will not be authorized to conduct aerial surveys over ESA-listed pinnipeds on land and will avoid flying rookeries and haul-out areas during aerial surveys. Considering the above conditions, in most cases, researchers will be able to completely avoid ESA-listed pinnipeds. Nonetheless, we recognize that short-term encounters with ESA-listed pinnipeds may occur if researchers do not spot these animals before vessels or aircraft are relatively close. Under these circumstances, we expect ESA-listed pinnipeds will respond similarly to other non-ESA-listed pinniped species and show no behavioral response or avoidance, which may be associated with a mild stress response (Andersen et al. 2012). Potential responses to aircraft overflights by pinnipeds range from no response to temporary entry into the water when hauled-out. Born et al. (1999) conducted a systematic study on the response of ringed seals to aircraft disturbance; 302 of 5,040 (six percent) ringed seals that were hauled-out entered the water in response to a low-flying (150 meters [492.1 feet] altitude) twin-engine plane. In Baffin Bay, Alaska, 44 bearded seals did not react to a twin-engine turboprop airplane flying at 100 to 200 meters (328.1 to 656.2 feet) altitude (Finley and Renaud 1980). Burns and Frost (1979) report that bearded seals raise their heads but usually remain on ice unless an airplane passes directly overhead. Kelly et al. (1986) report that all ringed seals (n=13) subsequently returned to their lairs and hauled-out, after entering the water in response to anthropogenic disturbances. In two separate studies, some Steller sea lions have demonstrated awareness to fixed-wing aerial surveys at elevations from

195 to 250 meters (639.8 to 820.2 feet), but no Steller sea lions left the beach or stampeded (Snyder et al. 2001; Wilson et al. 2012). Given these responses, and the short-term nature of the possible encounters, we do not anticipate that any disturbance from aerial and vessel surveys will have a measureable impact on ESA-listed pinniped behavior or physiology. As such, we find the effects of disturbance to ESA-listed pinnipeds from aerial and vessel surveys to be insignificant.

The likelihood of vessel strikes of ESA-listed pinnipeds during cetacean is expected to be extremely low given that the qualified researchers will adhere to slow and cautious transit speeds designed to avoid vessel strikes with cetaceans, many of which have less maneuverability than ESA-listed pinnipeds. The Permits and Conservation Division are not aware of any incidents of researchers striking a pinniped during cetacean research activities over the history of their program. In addition, observers will always be on the lookout for cetaceans to help vessels avoid collisions. Finally, we are not aware of any case of a cetacean research vessel striking a pinniped, including under previous permits held by the same researchers and/or organizations. Therefore, we find that it is extremely unlikely that a research vessel will strike an ESA-listed pinniped, and thus such effects are discountable.

Pinnipeds may be exposed to research activities with active acoustics, such as playbacks or prey mapping. Researchers will not be authorized for takes for ESA-listed pinnipeds, and will be required to shut-down any active acoustic sound source if ESA-listed pinnipeds approach the MMPA Level B harassment isopleth. In some cases, researchers may request takes for unintentional disturbance to ESA-listed pinnipeds during active acoustics targeted at cetaceans. Playbacks using natural or biological sounds (e.g., cetacean calls or whistles) may be audible to pinnipeds, but these sounds can already be heard by pinnipeds in the environment and it is unlikely that any exposed pinnipeds will be able to distinguish playbacks from actual cetacean calls, nor do we expect pinnipeds to exhibit any response beyond that which they will show to naturally occurring calls in the environment. If such sound source levels disturb non-target pinnipeds, we will expect them to leave the area as a result of the active acoustic trial exposure. The maximum received levels of active acoustics under this programmatic consultation will be below which is expected to cause a permanent threshold shift or injury in all marine mammal species. Furthermore, the nature of studies with active acoustics conducted under scientific research permits are not the same as other human activities, which may occur for longer periods of time or even continuously. The active acoustic trials permitted for research activities do not occur 24 hours per day, instread, they are typically short in duration and occur during daylight hours. Researchers are often conducting experiments using active acoustics to examine the behavioral impacts of noise on marine mammals. They are not trying to induce hearing loss as even a minor thresholf shift can alter a behavioral response and will only add a complicating factor to the research study. Therefore, if active acoustic trials are not expected to result in injury to targeted cetaceans, and non-target marine mammals of any hearing group, we do not expect injury or other adverse effects to non-target ESA-listed pinnipeds. Thus, even if non-target ESA-listed pinnipeds are exposed to sounds from active acoustics directed at cetaceans, we find it highly unlikely there will be any adverse effects. Therefore, we find the effects of disturbance to ESA-listed pinnipeds from the active acoustics to be insignificant or discountable.

Pinnipeds may be able to hear the lower 38 kiloHertz frequencies of the echosounder signal that will be used for prey mapping. However, as described above for cetaceans, these pulses would be of extremely short duration (usually less than one millisecond; less than one second under Permit 20648) and the animals will have to be located inside the highly directional acoustic beam in order to perceive these sounds. Pinnipeds will be expected to exhibit behavioral responses, but based on the criteria needed for pinnipeds to hear the echosounder, these responses will likely be rare. Therefore, we find the effects of disturbance to ESA-listed pinnipeds from the echosounder to be insignificant.

Researchers may collect parts, such as predation remains, from ESA-listed pinnipeds during prey sampling or if a pinniped carcass is encountered during research activities. Prey sampling may result in collection takes under the ESA, but there will be no effect to these ESA-listed species because the collection of parts from a dead animal will not result in take of a live animal. Therefore, there is no route to effect for individuals, populations, or species.

A small subset of researchers targeting cetaceans are expected to request directed take for opportunistic research activities that may result in MMPA Level B harassment if ESA-listed pinnipeds are encountered during research activities targeting cetaceans. Pursuit of ESA-listed pinnipeds during research activities targeting cetaceans is not likely to occur and will not be authorized by the Permits and Conservation Division. The permit will have terms and conditions that require if research activities directed at cetacenas may result in incidental disturbance of an ESA-listed pinniped, then researchers must stop pursuit. The Permits and Conservation Division states that no research activities directed at ESA-listed pinnipeds will rise to the level of take under the ESA will be authorized under this programmatic consultation.

In summary, we concur with the Permits and Conservation Division that the issuance of Permit No. 20648 is not likely to adversely affect the Western DPS of Steller sea lions and we will not discuss this species further in this opinion. We also concur with the Permits and Conservation Division that the issuance of Permit No. 21482 is not likely to adversely affect Beringia DPS of bearded seals, Okhotsk DPS of bearded seals, Guadalupe fur seals, Hawaiian monk seals, Mediterranean monk seals, Arctic subspecies of ringed seal, Baltic subspecies of ringed seal, Okhotsk subspecies of ringed seal, Southern DPS of spotted seal, and Western DPS of Steller sea lions, and we will not discuss these species further in this opinion.

7.3 Endangered Species Act-Listed Sea Turtles

The proposed actions spatially overlap with ESA-listed sea turtle species and/or DPSs including the Central North Pacific DPS of green turtles, Central South Pacific DPS of green turtles, Central West Pacific DPS of green turtles, East Indian-West Pacific DPS of green turtles, East Pacific DPS of green turtle, North Atlantic DPS of green turtles, South Atlantic DPS of green turtles, Mediterranean DPS of green turtles, North Indian DPS of green turtles, Southwest Indian

DPS of green turtles, Southwest Pacific DPS of green turtles, hawksbill turtles, Kemp's ridley turtles, leatherback turtles, Mediterranean Sea DPS of loggerhead turtles, Northeast Atlantic Ocean DPS of loggerhead turtles, Northwest Atlantic Ocean DPS of loggerhead turtles, North Indian Ocean DPS of loggerhead turtles, North Pacific Ocean DPS of loggerhead turtles, South Atlantic Ocean DPS of loggerhead turtles, Southeast Indo-Pacific Ocean DPS of loggerhead turtles, Southwest Indian Ocean DPS of loggerhead turtles, South Pacific Ocean DPS of loggerhead turtles, and Mexico's Pacific Coast breeding colonies as well as all other areas of olive ridley turtles. Under Permit Nos. 20648, 21482, and 21938, non-target ESA-listed sea turtles may occasionally be present with targeted cetaceans, but will not be directly approached or pursued during research activities.

Research activities that have the potential to disturb sea turtles include aerial surveys, vessel surveys, underwater photography and videography, active acoustic playbacks, biological sampling and tagging if animals are in the vicinity of researchers targeting cetaceans. Researchers will not purposely approach sea turtles and thus, disturbance is expected to be minimal. Researchers will constantly be on the lookout for cetaceans and thus be able to spot sea turtles at a distance (approximately 100 to 200 meters, Epperly, Avens et al. 2002), well before they are be expected to respond to aircraft and research vessels (Hazel et al. 2007). Furthermore, if a sea turtle were spotted, normally the researchers will exercise caution and remain a safe distance from the animal(s). Precautionary steps may include stopping research activities and move to another area or wait until the sea turtle has left the area. Visual observations will be conducted from the research vessel during net tows for prey sampling to ensure sea turtles do not come into contact with the nets. If a sea turtle is exposed to aerial or vessel surveys, exposure will likely be brief and temporary and result in short-term behavioral reactions such as swimming away from the aircraft or research vessel, which is not expected to have fitness consequences. Sounds associated with prey mapping activities should not be audible to sea turtles, as the dominant frequencies produced by the echosounders (at least 38 kiloHertz) are higher than the frequencies comprising the hearing range of sea turtles. Based on these factors, we find that disturbance of sea turtles associated with aerial and vessel surveys is extremely unlikely to occur, and thus discountable.

The likelihood of vessel strikes of sea turtles is also expected to be extremely unlikely given that researchers will typically adhere to slow vessel transit speeds (usually 18.5 kilometers per hour [10 knots] or less) and the numerous observers on lookout for cetaceans will also be able to spot sea turtles that come to the water's surface for air. On October 5, 2018, the Permits and Conservation Division received a report of an incident involving a vessel strike of an olive ridley turtle in Hawaii during cetacean research activities under Permit No. 20605. To the Permits and Conservation Division and ESA Interagency Cooperation Division's knowledge, this was the first report and only incident in the history of the program for the issuance of permits for research activities on cetaceans of a research vessel striking a sea turtle during cetacean research activities. At the time of the incident, the Permits and Conservation Division consulted with NMFS sea turtle experts, and determined that the likelihood of additional vessel strikes of sea turtles is expected to be extremely unlikely. For this particular incident, the permit holder identified factors contributing to this incident (e.g., Beaufort sea state, debris in the water, and poor vessel configuration for forward observer) and provided mitigation non-target species observer). In addition, Dr. Dan Engelhaupt and SEFSC has not struck a sea turtle during previously-permitted research activities targeting cetaceans. For these reasons, we find it is extremely unlikely that a research vessel will strike a sea turtle, and thus such effects related to the operation of research vessels to perform cetacean and pinniped research are discountable.

ESA-listed sea turtles may be exposed to active acoustics during research activities on cetaceans; however, researchers will not be authorized takes for ESA-listed sea turtles and will be required to shut-down any active acoustic research activities, or any other non-target protected species are observed. While less auditory data exists for sea turtles than marine mammals, the current best scientific evidence for hearing in sea turtles is thought to broadly encompass frequencies between 50 and 2,000 Hertz with peak hearing at frequencies between 100 to 400 Hertz in water (Ridgway et al. 1969; Samuel et al. 2005; Martin et al. 2012; Piniak et al. 2012; Piniak et al. 2016). Based on this information, many of the frequencies associated with the proposed active acoustic research methods as described in Section 3.4 should not be audible to sea turtles. Although sea turtles may be able to hear playbacks of biological sounds (e.g., cetacean calls or whistles), these sounds are naturally heard by sea turtles in the marine environment. The Permits and Conservation Division do not expect exposed sea turtles will be able to distinguish playbacks from actual cetacean calls, and therefore do not expect sea turtles to respond differently to such playbacks compared to naturally occurring calls. If such source levels disturb these non-target sea turtles, the sea turtles are not expected to leave the area of sound exposure; however, sea turtles are not expected to be harassed from disturbance.

Although no temporary or permanent threshold shift onset studies have been conducted for sea turtles, noise-induced hearing loss thresholds for cetacens or fish have been used as surrogates (Finneran and Jenkins 2012; Popper et al. 2014b). The maximum received levels of active acoustics that may be authorized under this consultation will not result in harassment or cause permanent threshold shifts or injury in marine mammals using the Navy Phase II sea turtle thresholds (which use marine mammals as a conservative surrogate) as reported in (Finneran and Jenkins 2012). Although these thresholds have not been developed directly for sea turtles yet due to lack of data on how sound exposure affects sea turtle hearing, others (e.g., U.S. Department of Navy) have applied temporary threshold shifts and permanent threshold shifts levels for marine mammal and fish species as surrogates for estimating temporary threshold shifts and permanent threshold shifts in sea turtles. Thus, if directed active acoustics are not expected to result in injury to targeted cetacans, and non-target marine mammals of any hearing group, the Permits and Conservation Division do not expect injury or other adverse effects to sea turtles. For these reasons, we find that the effects of active acoustics on sea turtles are insignificant or discountable.

ESA-listed sea turtles may be disturbed by biological sampling or tagging during research activities on cetaceans. As previously mentioned, researchers will not purposefully approach sea turtles and will exercise caution if sea turtles are seen. Precautions may include maintaining a safe distance from the animal(s), ceasing activities until the animal(s) has/have left the area, or moving to another area. For these reasons, we find that the effects of biological sampling or tagging on sea turtles are discountable.

In summary, we concur with the Permits and Conservation Division that the issuance of Permit Nos. 20648, 21482, and 21938 is not likely to adversely affect the Central North Pacific DPS of green turtles, Central South Pacific DPS of green turtles, Central West Pacific DPS of green turtles, East Indian-West Pacific DPS of green turtles, East Pacific DPS of green turtle, North Atlantic DPS of green turtles, South Atlantic DPS of green turtles, Mediterranean DPS of green turtles, North Indian DPS of green turtles, Southwest Indian DPS of green turtles, Southwest Pacific DPS of green turtles, hawksbill turtles, Kemp's ridley turtles, leatherback turtles, Mediterranean Sea DPS of loggerhead turtles, Northeast Atlantic Ocean DPS of loggerhead turtles, Northwest Atlantic Ocean DPS of loggerhead turtles, North Indian Ocean DPS of loggerhead turtles, North Pacific Ocean DPS of loggerhead turtles, South Atlantic Ocean DPS of loggerhead turtles, Southeast Indo-Pacific Ocean DPS of loggerhead turtles, Southwest Indian Ocean DPS of loggerhead turtles, South Pacific Ocean DPS of loggerhead turtles, and Mexico's Pacific Coast breeding colonies as well as all other areas of olive ridley turtles, and we will not discuss these species and/or DPSs further in this opinion.

7.4 Proposed or Designated Critical Habitat

7.4.1 Beluga Whale – Cook Inlet Distinct Population Segment Critical Habitat

In 2011, NMFS designated critical habitat for the Cook Inlet DPS of beluga whale (76 FR 20180). Two specific areas were designated comprising 7,809 square kilometers (2,276.7 square nautical miles) of marine habitat (Figure 20). Area 1 encompasses 1,918 square kilometers (559.2 square nautical miles) of Cook Inlet northeast of a line from the mouth of Threemile Creek to Point Possession. This area contains shallow tidal flats, river mouths or estuarine areas and is important as foraging and calving habitats. Area 1 has the highest concentrations of beluga whales in the spring through fall as well as the greatest potential for adverse impact from anthropogenic threats. Area 2 includes near and offshore areas of the mid and upper part of Cook Inlet, and nearshore areas of the lower part of Cook Inlet. Area 2 includes Tuxedni, Chinitna, and Kamishak Bays on the west coast and a portion of Kachemak Bay of the east coast. Dive studies indicate that beluga whales in this area dive to deeper depths and are at the surface less frequently than they are when they inhabit Area 1.

The physical and biological features (formerly called primary constituent elements) essential to the conservation of Cook Inlet DPS of beluga whales found in these areas include: (1) intertidal and subtidal waters of Cook Inlet with depths less than 9.1 meters (30 feet) (mean lower low water) and within 8 kilometers (five miles) of high and medium flow accumulation anadromous fish streams; (2) primary prey species consisting of four species of Pacific salmon (Chinook, coho, sockeye, and chum salmon), Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole; (3) the absence of toxins or other agents of a type or amount harmful to beluga whales; (4) unrestricted passage within or between the critical habitat areas; and (5) absence of in-water noise at levels result in the abandonment of habitat by Cook Inlet DPS of beluga whales (76 FR 20180).

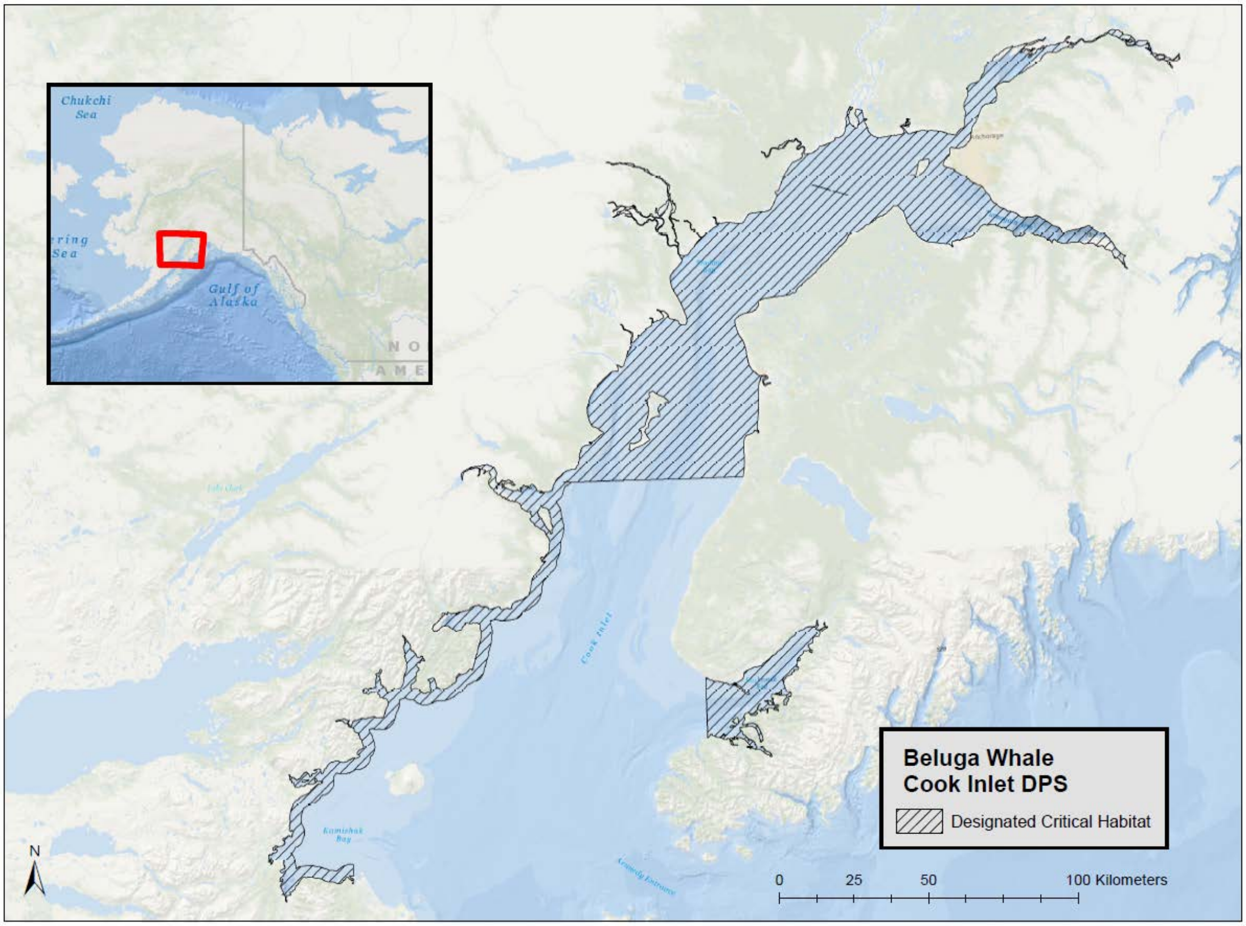


Figure 20. Map identifying the general range and designated critical habitat for the endangered Cook Inlet distinct population segment of beluga whale.

7.4.2 False Killer Whale – Main Hawaiian Island Insular Distinct Population Segment Critical Habitat

In 2018 (83 FR 35062), NMFS designated critical habitat for the Main Hawaiian Islands insular DPS of false killer whale, which includes waters from the 45 meter (147.6 feet) to the 3,200 meter (10,498.7 feet) depth contour around the Main Hawaiian Islands from Niihau east to the island of Hawaii (Figure 21). This area designated for critical habitat includes approximately 45,504 square kilometers (13,266.8 square nautical miles) surrounding the Main Hawaiian Islands within the geographical area presently occupied by Main Hawaiian Islands insular DPS of false killer whales. Due to the unique ecology of this island associated population, habitat use is largely driven by depth. Thus, the features essential to the species' conservation are found in those depths that allow the false killer whales to travel throughout a majority of their range seeking food and opportunities to socialize and reproduce. The final rule excludes from the designation particular areas where they overlap with 45 meter (147.6 feet) to the 3,200 meter (10,498.7 feet) depth contour around the Main Hawaiian Islands from Niihau east to the island of Hawaii which include (1) the Bureau of Ocean Energy Management's Call Area offshore of the Island of Oahu (which includes two sites, one off Kaena point and one off the south shore); (2) the U.S. Navy Pacific Missile Range Facilities Offshore ranges (including the Shallow Water Training Range, the Barking Sands Tactical Underwater Range, and the Barking Sands Underwater Range Extension (west of Kauai); (3) the U.S. Navy Kingfisher Range (northeast of Niihau); (4) Warning Area 188 (west of Kauai); (5) Kaula Island and Warning Area 187 (surrounding Kaula Island); (6) the U.S. Navy Fleet Operational Readiness Accuracy Check Site (west of Oahu); (7) the U.S. Navy Shipboard Electronic Systems Evaluation Facility (west of Oahu); (8) Warning Areas 196 and 191 (south of Oahu); (9) Warning Areas 193 and 194 (south of Oahu); (10) the Kaulakahi Channel portion of Warning Area 186 (the channel between Niihau and Kauai and extending east); (11) the area north of Molokai; (12) the Alenuihaha Channel; (13) Hawaii Area Tracking System; and (14) the Kahoolawe Training Minefield. In addition, the Ewa Training Minefield and the Naval Defensive Sea Area are precluded from designation under section 4(a)(3) of the ESA because they are managed under the Joint Base Pearl Harbor-Hickam Integrated Natural Resource Management Plan and we find provides a benefit to the Main Hawaiian Islands insular DPS of false killer whale. The physical and biological features essential for the conservation of the Main Hawaiian Islands insular DPS of false killer whales includes island-associated marine habitat for the Main Hawaiian Islands insular DPS of false killer whales. The following characteristics of this habitat support the Main Hawaiian Islands insular DPS of false killer whales ability to travel, forage, communicate, and move freely around and among the water surrounding the Main Hawaiian Islands: (1) adequate space for movement and use within shelf and slope habitat; (2) prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth; (3) waters free of pollutants of a type and amount harmful of Main Hawaiian Islands insular DPS of false killer whales; and (4) sound levels that will not significantly impair false killer whales' use or occupancy.

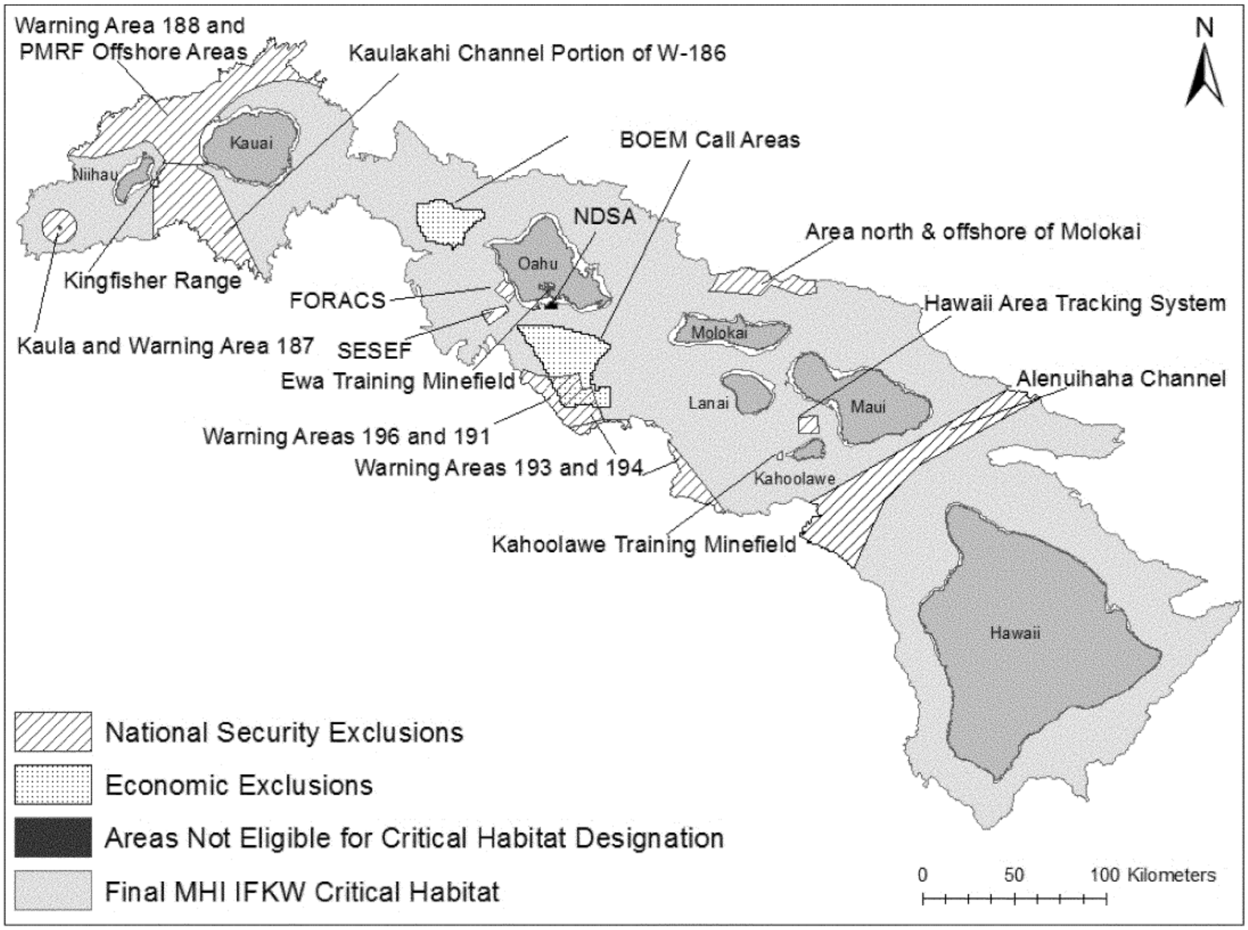


Figure 21. Map identifying designated critical habitat for the endangered Main Hawaiian Islands insular distinct population segment of false killer whale (83 FR 36062).

7.4.3 Hawaiian Monk Seal Critical Habitat

In 1986, NMFS originally designated critical habitat for the Hawaiian monk seal (51 FR 16047) and was extended on May 26, 1988. It includes all beach areas, sand spits, and islets (including all beach crest vegetation to its deepest extent inland), lagoon waters, inner reef waters, and ocean waters out to a depth of 37 meters (121.4 feet) around the northwestern Hawaiian Islands breeding atolls and islands Figure 22. The marine component of this habitat serves as foraging areas, while terrestrial habitat provides resting, pupping, and nursing habitat.

In 2015, NMFS published a final rule to revise designated critical habitat for Hawaiian monk seals (80 FR 50925), extending the current designation in the northwestern Hawaiian Islands out to the 200 meter (656.2 feet) depth contour (including Kure Atoll, Midway Islands, Pearl and Hermes Reef, Lisianski Island, Laysan Island, Maro Reef, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa Island). It also designated six new areas in the Main Hawaiian Islands (i.e., terrestrial and marine habitat from 5 meters [15.4 feet] inland from the shoreline extending seaward to the 200 meter [656.2 feet] depth contour around Kaula, Niihau, Kauai, Oahu, Maui, Nui, and Hawaii). The physical and biological features identified for this area include, adequate prey quality and quantity for juvenile and adult Hawaiian monk seal foraging (80 FR 50925).

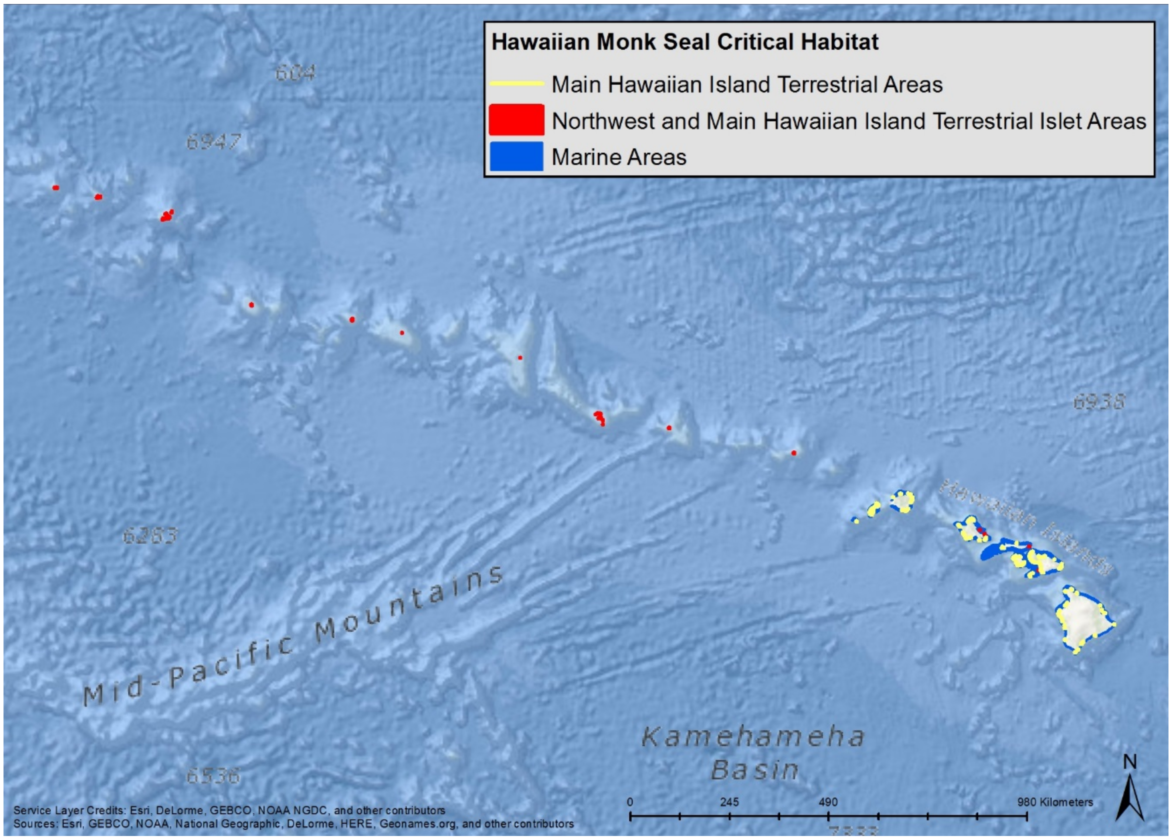


Figure 22. Map identifying designated critical habitat in the Northwest Hawaiian Islands and Main Hawaiian Islands for the endangered Hawaiian monk seal.

7.4.4 Killer Whale – Southern Resident Distinct Population Segment Critical Habitat

In 2006, NMFS designated critical habitat for the Southern Resident DPS of killer whale (71 FR 69054). The three specific areas in Washington: (1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; (2) Puget Sound; and (3) the Strait of Juan de Fuca (Figure 23), which comprise approximately 6,630 square kilometers (1,933 square nautical miles) of marine habitat. The physical and biological features essential to the conservation of Southern Resident DPS of killer whales includes: (1) water quality to support growth and development; (2) prey species of sufficient quantity, quality, and availability to support individual growth, reproduction and development, as well as overall population growth; and (3) inter-area passage conditions to allow for migration, resting, and foraging.

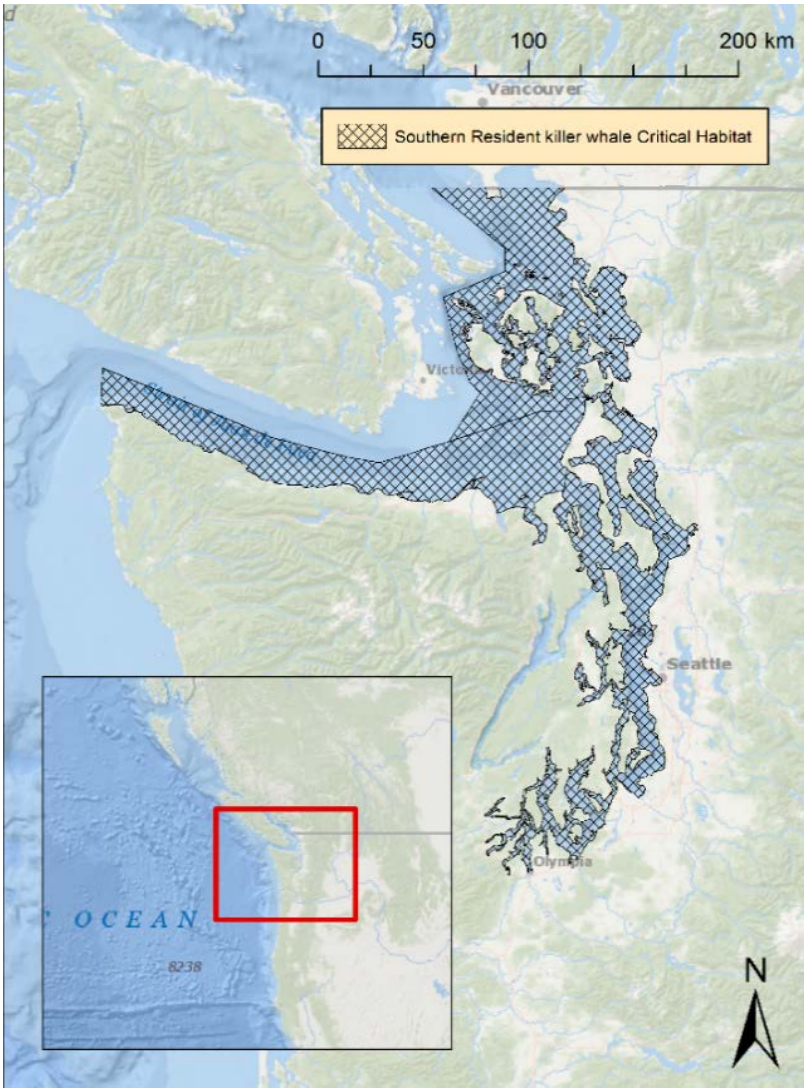


Figure 23. Map identifying designated critical habitat for the endangered Southern Resident distinct population segment of killer whale.

7.4.5 North Atlantic Right Whale Critical Habitat

In 1994, NMFS designated critical habitat for the Northern right whale population in the North Atlantic Ocean (59 FR 28805). This critical habitat designation included portions of Cape Cod Bay and Stellwagen Bank, the Great South Channel (each off the coast of Massachusetts) (Figure 24), and waters adjacent to the coasts of Georgia and the east coast of Florida (Figure 25). These areas were determined to provide critical feeding, nursery, and calving habitat for the North Atlantic population of northern right whales.

In 2016, NMFS revised designated critical habitat for the North Atlantic right whale with two new expanded areas. The areas designated as critical habitat contains approximately 102,084.2 square kilometers (29,763 square nautical miles) of marine habitat in the Gulf of Maine and Georges Bank region (Unit 1) and off the Southeast U.S. coast (Unit 2). The physical and biological features essential to the conservation of the North Atlantic right whale, which provide foraging area functions in Unit 1 are a combination of: (1) the physical oceanographic conditions and structures of the Gulf of Maine and Georges Bank region that combine to distribute and aggregate *C. finarchicus* for North Atlantic right whale foraging, namely prevailing currents and circulation patterns, bathymetric features (basins, banks, and channels), oceanic fronts, density gradients, and temperature regimes; (2) low flow velocities in Jordan, Wilkinson, and Georges Basins that allow diapausing *C. finmarchicus* to aggregate passively below the convective layer so that the copepods are retained in the basins; (3) late stage *C. finmarchicus* in dense aggregations in the Gulf of Maine and Georges Bank region; and (4) Diapausing *C. finmarchicus* in aggregations in the Gulf of Maine and Georges Bank region. The physical and biological features essential to the conservation of North Atlantic right whale calving habitat that are essential to the conservation of the North Atlantic right whale, which provide calving area functions in Unit 2 are: (1) calm sea surface conditions of Force 4 or less on the Beaufort Wind Scale; (2) sea surface temperatures from a minimum of seven degrees Celsius, and never more than 17 degrees Celsius; and (3) water depths of 6 to 28 meters (19.7 to 91.9 feet) where these features simultaneously co-occur over contiguous areas of at least 792.3 square kilometers (231 square nautical miles) of ocean waters during the months of November through April. When these features are available, they are selected by North Atlantic right whale cows and calves in dynamic combinations that are suitable for calving nursing, and rearing, and which vary, within the ranges specified, depending on factors such as weather and age of the calves (81 FR 4838).

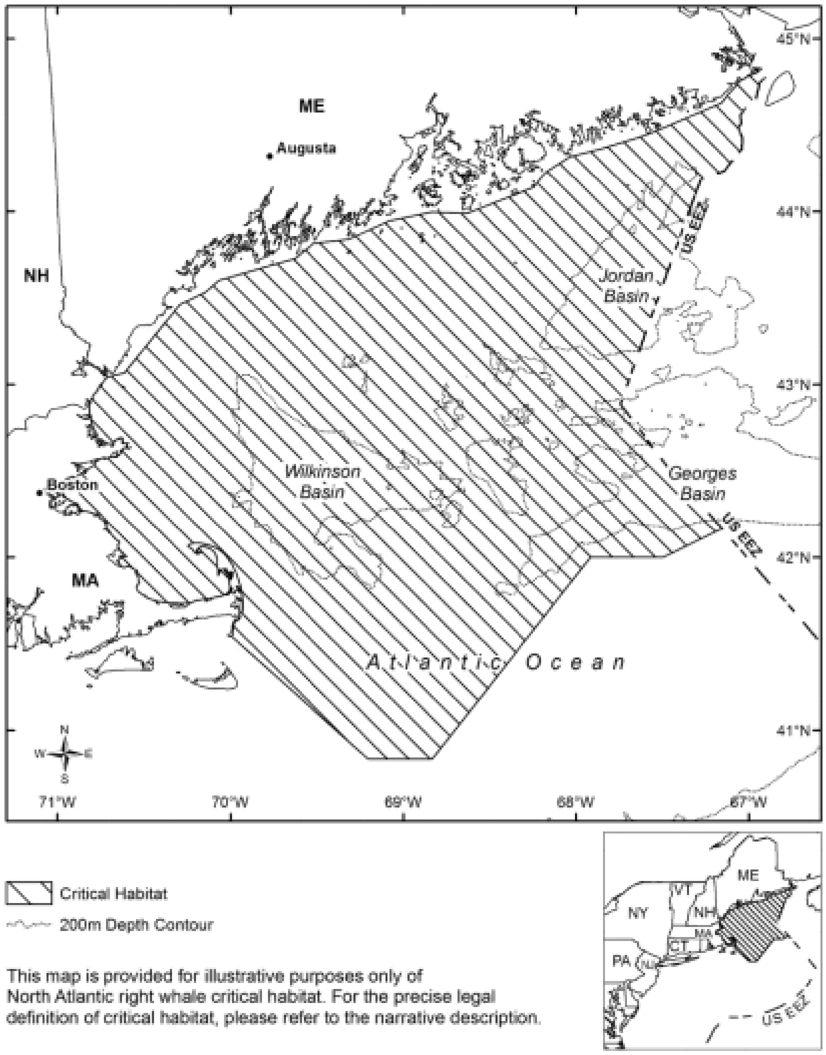


Figure 24. Map identifying designated critical habitat in the northeastern foraging area for the endangered North Atlantic right whale.

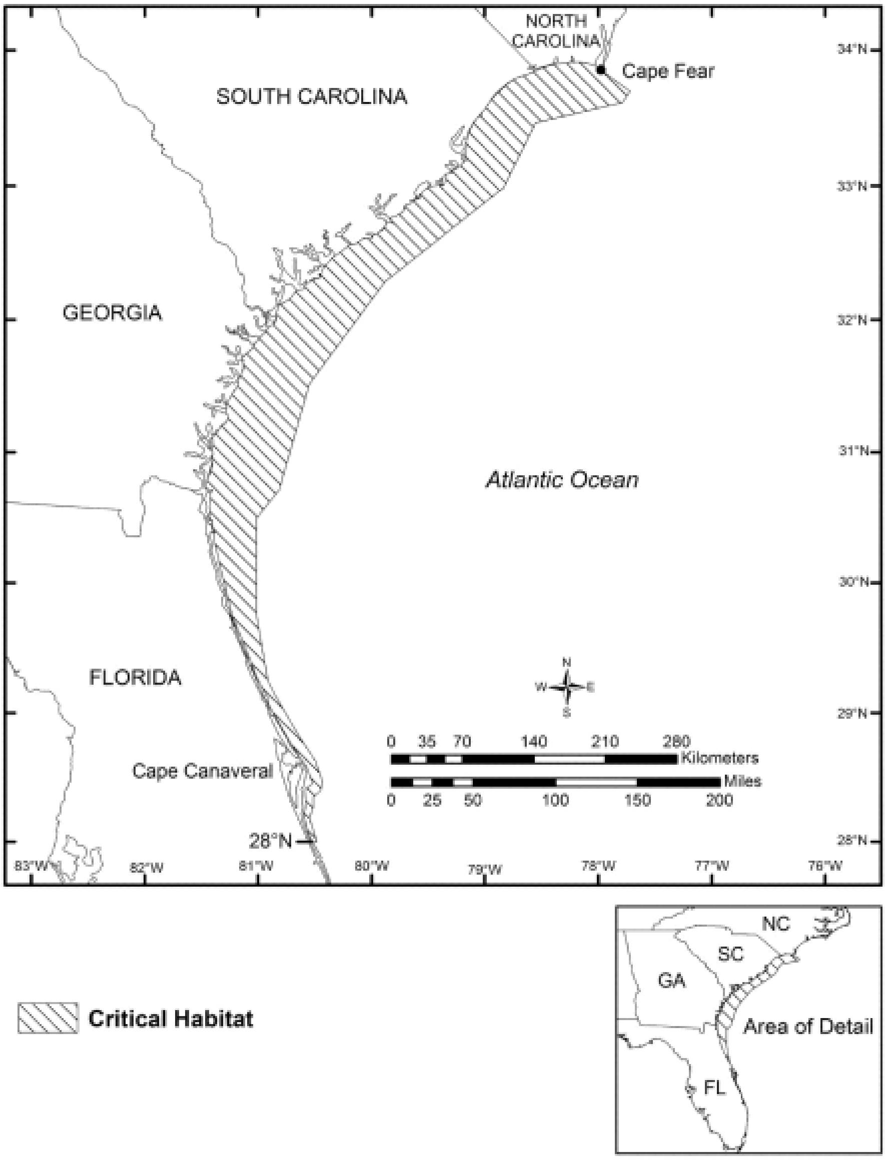


Figure 25. Map identifying designated critical habitat in the southeastern calving area for the endangered North Atlantic right whale.

7.4.6 North Pacific Right Whale Critical Habitat

In 2008, NMFS designated critical habitat for the North Pacific right whale, which includes an area in the Southeast Bering Sea and an area south of Kodiak Island in the Gulf of Alaska (Figure 26). Designated critical habitat for the North Pacific right whale is influenced by large eddies, submarine canyons, or frontal zones which enhance nutrient exchange and act to concentrate prey. North Pacific right whale designated critical habitat is adjacent to major ocean currents and characterized by relatively low circulation and water movement. The designated critical habitat supports feeding by North Pacific right whales because they contain specific physical and biological features that include: nutrients, physical oceanography processes, certain species of zooplankton (copepods), and a long photoperiod due to the high latitude (73 FR 19000).

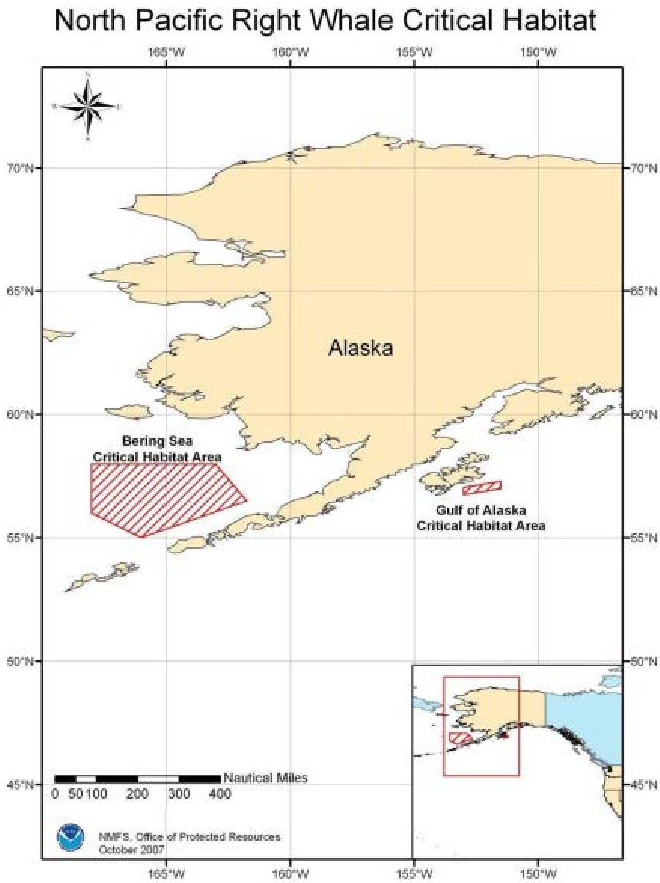


Figure 26. Map identifying designated critical habitat for the endangered North Pacific right whale in the Southeast Bering Sea and south of Kodiak Island in the Gulf of Alaska.

7.4.7 Proposed Ringed Seal – Arctic Subspecies Critical Habitat

In 2014, NMFS proposed to designate critical habitat for the Arctic subspecies of ringed seal in the northern Bering, Chukchi, and Beaufort Seas in Alaska (79 FR 73010) (Figure 27). The physical or biological features essential to the conservation of the species are: (1) sea ice habitat suitable for the formation and maintenance of subnivean birth lairs used for sheltering pups during whelping and nursing, which is defined as seasonal landfast (shorefast) ice, except for any bottom-fast ice extending seaward from the coastline in waters less than 2 meters (6.6 feet) deep, or dense, stable pack ice, that has undergone deformation and contains snowdrifts at least 54 centimeters (21.3 inches) deep; (2) sea ice habitat suitable as a platform for basking and molting, which is defined as sea ice of 15 percent or more concentration, except for any bottom-fast ice extending seaward from the coastline in waters less than 2 meters (6.6 feet) deep; (3) primary prey resources to support Arctic ringed seals, which are defined to be Arctic cod, saffron cod, shrimps, and amphipods.

Figure 27. Map identifying proposed designated critical habitat for the threatened Arctic subspecies of ringed seal in the Bering, Chukchi, and Beaufort Seas in Alaska.

7.4.8 Steller Sea Lion – Western Distinct Population Segment Critical Habitat

In 1997, NMFS designated critical habitat for the Steller sea lion (58 FR 45269), which remains in effect for the Western DPS despite the Eastern DPS being delisted in 2013 (78 FR 66139) (Figure 28). The designated critical habitat includes specific rookeries, haul-outs, and associated areas, as well as three marine foraging areas that are considered to be essential for health, continued survival, and recovery of the species. In Alaska, areas include major Steller sea lion rookeries, haul-outs and associated terrestrial, air, and aquatic zones. The aquatic zones extend 0.9 kilometers (0.5 nautical miles) seaward from the major rookeries and haul-outs east of 144° West. In addition, NMFS designated special aquatic foraging areas as critical habitat for the Steller sea lion. These areas include the Shelikoff Strait (in the Gulf of Alaska), Bogoslof Island, and Seaguam Pass (the latter two are in the Aleutian Islands). These sites are located near Steller sea lion abundance centers and include important foraging areas, large concentrations of prey, and host large commercial fisheries that often interact with the species. The physical and biological features identified for the aquatic areas of Steller sea lion designated critical habitat that occur within the action area are those that support foraging, such as adequate prey resources and available foraging habitat (58 FR 45269). While Steller sea lions do rest in aquatic habitat, there was insufficient information available at the time critical habitat was designated to include aquatic resting sites as part of the critical habitat designation (58 FR 45269).

Figure 28. Map identifying designated critical habitat for the endangered Western distinct population segment of Steller sea lion in Alaska.

7.4.9 Green Turtle Critical Habitat

In 1998, NMFS designated critical habitat for green turtles, which include coastal waters surrounding Culebra Island, Puerto Rico (Figure 29). Seagrass beds surrounding Culebra provide important foraging resources for juvenile, sub-adult, and adult green turtles. Additionally, coral reefs surrounding the island provide resting shelter and protection from predators. This area provides important developmental habitat for the species. Activities that may affect the critical habitat include beach renourishment, dredge and fill activities, coastal construction, and freshwater discharge. Due to its location, this critical habitat would be accessible by individuals of the North Atlantic DPS.

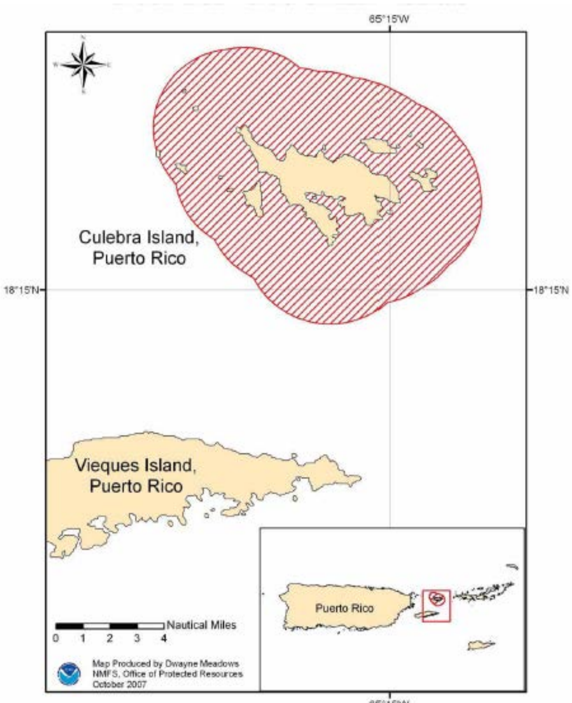


Figure 29. Map identifying designated critical habitat for the threatened North Atlantic distinct population segment of green turtle in Culebra Island, Puerto Rico.

7.4.10 Hawksbill Turtle Critical Habitat

In 1998, NMFS established critical habitat for hawksbill turtles around Mona and Monito Islands, Puerto Rico (Figure 30). Aspects of these areas that are important for hawksbill turtle survival and recovery include important natal development habitat, refuge from predation, shelter between foraging periods, and food for hawksbill turtle prey.

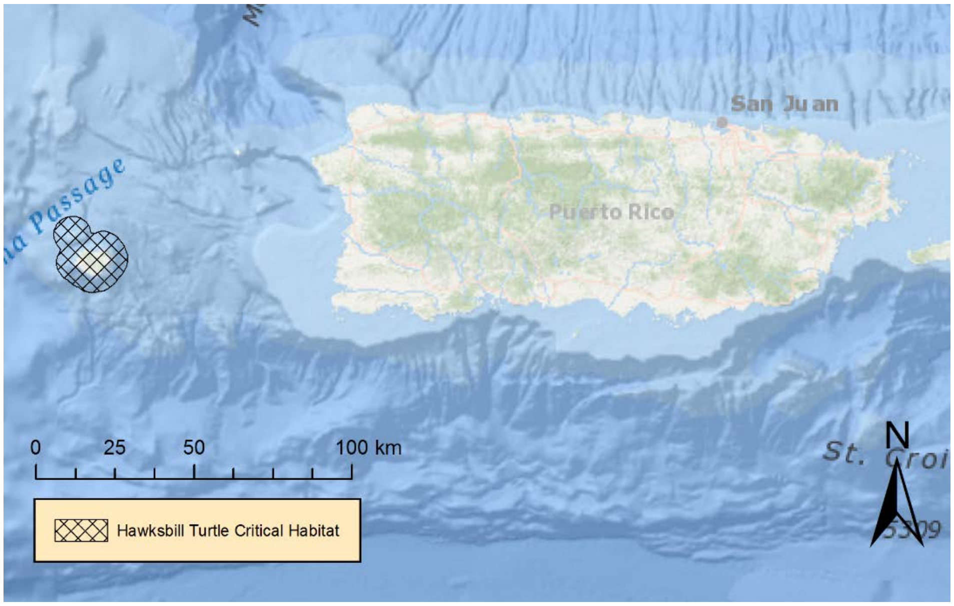


Figure 30. Map identifying designated critical habitat for the hawksbill turtle.

7.4.11 Leatherback Turtle Critical Habitat

In 1979, leatherback critical habitat was identified adjacent to Sandy Point, St. Croix, Virgin Islands from the 183 m (600 ft) isobath to mean high tide level between 17° 42’ 12” North and 65° 50’ 00” West (Figure 31). This habitat is essential for nesting, which has been increasingly threatened since 1979, when tourism increased significantly, bringing nesting habitat and people into close and frequent proximity. The designated critical habitat is within the Sandy Point National Wildlife Refuge. Leatherback turtle nesting increased at an annual rate of thirteen percent from 1994 to 2001; this rate has slowed according to nesting data from 2001 to 2010 (NMFS 2013b).

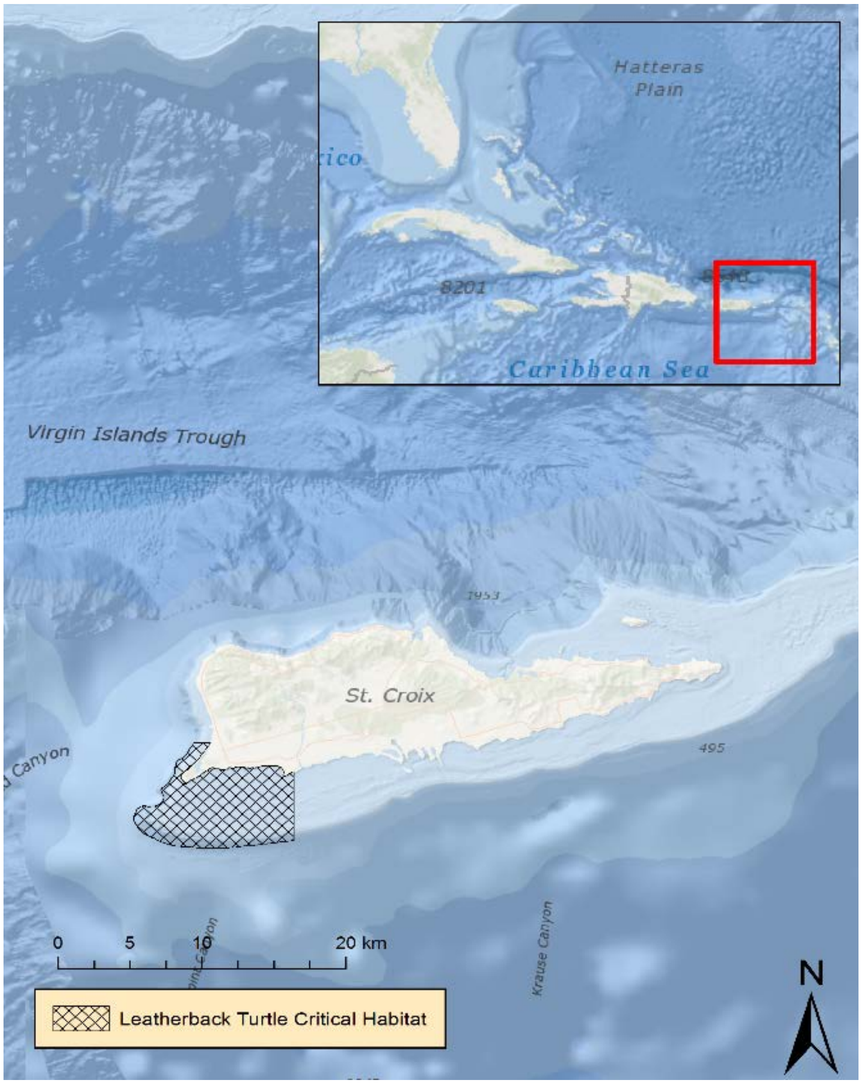


Figure 31. Map identifying designated critical habitat for the endangered leatherback turtle in the United States Virgin Islands.

In 2012, NMFS revised designated critical habitat for the leatherback turtle by designating additional areas within the Pacific Ocean (Figure 32). This designation includes approximately 43,798 square kilometers (16,910 square miles) stretching along the California coast from Point Arena to Point Arguello east of the 3,000 meter (9,842.4 feet) depth contour; and 64,760 square kilometers (25,004 square miles) stretching from Cape Flattery, Washington to Cape Blanco, Oregon east of the 2,000 meter (6,561.7 feet) depth contour. The designated areas comprise approximately 108,558 square kilometers (41,914 square miles) of marine habitat and include waters from the ocean surface down to a maximum depth of 80 meters (262 feet). NMFS has identified one physical and biological feature for the conservation of leatherback turtles in marine waters off the U.S. West Coast that includes the occurrence of prey species, primarily scyphomedusae (i.e., jellyfish) of the order Semaeostomeae (e.g., *Chrysaora*, *Aurelia*, *Phacellophora*, and *Cyanea*), of sufficient condition, distribution, diversity, abundance, and density necessary to support individual as well as population growth, reproduction, and development of leatherback turtles (77 FR 4170).

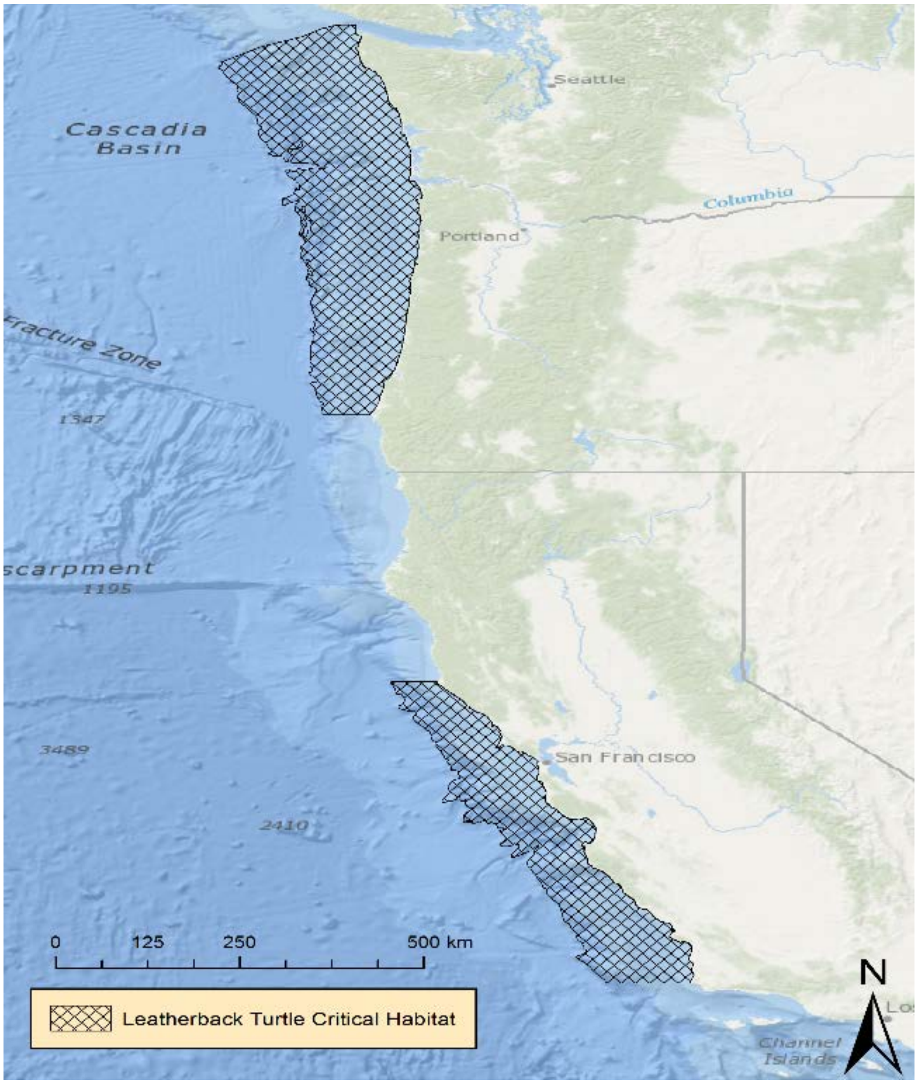


Figure 32. Map depicting leatherback turtle designated critical habitat along the United States Pacific Coast.

7.4.12 Loggerhead Turtle – Northwest Atlantic Ocean Distinct Population Segment Critical Habitat

In 2014, NMFS and the U.S. Fish and Wildlife Service designated critical habitat for the Northwest Atlantic Ocean DPS of loggerhead turtle along the U.S. Atlantic and Gulf of Mexico coasts, from North Carolina to Mississippi (79 FR 39856) (Figure 33). The final rule designated five different units of critical habitat, each supporting an essential biological function of loggerhead turtles. These units include nearshore reproductive habitat, winter area, *Sargassum*, breeding areas, and migratory corridors. In total, the critical habitat is composed of 38 occupied marine areas and 1,102.4 kilometers (685 miles) of nesting beaches. Loggerhead designated critical habitat occurs within the action area and the potential effects to each unit and its physical and biological features are discussed below (Table 13).

Table 13. Essential physical and biological features for loggerhead turtle designated critical habitat units.

Loggerhead Turtle Designated Critical Habitat Unit	Essential Physical or Biological Features
Nearshore Reproductive Habitat	1. Nearshore waters directly off the highest density nesting beaches and their adjacent beaches as identified in 50 C.F.R. 17.95(c) to 1.6 kilometers (0.9 nautical miles) offshore. 2. Waters sufficiently free of obstructions or artificial lighting to allow transit through the surf zone and outward toward open water. 3. Waters with minimal manmade structures that could promote predators (i.e., nearshore predator concentration caused by submerged and emergent offshore structures), disrupt wave patterns necessary for orientation, and/or create excessive longshore currents.
Winter Habitat	1. Water temperatures above 10° Celsius from November through April. 2. Continental shelf waters in proximity to the western boundary of the Gulf Stream. 3. Water depths between 20 and 100 meters (65.6 to 328.1 feet).
Breeding Habitat	1. High densities of reproductive male and female loggerheads. 2. Proximity to primary Florida migratory corridor. 3. Proximity to Florida nesting grounds.
Migratory Habitat	1. Constricted continental shelf area relative to nearby continental shelf waters but concentrate migratory pathways. 2. Passage conditions to allow for migration to and from nesting, breeding, and/or foraging areas.
Sargassum Habitat	1. Convergence zones, surface-water downwelling areas, the margins of major

	boundary currents (Gulf Stream), and other locations where there are concentrated components of the *Sargassum* community in water temperatures suitable for the optimal growth of *Sargassum* and inhabitance of loggerhead turtles. 2. *Sargassum* in concentrations that support adequate prey abundance and cover. 3. Available prey and other material associated with *Sargassum* habitat including, but not limited to, plants and cyanobacteria and animals native to the *Sargassum* community such as hydroids and copepods. 4. Sufficient water depth and proximity to available currents to ensure offshore transport (out of the surf zone), and foraging and cover requirements by *Sargassum* for post-hatchling loggerhead turtles, i.e., greater than 10 meters (32.8 feet) depth.

Nearshore Reproductive Habitat

Nearshore reproductive habitat is a portion of the nearshore waters adjacent to nesting beaches that are used by hatchlings to egress to the open-water environment as well as by nesting females to transit between beach and open water during nesting season. Nearshore reproductive habitat units occur in 35 areas from North Carolina to Mississippi. These units extend from the shore to 1.6 kilometer (0.9 nautical mile) seaward. The physical and biological features for nearshore reproductive habitat are shown in Table 13.

Winter Habitat

Winter habitat is designated off North Carolina from the 20 to 100 meter (65.6 to 328.1 feet) depth contour. Winter habitat is warm water habitat south of Cape Hatteras near the western edge of the Gulf Stream used by a high concentration of juveniles and adults during the winter months. The purpose in the designated winter habitat was to maintain habitat with suitable water temperatures and depths, and continental shelf waters in proximity to the Gulf Stream to support a loggerhead turtle foraging area (Table 13). The physical and biological features for winter habitat are shown in Table 13.

Constricted Migratory Habitat

Constricted migratory habitat is high use migratory corridors that are constricted (limited in width) by land on one side and the edge of the continental shelf and Gulf Stream on the other side. Loggerhead turtles migrate through this area northward in the spring (to foraging areas in the Mid-Atlantic Bight) and southward in the fall (south of Cape Hatteras) to be in warmer waters (78 FR 43005). The physical and biological features for contricted migratory habitat are shown in Table 13.

Breeding Habitat

Breeding habitat is sites with high densities of both male and female adult individuals during the breeding season. Loggerhead turtle breeding critical habitat includes two areas along the Atlantic Ocean coast of Florida, and into the Florida Keys. The southern unit starts at the Martin County/Palm Beach County line and extends south to the Marquesas Keys. The northern portion of the breeding habitat unit is located from near Titusville, Florida, south to Floridana Beach, from the shoreline to depths less than 60 meters (196.9 feet). The physical and biological features for breeding habitat are shown in Table 13.

Sargassum Habitat

Sargassum habitat is developmental and foraging habitat for young loggerhead turtles where surface waters form accumulations of floating material, especially Sargassum. The physical and biological features for *Sargassum* habitat are shown in Table 13.

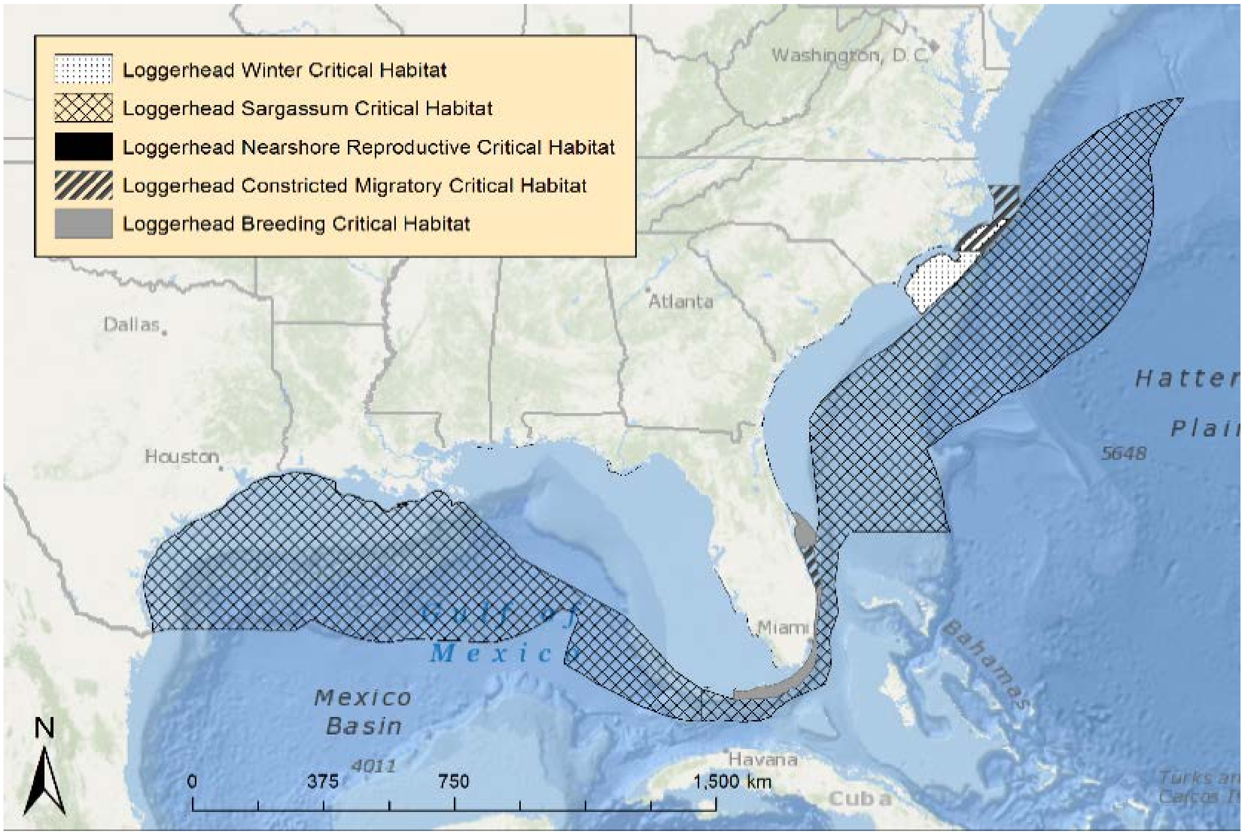


Figure 33. Map identifying designated critical habitat for the threatened Northwest Atlantic Ocean distinct population segment of loggerhead turtles.

7.4.13 Effects to Designated Critical Habitat

Marine areas of the above-described designated critical habitats occur within the action area and as such, may be affected by the research activities. We assess the probable exposure of these designated critical habitats to the research activities (i.e., vessel traffic, vessel noise, discharge, pollution, active acoustics, passive acoustic monitoring) and then evaluate the possible effects the proposed action may have on the physical and biological features of each critical habitat that will be exposed.

The above-described critical habitats contain a variety of physical and biological features deemed essential to the conservation of the ESA-listed species for which they were designated. Broadly speaking, these include waters free from obstruction; particular water properties including specific dissolved oxygen levels and temperatures, and low contaminant levels; specific water depths and sea states; oceanographic features and processes; abundant prey species; habitat free of anthropogenic noise; and available foraging habitat. Possible stressors that may affect these physical and biological features associated with exposure to research activities include pollution, vessel noise, gear entanglement, aerial surveys, vessel surveys and associated approaches to cetaceans for sampling and tagging, and active acoustics.

Vessel traffic, noise, and discharge are expected to have an insignificant effect on designated critical habitat physical and biological features for each designated critical habitat described in Section 7.4. Small and occasionally large research vessels are proposed to be used during research activities under Permit Nos. 20648, 21482, and 21938. Operation of research vessels will result in a temporary increase of vessel traffic within designated critical habitat. This increase in vessel traffic is likely to consist of only one research vessel operating within a particular critical habitat. The action area often has a lot of commercial and recreational traffic, and the addition of a single research vessel may not even be measurable. The physical transit of research vessels may result in brief obstruction of surface waters due to the presence of a vessel and slight changes in dissolved oxygen levels, water temperature, and currents due the vessels displacement and mixing of water, but is not expected to have any effect on contaminant levels, depth, benthic habitat, and sea state. Vessel presence may also cause a slight change in distribution of prey and/or *Sargassum*. These effects will be highly localized, occurring only within close proximity to the transiting research vessel, and temporary, with habitat conditions quickly returning to pre-exposure values once the research vessel leaves the area. Given the localized and short-term nature of vessel operation in critical habitats, it is expected to have an insignificant effect on the physical and biological features of designated critical habitats. As such, we find that vessel traffic may affect but is not likely to adversely affect designated critical habitats and we will not discuss effects from this stressor on designated critical habitat further.

Discharge and pollution from research vessels may occur. The International Convention for the Prevention of Pollution from Ships (MARPOL73/78) prohibits certain discharges of oil, noxious liquid substances, sewage, garbage, and air pollution from vessels within certain distances of the coastline. Unintentional and intentional discharge of pollutants from vessels may affect certain water quality properties, trigger harmful algal blooms, and temporarily affect distributions and behaviors of ESA-listed species and their prey if they are large in size, and duration. The localized extent of any discharges from a few research vessels associated with the proposed action will likely be minor relative to the size of the action area. In addition, any pollutant discharge would be mixed rapidly into the water column and is likely to be indistinguishable from discharges associated with vessel traffic that is common in the action area for all three proposed permits. Therefore, the effects of discharge and pollution from research vessels on designated critical habitat are considered to be insignificant. As such, we find that accidental discharge and pollution from research vessels may affect, but is not likely to adversely affect designated critical habitat and we will not discuss effects from these stressors on designated critical habitats further.

Transiting vessels also produce a variety of sounds characterized as low-frequency, continuous, or tonal, with sound pressure levels at a source varying according to speed, burden, capacity, and length (Richardson et al. 1995; Kipple and Gabriele 2007; Mckenna et al. 2012). While such noise would not physically obstruct water passage or affect water properties, depth, sea state, or oceanographic, benthic and algal features, it may affect prey in designated critical habitats. However, the vast majority of fishes do not show strong responses to low frequency sound. In addition, we do not expect invertebrates that are part of the physical and biological features essential to the conservation of some designated critical habitats in the action area of the proposed permit to respond strongly to vessel sound (Bennet et al. 1994; Albert 2011). A study on the effects of vessel noise on sea hare (*Stylocheilus striatus*) found that chronic exposure to vessel noise may affect some invertebrate's development and lead to increased mortality (Nedelec et al. 2014). However, the experimental conditions of this study are drastically different than the brief exposure to vessel noise that will result from research vessel operations in the action areas. Another recent study examining the effects of broadband sounds, including recorded continuous vessel noise, on three representative benthic invertebrates (the clam, *Ruditapes philippinarum*; the decapod, *Nephrops norvegicus*; and, the brittlestar, *Amphiura filiformis*) indicated that continued exposure to broadband sounds may affect benthic invertebrate behavior in ways that alter nutrient cycling (Solan et al. 2016). However, this study found no significant effects on invertebrate tissue biochemistry, and behavioral responses including avoidance behavior, were mixed (Solan et al. 2016). Importantly, this study examined time integrated effects, which differ from those that would result from the brief exposure to noise from a single, transiting vessel. While avoidance behavior in prey may lead to a change in distribution, any such change would be short-lived and likely not last much beyond when the vessel leaves the area. In addition, while at close ranges both fishes and invertebrates may experience injury from certain sound sources (Popper et al. 2014a; Sole et al. 2016), the injury or even loss of a few individual prey would not have a measurable impact on the overall prey abundance such that it will diminish the conservation value of designated critical habitat for

ESA-listed species within the action area for the proposed permit. Thus, we believe the effects of vessel transit on designated critical habitats associated with the proposed research activities are insignificant. As a result, we find that this stressor may affect, but is not likely to adversely affect designated critical habitats and we will not discuss effects from this stressor on designated critical habitats further.

The operation of active acoustics (i.e., playbacks and prey mapping,) involves actively transmitting sounds in the marine environment. Like noise from research vessels, such transmission would not physically obstruct water passage or affect water properties, depth, sea state, or oceanographic, benthic and algal features, but as further outlined below, it may affect prey in designated critical habitats. However, given the frequency bandwidth and sound source, we expect sounds originating from the active acoustic sources will be out of the audible hearing range and/or reduced to negligible sound levels by the time they reach prey, due to transmission loss. Also, playbacks will only occur in waters of Hawaii.

Studies indicate that exposure to sound has limited potential to affect fishes and invertebrates. As indicated by Popper et al. (2014b), the relative risk of a fish exhibiting a behavioral reaction in response to sonar is low, regardless of the distance from the sound source. Though squid and some other invertebrates appear to exhibit alarm responses and avoidance of sound sources, individuals will be expected to resume normal behaviors immediately after initial exposure. We do not expect any such responses to have a measurable impact on the abundance of prey within designated critical habitat. Sounds from the playbacks are expected to have a negligible impact because they are mimicking sounds that already occur in the action area and are transient in nature. Thus, we find that the effects of operating the active acoustic sound sources on designated critical habitats within the action area are insignificant. We find that this stressor may affect, but is not likely to adversely affect designated critical habitats and we will not discuss effects from this stressor on designated critical habitats further.

The research activities involve passive acoustic monitoring. Given that the operation of passive acoustic monitoring only involves the deployment of passive acoustic equipment (e.g., towed hydrophone arrays and unmanned autonomous underwater vehicles), we do not expect effects to critical habitats beyond that which has already been described above for transit of the research vessel. Unmanned autonomous underwater vehicles will be launched from research vessels and travel through the water column at very slow speeds and are therefore not expected to have any effect on the essential features of designated or proposed critical habitat in the action rea. Autonomous recording devices may also be deployed on the seafloor using a mooring, but these will be stationary and not affect the habitat. Free-floating autonomous recording devices will be launched from research vessels, but they will float freely at the top of the water column and therefore not expected to have any effects on the essential features of designated critical habitats in the action area. Dipping hydrophones will be temporarily deployed and retrieved from the research vessel and not affect the habitats. Thus, we find that the effects of conducting the proposed passive acoustic monitoring on designated critical habitat in the action areas are insignificant. As such, we find that this stressor may affect, but is not likely to adversely affect designated critical habitats and we will not discuss effects from this stressor on designated critical habitats further.

While the proposed research activities will directly overlap with the physical and biological features (i.e., water quantity, and quality and prey availability) of the designated critical habitats in Section 7.4, very few if any, effects to these habitats are expected. The proposed research activities will not significantly alter the physical or oceanographic conditions within the action area, as only very minor changes in water flow and current will be expected from vessel traffic and no changes in ocean bathymetry will occur. We do not expect the proposed research activities to affect the oceanographic features that concentrate copepod prey in the action area. For North Atlantic and North Pacific right whale critical habitat, copepod aggregation density is based upon oceanographic factors such as circulation patterns, water depth, thermal fronts and hydrographic density gradients (Pace III and Merrick 2008). During daylight hours, when research activities will mostly occur, copepods are usually found at depth near the thermocline far below the water's surface (Baumgartner et al. 2011). Therefore, disturbance to copepods from vessel traffic will be minimized. Furthermore, vessel pollution will be minimal, diluted, and likely not to reach them. In addition, we could not find any evidence suggesting that sound (from vessels, playbacks, and prey mapping) alters the densities of copepods (Bennet et al. 1994). Thus, we consider the effects of the potential stressors from the proposed research activities to be insignificant. Finally, the proposed research activities will in no way alter the sea state, temperature, or water depth and so effects to these features are also deemed discountable.

The proposed research activities related to the use of aerial and vessel surveys will not affect any terrestrial areas used by Hawaiian monk seals and the Western DPS of Steller sea lions that are part of designated critical habitat or areas used for hauling-out, resting, or molting. Because Hawaiian monk seals are foraging generalists that feed primarily on benthic and demersal prey, it is unlikely any of the proposed research activities will adversely affect the essential features of critical habitat for these animals related to feeding. Aquatic areas surround major rookeries and haul-out sites where the proposed research activities will occur, provide foraging habitats, prey resources, and refuge considered essential to the conservation of Western DPS of Steller sea lions. Proposed research activities will not affect prey resources or foraging and refuge habitat.

At present, the presence of large copepods, which is part of the essential features of North Atlantic and North Pacific right whale critical habitat, has not been significantly degraded due to human activity. However, significant concern has been voiced regarding the impact that oceanic contamination of pollutants may have on the food chain and consequent bioaccumulation of toxins by marine predators. Changes due to global warming have also been raised as a concern that can affect the distribution or abundance of copepod prey for several species of marine mammals, including North Atlantic right whales and North Pacific right whales.

The proposed actions will include vessel transit, biological sampling, active and passive acoustics, and tagging activities, which will not have a measurable effect on the physical and biological features of loggerhead turtle nearshore reproductive habitat, winter habitat, breeding habitat, constricted migratory habitat, and *Sargassum* habitat. As such, the effects to these designated critical habitat are considered insignificant and we find that the proposed actions are not likely to adversely affect designated nearshore reproductive habitat, winter habitat, breeding habitat, constricted migratory habitat, and *Sargassum* habitat for loggerhead turtles and these habitats will not be considered further in this opinion.

While the proposed research activities will occur in designated critical habitat for the Cook Inlet DPS of beluga whale, Main Hawaiian Islands insular DPS of false killer whale, Hawaiian monk seal, Southern Resident DPS of killer whale, North Atlantic right whale, North Pacific right whale, Arctic DPS of ringed seal, Western DPS of Steller sea lion, green turtle, hawksbill turtle, leatherback turtle, and Northwest Atlantic Ocean DPS of loggerhead turtle, the proposed research activities are not expected to adversely affect any of the physical, chemical, or biotic features of the designated critical habitats. Given the nature of the research activities under Permit Nos. 20648, 21482, and 21938 it is extremely unlikely that any of the physical and biological features essential to the conservation of the Cook Inlet DPS of beluga whale, Main Hawaiian Islands insular DPS of false killer whale, Hawaiian monk seal, Southern Resident DPS of killer whale, North Atlantic right whale, North Pacific right whale, Arctic DPS of ringed seal, Western DPS of Steller sea lion, green turtle, hawksbill turtle, leatherback turtle, and Northwest Atlantic Ocean DPS of loggerhead turtle found in this habitat will be altered.

For these reasons, we believe that the probability of the proposed research activities affecting the Cook Inlet DPS of beluga whale, Main Hawaiian Islands insular DPS of false killer whale, Hawaiian monk seal, Southern Resident DPS of killer whale, North Atlantic right whale, North Pacific right whale, Arctic DPS of ringed seal, Western DPS of Steller sea lion, green turtle, hawksbill turtle, leatherback turtle, and Northwest Atlantic Ocean DPS of loggerhead turtle designated critical habitat are insignificant or discountable, as described above, and the proposed research activities are not likely to adversely affect the conservation value of the designated critical habitat for Cook Inlet DPS of beluga whale, Main Hawaiian Islands insular DPS of false killer whale, Hawaiian monk seal, Southern Resident DPS of killer whale, North Atlantic right whale, North Pacific right whale, Arctic DPS of ringed seal, Western DPS of Steller sea lion, green turtle, hawksbill turtle, leatherback turtle, and Northwest Atlantic Ocean DPS of loggerhead turtle.

In conclusion, we find the potential stressors of pollution, vessel noise, vessel surveys, and active acoustics from research activities under Permit Nos. 20648, 21482, and 21938 may affect, but are not likely to adversely affect designated critical habitat for the Cook Inlet DPS of beluga whale, Main Hawaiian Islands insular DPS of false killer whale, Hawaiian monk seal, Southern Resident DPS of killer whale, North Atlantic right whale, North Pacific right whale, Arctic DPS of ringed seal, Western DPS of Steller sea lion, green turtle, hawksbill turtle, leatherback turtle, and Northwest Atlantic Ocean DPS of loggerhead turtle, and as such, we will not discuss these designated critical habitats further in this opinion.

8 Species Likely to be Adversely Affected

This section identifies the ESA-listed species that occur within the action areas (see Figure 17, Figure 18, and Figure 19) and that may be affected by the proposed issuance of Permit Nos. 20648, 21482, and 21938 (Table 14, Table 15,

Table 16). The regulatory status, designated critical habitat, and recovery plan references for these species are also included in Table 14, Table 15, and

Table 16.

Table 14. Endangered Species Act-listed threatened and endangered species that are likely to be asversely affected by the National Marine Fisheries Service's Permits and Conservation Division's proposed action of issuance of Permit No. 20648.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Cetaceans			
Fin Whale (*Balaenoptera physalus)*	E – 35 FR 18319	-- --	75 FR 47538 07/2010
Gray Whale (*Eschrichtius robustus*) – Western North Pacific Population	E – 35 FR 18319	-- --	-- --
Humpback Whale (*Megaptera novaeangliae*) – Mexico DPS	T – 81 FR 62259	-- --	11/1991
Humpback Whale (*Megaptera novaeangliae*) – Western North Pacific DPS	E – 81 FR 62259	-- --	11/1991
Sperm Whale (*Physeter macrocephalus*)	E – 35 FR 18319	-- --	75 FR 81584

DPS=Distinct Population Segment
E=Endangered
T=Threatened

Table 15. Endangered Species Act-listed threatened and endangered species that are likely to be adversely affected by the National Marine Fisheries Service's Permits and Conservation Division's proposed action of issuance of Permit No. 21482.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Cetaceans			
Blue Whale (*Balaenoptera musculus)*	E – 35 FR 18319	-- --	07/1998
Bowhead Whale (*Balaena mysticetus*)	E – 35 FR 18319	-- --	-- --

Species	ESA Status	Critical Habitat	Recovery Plan
Bryde's Whale (*Balaenoptera edeni*) – Gulf of Mexico Subspecies	E – 84 FR 15446	-- --	-- --
False Killer Whale (*Pseudorca crassidens*) – Main Hawaiian Islands Insular DPS	E – 77 FR 70915	83 FR 35062	-- --
Fin Whale (*Balaenoptera physalus)*	E – 35 FR 18319	-- --	75 FR 47538 07/2010
Gray Whale (*Eschrichtius robustus*) – Western North Pacific Population	E – 35 FR 18319	-- --	-- --
Humpback Whale (*Megaptera novaeangliae*) – Arabian Sea DPS	E – 81 FR 62259	-- --	11/1991
Humpback Whale (*Megaptera novaeangliae*) – Cape Verde Islands/Northwest Africa DPS	E – 81 FR 62259	-- --	11/1991
Humpback Whale (*Megaptera novaeangliae*) – Central America DPS	E – 81 FR 62259	-- --	11/1991
Humpback Whale (*Megaptera novaeangliae*) – Mexico DPS	T – 81 FR 62259	-- --	11/1991
Humpback Whale (*Megaptera novaeangliae*) – Western North Pacific DPS	E – 81 FR 62259	-- --	11/1991
North Atlantic Right Whale (*Eubalaena glacialis*)	E – 73 FR 12024	59 FR 28805 and 81 FR 4837	70 FR 32293 08/2004
North Pacific Right Whale (*Eubalaena japonica*)	E – 73 FR 12024	59 FR 28805 and 73 FR 19000	78 FR 34347 06/2013
Sei Whale (*Balaenoptera borealis*)	E – 35 FR 18319	-- --	12/2011
Southern Right Whale (*Eubalaena australis*)	E – 35 FR 8491	-- --	-- --
Sperm Whale (*Physeter macrocephalus*)	E – 35 FR 18319	-- --	75 FR 81584

DPS=Distinct Population Segment
E=Endangered
T=Threatened

Table 16. Endangered Species Act-listed threatened and endangered species that are likely to be adversely affected by the National Marine Fisheries Service's

Permits and Conservation Division's proposed action of issuance of Permit No. 21938.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Cetaceans			
Blue Whale (*Balaenoptera musculus)*	E – 35 FR 18319	-- --	07/1998
Bryde's Whale (*Balaenoptera edeni*) – Gulf of Mexico Subspecies	E – 84 FR 15446	-- --	-- --
Fin Whale (*Balaenoptera physalus)*	E – 35 FR 18319	-- --	75 FR 47538 07/2010
Humpback Whale (*Megaptera novaeangliae*) – Cape Verde Islands/Northwest Africa DPS	E – 81 FR 62259	-- --	11/1991
North Atlantic Right Whale (*Eubalaena glacialis*)	E – 73 FR 12024	59 FR 28805 and 81 FR 4837	70 FR 32293 08/2004
Sei Whale (*Balaenoptera borealis*)	E – 35 FR 18319	-- --	12/2011
Sperm Whale (*Physeter macrocephalus*)	E – 35 FR 18319	-- --	75 FR 81584

DPS=Distinct Population Segment
E=Endangered
T=Threatened

9 Status of Species Likely to be Adversely Affected

This section identifies and examines the status of each species that would be adversely affected by the proposed actions. 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 website: https://www.fisheries.noaa.gov/topic/endangered-species-conservation, among others.

9.1 Blue Whale

The blue whale is a widely distributed baleen whale found in all major oceans (Figure 34).

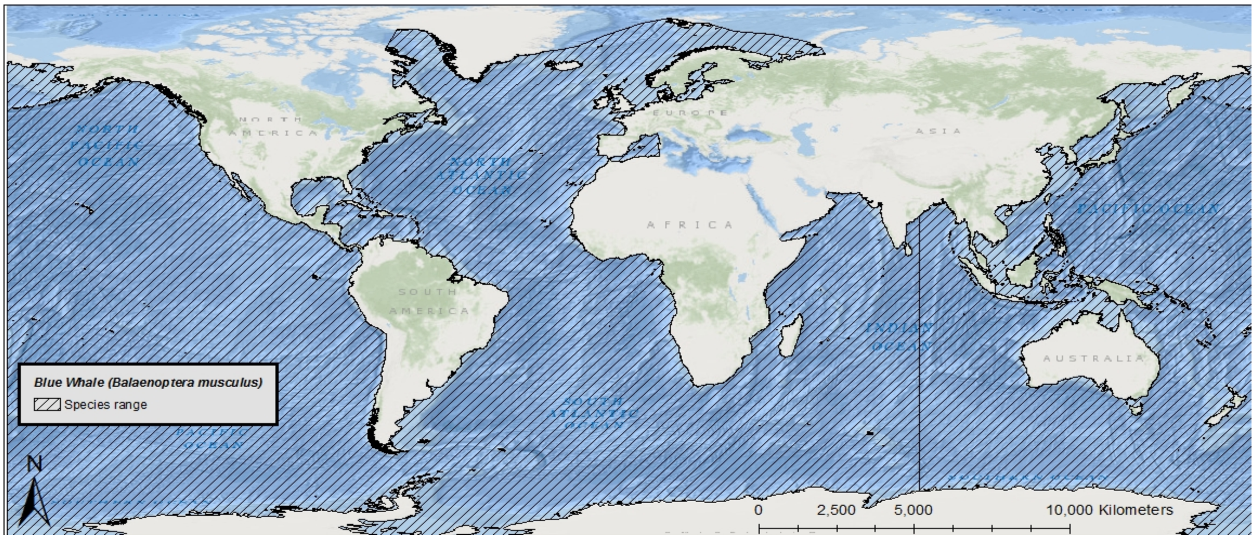


Figure 34. Map identifying the range of the endangered blue whale.

Blue whales are the largest animal on earth and distinguishable from other whales by a long-body and comparatively slender shape, a broad, flat "rostrum" when viewed from above, proportionally smaller dorsal fin, and a mottled gray color that appears light blue when seen through the water. Most experts recognize at least three subspecies of blue whale, *B. m. musculus*, which occurs in the Northern Hemisphere, *B. m. intermedia*, which occurs in the Southern Ocean, and *B. m. brevicauda*, a pygmy species found in the Indian Ocean and South Pacific Ocean. The blue whale was originally listed as endangered on December 2, 1970.

Information available from the recovery plan (NMFS 1998), recent stock assessment reports (Carretta et al. 2017; Hayes et al. 2017; Muto et al. 2017), and status review (COSEWIC 2002) were used to summarize the life history, population dynamics, and status of the species as follows.

9.1.1 Life History

The average life span of blue whales is 80 to 90 years. They have a gestation period of ten to 12 months, and calves nurse for six to seven months. Blue whales reach sexual maturity between five and 15 years of age with an average calving interval of two to three years. They winter at low latitudes, where they mate, calve and nurse, and summer at high latitudes, where they feed. Blue whales forage almost exclusively on krill and can eat approximately 3,600 kilograms (7,936.6 pounds) daily. Feeding aggregations are often found at the continental shelf edge, where upwelling produces concentrations of krill at depths of 90 to 120 meters (295.3 to 393.7 feet).

9.1.2 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 blue whale.

The global, pre-exploitation estimate for blue whales is approximately 181,200 (IWC 2007). Current estimates indicate approximately 5,000 to 12,000 blue whales globally (IWC 2007). Blue whales are separated into populations by ocean basin in the North Atlantic Ocean, North Pacific Ocean, and Southern Hemisphere. There are three stocks of blue whales designated in United States waters: the Eastern North Pacific Ocean (current best estimate N=1,647, N_{min}=1,551) (VanBlaricom, Ruediger et al. 1993), Central North Pacific Ocean (N=81, N_{min}=38), and Western North Atlantic Ocean (N=400 to 600, N_{min}=440). In the Southern Hemisphere, the latest abundance estimate for Antarctic blue whales is 2,280 individuals in 1997/1998 (95 percent confidence intervals 1,160 to 4,500 (Branch 2007). While no rangewide estimate for pygmy blue whales exists (Thomas et al. 2016), the latest estimate for pygmy blue whales off the west coast of Australia is 662 to 1,559 individuals based on passive acoustic monitoring (McCauley and Jenner 2010), or 712 to 1,754 individuals based on photographic mark-recapture (Jenner 2008).

Current estimates indicate a growth rate of just under three percent per year for the eastern North Pacific stock (Calambokidis 2009). An overall population growth rate for the species or growth rates for the two other individual U.S. stocks are not available at this time. In the Southern Hemisphere, population growth estimates are available only for Antarctic blue whales, which estimate a population growth rate of 8.2 percent per year (95 percent confidence interval 1.6 to 14.8 percent) (Branch 2007).

Little genetic data exist on blue whales globally. Data from Australia indicates that at least populations in this region experienced a recent genetic bottleneck, likely the result of commercial whaling, although genetic diversity levels appear to be similar to other, non-threatened mammal species (Attard et al. 2010). Consistent with this, data from Antarctica also demonstrate this bottleneck but high haplotype diversity, which may be a consequence of the recent timing of the bottleneck and blue whales long lifespan (Sremba et al. 2012). Data on genetic diversity of blue whales in the Northern Hemisphere are currently unavailable. However, genetic diversity information for similar cetacean population sizes can be applied. Stocks that have a total population size of 2,000 to 2,500 individuals or greater provide for maintenance of genetic diversity resulting in long-term persistence and protection from substantial environmental variance and catastrophes. Stocks that have a total population of 500 individuals or less may be at a greater risk of extinction due to genetic risks resulting from inbreeding. Stock population at low densities (less than 100) are more likely to suffer from the ‘Allee’ effect, where inbreeding and the heightened difficulty of finding mates reduces the population growth rate in proportion with reducing density.

In general, distribution is driven largely by food requirements; blue whales are more likely to occur in waters with dense concentrations of their primary food source, krill. While they can be found in coastal waters, they are thought to prefer waters further offshore (Figure 34). In the North Atlantic Ocean, the blue whale range extends form the subtropics to the Greenland Sea. They are most frequently sighted in waters of eastern Canada with a majority of sightings taking place in the Gulf of St. Lawrence. In the North Pacific Ocean, blue whales range from Kamchatka to southern Japan in the west and from the Gulf of Alaska and California to Costa Rica in the east. They primarily occur off the Aleutian Islands and the Bering Sea. In the northern Indian Ocean, there is a "resident" population of blue whales with sightings being reported from the Gulf of Aden, Persian Gulf, Arabian Sea, and across the Bay of Bengal to Burma and the Strait of Malacca. In the Southern Hemisphere, distributions of subspecies *(B. m. intermedia* and *B. m. brevicauda*) can be segregated. The subspecies *B. m. intermedia* occurs in relatively high latitudes south of the "Antarctic Convergence" (located between 48 and 61° South latitude) and close to the ice edge. The subspecies *B. m. brevicauda* is typically distributed north of the Antarctic Convergence.

9.1.3 Vocalization and Hearing

Blue whale vocalizations tend to be long (greater than 20 seconds), low frequency (less than 100 Hertz) signals (Thomson and Richardson 1995), with a range of 12 to 400 Hertz and dominant energy in the infrasonic range of 12 to 25 Hertz (McDonald et al. 1995; Ketten 1998; McDonald, et al. 2001; Mellinger and Clark 2003). Vocalizations are predominantly songs and calls.

Calls are short-duration sounds (two to five seconds) that are transient and frequency-modulated, having a higher frequency range and shorter duration than song units and often sweeping down in frequency (20 to 80 Hertz), with seasonally variable occurrence. Blue whale calls have high acoustic energy, with reports of source levels ranging from 180 to 195 dB re: 1 μPa at 1 meter (Cummings and Thompson 1971b; Aburto et al. 1997; Ketten 1998; McDonald et al. 2001; Clark and Gagnon 2004; Berchok et al. 2006; Samaran et al. 2010). Calling rates of blue whales tend to vary based on feeding behavior. For example, blue whales make seasonal migrations to areas of high productivity to feed, and vocalize less at the feeding grounds then during migration (Burtenshaw et al. 2004). Stafford et al. (2005) recorded the highest calling rates when blue whale prey was closest to the surface during its vertical migration. Wiggins et al. (2005) reported the same trend of reduced vocalization during daytime foraging followed by an increase at dusk as prey moved up into the water column and dispersed. Oleson et al. (2007a) reported higher calling rates in shallow diving (less than 30 meters [98.4 feet] whales), while deeper diving whales (greater than 50 meters [154 feet]) were likely feeding and calling less.

Although general characteristics of blue whale calls are shared in distinct regions (Thompson, et al. 1996; McDonald et al. 2001; Mellinger and Clark 2003; Rankin et al. 2005), some variability appears to exist among different geographic areas (Rivers 1997). Sounds in the North Atlantic Ocean have been confirmed to have different characteristics (i.e., frequency, duration, and repetition) than those recorded in other parts of the world (Mellinger and Clark 2003; Berchok, et al. 2006; Samaran et al. 2010). Clear differences in call structure suggestive of separate populations for the western and eastern regions of the North Pacific Ocean have also been reported (Stafford et al. 2001); however, some overlap in calls from the geographically distinct regions have been observed, indicating that the whales may have the ability to mimic calls (Stafford and Moore 2005). In Southern California, blue whales produce three known call types:

Type A, B, and D. B calls are stereotypic of blue whale population found in the eastern North Pacific (McDonald et al. 2006) and are produced exclusively by males and associated with mating behavior (Oleson et al. 2007b). These calls have long durations (20 seconds) and low frequencies (10 to 100 Hertz); they are produced either as repetitive sequences (song) or as singular calls. The B call has a set of harmonic tonals, and may be paired with a pulsed Type A call. D calls are produced in highest numbers during the late spring and early summer and in diminished numbers during the fall, when A-B song dominates blue whale calling (Oleson et al. 2007c; Hildebrand et al. 2011; Hildebrand et al. 2012).

Blue whale songs consist of repetitively patterned vocalizations produced over time spans of minutes to hours or even days (Cummings and Thompson 1971b; McDonald et al. 2001). The songs are divided into pulsed/tonal units, which are continuous segments of sound, and phrases, repeated in combinations of one to five units (Payne and Mcvay 1971; Mellinger and Clark 2003). Songs can be detected for hundreds, and even thousands of kilometers (Stafford et al. 1998), and have only been attributed to males (McDonald et al. 2001; Oleson et al. 2007a). Worldwide, songs are showing a downward shift in frequency (McDonald et al. 2009). For example, a comparison of recording from November 2003 and November 1964 and 1965 reveals a long-term shift in the frequency of blue whale calling near San Nicolas Island. In 2003, the spectral energy peak was 16 Hertz compared to approximately 22.5 Hertz in 1964 and 1965, illustrating a more than 30 percent shift in call frequency over four decades (McDonald et al. 2006). McDonald et al. (2009) observed a 31 percent downward frequency shift in blue whale calls off the coast of California, and also noted lower frequencies in seven of the world's ten known blue whale songs originating in the Atlantic, Pacific, Southern, and Indian Oceans. Many possible explanations for the shifts exist but none have emerged as the probable cause.

As with other baleen whale vocalizations, blue whale vocalization function is unknown, although numerous hypotheses exist (maintaining spacing between individuals, recognition, socialization, navigation, contextual information transmission, and location of prey resources) (Payne and Webb. 1971; Thompson et al. 1992; Edds-Walton 1997; Oleson et al. 2007b). Intense bouts of long, patterned sounds are common from fall through spring in low latitudes, but these also occur less frequently while in summer high-latitude feeding areas. Short, rapid sequences of 30 to 90 Hertz calls are associated with socialization and may be displays by males based upon call seasonality and structure. The low frequency sounds produced by blue whales can, in theory, travel long distances, and it is possible that such long distance communication occurs (Payne and Webb. 1971; Edds-Walton 1997). The long-range sounds may also be used for echolocation in orientation or navigation (Tyack 1999).

Direct studies of blue whale hearing have not been conducted, but it is assumed that blue whales can hear the same frequencies that they produce (low frequency) and are likely most sensitive to this frequency range (Richardson et al. 1995; Ketten 1997). Based on vocalizations and anatomy, blue whales are assumed to predominantly hear low-frequency sounds below 400 Hertz (Croll et al. 2001; Stafford and Moore 2005; Oleson et al. 2007b). In terms of functional hearing capability, blue whales belong to the low frequency group, which have a hearing range of 7 Hertz to 35 kiloHertz (NOAA 2018).

9.1.4 Status

The blue whale is endangered as a result of past commercial whaling. In the North Atlantic Ocean, at least 11,000 blue whales were taken from the late 19th to mid-20th centuries. In the North Pacific Ocean, at least 9,500 whales were killed between 1910 and 1965. Commercial whaling no longer occurs, but blue whales are affected by anthropogenic noise, threatened by ship strikes, entanglement in fishing gear, pollution, harassment due to whale watching, and reduced prey abundance and habitat degradation due to climate change. Because populations appear to be increasing in size, the species appears to be somewhat resilient to current threats; however, the species has not recovered to pre-exploitation levels.

9.1.5 Critical Habitat

No critical habitat has been designated for the blue whale.

9.1.6 Recovery Goals

In response to the current threats facing the species, NMFS developed goals to recover blue whale populations. These threats will be discussed in further detail in the *Environmental Baseline* section (Section 10) of this opinion. See the 1998 Final Recovery Plan for the Blue Whale for complete downlisting/delisting criteria for each of the following recovery goals.

1. Determine stock structure of blue whale populations occurring in U.S. waters and elsewhere.
2. Estimate the size and monitor trends in abundance of blue whale populations.
3. Identify and protect habitat essential to the survival and recovery of blue whale populations.
4. Reduce or eliminate human-caused injury and mortality of blue whales.
5. Minimize detrimental effects of directed vessel interactions with blue whales.
6. Maximize efforts to acquire scientific information from dead stranded, and entangled blue whales.
7. Coordinate state, federal, and international efforts to implement recovery actions for blue whales.
8. Establish criteria for deciding whether to delist or downlist blue whales.

9.2 Bowhead Whale

The bowhead whale is a circumpolar baleen whale found throughout high latitudes in the Northern Hemisphere (Figure 35).

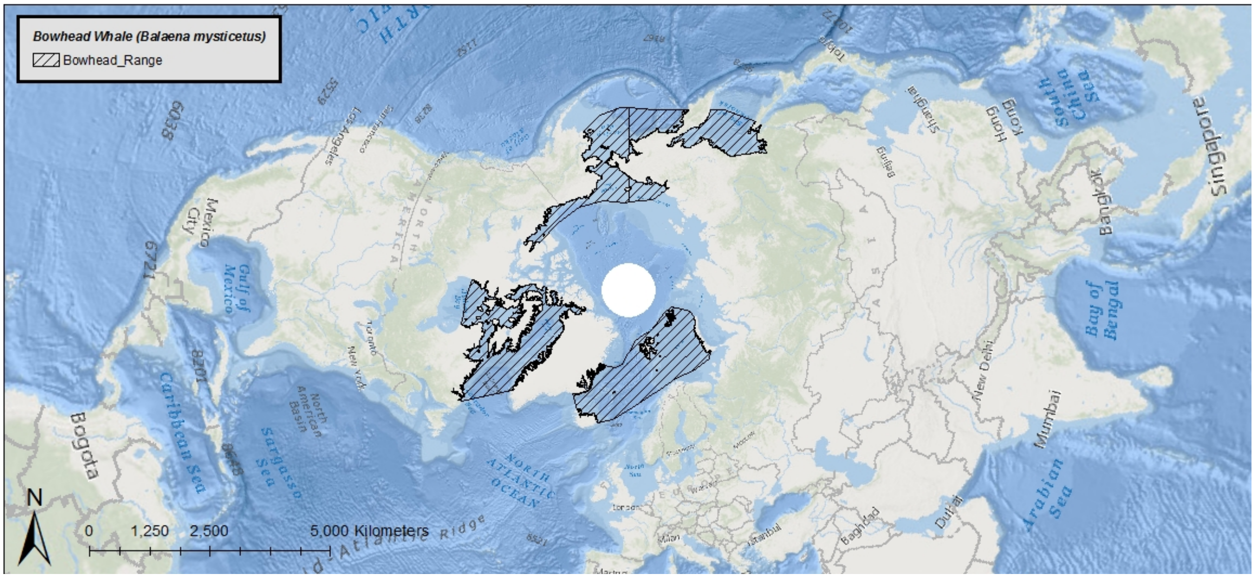


Figure 35. Map identifying the range of the endangered bowhead whale.

Bowheads are baleen whales distinguishable from other whales by a dark body with a distinctive white chin, no dorsal fin, and a bow-shaped skull that takes up about 35 percent of their total body length. The bowhead whale was originally listed as endangered on December 2, 1970.

Information available from the recent stock assessment report (Muto et al. 2017) and the scientific literature was used to summarize the life history, population dynamics, and status of the species as follows.

9.2.1 Life History

The average lifespan of bowhead whales is unknown; however, some evidence suggests that they can live for over one hundred years. They have a gestation period of 13 to 14 months and it is unknown how long calves nurse. Sexual maturity is reached around twenty years of age with an average calving interval of three to four years. They spend the winter associated with the southern limit of the pack ice and move north as the sea ice breaks up and recedes during spring. Bowhead whales use their large skulls to break through thick ice and feed on zooplankton (crustaceans like copepods, euphausiids, and mysids), other invertebrates, and fish.

9.2.2 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 bowhead whale.

The global, pre-exploitation estimate for bowhead whales is 30,000 to 50,000 animals. There are currently four or five recognized stocks of bowhead whales, the Western Arctic (or Bering-Chukchi-Beaufort) stock, the Okhotsk Sea stock, the Davis Strait and Hudson Bay stock (sometimes considered separate stocks), and the Spitsbergen stock (Rugh and Shelden 2009). The only stock thought to be found within United States waters is the Western Arctic stock. The

2011 ice-based abundance estimate puts this stock, the largest remnant stock, at over 16,892 (N_{min}=16,091) individuals. Prior to commercial whaling, there may have been 10,000 to 23,000 whales in this stock (Rugh and Shelden 2009). Historically the Davis Strait and Hudson Bay stock may have contained over 11,000 individuals, but now it is thought to number around 7,000 bowhead whales (Cosens et al. 2006). In the Okhotsk Sea, there were originally more than 3,000 bowhead whales, but now there are only about 300 to 400. The Spitsbergen stock originally had about 24,000 bowhead whales and supported a huge European fishery, but today is thought to only contain tens of whales (Shelden and Rugh 1995).

Current estimates indicate approximately 16,892 (N_{min}=16,091) bowhead whales in the Western Arctic stock, with an annual growth rate of 3.7 percent (Givens et al. 2013). While no quantitative estimates exist, the Davis Strait and Hudson Bay stock is also thought to be increasing (COSEWIC 2009). We could find no information on population trends for the Okhotsk Sea stock. Likewise, no information is available on the population trend for the Spitsbergen stock, but it is thought to be nearly extinct.

Genetic studies conducted on the Western Arctic stock of bowhead whales revealed 68 different haplotypes defined by 44 variable sites (Leduc et al. 2008) making it the most diverse stock of bowhead whales. These results are consistent with a single stock with genetic heterogeneity related to age cohorts and indicate no historic genetic bottlenecks (Rugh et al. 2003). In the Okhotsk Sea stock, only four to seven mitochondrial DNA haplotypes have been identified, three of which are shared with the Western Arctic stock, indicating lower genetic diversity, as might be expected given its much smaller population size (MacLean 2002; LeDuc et al. 2005; Alteret al. 2012). The Davis Strait and Hudson Bay stock has 23 mitochondrial DNA haplotypes, making it more diverse than the Okhotsk stock but less diverse than the large Western Arctic stock (Alter et al. 2012). Based on historic mitochondrial DNA, the Spitsbergen stock previously had at least 58 mitochondrial DNA haplotypes, but its current genetic diversity remains unknown (Borge et al. 2007). However, given its near extirpation, it likely has low genetic diversity.

The Western Arctic stock is found in waters around Alaska, the Okhotsk Sea stock in eastern Russia waters, the Davis Strait and Hudson Bay stock in northeastern waters near Canada, and the Spitsbergen stock in the northeastern Atlantic Ocean (Rugh and Shelden 2009) (Figure 34).

9.2.3 Vocalization and Hearing

Bowhead whales produce songs of an average source level of 185±2 dB re: 1 µPa at 1 meter (rms) centered at a frequency of 444±48 Hertz (Roulin, Tervo et al. 2012). Given background noise, this allows bowhead whales an active space of 40 to 130 kilometer (21.6 to 70.2 nautical miles) (Roulin et al. 2012). We are aware of no information directly on the hearing abilities of bowhead whales, but all marine mammals, we presume they hear best in frequency ranges at which they produce sounds (444±48 Hertz).

9.2.4 Status

The bowhead whale is endangered because of past commercial whaling. Prior to commercial whaling, thousands of bowhead whales existed. Global abundance declined to 3,000 by the 1920's. Bowhead whales may be killed under "aboriginal subsistence whaling" provisions of the International Whaling Commission. Additional threats include ship strikes, fisheries interactions (including entanglement), contaminants, and noise. The species' large population size and increasing trends indicate that it is resilient to current threats.

9.2.5 Critical Habitat

No critical habitat has been designated for the bowhead whale.

9.2.6 Recovery Goals

There is currently no recovery plan available for the bowhead whale.

9.3 Bryde's Whale – Gulf of Mexico Subspecies

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 subspecies of Bryde's whale is found in the northeastern Gulf of Mexico near De Soto Canyon between the 100 and 300 meter (328.1 to 984.3 feet) depth contours (Figure 36). Consequently, LaBrecque et al. (2015) designated this area as a Biologically Important Area. There have also been sightings at 302 and 309 meters (990.8 and 1,013.8 feet) 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 (1,312.3 feet) 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 2016). 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.

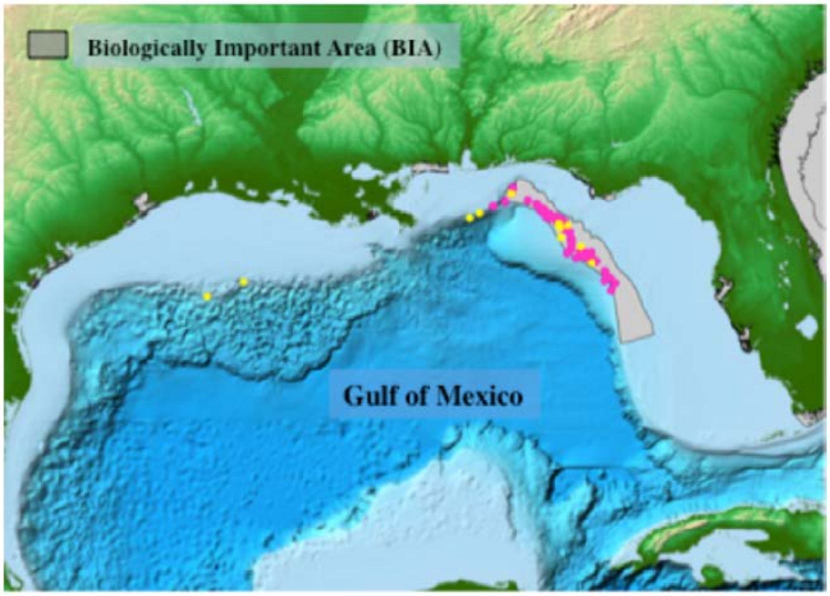


Figure 36. Map identifying the biologically important area and known range of the proposed endangered Gulf of Mexico subspecies of Bryde's whale (Rosel 2016).

Bryde's whales are baleen whales that grow to lengths of 13 to 16.5 meters (42.7 to 54.1 feet). Bryde's whales in the Gulf of Mexico are a taxonomically distinct subspecies. The Gulf of Mexico subspecies of Bryde's whales have a large falcate dorsal fin, streamlined body shape, and 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 2016). Bryde's whales have a counter-shaded color that is uniformly dark dorsally and light to pinkish ventrally. The Gulf of Mexico subspecies of Bryde's whale was listed under the ESA as endangered on April 15, 2019 (84 FR 15446).

Information available from the status review (Rosel 2016), the proposed listing (81 FR 88639), final rule (84 FR 15446), recent stock assessment report (Hayes et al. 2017), and available literature were used to summarize the life history, population dynamics, and status of the species as follows.

9.3.1 Life History

Little is known about the Gulf of Mexico subspecies of Bryde's whale life history compared to Bryde's whales more generally and worldwide. The life expectancy of Gulf of Mexico subspecies of Bryde's whales is unknown. Other stocks of this species have a gestation period of 11 to 12 months, 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 subspecies 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. Gulf of Mexico subspecies of

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 2016).

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 (656.2 feet) depth to feed on small fish or crustaceans and their occurrence is thought to be determined to prey abundance (Kerosky et al. 2012). They are observed in small groups, pairs or solitary and reportedly seem curious about ships (Tershy 1992; Lodi et al. 2015; Rosel 2016).

According to Rice (1998), adult *B. e. edeni* rarely exceed 11.5 meters (37 feet) total length and adult *B. e. brydei* reach approximately 14 to 15 meters (46 to 49 feet). 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 12.2 to 12.5 meters (40 to 41 feet) compared to 12.8 to 13.7 meters (42 to 45 feet) for offshore males, while inshore females reach sexual maturity at 11.9 to 12.5 meters (39 to 41 feet) compared to 12.8 to 13.1 meters (42 to 43 feet) for offshore females (Best 2001).

9.3.2 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 subspecies Bryde’s whale.

The Gulf of Mexico subspecies of Bryde’s whale population is very small; the most recent estimate from 2009 places the population size at 33 individuals (N_{min}=16). A second estimate incorporating visual survey data from 1992 through 2009 estimated 44 individuals (Rosel 2016). There is no population trend information available for the Gulf of Mexico subspecies of Bryde’s whale.

Genetic diversity within the Gulf of Mexico subspecies of 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 60 percent were monomorphic, meaning no genetic variability was seen for the 21 Gulf of Mexico subspecies of Bryde’s whales sampled (Rosel 2016).

Phylogenetic reconstruction using the control region and all published Bryde’s whale sequences reveal that the Gulf of Mexico Bryde’s whale 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 subspecies of 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 subspecies of 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 (328 to 1,312 feet) deep along the continental shelf break (Figure 36). It inhabits the Gulf of Mexico year round, but its distribution outside of this biologically important area is unknown.

9.3.3 Vocalization and Hearing

Bryde's whales produce low-frequency tonal and broadband calls for communication, navigation, and reproduction (Richardson, Charles R. Greene et al. 1995). Like other balaenopterids, Bryde's whales have distinctive calls depending on geographic regions (Figueiredo 2014; Širović et al. 2014; Rosel 2016). In areas of the Gulf of Mexico where Bryde's whales are thought to be the main baleen whale present, a variety of vocalizations consistent with Bryde's whale vocalizations from other locations have been recorded ranging in frequency from 43 to 208 Hertz (Rice et al. 2014). While no data exist on the hearing abilities of Bryde's whale, as with other marine mammals we assume they hear best in the frequency range in which they produce calls.

9.3.4 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 subspecies of 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 subspecies of 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 subspecies of 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 subspecies of Bryde's whale population is so small size and has low genetic diversity, it is highly susceptible to further perturbations.

9.3.5 Critical Habitat

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

9.3.6 Recovery Goals

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

9.4 False Killer Whale – Main Hawaiian Islands Insular Distinct Population Segment

False killer whales are distributed worldwide in tropical and temperate waters more than 1,000 meters (3,281 feet) deep. The Main Hawaiian Islands insular DPS of false killer whales is found in waters around the Main Hawaiian Islands (Figure 37).

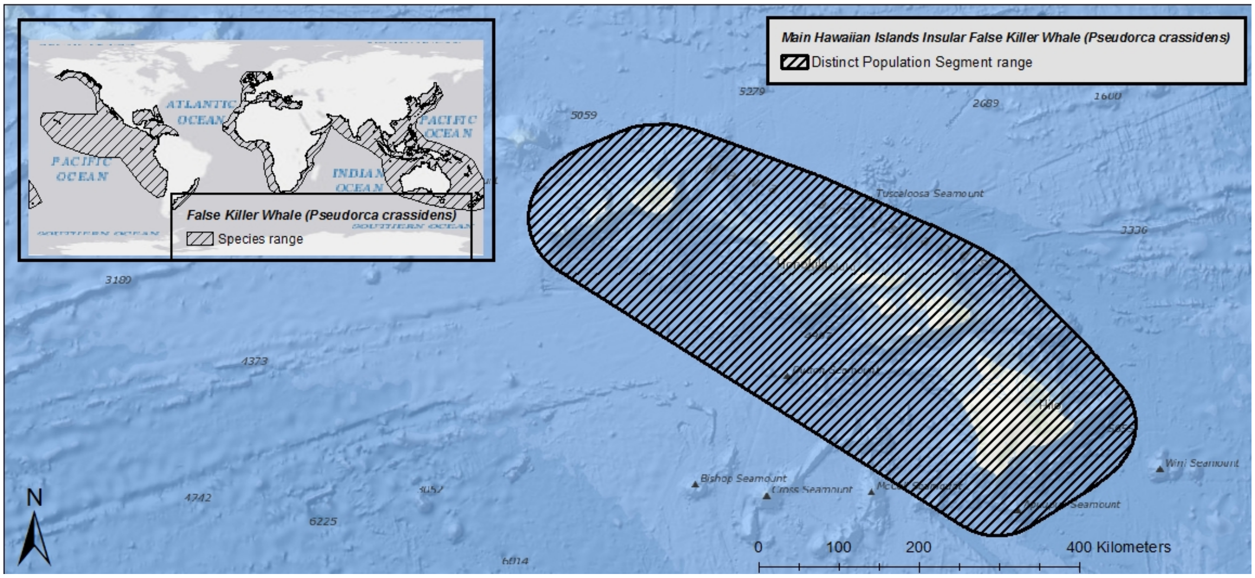


Figure 37. Map identifying the range of false killer whales and the endangered Main Hawaiian Islands insular distinct population segment of false killer whale.

The false killer whale is a toothed whale and large member of the dolphin family. False killer whales are distinguishable from other whales by having a small conical head without a beak, tall dorsal fin, and a distinctive bulge in the middle of the front edge of their pectoral fins. The Main Hawaiian Islands insular DPS of false killer whale was originally listed as endangered on November 28, 2012.

Information available from the most recent status review (NMFS 2010c) and recent stock assessment (Carretta et al. 2017) were used to summarize the status of the species as follows.

9.4.1 Life History

False killer whales can live, on average, for 60 years. They have a gestation period of 14 to 16 months, and calves nurse for 1.5 to two years. Sexual maturity is reached around 12 years of age with a very low reproduction rate and calving interval of approximately seven years. False killer whales prefer tropical to temperate waters that are deeper than 1,000 meters (3,281 feet). They feed during the day and at night on fishes and cephalopods, and are known to attack other marine mammals, indicating they may occasionally feed on them.

9.4.2 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 Main Hawaiian Islands insular DPS of false killer whales.

Recent, unpublished estimates of abundance for two time periods, 2000 through 2004 and 2006 through 2009, were 162 and 151 respectively. The minimum population estimate for the Main Hawaiian Islands insular DPS of false killer whale is the number of distinct individuals identified during the 2011 through 2014 photo-identification studies, or 92 false killer whales (Baird et al. 2015).

A current estimated population growth rate for the Main Hawaiian Islands insular DPS of false killer whales is not available at this time. Reeves, Leatherwood et al. (2009) suggested that the population may have declined during the last two decades, based on sighting data collected near Hawaii using various methods between 1989 and 2007. A modeling exercise conducted by Oleson et al. (2010) evaluated the probability of actual or near extinction, defined as fewer than 20 animals, given measured, estimated, or inferred information on population size and trends, and varying impacts of catastrophes, environmental stochasticity and Allee effects. A variety of alternative scenarios were evaluated indicating the probability of decline to fewer than 20 animals within 75 years as greater than 20 percent. Although causation was not evaluated, all models indicated current declines at an average rate of negative nine percent since 1989.

The Main Hawaiian Islands insular DPS of false killer whale is considered resident to the Main Hawaiian Islands and is genetically and behaviorally distinct compared to other stocks. Genetic data suggest little immigration into the Main Hawaiian Islands insular DPS of false killer whale (Baird et al. 2012). Genetic analyses indicated restricted gene flow between false killer whales sampled near the Main Hawaiian Islands, the Northwestern Hawaiian Islands, and pelagic waters of the Eastern and Central North Pacific Ocean.

NMFS currently recognizes three stocks of false killer whales in Hawaiian waters: the Main Hawaiian Islands insular, Hawaii pelagic, and the Northwestern Hawaiian Islands. All false killer whales found within 40 kilometers (21.6 nautical miles) of the Main Hawaiian Islands belong to the insular stock and all false killer whales beyond 140 kilometers (75.6 nautical miles) belong to the pelagic stock. Animals belonging to the Northwest Hawaiian Islands stock are insular to the Northwest Hawaiian Islands (Bradford et al. 2012), however, this stock was identified by animals encountered off Kauai.

9.4.3 Vocalization and Hearing

Functional hearing in mid-frequency cetaceans, including Main Hawaiian Islands insular DPS of false killer whales, is conservatively estimated to be between approximately 150 Hertz and 160 kiloHertz (Southall et al. 2007). There are three categories of sounds that odontocetes make. The first includes echolocation sounds of high intensity, high frequency, high repetition rate, and very short duration (Au et al. 2000). The second category of odontocete sounds is comprised of pulsed sounds. Burst pulses are generally very complex and fast, with frequency components sometimes above 100 kiloHertz and average repetition rates of 300 per second (Yuen et al. 2007).

The final category of odontocete sounds is the narrowband, low frequency, tonal whistles (Caldwell et al. 1990; Au et al. 2000). With most of their energy below 20 kiloHertz, whistles have been observed with an extensive variety of frequency patterns, durations, and source levels, each of which can be repeated or combined into more complex phrases (Tyack and Clark 2000; Yuen et al. 2007).

In general, odontocetes produce sounds across the wildest band of frequencies. Their social vocalizations range from a few hundreds of Hertz to tens of kiloHertz (Southall et al. 2007) with source levels in the range of 100 to 170 dB re: 1 µPa (see Richardson et al. 1995). They also generate specialized clicks used in echolocation at frequencies above 100 kiloHertz that are used to detect, localize and characterize underwater objects such as prey (Au et al. 1993). Echolocation clicks have source levels that can be as high as 229 dB re: 1 µPa peak-to-peak (Au et al. 1974).

Nachtigall and Supin (2008) investigated the signals from an echolocating false killer whale and found that the majority of clicks had a single-lobed structure with peak energy between 20 and 80 kiloHertz false rather than dual-lobed clicks, as has been demonstrated in the bottlenose dolphin. U.S. Navy researchers measured the hearing of a false killer whale and demonstrated the ability of this species to change its hearing during echolocation (Nachtigall and Supin 2008). They found that there are at least three mechanisms of automatic gain control in odontocete echolocation, suggesting that echolocation and hearing are a very dynamic process (Nachtigall and Supin 2008). For instance, false killer whales change the focus of the echolocation beam based on the difficulty of the task and the distance to the target. The echo from an outgoing signal can change by as much as 40 dB, but the departing and returning signal are the same strength entering the brain (Nachtigall and Supin 2008). The U.S. Navy demonstrated that with a warning signal, the false killer whale can adjust hearing by 15 dB prior to sound exposure (Nachtigall and Supin 2008).

9.4.4 Status

The exact causes for the decline in the Main Hawaiian Islands insular DPS of the false killer whale are not specifically known, but multiple factors have threatened and continue to threaten the population. Threats to the DPS include small population size, including inbreeding depression and Allee effects, exposure to environmental contaminants, competition for food with commercial fisheries, and hooking, entanglement, or intentional harm by fishermen. Recent photographic evidence of dorsal fin disfigurements and mouthline injuries suggest a high rate of fisheries interactions for this population compared to others in Hawaiian waters (Baird et al. 2015).

9.4.5 Recovery Goals

There is currently no Recovery Plan available for the Main Hawaiian Islands insular DPS of the false killer whale.

9.5 Fin Whale

The fin whale is a large, widely distributed baleen whale found in all major oceans and comprised of three subspecies: *B. p. physalus* in the Northern Hemisphere, and *B. p. quoyi* and *B. p. patachaonica* (a pygmy form) in the Southern Hemisphere (Figure 38).

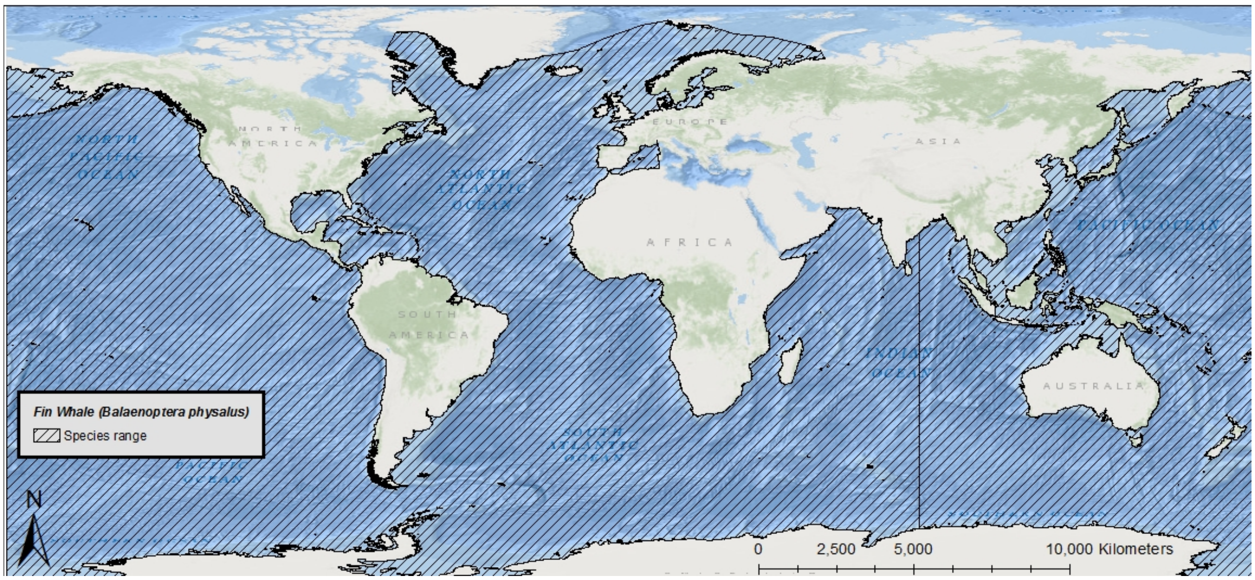


Figure 38. Map identifying the range of the endangered fin whale.

Fin whales are distinguishable from other whales by a sleek, streamlined body, with a V-shaped head, a tall falcate dorsal fin, and a distinctive color pattern of a black or dark brownish-gray body and sides with a white ventral surface. The lower jaw is gray or black on the left side and creamy white on the right side. The fin whale was originally listed as endangered on December 2, 1970.

Information available from the recovery plan (NMFS 2010b), recent stock assessment reports (Carretta et al. 2017; Hayes et al. 2017; Muto et al. 2017), and status review (NMFS 2011a) were used to summarize the life history, population dynamics and status of the species as follows.

9.5.1 Life History

Fin whales can live, on average, 80 to 90 years. They have a gestation period of less than one year, and calves nurse for six to seven months. Sexual maturity is reached between six and ten years of age with an average calving interval of two to three years. They mostly inhabit deep, offshore waters of all major oceans. They winter at low latitudes, where they calve and nurse, and summer at high latitudes, where they feed, although some fin whales appear to be residential to certain areas. Fin whales eat pelagic crustaceans (mainly euphausiids or krill) and schooling fish such as capelin, herring, and sand lice.

9.5.2 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 fin whale.

The pre-exploitation estimate for the fin whale population in the North Pacific Ocean was 42,000 to 45,000 (Ohsumi and Wada 1974). In the North Atlantic Ocean, at least 55,000 fin whales were killed between 1910 and 1989. Approximately 704,000 fin whales were killed in the Southern Hemisphere from 1904 to 1975. Of the three to seven stocks in the North Atlantic Ocean (approximately 50,000 individuals), one occurs in United States waters, where the best estimate of abundance is 1,618 individuals (N_{min}=1,234); however, this may be an underrepresentation as the entire range of stock was not surveyed (Palka 2012). There are three stocks in United States Pacific Ocean waters: Northeast Pacific [minimum 1,368 individuals], Hawaii (approximately 58 individuals [N_{min}=27]) and California/Oregon/Washington (approximately 9,029 [N_{min}=8,127] individuals) (Nadeem et al. 2016). The International Whaling Commission also recognizes the China Sea stock of fin whales, found in the Northwest Pacific Ocean, which currently lacks an abundance estimate (Reilly et al. 2013). Abundance data for the Southern Hemisphere stock are limited; however, there were assumed to be somewhat more than 15,000 in 1983 (Thomas et al. 2016).

Current estimates indicate approximately 10,000 fin whales in United States Pacific Ocean waters, with an annual growth rate of 4.8 percent in the Northeast Pacific stock and a stable population abundance in the California/Oregon/Washington stock (Nadeem et al. 2016). Overall population growth rates and total abundance estimates for the Hawaii stock, China Sea stock, western North Atlantic stock, and Southern Hemisphere fin whales are not available at this time.

Archer et al. (2013) recently examined the genetic structure and diversity of fin whales globally. Full sequencing of the mitochondrial DNA genome for 154 fin whales sampled in the North Atlantic Ocean, North Pacific Ocean, and Southern Hemisphere, resulted in 136 haplotypes, none of which were shared among ocean basins suggesting differentiation at least at this geographic scale. However, North Atlantic Ocean fin whales appear to be more closely related to the Southern Hemisphere population, as compared to fin whales in the North Pacific Ocean, which may indicate a revision of the subspecies delineations is warranted. Generally speaking, haplotype diversity was found to be high both within oceans basins, and across. Such high genetic diversity and lack of differentiation within ocean basins may indicate that despite some populations having small abundance estimates, the species may persist long-term and be somewhat protected from substantial environmental variance and catastrophes.

There are over 100,000 fin whales worldwide, occurring primarily in the North Atlantic Ocean, North Pacific Ocean, and Southern Hemisphere where they appear to be reproductively isolated.

The availability of prey, sand lice in particular, is thought to have had a strong influence on the distribution and movements of fin whales.

9.5.3 Vocalization and Hearing

Fin whales produce a variety of low frequency sounds in the 10 to 200 Hertz range (Watkins 1981; Watkins et al. 1987; Edds 1988; Thompson et al. 1992). Typical vocalizations are long, patterned pulses of short duration (0.5 to two seconds) in the 18 to 35 Hertz range, but only males are known to produce these (Patterson and Hamilton 1964; Clark et al. 2002). The most typically recorded call is a 20 Hertz pulse lasting about one second, and reaching source levels of 189 ±4 dB re: 1 µPa at 1 meter (Watkins 1981; Watkins et al. 1987; Edds 1988; Richardson et al. 1995; Charif et al. 2002; Clark et al. 2002; Sirovic et al. 2007). These pulses frequently occur in long sequenced patterns, are down swept (e.g., 23 to 18 Hertz), and can be repeated over the course of many hours (Watkins et al. 1987). In temperate waters, intense bouts of these patterned sounds are very common from fall through spring, but also occur to a lesser extent during the summer in high latitude feeding areas (Clark and Charif 1998). Richardson et al. (1995) reported this call occurring in short series during spring, summer, and fall, and in repeated stereotyped patterns in winter. The seasonality and stereotype nature of these vocal sequences suggest that they are male reproductive displays (Watkins 1981; Watkins et al. 1987); a notion further supported by data linking these vocalizations to male fin whales only (Croll et al. 2002). In Southern California, the 20 Hertz pulses are the dominant fin whale call type associated both with call-counter-call between multiple animals and with singing (U.S. Navy 2010; U.S. Navy 2012). An additional fin whale sound, the 40 Hertz call described by Watkins (1981), was also frequently recorded, although these calls are not as common as the 20 Hertz fin whale pulses. Seasonality of the 40 Hertz calls differed from the 20 Hertz calls, since 40 Hertz calls were more prominent in the spring, as observed at other sites across the northeast Pacific Ocean (Sirovic et al. 2012). Source levels of Eastern Pacific Ocean fin whale 20 Hertz calls has been reported as 189 ± 5.8 dB re: 1 µPa at 1 meter (Weirathmueller et al. 2013). Some researchers have also recorded moans of 14 to 118 Hertz, with a dominant frequency of 20 Hertz, tonal vocalizations of 34 to 150 Hertz, and songs of 17 to 25 Hertz (Watkins 1981; Edds 1988; Cummings and Thompson 1994). In general, source levels for fin whale vocalizations are 140 to 200 dB re: 1 µPa at 1 meter (as compiled by Erbe 2002a; see also Clark and Gagnon 2004). The source depth of calling fin whales has been reported to be about 50 meters (164 feet) (Watkins et al. 1987). Although acoustic recordings of fin whales from many diverse regions show close adherence to the typical 20-Hertz bandwidth and sequencing when performing these vocalizations, there have been slight differences in the pulse patterns, indicative of some geographic variation (Watkins et al. 1987; Thompson et al. 1992).

Although their function is still in doubt, low frequency fin whale vocalizations travel over long distances and may aid in long distance communication (Payne and Webb 1971; Edds-Walton 1997). During the breeding season, fin whales produce pulses in a regular repeating pattern, which have been proposed to be mating displays similar to those of humpback whales (Croll et al. 2002). These vocal bouts last for a day or longer (Tyack 1999). Also, it has been suggested that some fin whale sounds may function for long range echolocation of large-scale geographic targets such as seamounts, which might be used for orientation and navigation (Tyack 1999).

Direct studies of fin whale hearing have not been conducted, but it is assumed that fin whales can hear the same frequencies that they produce (low) and are likely most sensitive to this frequency range (Richardson et al. 1995; Ketten 1997). This suggests fin whales, like other baleen whales, are more likely to have their best hearing capacities at low frequencies, including frequencies lower than those of normal human hearing, rather than mid- to high-frequencies (Ketten 1997). In a study using computer tomography scans of a calf fin whale skull, Cranford and Krysl (2015) found sensitivity to a broad range of frequencies between 10 Hertz and 12 kiloHertz and a maximum sensitivity to sounds in the 1 to 2 kiloHertz range. In terms of functional hearing capability, fin whales belong to the low-frequency group, which have a hearing range of 7 Hertz to 35 kiloHertz (NOAA 2018).

9.5.4 Status

The fin whale is endangered as a result of past commercial whaling. Prior to commercial whaling, hundreds of thousands of fin whales existed. Fin whales may be killed under "aboriginal subsistence whaling" in Greenland, under Japan's scientific whaling program, and Iceland's formal objection to the International Whaling Commission's ban on commercial whaling. Additional threats include ship strikes, reduced prey availability due to overfishing or climate change, and noise. The species' overall large population size may provide some resilience to current threats, but trends are largely unknown.

9.5.5 Critical Habitat

No critical habitat has been designated for the fin whale.

9.5.6 Recovery Goals

In response to the current threats facing the species, NMFS developed goals to recover fin whale populations. These threats will be discussed in further detail in the *Environmental Baseline* section (Section 10) of this opinion. See the 2010 Final Recovery Plan for the fin whale for complete downlisting/delisting criteria for both of the following recovery goals.

1. Achieve sufficient and viable population in all ocean basins.
2. Ensure significant threats are addressed.

9.6 Gray Whale – Western North Pacific Population

The gray whale is a baleen whale and the only species in the family Eschrichtiidae. There are two isolated geographic distributions of gray whales in the North Pacific Ocean: the Eastern North Pacific stock, found along the west coast of North America, and the Western North Pacific or "Korean" stock, found along the coast of eastern Asia (Figure 39).

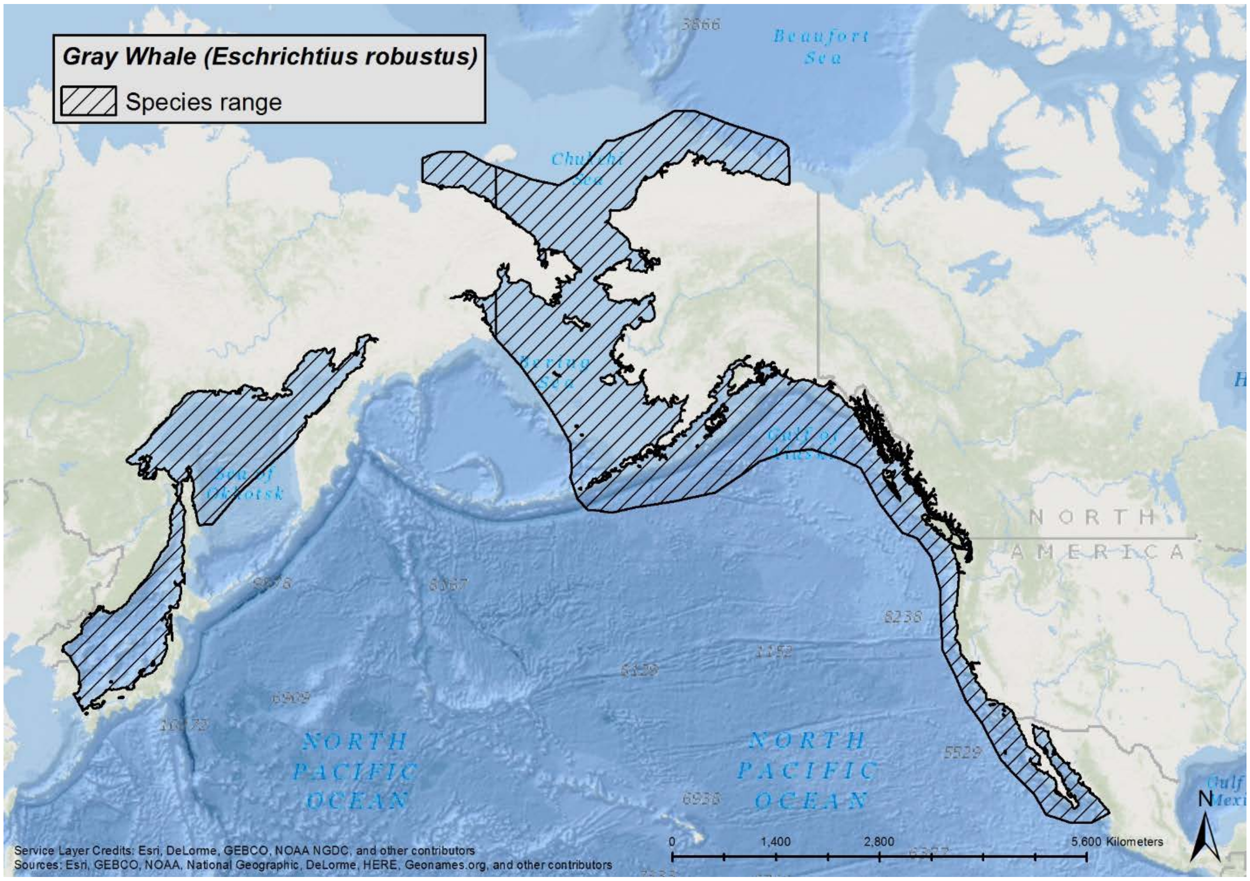


Figure 39. Map identifying the range of the gray whale.

Gray whales are distinguishable from other whales by a mottled gray body, small eyes located near the corners of their mouth, no dorsal fin, broad, paddle-shaped pectoral fins and a dorsal hump with a series of eight to 14 small bumps known as "knuckles." The gray whale was originally listed as endangered on December 2, 1970. The Eastern North Pacific stock was officially delisted on June 16, 1994 when it reached pre-exploitation numbers. The Western North Pacific population of gray whales remained listed as endangered.

Information available from the recent stock assessment reports (Carretta et al. 2016b; Muto et al. 2016; Waring et al. 2016) were used to summarize the life history, population dynamics and status of the species as follows.

9.6.1 Life History

The average life span of gray whales is unknown but it is thought to be as long as 80 years. They have a gestation period of twelve to thirteen months, and calves nurse for seven to eight months. Sexual maturity is reached between six and 12 years of age with an average calving interval of two to four years (Weller et al. 2009). Gray whales mostly inhabit shallow coastal waters in the North Pacific Ocean. Some Western North Pacific gray whales winter on the west coast of North America while others migrate south to winter in waters off Japan and China, and summer in the Okhotsk Sea off northeast Sakhalin Island, Russia, and off southeastern Kamchatka in the Bering

Sea (Burdin et al. 2013). Gray whales travel alone or in small, unstable groups and are known as bottom feeders that eat “benthic” amphipods.

9.6.2 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 gray whale.

Photo-identification data collected between 1994 and 2011 on the Western North Pacific population of gray whale summer feeding ground off Sakhalin Island were used to calculate an abundance estimate of 140 whales for the non-calf population size in 2012 (Cooke et al. 2013). The minimum population estimate for the Western North Pacific stock is 135 individual gray whales on the summer feeding ground off Sakhalin Island. The current best growth rate estimate for the Western North Pacific population of gray whale stock is 3.3 percent annually.

There are often observed movements between individuals from the Eastern North Pacific stock and Western North Pacific stock; however, genetic comparisons show significant mitochondrial and nuclear genetic differences between whales sampled from each stock indicating genetically distinct populations (Leduc et al. 2002). A study conducted between 1995 and 1999 using biopsy samples found that Western North Pacific population of gray whales have retained a relatively high number of mitochondrial DNA haplotypes for such a small population. Although the number of haplotypes currently found in the Western North Pacific stock is higher than might be expected, this pattern may not persist into the future. Populations reduced to small sizes, such as the Western North Pacific stock, can suffer from a loss of genetic diversity, which in turn may compromise their ability to respond to changing environmental conditions (Willi et al. 2006) and negatively influence long-term viability (Spielman et al. 2004; Frankham 2005).

Gray whales in the Western North Pacific population are thought to feed in the summer and fall in the Okhotsk Sea, primarily off Sakhalin Island, Russia and the Kamchatka peninsula in the Bering Sea, and winter in the South China Sea. However, tagging, photo-identification, and genetic studies have shown that some whales identified as members of the Western North Pacific stock have been observed in the Eastern North Pacific Ocean, which may indicate that not all gray whales share the same migratory patterns.

9.6.3 Vocalization and Hearing

No data are available regarding Western North Pacific population of gray whale hearing or communication. We assume that Eastern North Pacific population of gray whale communication is representative of the Western North Pacific population of gray whale and present information stemming from this population. Individuals produce broadband sounds within the 100 Hertz to 12 kiloHertz range (Thompson et al. 1979; Dahlheim et al. 1984; Jones and Swartz 2002). The most common sounds encountered are on feeding and breeding grounds, where “knocks” of roughly 142 dB re: 1 µPa at 1 meter (source level) have been recorded (Cummings et al. 1968; Thomson and Richardson 1995; Jones and Swartz 2002). However, other sounds have also been recorded in Russian foraging areas, including rattles, clicks, chirps, squeaks, snorts, thumps, knocks, bellows, and sharp blasts at frequencies of 400 Hertz to 5 kiloHertz (Petrochenko et al. 1991). Estimated source levels for these sounds ranged from 167 to 188 dB re: 1 μPa at 1 meter (Petrochenko et al. 1991). Low frequency (less than 1.5 kiloHertz) "bangs" and "moans" are most often recorded during migration and during ice-entrapment (Carroll et al. 1989; Crane and Lashkari 1996). Sounds vary by social context and may be associated with startle responses (Rohrkasse-Charles et al. 2011). Calves exhibit the greatest variation in frequency range used, while adults are narrowest; groups with calves were never silent while in calving grounds (Rohrkasse-Charles et al. 2011). Based upon a single captive calf, moans were more frequent when the calf was less than a year old, but after a year, croaks were the predominant call type (Wisdom et al. 1999).

Auditory structure suggests hearing is attuned to low frequencies (Ketten 1992). Responses of free-ranging and captive individuals to playbacks in the 160 Hertz to 2 kiloHertz range demonstrate the ability of individuals to hear within this range (Cummings and Thompson 1971a; Dahlheim and Ljungblad 1990; Buck and Tyack 2000; Wisdom et al. 2001; Moore and Clark 2002). Responses to low-frequency sounds stemming from oil and gas activities also support low-frequency hearing (Malme et al. 1986; Moore and Clark 2002).

9.6.4 Status

The Western North Pacific population of gray whale is endangered as a result of past commercial whaling and may still be hunted under "aboriginal subsistence whaling" provisions of the International Whaling Commission. Current threats include ship strikes, fisheries interactions (including entanglement), habitat degradation, harassment from whale watching, illegal whaling or resumed legal whaling, and noise.

The Western North Pacific population of gray whales has increased over the last ten years at an estimated rate of 3.3 percent. The Western North Pacific population was thought to be geographically isolated from the Eastern North Pacific population, but recent documentation of some gray whales moving between geographic areas in the Pacific Ocean indicate otherwise. Also, in recent years, gray whales have been sighted in the Eastern Atlantic Ocean and Mediterranean Sea, but it is unknown to which population those animals belong.

9.6.5 Critical Habitat

No critical habitat has been designated for the Western North Pacific population of gray whale. NMFS cannot designate critical habitat in foreign waters.

9.6.6 Recovery Goals

There is currently no Recovery Plan for the Western North Pacific population of gray whale. In general, ESA-listed species, which occur entirely outside United States jurisdiction, are not likely to benefit from recovery plans (55 FR 24296; June 15, 1990).

9.7 Humpback Whale – Arabian Sea Distinct Population Segment

The humpback whale is a widely distributed baleen whale found in all major oceans (Figure 40).

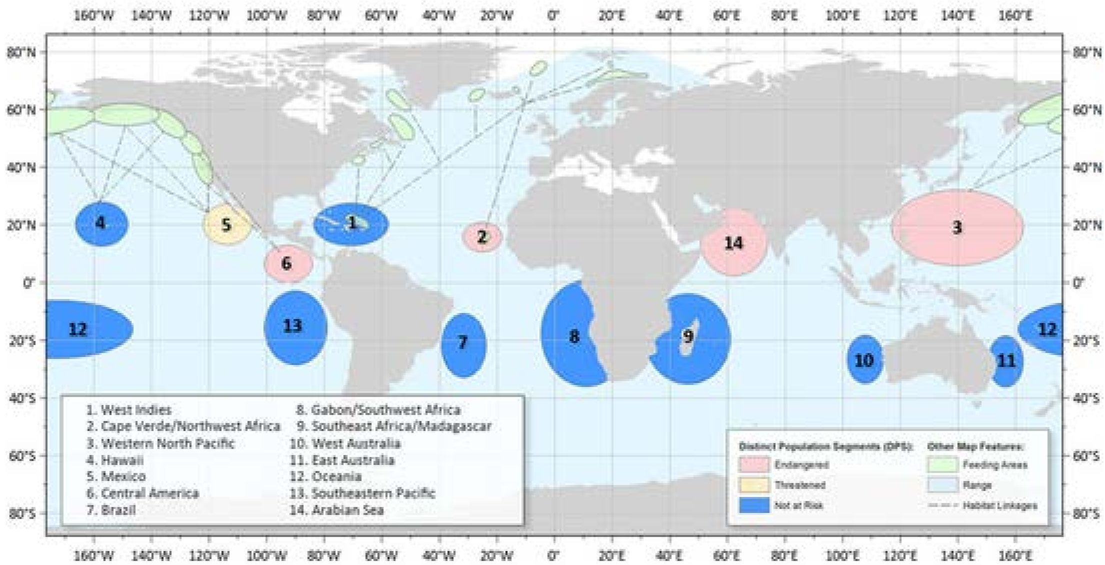


Figure 40. Map identifying 14 distinct population segments with one threatened and four endangered, based on primarily breeding location of the humpback whale, their range, and feeding areas (Bettridge et al. 2015).

Humpback whales are distinguishable from other whales by long pectoral fins and are typically dark grey with some areas of white. The humpback whale was originally listed as endangered on December 2, 1970 (35 FR 18319). Since then, NMFS has designated 14 DPSs with four identified as endangered (Cape Verde Islands/Northwest Africa, Western North Pacific, Central America, and Arabian Sea) and one as threatened (Mexico).

Information available from the recovery plan (NMFS 1991), recent stock assessment reports (Carretta et al. 2016b; Muto et al. 2016; Waring et al. 2016), the status review (Bettridge et al. 2015), and the final listing were used to summarize the life history, population dynamics and status of the species as follows.

9.7.1 Life History

Humpback whales can live, on average, 50 years. They have a gestation period of 11 to 12 months, and calves nurse for one year. Sexual maturity is reached between five to 11 years of age with an average calving interval of two to three years. Humpback whales mostly inhabit coastal and continental shelf waters. They winter at lower latitudes, where they calve and nurse, and summer at high latitudes, where they feed. Humpback whales exhibit a wide range of foraging behaviors and feed on a range of prey types, including: small schooling fishes, euphausiids, and other large zooplankton (Bettridge et al. 2015).

9.7.2 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 Arabian Sea DPS of humpback whales.

The global, pre-exploitation estimate for humpback whales is 1,000,000 (Roman and Palumbi 2003). The current abundance of the Arabian Sea DPS is 82. A population growth rate is currently unavailable for the Arabian Sea DPS of humpback whale.

For humpback whales, DPSs that have a total population size of 2,000 to 2,500 individuals or greater provide for maintenance of genetic diversity resulting in long-term persistence and protection from substantial environmental variance and catastrophes. Distinct population segments that have a total population of 500 individuals or less may be at a greater risk of extinction due to genetic risks resulting from inbreeding. Population at low densities (less than one hundred) are more likely to suffer from the 'Allee" effect, where inbreeding and the heightened difficulty of finding mates reduces the population growth rate in proportion with reducing density. The entire range of the Arabian Sea DPS has not been surveyed, but the most recent estimate abundance is less than 100 individuals, putting it at high risk of extinction due to lack of genetic diversity. The low abundance of this DPS suggests that the population has reached a genetic bottleneck and is at an increased risk to impacts from inbreeding, such as reduced genetic fitness and susceptibility to disease (Bettridge et al. 2015).

9.7.3 Vocalization and Hearing

Humpback whale vocalization is much better understood than is hearing. Different sounds are produced that correspond to different functions: feeding, breeding, and other social calls (Dunlop et al. 2008). Males sing complex sounds while in low-latitude breeding areas in a frequency range of 20 Hertz to 4 kiloHertz with estimated source levels from 144 to 174 dB (Winn et al. 1970; Richardson et al. 1995; Au et al. 2000; Frazer and Mercado III 2000; Au et al. 2006). Males also produce sounds associated with aggression, which are generally characterized by frequencies between 50 Hertz to 10 kHertz with most energy below 3 kHertz (Tyack 1983; Silber 1986). Such sounds can be heard up to 9 kilometers (4.9 nautical miles) away (Tyack 1983). Other social sounds from 50 Hertz to 10 kiloHertz (most energy below 3 kiloHertz) are also produced in breeding areas (Tyack 1983; Richardson et al. 1995). While in northern feeding areas, both sexes vocalize in grunts (25 Hertz to 1.9 kiloHertz), pulses (25 to 89 Hertz) and songs (ranging from 30 Hertz to 8 kiloHertz but dominant frequencies of 120 Hertz to 4 kiloHertz), which can be very loud (175 to 192 dB re: 1 μPa at 1 m) (Payne 1985; Thompson et al. 1986; Richardson et al. 1995; Au et al. 2000; Erbe 2002a). However, humpback whales tend to be less vocal in northern feeding areas than in southern breeding areas (Richardson et al. 1995). NMFS classified humpback whales in the low-frequency cetacean (i.e., baleen whale) functional hearing group. As a group, it is estimated that baleen whales can hear frequencies between 0.007 and 30 Hertz (NOAA 2013). Houser et al. (2001) produced a mathematical model of humpback whale hearing sensitivity based on the anatomy of the humpback whale ear. Based on the model, they concluded that humpback whales would be sensitive to sound in frequencies ranging from 0.7 to 10 kiloHertz, with a maximum sensitivity between 2 to 6 kiloHertz.

Humpback whales are known to produce three classes of vocalizations: (1) "songs" in the late fall, winter, and spring by solitary males; (2) social sounds made by calves (Zoidis, Smultea et al. 2008) or within groups on the wintering (calving) grounds; and (3) social sounds made on the feeding grounds (Thomson and Richardson 1995). The best-known types of sounds produced by humpback whales are songs, which are thought to be reproductive displays used on breeding grounds and sung only by adult males (Schevill et al. 1964; Helweg et al. 1992; Gabriele and Frankel 2002; Clark and Clapham 2004; Smith et al. 2008). Singing is most common on breeding grounds during the winter and spring months, but is occasionally heard in other regions and seasons (Mcsweeney et al. 1989; Gabriele and Frankel 2002; Clark and Clapham 2004). (Au et al. 2006) noted that humpback whales off Hawaii tended to sing louder at night compared to the day. There is a geographical variation in humpback whale song, with different populations singing a basic form of a song that is unique to their own group. However, the song evolves over the course of a breeding season but remains nearly unchanged from the end of one season to the start of the next (Payne et al. 1983). The song is an elaborate series of patterned vocalizations that are hierarchical in nature, with a series of songs ('song sessions') sometimes lasting for hours (Payne and Mcvay 1971). Components of the song range from below 20 Hz up to 4 kHz, with source levels measured between 151 and 189 dB re: 1 µPa-m and high frequency harmonics extending beyond 24 kHz (Winn et al. 1970; Au et al. 2006).

Social calls range from 20 Hertz to 10 kiloHertz, with dominant frequencies below 3 kiloHertz (D'Vincent et al. 1985; Silber 1986; Simao and Moreira 2005; Dunlop et al. 2008). Female vocalizations appear to be simple; Simao and Moreira (2005) noted little complexity.

"Feeding" calls, unlike song and social sounds are a highly stereotyped series of narrow-band trumpeting calls. These calls are 20 Hertz to 2 kiloHertz, less than one second in duration, and have source levels of 162 to 192 dB re: 1 µPa-m (D'Vincent et al. 1985; Thompson et al. 1986). The fundamental frequency of feeding calls is approximately 500 Hertz (D'Vincent et al. 1985; Thompson et al. 1986). The acoustics and dive profiles associated with humpback whale feeding behavior in the northwest Atlantic Ocean has been documented with Digital Acoustic Recording Tags[2] (DTAGs) (Stimpert et al. 2007). Underwater lunge behavior was associated with nocturnal feeding at depth and with multiple boats of broadband click trains that were acoustically different from toothed whale echolocation: Stimpert et al. (2007) termed these sounds "mega-clicks"

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[2] DTAG is a novel archival tag, developed to monitor the behavior of marine mammals, and their response to sound, continuously throughout the dive cycle. The tag contains a large array of solid-state memory and records continuously from a built-in hydrophone and suite of sensors. The sensors sample the orientation of the animal in three dimensions with sufficient speed and resolution to capture individual fluke strokes. Audio and sensor recording is synchronous so the relative timing of sounds and motion can be determined precisely Johnson, M. P. and P. L. Tyack (2003). "A digital acoustic recording tag for measuring the response of wild marine mammals to sound." IEEE Journal of Oceanic Engineering **28**(1): 3-12.

which showed relatively low received levels at the DTAGs (143 to 154 dB re: 1 µPa), with the majority of acoustic energy below 2 kiloHertz.

In terms of functional hearing capability, humpback whales belong to low frequency cetaceans which have a hearing range of 7 Hertz to 22 kiloHertz (Southall et al. 2007). Humpback whale audiograms using a mathematical model based on the internal structure of the ear estimate sensitivity is from 700 Hertz to 10 kiloHertz, with maximum relative sensitivity between 2 kiloHertz and 6 kiloHertz (Ketten and Mountain 2014). Research by Au et al. (2001) and Au et al. (2006) off Hawaii indicated the presence of high frequency harmonics in vocalizations up to and beyond 24 kiloHertz. While recognizing this was the upper limit of the recording equipment, it does not demonstrate that humpback whales can actually hear those harmonics, which may simply be correlated harmonics of the frequency fundamental in the humpback whale song. The ability of humpback whales to hear frequencies around 3 kiloHertz may have been demonstrated in a playback study. Maybaum (1990) reported that humpback whales showed a mild response to a handheld sonar marine mammal detection and location device with frequency of 3.3 kiloHertz at 219 dB re: 1 µPa-m or frequency sweep of 3.1 to 3.6 kiloHertz. In addition, the system had some low frequency components (below 1 kiloHertz) which may have been an artifact of the acoustic equipment. This possible artifact may have affected the response of the whales to both the control and sonar playback conditions.

9.7.4 Status

Humpback whales were originally listed as endangered as a result of past commercial whaling, and the five DPSs that remain listed (Cape Verde Islands/Northwest Africa, Western North Pacific, Central America, Arabian Sea, and Mexico) have likely not yet recovered from this. Prior to commercial whaling, hundreds of thousands of humpback whales existed. Global abundance declined to the low thousands by 1968, the last year of substantial catches (IUCN 2012). Humpback whales may be killed under “aboriginal subsistence whaling” and “scientific permit whaling” provisions of the International Whaling Commission. Additional threats include ship strikes, fisheries interactions (including entanglement), energy development, harassment from whaling watching noise, harmful algal blooms, disease, parasites, and climate change. The species’ large population size and increasing trends indicate that it is resilient to current threats, but the Arabian Sea DPS of humpback whales still faces a risk of extinction.

9.7.5 Critical Habitat

No critical habitat has been designated for humpback whales.

9.7.6 Recovery Goals

See the 1991 Final Recovery Plan for the humpback whale for the complete downlisting/delisting criteria for each of the four following recovery goals:

1. Maintain and enhance habitats used by humpback whales currently or historically.
2. Identify and reduce direct human-related injury and mortality.

3. Measure and monitor key population parameters.
4. Improve administration and coordination of recovery program for humpback whales.

9.8 Humpback Whale – Cape Verde Islands/Northwest Africt Distinct Population Segment

The humpback whale is a widely distributed baleen whale found in all major oceans (Figure 40). Humpbacks are distinguishable from other whales by long pectoral fins and are typically dark grey with some areas of white. They humpback whale was originally listed as endangered on December 2, 1970 (35 FR 18319). Since then, NMFS has designated 14 DPSs with four identified as endangered (Cape Verde Islands/Northwest Africa, Western North Pacific, Central America, and Arabian Sea) and one as threatened (Mexico).

Information available from the recovery plan (NMFS 1991), recent stock assessment reports (Carretta et al. 2016b; Muto et al. 2016; Waring et al. 2016), the status review (Bettridge et al. 2015), and the final listing were used to summarize the life history, population dynamics and status of the species as follows.

9.8.1 Life History

Humpback whales can live, on average, 50 years. They have a gestation period of 11 to 12 months, and calves nurse for one year. Sexual maturity is reached between five to 11 years of age with an average calving interval of two to three years. Humpbacks mostly inhabit coastal and continental shelf waters. They winter at lower latitudes, where they calve and nurse, and summer at high latitudes, where they feed. Humpback whales exhibit a wide range of foraging behaviors and feed on a range of prey types, including: small schooling fishes, euphausiids, and other large zooplankton (Bettridge et al. 2015).

9.8.2 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 Cape Verde Islands/Northwest Africa DPS of humpback whales.

The global, pre-exploitation estimate for humpback whales is 1,000,000 (Roman and Palumbi 2003). The current abundance of the Cape Verde Islands/Northwest Africa DPS of humpback whales is unknown (81 FR 62259). Ryan et al. (2014) states that the best abundance estimate for the Cape Verde Islands/Northwest Africa DPS of humpback whales is 171 to 260 animals, which is higher than the 99 animals previously reported by Punt et al. (2006). Corkeron and Wenzel have reanalyzed the population size of the Cape Verde Islands/Northwest Africa DPS of humpback whales from 2010 through 2018 and state the abundance estimate is just under approximately 300 animals (P. Corkeron, NMFS Northeast Fisheries Science Center, personal communication to Howard Goldstein, NMFS, April 4, 2019). A population growth rate is currently unavailable for the Cape Verde Islands/Northwest Africa DPS of humpback whales.

For humpback whales, DPSs that have a total population size of 2,000 to 2,500 individuals or greater provide for maintenance of genetic diversity resulting in long-term persistence and protection from substantial environmental variance and catastrophes. Distinct population segments that have a total population of five hundred individuals or less may be at a greater risk of extinction due to genetic risks resulting from inbreeding. Population at low densities (less than one hundred) are more likely to suffer from the ‘Allee” effect, where inbreeding and the heightened difficulty of finding mates reduces the population growth rate in proportion with reducing density. The exact population size of the Cape Verde Islands/Northwest Africa DPS of humpback whales is unknown at this time and therefore evidence of genetic diversity (or lack of) cannot be determined (Bettridge et al. 2015).

The Cape Verde Islands/Northwest Africa DPS consists of humpback whales whose breeding range includes waters surrounding the Cape Verde Islands as well as undetermined breeding area in the eastern tropical Atlantic Ocean, and possibly the Caribbean Sea. Evidence shows that some humpback whales are using Eastern North Atlantic Ocean feeding areas and migrating to the Cape Verde Islands (Reiner et al. 1996; Wenzel et al. 2009; Stevick et al. 2016) as four have been photographed and identified in both the Cape Verde Islands and the Caribbean Sea (Stevick et al. 2016).

The Cape Verde Islands are the only known breeding area for humpback whales in the Eastern North Atlantic Ocean (Ryan et al. 2014). Its feeding range includes primarily Iceland and Norway (Figure 40). The population of humpback whales breeding in the Cape Verde Islands, plus this unknown area, likely represent the remnants of a historically larger population breeding around the Cape Verde Islands and Northwestern Africa (Reeves et al. 2002). Recent information provides some evidence to indicate there may be two different breeding areas in the Caribbean Sea, with different breeding times, and the humpback whales breeding in the Southeast Caribbean Sea seem to be more prevalent in the Eastern North Atlantic Ocean feeding areas (Stevick et al. 2016). Some humpback whales from the Cape Verde Islands breeding areas have been resighted in the Southeast Caribbean Sea (Guadeloupe) (Stevick et al. 2016), suggesting the Caribbean Sea may be part of Cape Verde Islands/Northwest Africa DPS breeding area, though this has not been confirmed. Preliminary results from whaling records, photo-identification, and genetic analysis studies suggest that the Cape Verde Islands/Northwest Africa DPS is reproductively isolated from other populations (e.g., West Indies DPS) breeding in other locations in the North Atlantic Ocean (Ryan et al. 2014).

Clapham and Wade (in review) state that recent genetic analysis by Palsboll indicates that humpback whales from the Eastern North Atlantic Ocean likely belong to a separate breeding population from the West Indies, but the migratory destination is unknown and is unlikely to be just the Cape Verde Islands. The number of animals in the Cape Verde Islands/Northwest Africa DPS is too small to account for all of the animals feeding in the Eastern North Atlantic Ocean. Most animals from the Cape Verde Islands/Northwest Africa DPS come from the Eastern North

Atlantic Ocean feeding area, but not all animals from the Eastern North Atlantic Ocean feeding area migrate to the Cape Verde Islands to breed (Clapham and Wade in review).

Based on Stevick et al. (2016) there have been four animals resighted from the Cape Verde Islands in the Guadeloupe region (Lesser Antilles) of the Caribbean Sea. Two of these humpback whales are assumed/confirmed as males (one was a biopsy confirmation and in a competitive group, one was a singer, and the other was in a competitive group). The male humpback whales were matched/resighted in the Cape Verde Islands, one was a resight in the northern feeding area (Norway), and all four were seen in Guadeloupe. None of these four animals has been resighted in the Cape Verde Islands and Guadeloupe during the same year. No resightings of Cape Verde Islands/Northwest Africa DPS of humpback whales have been made in the Navidad/Silver Bank breeding/calving area. The assumption is that the animals are traveling from the Cape Verde Islands to the northern feeding areas (Eastern North Atlantic Ocean) and then continuing to the Southeast Caribbean Sea in subsequent seasons. This is approximately 7,000 kilometers (3,779.7 nautical miles) from the Cape Verde Islands to Norway and 7,700 kilometers (4,158 nautical miles) from Norway to Guadeloupe. The two breeding and calving area sites (Cape Verde Islands and Caribbean Sea) are separated by an ocean basin and greater than approximately 4,000 kilometers (2,160 nautical miles). Timing of the humpback whales (all) arrival in Guadeloupe (February through May) is approximately six weeks later (greatest abundance) than the humpback whales in Navidad Bank/Silver Bank (January through April) and may be related to the feeding area origin/destination (Stevick et al. 2018).

During a passive acoustic monitoring study from 2016 through 2017, humpback whales in the Greater Antilles were recorded singing from December through May and in the Lesser Antilles from January through June (Heenehan et al. in review). Humpback whale songs were detected four to six weeks later in the Lesser Antilles (Guadeloupe and Martinique) (Corkeron et al. in review). These passive acoustic monitoring data provide additional evidence of a delayed arrival and late departure in the Lesser Antilles compared to the Greater Antilles.

The status of populations of humpback whale in the breeding areas of the Caribbean Sea is unresolved (Corkeron et al. in review). There are currently two competing hypotheses for humpback whales in the North Atlantic Ocean: (1) humpback whales in the Caribbean Sea consist of a single population; and (2) humpback whales in the Caribbean Sea consist of two sub-populations – a larger number of animals from the Western North Atlantic Ocean occur in the Northwestern Caribbean Sea or West Indies (Greater Antilles) earlier in the breeding season (December through early March) and a smaller number of animals from the Eastern North Atlantic Ocean occur in the Southeast Caribbean Sea (Lesser Antilles) later in the breeding season (mid-March through late May) and include the Cape Verde Islands/Northwest Africa DPS (Stevick et al. 2018; Corkeron et al. in review). Kennedy and Clapham (2018) state that the two population hypothesis is unlikely due to animals from the Western North Atlantic feeding area have been matched using photo-identification to the breeding areas in the Greater Antilles and Lesser Antilles. Photo-identification matches within the range of the breeding area also indicate some inter-island movement (Kennedy et al. 2014). However, Heenehan et al. (in review) states that passive acoustic monitoring data from the five sites on four islands in the Caribbean Sea supports the two population hypothesis. If the two population hypothesis is correct, a key question to consider is whether or not humpback whales that use the Eastern North Atlantic Ocean as a feeding area and have a delayed migration to the breeding area in the Caribbean Sea be considered part of the West Indies DPS or Cape Verde Islands/Northwest Africa DPS (P. Corkeron, NMFS Northeast Fisheries Science Center, personal communication to Howard Goldstein, NMFS, April 4, 2019).

9.8.3 Vocalization and Hearing

Humpback whale vocalization is much better understood than is hearing. Different sounds are produced that correspond to different functions: feeding, breeding, and other social calls (Dunlop et al. 2008). Males sing complex sounds while in low-latitude breeding areas in a frequency range of 20 Hertz to 4 kiloHertz with estimated source levels from 144 to 174 dB (Winn et al. 1970; Richardson et al. 1995; Au et al. 2000; Frazer and Mercado III 2000; Au et al. 2006). Males also produce sounds associated with aggression, which are generally characterized by frequencies between 50 Hertz to 10 kiloHertz with most energy below 3 kiloHertz (Tyack 1983; Silber 1986). Such sounds can be heard up to 9 kilometers (4.9 nautical miles) away (Tyack 1983). Other social sounds from 50 Hertz to 10 kiloHertz (most energy below 3 kiloHertz) are also produced in breeding areas (Tyack 1983; Richardson et al. 1995). While in northern feeding areas, both sexes vocalize in grunts (25 Hertz to 1.9 kiloHertz), pulses (25 to 89 Hertz) and songs (ranging from 30 Hertz to 8 kiloHertz but dominant frequencies of 120 Hertz to 4 kiloHertz), which can be very loud (175 to 192 dB re: 1 μPa at 1 meter) (Payne 1985; Thompson et al. 1986; Richardson et al. 1995; Au et al. 2000; Erbe 2002a). However, humpback whales tend to be less vocal in northern feeding areas than in southern breeding areas (Richardson et al. 1995). NMFS classified humpback whales in the low-frequency cetacean (i.e., baleen whale) functional hearing group. As a group, it is estimated that baleen whales can hear frequencies between 0.007 and 30 Hertz (NOAA 2013). Houser et al. (2001) produced a mathematical model of humpback whale hearing sensitivity based on the anatomy of the humpback whale ear. Based on the model, they concluded that humpback whales would be sensitive to sound in frequencies ranging from 0.7 to 10 kiloHertz, with a maximum sensitivity between 2 to 6 kiloHertz.

Humpback whales are known to produce three classes of vocalizations: (1) “songs” in the late fall, winter, and spring by solitary males; (2) social sounds made by calves (Zoidis et al. 2008) or within groups on the wintering (calving) grounds; and (3) social sounds made on the feeding grounds (Thomson and Richardson 1995). The best-known types of sounds produced by humpback whales are songs, which are thought to be reproductive displays used on breeding grounds and sung only by adult males (Schevill et al. 1964; Helweg et al. 1992; Gabriele and Frankel 2002; Clark and Clapham 2004; Smith et al. 2008). Singing is most common on breeding grounds during the winter and spring months, but is occasionally heard in other regions and seasons (McSweeney et al. 1989; Gabriele and Frankel 2002; Clark and Clapham 2004). Au, et al. (2006) noted that humpback whales off Hawaii tended to sing louder at night compared to the day. There is a geographical variation in humpback whale song, with different populations singing a basic form of a song that is unique to their own group. However, the song evolves over the course of a breeding season but remains nearly unchanged from the end of one season to the start of the next (Payne et al. 1983). The song is an elaborate series of patterned vocalizations that are hierarchical in nature, with a series of songs ('song sessions') sometimes lasting for hours (Payne and Mcvay 1971). Components of the song range from below 20 Hz up to 4 kHz, with source levels measured between 151 and 189 dB re: 1 µPa-m and high frequency harmonics extending beyond 24 kHz (Winn et al. 1970; Au et al. 2006).

Social calls range from 20 Hertz to 10 kiloHertz, with dominant frequencies below 3 kiloHertz (D'Vincent et al. 1985; Silber 1986; Simao and Moreira 2005; Dunlop et al. 2008). Female vocalizations appear to be simple; Simao and Moreira (2005) noted little complexity.

"Feeding" calls, unlike song and social sounds are a highly stereotyped series of narrow-band trumpeting calls. These calls are 20 Hertz to 2 kiloHertz, less than one second in duration, and have source levels of 162 to 192 dB re: 1 µPa-m (D'Vincent et al. 1985; Thompson et al. 1986). The fundamental frequency of feeding calls is approximately 500 Hertz (D'Vincent et al. 1985; Thompson et al. 1986). The acoustics and dive profiles associated with humpback whale feeding behavior in the northwest Atlantic Ocean has been documented with DTAGs[2] (Stimpert et al. 2007). Underwater lunge behavior was associated with nocturnal feeding at depth and with multiple boats of broadband click trains that were acoustically different from toothed whale echolocation: (Stimpert et al. 2007) termed these sounds "mega-clicks" which showed relatively low received levels at the DTAGs (143 to 154 dB re: 1 µPa), with the majority of acoustic energy below 2 kiloHertz.

In terms of functional hearing capability, humpback whales belong to low frequency cetaceans which have a hearing range of 7 Hertz to 22 kiloHertz (Southall et al. 2007). Humpback whale audiograms using a mathematical model based on the internal structure of the ear estimate sensitivity is from 700 Hertz to 10 kiloHertz, with maximum relative sensitivity between 2 kiloHertz and 6 kiloHertz (Ketten and Mountain 2014). Research by Au et al. (2001) and Au et al. (2006) off Hawaii indicated the presence of high frequency harmonics in vocalizations up to and beyond 24 kiloHertz. While recognizing this was the upper limit of the recording equipment, it does not demonstrate that humpback whales can actually hear those harmonics, which may simply be correlated harmonics of the frequency fundamental in the humpback whale song. The ability of humpback whales to hear frequencies around 3 kiloHertz may have been demonstrated in a playback study. Maybaum (1990) reported that humpback whales showed a mild response to a handheld sonar marine mammal detection and location device with frequency of 3.3 kiloHertz at 219 dB re: 1 µPa-m or frequency sweep of 3.1 to 3.6 kiloHertz. In addition, the system had some low frequency components (below 1 kiloHertz) which may have been an artifact of the acoustic equipment. This possible artifact may have affected the response of the whales to both the control and sonar playback conditions.

9.8.4 Status

Humpback whales were originally listed as endangered as a result of past commercial whaling, and the five DPSs that remain listed (Cape Verde Islands/Northwest Africa, Western North Pacific, Central America, Arabian Sea, and Mexico) have likely not yet recovered from this. Prior to commercial whaling, hundreds of thousands of humpback whales existed. Global abundance declined to the low thousands by 1968, the last year of substantial catches (IUCN 2012). Humpback whales may be killed under “aboriginal subsistence whaling” and “scientific permit whaling” provisions of the International Whaling Commission. Additional threats include ship strikes, fisheries interactions (including entanglement), energy development, harassment from whaling watching noise, harmful algal blooms, disease, parasites, and climate change. The species’ large population size and increasing trends indicate that it is resilient to current threats, but the Cape Verde Islands/Northwest Africa DPS of humpback whales still faces a risk of extinction.

9.8.5 Critical Habitat

No critical habitat has been designated for humpback whales.

9.8.6 Recovery Goals

See the 1991 Final Recovery Plan for the humpback whale for the complete downlisting/delisting criteria for each of the four following recovery goals:

1. Maintain and enhance habitats used by humpback whales currently or historically.
2. Identify and reduce direct human-related injury and mortality.
3. Measure and monitor key population parameters.
4. Improve administration and coordination of recovery program for humpback whales.

9.9 Humpback Whale – Central America Distinct Population Segment

The humpback whale is a widely distributed baleen whale found in all major oceans (Figure 40). Humpback whales are distinguishable from other whales by long pectoral fins and are typically dark grey with some areas of white. They humpback whale was originally listed as endangered on December 2, 1970 (35 FR 18319). Since then, NMFS has designated 14 DPSs with four identified as endangered (Cape Verde Islands/Northwest Africa, Western North Pacific, Central America, and Arabian Sea) and one as threatened (Mexico).

Information available from the recovery plan (NMFS 1991), recent stock assessment reports (Carretta et al. 2016b; Muto et al. 2016; Waring et al. 2016), the status review (Bettridge et al. 2015), and the final listing were used to summarize the life history, population dynamics and status of the species as follows.

9.9.1 Life History

Humpback whales can live, on average, 50 years. They have a gestation period of 11 to 12 months, and calves nurse for one year. Sexual maturity is reached between five to 11 years of age with an average calving interval of two to three years. Humpback whales mostly inhabit coastal and continental shelf waters. They winter at lower latitudes, where they calve and nurse, and summer at high latitudes, where they feed. Humpback whales exhibit a wide range of foraging behaviors and feed on a range of prey types, including: small schooling fishes, euphausiids, and other large zooplankton (Bettridge et al. 2015).

9.9.2 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 Central America DPS of humpback whales.

The global, pre-exploitation estimate for humpback whales is 1,000,000 (Roman and Palumbi 2003). The current abundance of the Central America DPS is 411. A population growth rate is currently unavailable for the Central America DPS of humpback whales.

For humpback whales, DPSs that have a total population size of 2,000 to 2,500 individuals or greater provide for maintenance of genetic diversity resulting in long-term persistence and protection from substantial environmental variance and catastrophes. Distinct population segments that have a total population of 500 individuals or less may be at a greater risk of extinction due to genetic risks resulting from inbreeding. Population at low densities (less than one hundred) are more likely to suffer from the 'Allee" effect, where inbreeding and the heightened difficulty of finding mates reduces the population growth rate in proportion with reducing density. The Central America DPS has just below 500 individuals and so may be subject to genetic risks due to inbreeding and moderate environmental variance (Bettridge et al. 2015).

The Central America DPS is composed of humpback whales that breed along the Pacific coast of Costa Rica, Panama, Guatemala, El Salvador, Honduras, and Nicaragua. This DPS feeds almost exclusively offshore of California and Oregon in the eastern Pacific Ocean, with only a few individuals identified at the northern Washington – southern British Columbia feeding grounds (Figure 40).

9.9.3 Vocalization and Hearing

Humpback whale vocalization is much better understood than is hearing. Different sounds are produced that correspond to different functions: feeding, breeding, and other social calls (Dunlop et al. 2008). Males sing complex sounds while in low-latitude breeding areas in a frequency range of 20 Hertz to 4 kiloHertz with estimated source levels from 144 to 174 dB (Winn et al. 1970; Richardson et al. 1995; Au et al. 2000; Frazer and Mercado III 2000; Au et al. 2006). Males also produce sounds associated with aggression, which are generally characterized by frequencies between 50 Hertz to 10 kiloHertz with most energy below 3 kiloHertz (Tyack 1983; Silber 1986). Such sounds can be heard up to 9 kilometers (4.9 nautical miles) away (Tyack 1983). Other social sounds from 50 Hertz to 10 kiloHertz (most energy below 3 kiloHertz) are also produced in breeding areas (Tyack 1983; Richardson et al. 1995). While in northern feeding areas, both sexes vocalize in grunts (25 Hertz to 1.9 kiloHertz), pulses (25 to 89 Hertz) and songs (ranging from 30 Hertz to 8 kiloHertz but dominant frequencies of 120 Hertz to 4 kiloHertz), which can be very loud (175 to 192 dB re: 1 µPa at 1 m) (Payne 1985; Thompson et al. 1986; Richardson et al. 1995; Au et al. 2000; Erbe 2002a). However, humpback whales tend to be less vocal in northern feeding areas than in southern breeding areas (Richardson et al. 1995). NMFS classified humpback whales in the low-frequency cetacean (i.e., baleen whale) functional hearing group. As a group, it is estimated that baleen whales can hear frequencies between 0.007 and 30 Hertz (NOAA 2013). Houser et al. (2001) produced a mathematical model of humpback whale hearing sensitivity based on the anatomy of the humpback whale ear. Based on the model, they concluded that humpback whales will be sensitive to sound in frequencies ranging from 0.7 to 10 kiloHertz, with a maximum sensitivity between 2 to 6 kiloHertz.

Humpback whales are known to produce three classes of vocalizations: (1) "songs" in the late fall, winter, and spring by solitary males; (2) social sounds made by calves (Zoidis et al. 2008) or within groups on the wintering (calving) grounds; and (3) social sounds made on the feeding grounds (Thomson and Richardson 1995). The best-known types of sounds produced by humpback whales are songs, which are thought to be reproductive displays used on breeding grounds and sung only by adult males (Schevill et al. 1964; Helweg et al. 1992; Gabriele and Frankel 2002; Clark and Clapham 2004; Smith et al. 2008). Singing is most common on breeding grounds during the winter and spring months, but is occasionally heard in other regions and seasons (McSweeney et al. 1989; Gabriele and Frankel 2002; Clark and Clapham 2004). (Au et al. 2006) noted that humpback whales off Hawaii tended to sing louder at night compared to the day. There is a geographical variation in humpback whale song, with different populations singing a basic form of a song that is unique to their own group. However, the song evolves over the course of a breeding season but remains nearly unchanged from the end of one season to the start of the next (Payne et al. 1983). The song is an elaborate series of patterned vocalizations that are hierarchical in nature, with a series of songs ('song sessions') sometimes lasting for hours (Payne and Mcvay 1971). Components of the song range from below 20 Hz up to 4 kHz, with source levels measured between 151 and 189 dB re: 1 µPa-m and high frequency harmonics extending beyond 24 kHz (Winn et al. 1970; Au et al. 2006).Social calls range from 20 Hertz to 10 kiloHertz, with dominant frequencies below 3 kiloHertz (D'Vincent et al. 1985; Silber 1986; Simao and Moreira 2005; Dunlop et al. 2008). Female vocalizations appear to be simple; Simao and Moreira (2005) noted little complexity.

"Feeding" calls, unlike song and social sounds are a highly stereotyped series of narrow-band trumpeting calls. These calls are 20 Hertz to 2 kiloHertz, less than one second in duration, and have source levels of 162 to 192 dB re: 1 µPa-m (D'Vincent et al. 1985; Thompson et al. 1986). The fundamental frequency of feeding calls is approximately 500 Hz (D'Vincent et al. 1985; Thompson et al. 1986). The acoustics and dive profiles associated with humpback whale feeding behavior in the northwest Atlantic Ocean has been documented with DTAGs (Stimpert et al. 2007). Underwater lunge behavior was associated with nocturnal feeding at depth and with multiple boats of broadband click trains that were acoustically different from toothed whale echolocation: (Stimpert et al. 2007) termed these sounds “mega-clicks” which showed relatively low received levels at the DTAGs (143 to 154 dB re: 1 µPa), with the majority of acoustic energy below 2 kiloHertz.

In terms of functional hearing capability, humpback whales belong to low frequency cetaceans which have a hearing range of 7 Hertz to 22 kiloHertz (Southall et al. 2007). Humpback whale audiograms using a mathematical model based on the internal structure of the ear estimate sensitivity is from 700 Hertz to 10 kiloHertz, with maximum relative sensitivity between 2 kiloHertz and 6 kiloHertz (Ketten and Mountain 2014). Research by Au et al. (2001) and Au et al. (2006) off Hawaii indicated the presence of high frequency harmonics in vocalizations up to and beyond 24 kiloHertz. While recognizing this was the upper limit of the recording equipment, it does not demonstrate that humpback whales can actually hear those harmonics, which may simply be correlated harmonics of the frequency fundamental in the humpback whale song. The ability of humpback whales to hear frequencies around 3 kiloHertz may have been demonstrated in a playback study. Maybaum (1990) reported that humpback whales showed a mild response to a handheld sonar marine mammal detection and location device with frequency of 3.3 kiloHertz at 219 dB re: 1 µPa-m or frequency sweep of 3.1 to 3.6 kiloHertz. In addition, the system had some low frequency components (below 1 kiloHertz) which may have been an artifact of the acoustic equipment. This possible artifact may have affected the response of the whales to both the control and sonar playback conditions.

9.9.4 Status

Humpback whales were originally listed as endangered because of past commercial whaling, and the five DPSs that remain listed (Cape Verde Islands/Northwest Africa, Western North Pacific, Central America, Arabian Sea, and Mexico) have likely not yet recovered from this. Prior to commercial whaling, hundreds of thousands of humpback whales existed. Global abundance declined to the low thousands by 1968, the last year of substantial catches (IUCN 2012). Humpback whales may be killed under “aboriginal subsistence whaling” and “scientific permit whaling” provisions of the International Whaling Commission. Additional threats include ship strikes, fisheries interactions (including entanglement), energy development, harassment from whaling watching noise, harmful algal blooms, disease, parasites, and climate change. The species’ large population size and increasing trends indicate that it is resilient to current threats, but the Central America DPS still faces a risk of extinction.

9.9.5 Critical Habitat

No critical habitat has been designated for humpback whales.

9.9.6 Recovery Goals

In response to the current threats facing the species, NMFS developed goals to recover humpback whale populations. These threats will be discussed in further detail in the *Environmental Baseline* section (Section 10) of this opinion. See the 1991 Final Recovery Plan for the humpback whale for the complete downlisting/delisting criteria for each of the four following recovery goals:

1. Maintain and enhance habitats used by humpback whales currently or historically.
2. Identify and reduce direct human-related injury and mortality.
3. Measure and monitor key population parameters.
4. Improve administration and coordination of recovery program for humpback whales.

9.10 Humpback Whale – Mexico Distinct Population Segment

The humpback whale is a widely distributed baleen whale found in all major oceans (Figure 40). Humpback whales are distinguishable from other whales by long pectoral fins and are typically dark grey with some areas of white. They humpback whale was originally listed as endangered on December 2, 1970 (35 FR 18319). Since then, NMFS has designated 14 DPSs with four identified as endangered (Cape Verde Islands/Northwest Africa, Western North Pacific, Central America, and Arabian Sea) and one as threatened (Mexico).

Information available from the recovery plan (NMFS 1991), recent stock assessment reports (Carretta et al. 2016b; Muto et al. 2016; Waring et al. 2016), the status review (Bettridge et al. 2015), and the final listing were used to summarize the life history, population dynamics and status of the species as follows.

9.10.1 Life History

Humpback whales can live, on average, 50 years. They have a gestation period of 11 to 12 months, and calves nurse for one year. Sexual maturity is reached between five to 11 years of age with an average calving interval of two to three years. Humpback whales mostly inhabit coastal and continental shelf waters. They winter at lower latitudes, where they calve and nurse, and summer at high latitudes, where they feed. Humpback whales exhibit a wide range of foraging behaviors and feed on a range of prey types, including: small schooling fishes, euphausiids, and other large zooplankton (Bettridge et al. 2015).

9.10.2 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 Mexico DPS of humpback whales.

The global, pre-exploitation estimate for humpback whales is 1,000,000 (Roman and Palumbi 2003). The current abundance of the Mexico DPS is unavailable. A population growth rate is currently unavailable for the Mexico DPS of humpback whales.

For humpback whales, DPSs that have a total population size of 2,000 to 2,500 individuals or greater provide for maintenance of genetic diversity resulting in long-term persistence and protection from substantial environmental variance and catastrophes. Distinct population segments that have a total population of 500 individuals or less may be at a greater risk of extinction due to genetic risks resulting from inbreeding. Population at low densities (less than one hundred) are more likely to suffer from the ‘Allee” effect, where inbreeding and the heightened difficulty of finding mates reduces the population growth rate in proportion with reducing density. The Mexico DPS is estimated to have more than 2,000 individuals and thus, should have enough genetic diversity for long-term persistence and protection from substantial environmental variance and catastrophes (Bettridge et al. 2015).

The Mexico DPS is composed of humpback whales that breed along the Pacific coast of mainland Mexico, and the Revillagigedos Islands, and transit through the Baja California Peninsula coast. This DPS feeds across a broad geographic range from California to the Aleutian Islands, with concentrations in California-Oregon, northern Washington-southern British Columbia, northern and western Gulf of Alaska, and Bering Sea feeding grounds (Figure 40) (81 FR 62259).

9.10.3 Vocalization and Hearing

Humpback whale vocalization is much better understood than is hearing. Different sounds are produced that correspond to different functions: feeding, breeding, and other social calls (Dunlop et al. 2008). Males sing complex sounds while in low-latitude breeding areas in a frequency range of 20 Hertz to 4 kiloHertz with estimated source levels from 144 to 174 dB (Winn et al. 1970, Richardson et al. 1995; Au et al. 2000; Frazer and Mercado III 2000; Au et al. 2006). Males also produce sounds associated with aggression, which are generally characterized by frequencies between 50 Hertz to 10 kiloHertz with most energy below 3 kiloHertz (Tyack 1983; Silber 1986). Such sounds can be heard up to 9 kilometer (4.9 nautical miles) away (Tyack 1983). Other social sounds from 50 Hertz to 10 kiloHertz (most energy below 3 kiloHertz) are also produced in breeding areas (Tyack 1983; Richardson et al. 1995). While in northern feeding areas, both sexes vocalize in grunts (25 Hertz to 1.9 kiloHertz), pulses (25 to 89 Hertz) and songs (ranging from 30 Hertz to 8 kiloHertz but dominant frequencies of 120 Hertz to 4 kiloHertz), which can be very loud (175 to 192 dB re: 1 μPa at 1 meter) (Payne 1985; Thompson, Cummings et al. 1986; Richardson et al. 1995; Au et al. 2000; Erbe 2002a). However, humpback whales tend to be less vocal in northern feeding areas than in southern breeding areas (Richardson et al. 1995). NMFS classified humpback whales in the low-frequency cetacean (i.e., baleen whale) functional hearing group. As a group, it is estimated that baleen whales can hear frequencies between 0.007 and 30 Hertz (NOAA 2013). Houser et al. (2001) produced a mathematical model of humpback whale hearing sensitivity based on the anatomy of the humpback whale ear. Based on the model, they concluded that humpback whales would be sensitive to sound in frequencies ranging from 0.7 to 10 kiloHertz, with a maximum sensitivity between 2 to 6 kiloHertz.

Humpback whales are known to produce three classes of vocalizations: (1) “songs” in the late fall, winter, and spring by solitary males; (2) social sounds made by calves (Zoidis et al. 2008) or within groups on the wintering (calving) grounds; and (3) social sounds made on the feeding grounds (Thomson and Richardson 1995). The best-known types of sounds produced by humpback whales are songs, which are thought to be reproductive displays used on breeding grounds and sung only by adult males (Schevill et al. 1964; Helweg et al. 1992; Gabriele and Frankel 2002; Clark and Clapham 2004; Smith et al. 2008). Singing is most common on breeding grounds during the winter and spring months, but is occasionally heard in other regions and seasons (McSweeney et al. 1989; Gabriele and Frankel 2002; Clark and Clapham 2004). (Au et al. 2006) noted that humpback whales off Hawaii tended to sing louder at night compared to the day. There is a geographical variation in humpback whale song, with different populations singing a basic form of a song that is unique to their own group. However, the song evolves over the course of a breeding season but remains nearly unchanged from the end of one season to the start of the next (Payne et al. 1983). The song is an elaborate series of patterned vocalizations that are hierarchical in nature, with a series of songs ('song sessions') sometimes lasting for hours (Payne and Mcvay 1971). Components of the song range from below 20 Hz up to 4 kHz, with source levels measured between 151 and 189 dB re: 1 µPa-m and high frequency harmonics extending beyond 24 kHz (Winn et al. 1970; Au et al. 2006). Social calls range from 20 Hertz to 10 kiloHertz, with dominant frequencies below 3 kiloHertz (D'Vincent et al. 1985; Silber 1986; Simao and Moreira 2005; Dunlop et al. 2008). Female vocalizations appear to be simple; Simao and Moreira (2005) noted little complexity.

"Feeding" calls, unlike song and social sounds are a highly stereotyped series of narrow-band trumpeting calls. These calls are 20 Hertz to 2 kiloHertz, less than one second in duration, and have source levels of 162 to 192 dB re: 1 µPa-m (D'Vincent et al. 1985; Thompson et al. 1986). The fundamental frequency of feeding calls is approximately 500 kiloHertz (D'Vincent et al. 1985; Thompson et al. 1986). The acoustics and dive profiles associated with humpback whale feeding behavior in the northwest Atlantic Ocean has been documented with DTAGs (Stimpert et al. 2007). Underwater lunge behavior was associated with nocturnal feeding at depth and with multiple boats of broadband click trains that were acoustically different from toothed whale echolocation: (Stimpert et al. 2007) termed these sounds "mega-clicks" which showed relatively low received levels at the DTAGs (143 to 154 dB re: 1 µPa), with the majority of acoustic energy below 2 kiloHertz.

In terms of functional hearing capability, humpback whales belong to low frequency cetaceans which have a hearing range of 7 Hertz to 22 kiloHertz (Southall et al. 2007). Humpback whale audiograms using a mathematical model based on the internal structure of the ear estimate sensitivity is from 700 Hertz to 10 kiloHertz, with maximum relative sensitivity between 2 kiloHertz and 6 kiloHertz (Ketten and Mountain 2014). Research by Au et al. (2001) and Au et al. (2006) off Hawaii indicated the presence of high frequency harmonics in vocalizations up to and beyond 24 kiloHertz. While recognizing this was the upper limit of the recording equipment, it does not demonstrate that humpback whales can actually hear those harmonics, which may simply be correlated harmonics of the frequency fundamental in the humpback whale song. The ability of humpback whales to hear frequencies around 3 kiloHertz may have been demonstrated in a playback study. Maybaum (1990) reported that humpback whales showed a mild response to a handheld sonar marine mammal detection and location device with frequency of 3.3 kiloHertz at 219 dB re: 1 µPa-m or frequency sweep of 3.1 to 3.6 kiloHertz. In addition, the system had some low frequency components (below 1 kiloHertz) which may have been an artifact of the acoustic equipment. This possible artifact may have affected the response of the whales to both the control and sonar playback conditions.

9.10.4 Status

Humpback whales were originally listed as endangered because of past commercial whaling, and the five DPSs that remain listed (Cape Verde Islands/Northwest Africa, Western North Pacific, Central America, Arabian Sea, and Mexico) have likely not yet recovered from this. Prior to commercial whaling, hundreds of thousands of humpback whales existed. Global abundance declined to the low thousands by 1968, the last year of substantial catches (IUCN 2012). Humpback whales may be killed under “aboriginal subsistence whaling” and “scientific permit whaling” provisions of the International Whaling Commission. Additional threats include ship strikes, fisheries interactions (including entanglement), energy development, harassment from whaling watching noise, harmful algal blooms, disease, parasites, and climate change. The species’ large population size and increasing trends indicate that it is resilient to current threats, but the Mexico DPS still faces a risk of becoming endangered within the foreseeable future throughout all or a significant portion of its range.

9.10.5 Critical Habitat

No critical habitat has been designated for humpback whales.

9.10.6 Recovery Goals

In response to the current threats facing the species, NMFS developed goals to recover humpback whale populations. These threats will be discussed in further detail in the *Environmental Baseline* section (Section 10) of this opinion. See the 1991 Final Recovery Plan for the humpback whale for the complete downlisting/delisting criteria for each of the four following recovery goals:

1. Maintain and enhance habitats used by humpback whales currently or historically.
2. Identify and reduce direct human-related injury and mortality.
3. Measure and monitor key population parameters.
4. Improve administration and coordination of recovery program for humpback whales.

9.11 Humpback Whale – Western North Pacific Distinct Population Segment

The humpback whale is a widely distributed baleen whale found in all major oceans (Figure 40). Humpback whales are distinguishable from other whales by long pectoral fins and are typically dark grey with some areas of white. They humpback whale was originally listed as endangered on December 2, 1970 (35 FR 18319). Since then, NMFS has designated 14 DPSs with four identified as endangered (Cape Verde Islands/Northwest Africa, Western North Pacific, Central America, and Arabian Sea) and one as threatened (Mexico).

Information available from the recovery plan (NMFS 1991), recent stock assessment reports (Carretta et al. 2016b; Muto et al. 2016; Waring et al. 2016), the status review (Bettridge et al.

2015), and the final listing were used to summarize the life history, population dynamics and status of the species as follows.

9.11.1 Life History

Humpback whales can live, on average, 50 years. They have a gestation period of 11 to 12 months, and calves nurse for one year. Sexual maturity is reached between five to 11 years of age with an average calving interval of two to three years. Humpback whales mostly inhabit coastal and continental shelf waters. They winter at lower latitudes, where they calve and nurse, and summer at high latitudes, where they feed. Humpback whales exhibit a wide range of foraging behaviors and feed on a range of prey types, including: small schooling fishes, euphausiids, and other large zooplankton (Bettridge et al. 2015).

9.11.2 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 Western North Pacific DPS of humpback whales.

The global, pre-exploitation estimate for humpback whales is 1,000,000 (Roman and Palumbi 2003). The current abundance of the Western North Pacific DPS is 1,059. A population growth rate is currently unavailable for the Western North Pacific DPS of humpback whales.

For humpback whales, DPSs that have a total population size of 2,000 to 2,500 individuals or greater provide for maintenance of genetic diversity resulting in long-term persistence and protection from substantial environmental variance and catastrophes. Distinct population segments that have a total population of 500 individuals or less may be at a greater risk of extinction due to genetic risks resulting from inbreeding. Population at low densities (less than one hundred) are more likely to suffer from the 'Allee" effect, where inbreeding and the heightened difficulty of finding mates reduces the population growth rate in proportion with reducing density. The Western North Pacific DPS has less than 2,000 individuals total, and is made up of two sub-populations, Okinawa/Philippines and the Second West Pacific. Thus, while its genetic diversity may be protected from moderate environmental variance, it could be subject to extinction due to genetic risks due to low abundance (Bettridge et al. 2015).

The Western North Pacific DPS is composed of humpback whales that breed/winter in the area of Okinawa and the Philippines, another unidentified breeding area (inferred from sightings of whales in the Aleutian Islands area feeding grounds), and those transiting from the Ogasawara area. These whales migrate to feeding grounds in the northern Pacific Ocean, primarily off the Russian coast (Figure 40).

9.11.3 Vocalization and Hearing

Humpback whale vocalization is much better understood than is hearing. Different sounds are produced that correspond to different functions: feeding, breeding, and other social calls (Dunlop et al. 2008). Males sing complex sounds while in low-latitude breeding areas in a frequency range of 20 Hertz to 4 kiloHertz with estimated source levels from 144 to 174 dB (Winn et al. 1970; Richardson et al. 1995; Au et al. 2000; Frazer and Mercado III 2000; Au et al. 2006). Males also produce sounds associated with aggression, which are generally characterized by frequencies between 50 Hertz to 10 kiloHertz with most energy below 3 kiloHertz (Tyack 1983; Silber 1986). Such sounds can be heard up to 9 kilometer (4.9 nautical miles) away (Tyack 1983). Other social sounds from 50 Hertz to 10 kiloHertz (most energy below 3 kiloHertz) are also produced in breeding areas (Tyack 1983; Richardson et al. 1995). While in northern feeding areas, both sexes vocalize in grunts (25 Hertz to 1.9 kiloHertz), pulses (25 to 89 Hertz) and songs (ranging from 30 Hertz to 8 kiloHertz but dominant frequencies of 120 Hertz to 4 kiloHertz), which can be very loud (175 to 192 dB re: 1 μPa at 1 meter) (Payne 1985; Thompson et al. 1986; Richardson et al. 1995; Au et al. 2000; Erbe 2002a). However, humpback whales tend to be less vocal in northern feeding areas than in southern breeding areas (Richardson et al. 1995). NMFS classified humpback whales in the low-frequency cetacean (i.e., baleen whale) functional hearing group. As a group, it is estimated that baleen whales can hear frequencies between 0.007 and 30 Hertz (NOAA 2013). Houser et al. (2001) produced a mathematical model of humpback whale hearing sensitivity based on the anatomy of the humpback whale ear. Based on the model, they concluded that humpback whales would be sensitive to sound in frequencies ranging from 0.7 to 10 kiloHertz, with a maximum sensitivity between 2 to 6 kiloHertz.

Humpback whales are known to produce three classes of vocalizations: (1) “songs” in the late fall, winter, and spring by solitary males; (2) social sounds made by calves (Zoidis et al. 2008) or within groups on the wintering (calving) grounds; and (3) social sounds made on the feeding grounds (Thomson and Richardson 1995). The best-known types of sounds produced by humpback whales are songs, which are thought to be reproductive displays used on breeding grounds and sung only by adult males (Schevill et al. 1964; Helweg et al. 1992; Gabriele and Frankel 2002; Clark and Clapham 2004; Smith et al. 2008). Singing is most common on breeding grounds during the winter and spring months, but is occasionally heard in other regions and seasons (McSweeney et al. 1989; Gabriele and Frankel 2002; Clark and Clapham 2004). (Au et al. 2006) noted that humpback whales off Hawaii tended to sing louder at night compared to the day. There is a geographical variation in humpback whale song, with different populations singing a basic form of a song that is unique to their own group. However, the song evolves over the course of a breeding season but remains nearly unchanged from the end of one season to the start of the next (Payne et al. 1983). The song is an elaborate series of patterned vocalizations that are hierarchical in nature, with a series of songs (‘song sessions’) sometimes lasting for hours (Payne and Mcvay 1971). Components of the song range from below 20 Hz up to 4 kHz, with source levels measured between 151 and 189 dB re: 1 μPa-m and high frequency harmonics extending beyond 24 kHz (Winn et al. 1970; Au et al. 2006).

Social calls range from 20 Hertz to 10 kiloHertz, with dominant frequencies below 3 kiloHertz (D'Vincent et al. 1985; Silber 1986; Simao and Moreira 2005; Dunlop et al. 2008). Female vocalizations appear to be simple; Simao and Moreira (2005) noted little complexity.

“Feeding” calls, unlike song and social sounds are a highly stereotyped series of narrow-band trumpeting calls. These calls are 20 Hertz to 2 kiloHertz, less than one second in duration, and have source levels of 162 to 192 dB re: 1 µPa-m (D'Vincent et al. 1985; Thompson et al. 1986). The fundamental frequency of feeding calls is approximately 500 Hertz (D'Vincent et al. 1985; Thompson et al. 1986). The acoustics and dive profiles associated with humpback whale feeding behavior in the northwest Atlantic Ocean has been documented with DTAGs (Stimpert et al. 2007). Underwater lunge behavior was associated with nocturnal feeding at depth and with multiple boats of broadband click trains that were acoustically different from toothed whale echolocation: Stimpert et al. (2007) termed these sounds “mega-clicks” which showed relatively low received levels at the DTAGs (143 to 154 dB re: 1 µPa), with the majority of acoustic energy below 2 kiloHertz.

In terms of functional hearing capability, humpback whales belong to low frequency cetaceans which have a hearing range of 7 Hertz to 22 kiloHertz (Southall et al. 2007). Humpback whale audiograms using a mathematical model based on the internal structure of the ear estimate sensitivity is from 700 Hertz to 10 kiloHertz, with maximum relative sensitivity between 2 kiloHertz and 6 kiloHertz (Ketten and Mountain 2014). Research by Au et al. (2001) and Au et al. (2006) off Hawaii indicated the presence of high frequency harmonics in vocalizations up to and beyond 24 kiloHertz. While recognizing this was the upper limit of the recording equipment, it does not demonstrate that humpback whales can actually hear those harmonics, which may simply be correlated harmonics of the frequency fundamental in the humpback whale song. The ability of humpback whales to hear frequencies around 3 kiloHertz may have been demonstrated in a playback study. Maybaum (1990) reported that humpback whales showed a mild response to a handheld sonar marine mammal detection and location device with frequency of 3.3 kiloHertz at 219 dB re: 1 µPa-m or frequency sweep of 3.1 to 3.6 kiloHertz. In addition, the system had some low frequency components (below 1 kiloHertz) which may have been an artifact of the acoustic equipment. This possible artifact may have affected the response of the whales to both the control and sonar playback conditions.

9.11.4 Status

Humpback whales were originally listed as endangered as a result of past commercial whaling, and the five DPSs that remain listed (Cape Verde Islands/Northwest Africa, Western North Pacific, Central America, Arabian Sea, and Mexico) have likely not yet recovered from this. Prior to commercial whaling, hundreds of thousands of humpback whales existed. Global abundance declined to the low thousands by 1968, the last year of substantial catches (IUCN 2012). Humpback whales may be killed under “aboriginal subsistence whaling” and “scientific permit whaling” provisions of the International Whaling Commission. Additional threats include ship strikes, fisheries interactions (including entanglement), energy development, harassment from whaling watching noise, harmful algal blooms, disease, parasites, and climate change. The species’ large population size and increasing trends indicate that it is resilient to current threats, but the Western North Pacific DPS of humpback whales still faces a risk of extinction.

9.11.5 Critical Habitat

No critical habitat has been designated for humpback whales.

9.11.6 Recovery Goals

In response to the current threats facing the species, NMFS developed goals to recover humpback whale populations. These threats will be discussed in further detail in the *Environmental Baseline* section (Section 10) of this opinion. See the 1991 Final Recovery Plan for the humpback whale for the complete downlisting/delisting criteria for each of the four following recovery goals:

1. Maintain and enhance habitats used by humpback whales currently or historically.
2. Identify and reduce direct human-related injury and mortality.
3. Measure and monitor key population parameters.
4. Improve administration and coordination of recovery program for humpback whales.

9.12 North Atlantic Right Whale

The North Atlantic right whale is a narrowly distributed baleen whale found in temperate and sub-polar latitudes in the North Atlantic Ocean (Figure 41). Today they are mainly found in the Western North Atlantic Ocean, but have been historically recorded south of Greenland and in the Denmark straight, as well as in Eastern North Atlantic Ocean waters (Kraus and Rolland 2007).

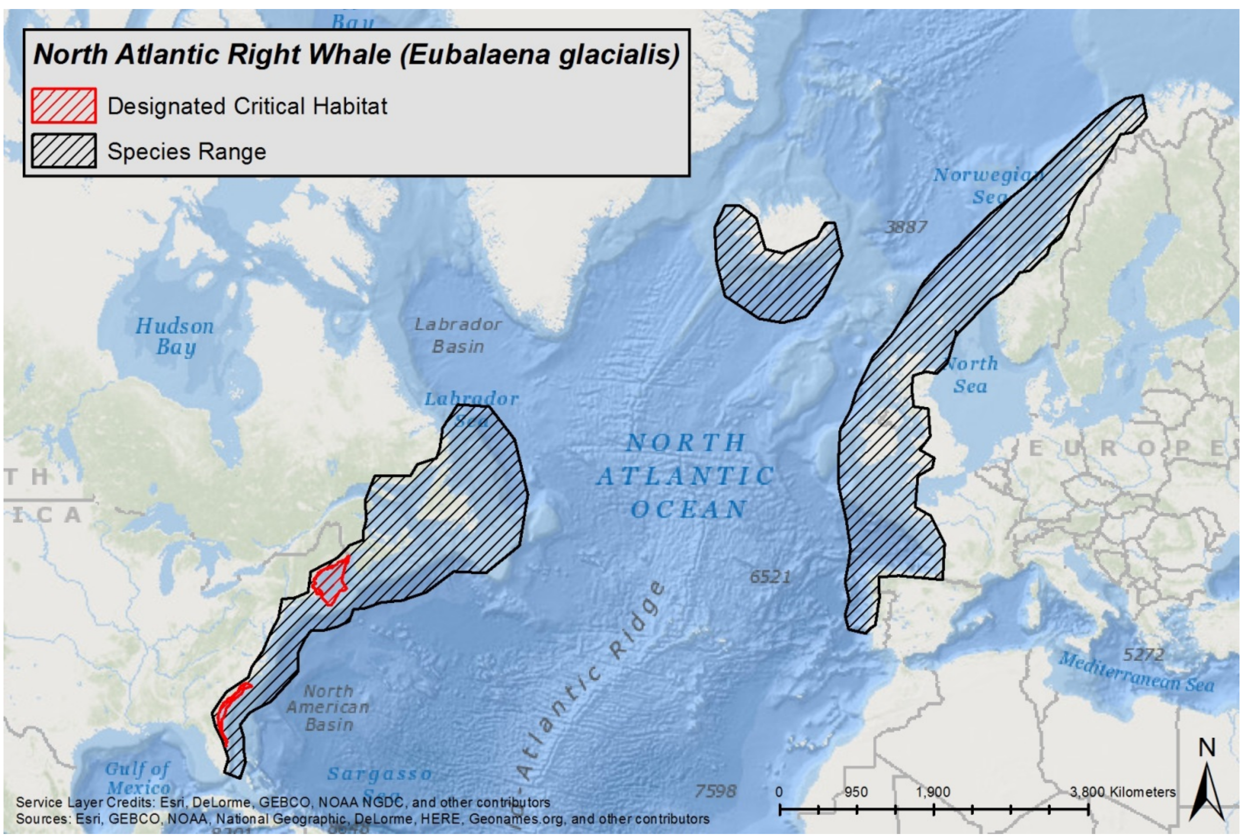

Figure 41. Map identifying range and designated critical habitat of the endangered North Atlantic right whale.

The North Atlantic right whale is distinguished by its stocky body and lack of a dorsal fin. The species was originally listed as endangered on December 2, 1970. The North Atlantic right whale was listed separately as endangered on March 6, 2008.

We used information available in the five-year review (NMFS 2017c)**,** the most recent stock assessment report (Hayes et al. 2017), and the scientific literature to summarize the life history, population dynamics, and status of the species as follows.

9.12.1 Life History

The maximum lifespan of North Atlantic right whales is unknown, but one individual is thought to have reached around 70 years of age (Hamilton et al. 1998; Kenney 2009). Previous modelling efforts suggest that in 1980, females had a life expectancy of approximately 52 years of age, which was twice that of males at the time (Fujiwara and Caswell 2001). However, due to reduced survival probability (Caswell et al. 1999), in 1995 female life expectancy was estimated to have declined to approximately 15 years, with males having a slightly higher life expectancy into the 20s (Fujiwara and Caswell 2001). A recent study demonstrated that females have substantially higher mortality than males (Pace et al. 2017), and as a result, also have substantially shorter life expectancies.

Gestation is approximately one year, after which calves typically nurse for around a year (Lockyer 1984; Kraus et al. 2007; Kenney 2009). After weaning calves, females typically undergo a ‘resting’ year before becoming pregnant again, presumably because they need time to recover from the energy deficit experienced during lactation (Fortune et al. 2012; Fortune et al. 2013; Pettiset al. 2017). From 1983 through 2005, annual average calving intervals ranged from three to 5.8 years (overall average of 4.23 years) (Knowlton et al. 1994; Kraus et al. 2007). Between 2006 and 2015, annual average calving intervals continued to vary within this range, but in 2016 and 2017 longer calving intervals were reported (6.3 to 6.6 years in 2016 and 10.2 years in 2017; Pettis and Hamilton 2015; Pettis and Hamilton 2016; Pettis et al. 2017a; Surrey-Marsden et al. 2017). Females have been known to give birth as young as five years old, but the mean age of first partition is about ten years old (Kraus et al. 2007).

Pregnant North Atlantic right whales migrate south, through the mid-Atlantic region of the United States, to low latitudes during late fall where they overwinter and give birth in shallow, coastal waters (Kenney 2009). During spring, these females migrate back north with their new calves to high latitude foraging grounds where they feed on large concentrations of copepods, primarily *Calanus finmarchicus* (NMFS 2017c; Mayo et al. 2018). Some non-reproductive North Atlantic right whales (males, juveniles, non-reproducing females) also migrate south along the mid-Atlantic region, although at more variable times throughout the winter, while others appear to not migrate south, and instead remain in the northern feeding grounds year round or go elsewhere (Morano et al. 2012; Bort et al. 2015; NMFS 2017c; Mayo et al. 2018). Little is known about North Atlantic right whale habitat use in the mid-Atlantic Ocean, but recent acoustic data indicate near year round presence of at least some whales off the coasts of New Jersey, Virginia, and North Carolina (Whitt et al. 2013; Hodge et al. 2015; Salisbury et al. 2016; Davis et al. 2017). While it is generally not known where North Atlantic right whales mate, some evidence suggests that mating may occur in the northern feeding grounds (Cole et al. 2013; Matthews et al. 2014).

9.12.2 Population Dynamics

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

There are currently two recognized populations of North Atlantic right whales, an eastern and a western population. In the eastern North Atlantic, sightings of right whales are rare and the population may be functionally extinct (Best et al. 2001). In the western North Atlantic, there were estimated to be 458 in November 2015 based on a Bayesian mark–recapture open population model, which accounts for individual differences in the probability of being photographed (95 percent credible intervals 444–471; Pace et al. 2017). While photographic data for 2016 are still being processed, using this same Bayesian methodology with the available data as of September 1, 2017, gave an estimate of 451 individuals for 2016 (Pettis et al. 2017a). Accurate pre-exploitation abundance estimates are not available for either population of the species. The western population may have numbered fewer than 100 individuals by 1935, when international protection for right whales came into effect (Kenney et al. 1995).

The western North Atlantic population demonstrated overall growth of 2.8 percent per year between 1990 to 2010, despite a decline in 1993 and no growth between 1997 and 2000 (Pace et al. 2017). However, since 2010 the population has been in decline, with a 99.99 percent probability of a decline of just under one percent per year (Pace et al. 2017). Between 1990 and 2015, survival rates appeared to be relatively stable, but differed between the sexes, with males having higher survivorship than females (males: 0.985 ± 0.0038; females: $0.968 + 0.0073$) leading to a male-biased sex ratio (approximately 1.46 males per female; Pace et al. 2017). During this same period, calving rates varied substantially, with low calving rates coinciding with all three periods of decline or no growth (Pace et al. 2017). On average, North Atlantic right whale calving rates are estimated to be roughly half that of Southern right whales (*Eubalaena australis*) (Pace et al. 2017), which are increasing in abundance (NMFS 2015a).

While data are not yet available to statistically estimate the population's trend beyond 2015, three lines of evidence indicate the population is still in decline. First, calving rates in 2016, 2017, and 2018 were low. Only five new calves were documented in 2017 (Pettis et al. 2017a), well below the number needed to compensate for expected mortalities (Pace et al. 2017), and no new calves were reported for 2018. Long-term photographic identification data indicate new calves rarely go undetected, so these years likely represent a continuation of the low calving rates that began in 2012 (Kraus et al. 2007; Pace et al. 2017). Second, as noted above, the preliminary abundance estimate for 2016 is 451 individuals, down approximately 1.5 percent from 458 in 2015. Third, since June 2017, at least 17 North Atlantic right whales have died in what has been declared an Unusual Mortality Event[3] (UME), and at least one calf died prior to this in April 2017 (NMFS 2017c; Meyer-Gutbrod et al. 2018). Twelve whales died in Canada in the Gulf of St. Lawrence area, five off the New England coast of the United States, and one off the coast of the Virginia-North Carolina border. To date, three mortalities have been attributed to entanglement in fishing gear and five showed signs of blunt force trauma consistent with vessel strikes (Daoust et al. 2017; Pettis et al. 2017a; Meyer-Gutbrod et al. 2018; M. Hardy personal communication to D. Fauquier on October 5, 2017). The remaining causes of death could not be, or have yet to be, determined.

Analysis of mtDNA from North Atlantic right whales has identified seven mtDNA haplotypes in the western North Atlantic Ocean (Malik et al. 1999; McLeod and White 2010). This is significantly less diverse than Southern right whales and may indicate inbreeding (Schaeff et al. 1997; Malik et al. 2000; Hayes et al. 2017). While analysis of historic DNA taken from museum specimens indicates that the eastern and western populations were likely not genetically distinct, the lack of recovery of the eastern North Atlantic Ocean population indicates at least some level of population segregation (Rosenbaum et al. 1997; Rosenbaum et al. 2000a). Overall, the species has low genetic diversity as would be expected based on its low abundance. However, analysis of 16th and 17th century whaling bones indicate this low genetic diversity may pre-date whaling activities (McLeod et al. 2010). Despite this, Frasier et al. (2013) recently identified a post-copulatory mechanism that appears to be slowly increasing genetic diversity among right whale calves.

Today, North Atlantic right whales are primarily found in the western North Atlantic Ocean, from their calving grounds in lower latitudes off the coast of the southeastern United States to their feeding grounds in higher latitudes off the coast of New England and Nova Scotia (Hayes et al. 2017). In recent years, there has been a shift in distribution in their feeding grounds, with fewer animals being seen in the Great South Channel and the Bay of Fundy and more animals being observed in the Gulf of Saint Lawrence and mid-Atlantic region (Daoust et al. 2017; Davis et al. 2017; Hayes et al. 2017; Pace et al. 2017; Meyer-Gutbrod et al. 2018). Very few individuals likely make up the population in the eastern Atlantic Ocean, which is thought to be functionally extinct (Best et al. 2001). However, in recent years, a few known individuals from the western population have been seen in the eastern Atlantic Ocean, suggesting some individuals may have wider ranges than previously thought (Kenney 2009).

9.12.3 Vocalization and Hearing

North Atlantic right whales vocalize during social interaction and likely to communicate over long distances (Parks and Clark 2007; Tyson et al. 2007, Parks et al. 2011c; McCordic et al.

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[3] https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2018-north-atlantic-right-whale-unusual-mortality-event

2016). Calls among North Atlantic right whales are similar to those of other right whale species, and can be classified into six major call types: screams, gunshots, blows, upcalls, warbles, and downcalls (McDonald and Moore 2002; Parks and Tyack 2005; Parks et al. 2011c; Soldevilla et al. 2014). The majority of vocalizations occur in the 200 Hertz to one kiloHertz range with most energy being below one kiloHertz, but there is large variation in frequency depending on the call type (Vanderlaan et al. 2003; Parks and Tyack 2005; Hatch et al. 2012; Trygonis et al. 2013). Source levels range from 137 to 192 dB re: 1 μPa at 1 meter (rms), with gunshot calls having higher source levels as compared to other call types (Parks and Tyack 2005; Hatch et al. 2012; Trygonis et al. 2013). Some of these levels are low compared to some other baleen whales, which may put North Atlantic right whales at greater risk of communication masking compared to other species (Clark et al. 2009; Hatch et al. 2012). However, recent evidenced suggests that gunshot calls with their higher source levels may be less susceptible to masking compared to other baleen whale sounds (Cholewiak et al. 2018). Individual calls typically have a duration of 0.04 to 1.5 seconds depending on the call type, and bouts of calls can last for several hours (Vanderlaan et al. 2003; Parks and Tyack 2005; Parks et al. 2012; Trygonis et al. 2013).

Vocalizations vary by demographic and context. Upcalls are perhaps the most ubiquitous call type, being commonly produced by all age and sex classes (Parks et al. 2011c). Other non-stereotyped tonal calls (e.g., screams) are also produced by all age sex classes (Parks et al. 2011c) but have been primarily attributed to adult females (Parks and Tyack 2005). Warbles are thought to be produced by calves and may represent 'practice' screams (Parks and Tyack 2005; Parks and Clark 2007). Blows are associated with ventilation and are generally inaudible underwater (Parks and Clark 2007). Gunshots appear to be largely or exclusively male vocalizations and may be a form of vocal display (Parks et al. 2005; Parks and Clark 2007; Parks et al. 2011c). Downcalls have been less frequently recorded, and while it is not known if they are produced by specific age-sex classes, they have been recorded in various demographic make ups of surface-active groups (Parks and Tyack 2005). A recent study examining the development of calls in North Atlantic right while found age-related changes in call production continue into adulthood (Root-Gutteridge et al. 2018).

All types of right whale calls have been recorded in surface-active groups, with smaller groups vocalizing more than larger groups and vocalization being more frequent in the evening, at night, and perhaps on the calving grounds (Matthews et al. 2001; Parks and Clark 2007; Morano et al. 2012; Parks et al. 2012; Trygonis et al. 2013; Matthews et al. 2014; Soldevilla et al. 2014; Salisbury et al. 2016). Screams are usually produced within 10 meters (32.8 feet) of the surface (Matthews et al. 2001). Upcalls have been detected nearly year-round in Massachusetts Bay, peaking in April (Mussoline et al. 2012). Individuals remaining in the Gulf of Maine through winter continue to call, showing a strong diel pattern of upcall and gunshot vocalizations from November through January possibly associated with mating (Morano et al. 2012; Mussoline et al. 2012; Matthews et al. 2014; Bort et al. 2015). Upcalls may be used for long distance communication (McCordic et al. 2016), including to reunite calves with mothers (Parks and Clark 2007; Tennessen and Parks 2016). In fact, a recent study indicates they contain information on individual identity and age (McCordic et al. 2016). However, while upcalls are frequently heard on the calving grounds (Soldevilla et al. 2014), they are infrequently produced by mothers and calves here perhaps because the two maintain visual contact until calves are approximately three to four months of age (Parks and Clark 2007; Trygonis et al. 2013; Parks and Van Parijs 2015). North Atlantic right whales shift calling frequencies, particularly those of upcalls, and increase call amplitude over both long and short term periods due to exposure to vessel sound, which may limit their communication space by as much as 67 percent compared to historically lower sound conditions (Parks and Clark 2007; Parks et al. 2007; Parks et al. 2009; Parks et al. 2011b; Hatch et al. 2012; Parks et al. 2012; Tennessen and Parks 2016).

There are no direct data on the hearing range of North Atlantic right whales, although they are considered to be part of the low frequency hearing group with a hearing range between 7 Hertz and 35 kiloHertz (NOAA 2018). However, based on anatomical modeling, their hearing range is predicted to be from 10 Hertz to 22 kiloHertz with a functional range probably between 15 Hertz to 18 kiloHertz (Parks et al. 2007).

9.12.4 Status

The North Atlantic right whale is listed under the ESA as endangered. Currently, none of its recovery goals have been met (NMFS 2017c). With whaling now prohibited, the two major known human causes of mortality are vessel strikes and entanglement in fishing gear. Progress has been made in mitigating vessel strikes by regulating vessel speeds (78 FR 73726) (Conn and Silber 2013), but entanglement in fishing gear remains a major threat (Kraus et al. 2016). From 1990 through 2010, the population experienced overall growth consistent with one of its recovery goals. However, the population is currently experiencing an unusual mortality event that appears to be related to both vessel strikes and entanglement in fishing gear (Daoust et al. 2017). On top of this, recent modeling efforts indicate that low female survival, a male biased sex ratio, and low calving success are contributing to the population's current decline (Pace et al. 2017). While there are likely a multitude of factors involved, low calving has been linked to poor female health (Rolland et al. 2016) and reduced prey availability (Meyer-Gutbrod and Greene 2014; Devine et al. 2017; Johnson et al. 2017; Meyer-Gutbrod et al. 2018; Meyer-Gutbrod and Greene 2018). Furthermore, entanglement in fishing gear appears to have substantial health and energetic costs that affect both survival and reproduction (Robbins et al. 2015; Pettis et al. 2017b; Rolland et al. 2017; van der Hoop et al. 2017; Lysiak et al. 2018). In fact, there is evidence of a population wide decline in health since the early 1990s, the last time the population experienced a population decline (Rolland et al. 2016). Given this status, the species resilience to future perturbations is considered very low. Recent modelling efforts by Meyer-Gutbrod and Greene (2018) indicate that that the species may decline towards extinction if prey conditions worsen, as predicted under future climate scenarios (Grieve et al. 2017), and anthropogenic mortalities are not reduced (Meyer-Gutbrod et al. 2018). In fact, recent data from the Gulf of Maine and Gulf of St. Lawrence indicate prey densities may already be in decline (Devine et al. 2017; Johnson et al. 2017; Meyer-Gutbrod et al. 2018).

9.12.5 Recovery Goals

In response to the current threats facing the species, NMFS developed goals to recover North Atlantic right whale populations. These threats will be discussed in further detail in the *Environmental Baseline* section (Section 10) of this opinion. See the 2005 updated Recovery Plan for the North Atlantic right whale for complete downlisting criteria for the following recovery goals:

The population ecology (range, distribution, age structure, and gender ratios, etc.) and vital rates (age-specific survival, age-specific reproduction, and lifetime reproductive success) of North Atlantic right whales are indicative of an increasing population;

The population has increased for a period of 35 years at an average rate of increase equal to or greater than two percent per year;

None of the known threats to North Atlantic right whales are known to limit the population's growth rate; and

Given current and projected threats and environmental conditions, the North Atlantic right whale population has no more than a one percent chance of quasi-extinction in 100 years.

9.13 North Pacific Right Whale

North Pacific right whales are found in temperate and sub-polar waters of the North Pacific Ocean (Figure 42).

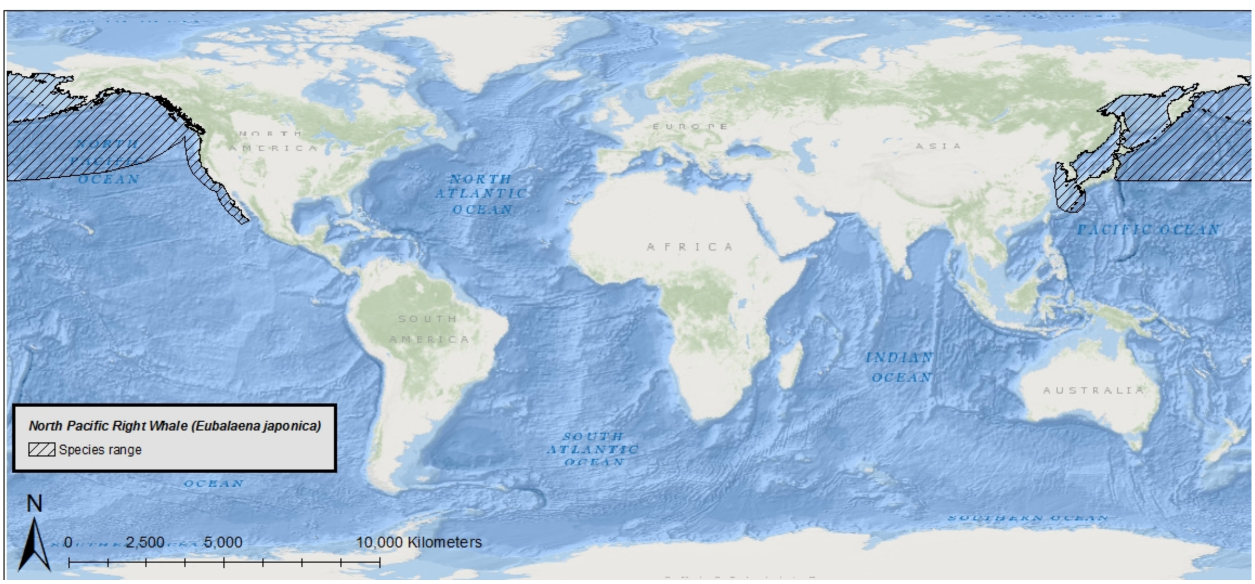

Figure 42. Map identifying the range of the endangered North Pacific right whale.

The North Pacific right whale is a baleen whale found only in the North Pacific Ocean and is distinguishable by a stocky body, lack of dorsal fin, generally black coloration, and callosities on the head region. The species was originally listed with the North Atlantic right whale (i.e., "Northern" right whale) as endangered on December 2, 1970. The North Pacific right whale was listed separately as endangered on March 6, 2008.

Information available from the recovery plan (NMFS 2013a) recent stock assessment reports (Muto et al. 2017), and status review (NMFS 2012a; NMFS 2017d) were used to summarize the life history, population dynamics and status of the species as follows.

9.13.1 Life History

North Pacific right whales can live, on average, 50 or more years. They have a gestation period of approximately one year, and calves nurse for approximately one year. Sexual maturity is reached between nine and ten years of age. The reproduction rate of North Pacific right whales remains unknown. However, it is likely low due to a male-biased sex ratio that may make it difficult for females to find viable mates. North Pacific right whales mostly inhabit coastal and continental shelf waters. Little is known about their migration patterns, but they have been observed in lower latitudes during winter (Japan, California, and Mexico) where they likely calve and nurse. In the summer, they feed on large concentrations of copepods in Alaskan waters. North Pacific right whales are unique compared to other baleen whales in that they are skim feeders meaning they continuously filtering through their baleen while moving through a patch of zooplankton.

9.13.2 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 Pacific right whale.

The North Pacific right whale remains one of the most endangered whale species in the world. Their abundance likely numbers fewer than 1,000 individuals. There are two currently recognized stocks of North Pacific right whales, a Western North Pacific stock that feeds primarily in the Sea of Okhotsk, and an Eastern North Pacific stock that feeds in eastern north Pacific Ocean waters off Alaska, Canada, and Russia. Several lines of evidence indicate a total population size of less than 100 for the Eastern North Pacific stock. Based on photo-identification from 1998 through 2013 (Wade et al. 2011) estimated 31 individuals, with a minimum population estimate of 26 individuals (Muto et al. 2017). Genetic data have identified 23 individuals based on samples collected between 1997 and 2011 (Leduc et al. 2012). The Western North Pacific stock is likely more abundant and was estimated to consist of 922 whales (95 percent confidence intervals 404 to 2,108) based on data collected in 1989, 1990, and 1992 (IWC 2001; Thomas et al. 2016). The population estimate for the Western North Pacific stock is likely in the low hundreds (Brownell Jr. et al. 2001). While there have been several sightings of Western North Pacific right whales in recent years, with one sighting identifying at least 77 individuals, these data have yet to be compiled to provide a more recent abundance estimate (Thomas et al. 2016). There is currently no information on the population trend of North Pacific right whales.

As a result of past commercial whaling, the remnant population of North Pacific right whales has been left vulnerable to genetic drift and inbreeding due to low genetic variability. This low diversity potentially affects individuals by depressing fitness, lowering resistance to disease and parasites, and diminishing the whales' ability to adapt to environmental changes. At the population level, low genetic diversity can lead to slower growth rates, lower resilience, and poorer long-term fitness (Lacy 1997). Marine mammals with an effective population size of a few dozen individuals likely can resist most of the deleterious consequences of inbreeding (Lande 1991). It has also been suggested that if the number of reproductive animals is fewer than fifty, the potential for impacts associated with inbreeding increases substantially. Rosenbaum et al. (2000b) found that historic genetic diversity of North Pacific right whales was relatively high compared to North Atlantic right whales, but samples from extant individuals showed very low genetic diversity, with only two matrilineal haplotypes among the five samples in their dataset.

The North Pacific right whale inhabits the Pacific Ocean, particularly between 20 and 60° North latitude (Figure 42). Prior to exploitation by commercial whalers, concentrations of North Pacific right whales were found in the Gulf of Alaska, Aleutian Islands, south central Bering Sea, Sea of Okhotsk, and Sea of Japan. There has been little recent sighting data of North Pacific right whales occurring in the central North Pacific and Bering Sea. However, since 1996, North Pacific right whales have been consistently observed in Bristol Bay and the southeastern Bering Sea during summer months. In the Western North Pacific Ocean where the population is thought to be somewhat larger, North Pacific right whales have been sighted in the Sea of Okhotsk and other areas off the coast of Japan, Russia, and South Korea (Thomas et al. 2016). Although North Pacific right whales are typically found in higher latitudes, they are thought to migrate to more temperate waters during winter to reproduce, and have been sighted as far south as Hawaii and Baja California.

9.13.3 Vocalization and Hearing

Given their extremely small population size and remote location, little is known about North Pacific right whale vocalizations (Marques et al. 2011). However, data from other right whales is informative. Right whales vocalize to communicate over long distances and for social interaction, including communication apparently informing others of prey path presence (Biedron et al. 2005; Tyson and Nowacek 2005). Vocalization patterns amongst all right whale species are generally similar, with six major call types: scream, gunshot, blow, up call, warble, and down call (McDonald and Moore 2002; Parks and Tyack 2005). A large majority of vocalizations occur in the 300 to 600 Hertz range with up and down sweeping modulations (Vanderlaan et al. 2003). Vocalizations below 200 Hertz and above 900 Hertz were rare (Vanderlaan et al. 2003). Calls tend to be clustered, with periods of silence between clusters (Vanderlaan et al. 2003). Gunshot bouts last 1.5 hours on average and up to seven hours (Parks et al. 2012). Blows are associated with ventilation and are generally inaudible underwater (Parks and Clark 2007). Up calls are 100 to 400 Hertz (Gillespie and Leaper 2001). Gunshots appear to be largely or exclusively male vocalization (Parks et al. 2005).

Smaller groups vocalize more than larger groups and vocalization is more frequent at night (Matthews et al. 2001). Moans are usually produced within 10 meters (33 feet) of the surface (Matthews et al. 2001). Up calls were detected year-round in Massachusetts Bay except July and August and peaking in April (Mussoline et al. 2012). Individuals remaining in the Gulf of Maine through winter continue to call, showing a strong diel pattern of up call and gunshot vocalizations from November through January possibly associated with mating (Bort et al. 2011; Morano et al. 2012; Mussoline et al. 2012). Estimated source levels of gunshots in non-surface active groups are 201 dB re: 1 μPa peak-to-peak (Hotchkin et al. 2011). While in surface active groups, females produce scream calls and males produce up calls and gunshot calls as threats to other males; calves (at least female calves) produce warble sounds similar top their mothers' screams (Parks et al. 2003; Parks and Tyack 2005). Source levels for these calls in surface active groups range from 137 to 162 dB re: 1 μPa-m (rms), except for gunshots, which are 174 to 192 dB re: 1 μPa-m (rms) (Parks and Tyack 2005). Up calls may also be used to reunite mothers with calves (Parks and Clark 2007). North Atlantic right whales shift calling frequencies, particularly of up calls, as well as increase call amplitude over both long and short term periods due to exposure to vessel noise (Parks et al. 2005; Parks et al. 2006; Parks and Clark 2007; Parks et al. 2007; Parks et al. 2010; Parks et al. 2011b; Parks et al. 2012), particularly the peak frequency (Parks et al. 2009). North Atlantic right whales respond to anthropogenic sound designed to alert whales to vessel presence by surfacing (Nowacek et al. 2003; Nowacek et al. 2004).

There is no direct data on the hearing range of North Pacific right whales. However, based on anatomical modeling, the hearing range for North Atlantic right whales is predicted to be from 10 Hertz to 22 kiloHertz with functional ranges probably between 15 Hertz to 18 kiloHertz (Parks et al. 2007).

9.13.4 Status

The North Pacific right whale is endangered because of past commercial whaling. Prior to commercial whaling, abundance has been estimated to have been more than 11,000 individuals. Current threats to the survival of this species include hunting, ship strikes, climate change, and fisheries interactions (including entanglement). The resilience of North Pacific right whales to future perturbations is low due to its small population size and continued threats. Recovery is not anticipated in the foreseeable future (several decades to a century or more) due to small population size and lack of available current information.

9.13.5 Critical Habitat

In 2008, NMFS designated critical habitat for the North Pacific right whale, which includes an area in the Southeast Bering Sea and an area south of Kodiak Island in the Gulf of Alaska (Figure 43). These areas are influenced by large eddies, submarine canyons, or frontal zones which enhance nutrient exchange and act to concentrate prey. These areas are adjacent to major ocean currents and are characterized by relatively low circulation and water movement. Both critical habitat areas support feeding by North Pacific right whales because they contain the designated physical and biological features (previously referred to as primary constituent elements), which include: nutrients, physical oceanographic processes, certain species of zooplankton, and a long photoperiod due to the high latitude. Consistent North Pacific right whale sightings are a proxy for locating these elements.

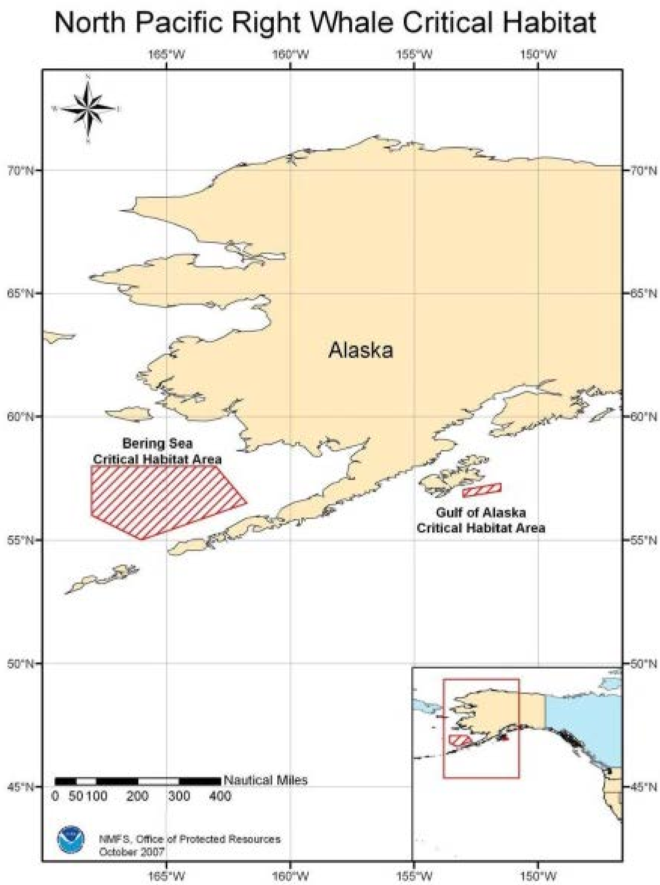

Figure 43. Map identifying designated critical habitat for the North Pacific right whale in the Southeast Bering Sea and south of Kodiak Island in the Gulf of Alaska.

9.13.6 Recovery Goals

In response to the current threats facing the species, NMFS developed goals to recover North Pacific right whale populations. These threats will be discussed in further detail in the *Environmental Baseline* section (Section 10) of this opinion. See the 2013 Final Recovery Plan for the North Pacific right whale for complete downlisting/delisting criteria for both of the following recovery goals.

1. Achieve sufficient and viable populations in all ocean basins.
2. Ensure significant threats are addressed.

9.14 Sei Whale

The sei whale is a widely distributed baleen whale found in all major oceans (Figure 44).

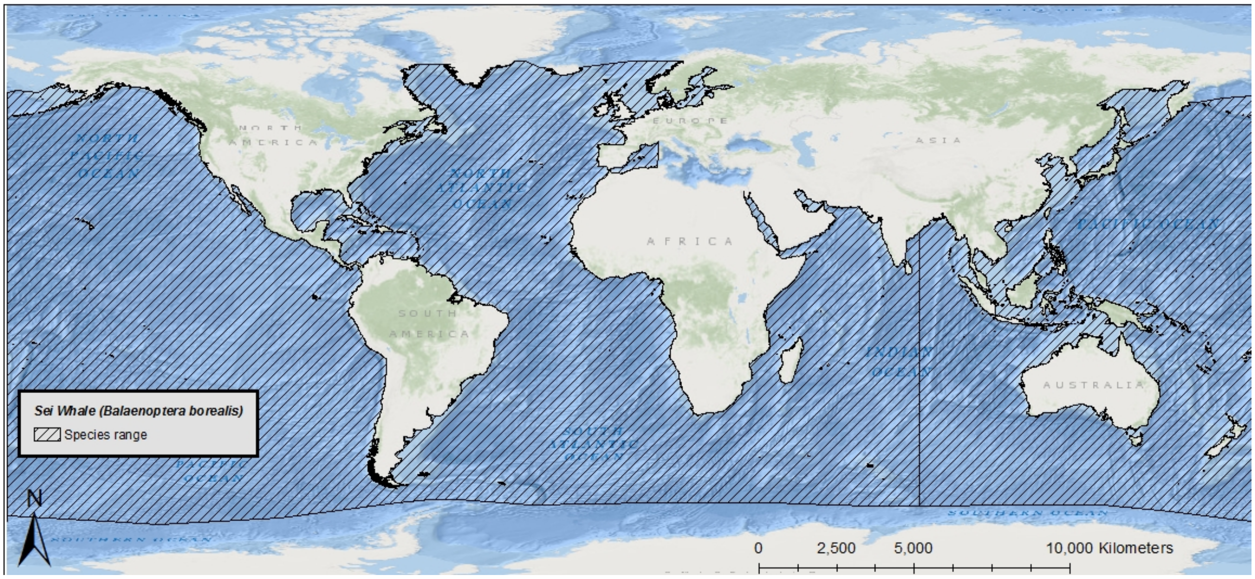

Figure 44. Map identifying the range of the endangered sei whale.

Sei whales are distinguishable from other whales by a long, sleek body that is dark bluish-gray to black in color and pale underneath, and a single ridge located on their rostrum. The sei whale was originally listed as endangered on December 2, 1970.

Information available from the recovery plan (NMFS 2011b), recent stock assessment reports (Carretta et al. 2017; Hayes, et al. 2017; Muto et al. 2017), and status review (NMFS 2012b) were used to summarize the life history, population dynamics, and status of the species as follows.

9.14.1 Life History

Sei whales can live, on average, between 50 and 70 years. They have a gestation period of ten to 12 months, and calves nurse for six to nine months. Sexual maturity is reached between six and 12 years of age with an average calving interval of two to three years. Sei whales mostly inhabit continental shelf and slope waters far from the coastline. They winter at low latitudes, where they calve and nurse, and summer at high latitudes, where they feed on a range of prey types, including: plankton (copepods and krill) small schooling fishes, and cephalopods.

9.14.2 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 sei whale.

Two subspecies of sei whale are recognized, *B. b. borealis* in the Northern Hemisphere and *B. b. schlegellii* in the Southern Hemisphere. There are no estimates of pre-exploitation abundance for the North Atlantic Ocean. Models indicate that total abundance declined from 42,000 to 8,600 individuals between 1963 and 1974 in the North Pacific Ocean. More recently, the North Pacific Ocean population was estimated to be 29,632 (95 percent confidence intervals 18,576 to 47,267) between 2010 and 2012 (IWC 2016; Thomas et al. 2016). In the Southern Hemisphere, pre-exploitation abundance is estimated at 65,000 whales, with recent abundance estimated at 9,800 to 12,000 whales. Three relatively small stocks occur in U.S. waters: Nova Scotia (N=357, N_{min}=236), Hawaii (N=178, N_{min}=93), and Eastern North Pacific (N=519, N_{min}=374). Population growth rates for sei whales are not available at this time as there are little to no systematic survey efforts to study sei whales.

Based on genetic analyses, there appears to be some differentiation between sei whale populations in different ocean basins. An early study of allozyme variation at 45 loci found some genetic differences between Southern Ocean and the North Pacific sei whales (Wada and Numachi 1991). However, more recent analyses of mtDNA control region variation show no significant differentiation between Southern Ocean and the North Pacific sei whales, though both appear to be genetically distinct from sei whales in the North Atlantic (Baker and Clapham 2004; Huijser et al. 2018). Within ocean basin, there appears to be intermediate to high genetic diversity and little genetic differentiation despite there being different managed stocks (Danielsdottir et al. 1991; Kanda et al. 2006; Kanda et al. 2011; Kanda et al. 2013; Kanda et al. 2015; Huijser et al. 2018).

Sei whales are distributed worldwide, occurring in the North Atlantic Ocean, North Pacific Ocean, and Southern Hemisphere.

9.14.3 Vocalization and Hearing

Data on sei whale vocal behavior is limited, but includes records off the Antarctic Peninsula of broadband sounds in the 100 to 600 Hertz range with 1.5 second duration and tonal and upsweep calls in the 200 to 600 Hertz range of one to three second durations (McDonald et al. 2005). Vocalizations from the North Atlantic Ocean consisted of paired sequences (0.5 to 0.8 seconds, separated by 0.4 to 1.0 seconds) of 10 to 20 short (4 milliseconds) frequency modulated sweeps between 1.5 to 3.5 kiloHertz (Thomson and Richardson 1995). Source levels of 189 ±5.8 dB re: 1 µPa at 1 meter have been established for sei whales in the northeastern Pacific Ocean (Weirathmueller 2013).

Direct studies of sei whale hearing have not been conducted, but it is assumed that they can hear the same frequencies that they produce (low) and are likely most sensitive to this frequency range (Richardson et al. 1995; Ketten 1997). This suggests sei whales, like other baleen whales, are more likely to have their best hearing capacities at low frequencies, including frequencies lower than those of normal human hearing, rather than mid- to high-frequencies (Ketten 1997). In terms of functional hearing capability, sei whales belong to the low-frequency group, which have a hearing range of 7 Hertz to 35 kiloHertz (NOAA 2018).

9.14.4 Status

The sei whale is endangered as a result of past commercial whaling. Now, only a few individuals are taken each year by Japan; however, Iceland has expressed an interest in targeting sei whales. Current threats include ship strikes, fisheries interactions (including entanglement), climate change (habitat loss and reduced prey availability), and anthropogenic sound. Given the species' overall abundance, they may be somewhat resilient to current threats. However, trends are largely unknown, especially for individual stocks, many of which have relatively low abundance estimates.

9.14.5 Critical Habitat

No critical habitat has been designated for the sei whale.

9.14.6 Recovery Goals

In response to the current threats facing the species, NMFS developed goals to recover sei whale populations. These threats will be discussed in further detail in the *Environmental Baseline* section (Section 10) of this opinion. See the 2011 Final Recovery Plan for the sei whale for complete downlisting/delisting criteria for both of the following recovery goals.

1. Achieve sufficient and viable populations in all ocean basins.
2. Ensure significant threats are addressed.

9.15 Southern Right Whale

Southern right whales are a large baleen whale species distributed in the Southern Hemisphere worldwide from 20 to 60° South (Figure 45).

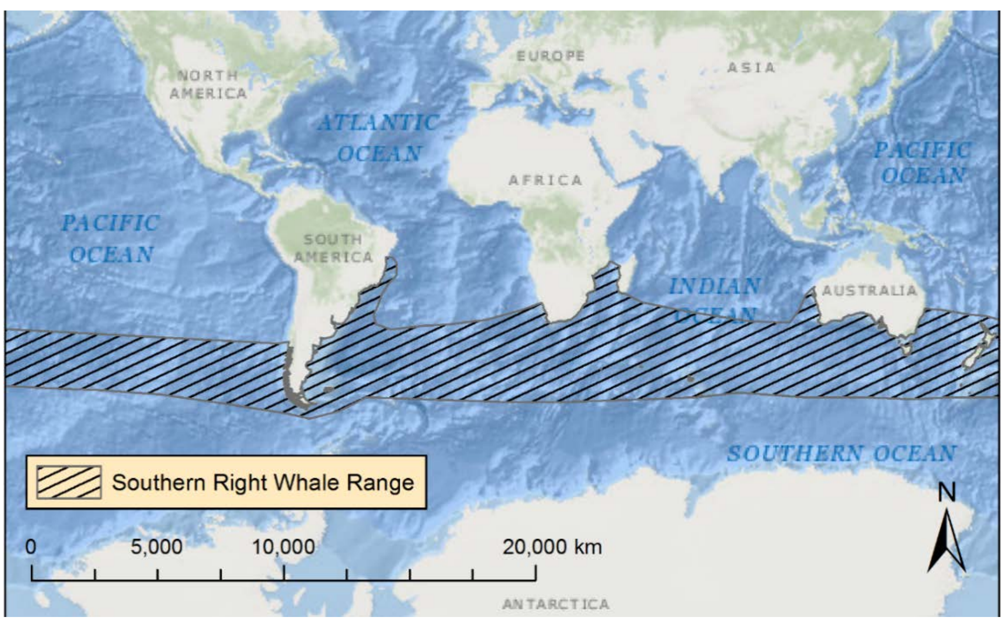

Figure 45. Map identifying the range of the endangered Southern right whale.

Southern right whales have a stocky, black body lacking a dorsal fin and a large head covered in callosities. They range in length between 13 to 17 meters (43 to 56 feet), and weigh up to 54,431 kilograms (120,000 pounds). The Southern right whale was listed as endangered under the Endangered Species Preservation Act on June 2, 1970, and this listing was carried over when the ESA was enacted.

We used information available in the 2015 Status Review (NMFS 2015a) and the International Whaling Commission's 2012 Report on the Assessment of Southern Right Whales (IWC 2012b) to summarize the life history, population dynamics, and status of this species, as follows.

9.15.1 Life History

The lifespan of Southern right whales is currently unknown but likely similar to North Pacific and North Atlantic right whales, who are believed to live to around 50 years old. Females usually give birth to their first calf between eight and ten years old and gestation takes approximately one year. Offspring wean at approximately one year of age, and females reproduce every three to four years. Southern right whales feed during austral summer in high latitude feeding grounds in the Southern Ocean, where they use their baleen to "skim" copepods and krill from the water. Mating likely occurs in winter in the low latitude breeding and calving grounds.

9.15.2 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 Southern right whale.

In 2010, there were an estimated 15,000 Southern right whales worldwide; this is over twice the species estimate of 7,000 in 1997. The population structure for Southern right whales is uncertain, but some separation to the population level exists. Breeding populations can be delineate based on geographic region: South Africa, Argentina, Brazil, Peru and Chile, Australia, and New Zealand. Population estimates for all of the breeding populations are not available. There are about 3,500 Southern right whales in the Australia breeding population, about 4,000 in Argentina, 4,100 in South Africa, and 2,169 in New Zealand. Other smaller Southern right whale populations occur off Tristan da Cunha, South Georgia, Namibia, Mozambique and Uruguay, but not much is known about the population abundance of these groups.

The Australia, South Africa and Argentina breeding stocks of Southern right whales are increasing at an estimated seven percent annually. The Brazil breeding population is increasing, while the status of the Peru and Chile breeding population is unknown (NMFS 2015a). The New Zealand breeding population is showing signs of recovery; recent population modeling estimates the population growth rate at 5.6 percent (Davidson 2016). Juveniles in New Zealand show high apparent annual survival rates, between 0.87 and 0.95 percent (Carroll et al. 2016).

Mitochondrial DNA analysis of Southern right whales indicates at least 37 unique haplotypes and greater genetic diversity in the South Atlantic Ocean than in the Indo-Pacific Oceans (Patenaude et al. 2007). Females exhibit high site fidelity to calving grounds, restricting gene flow and establishing geographic breeding populations. Recent genetic testing reveals the possibility that individuals from different ocean basins are mixing on the Antarctic feeding grounds (Kanda et al. 2014).

Southern right whales are found in the Southern Hemisphere from temperate to polar waters, favoring shallow waters less than 20 meters (65.6 feet) deep. Southern right whales migrate between winter breeding areas in coastal waters of the South Atlantic, Pacific, and Indian Oceans from May to December and offshore summer (January through April) foraging locations in the Subtropical and Antarctic Convergence zones (Figure 45).

9.15.3 Vocalization and Hearing

Data on Southern right whale vocalizations indicates that they exhibit similar acoustic behavior to other right whales (Clark 1982; Matthews et al. 2001). Right whales vocalize to communicate over long distances and for social interaction, including communication apparently informing others of prey path presence (Biedron et al. 2005; Tyson and Nowacek 2005). Vocalization patterns amongst all right whale species are generally similar, with six major call types: scream, gunshot, blow, up call, warble, and down call (McDonald and Moore 2002; Parks and Tyack 2005). A large majority of vocalizations occur in the 300 to 600 Hertz range with up and down sweeping modulations (Vanderlaan et al. 2003). Vocalizations below 200 Hertz and above 900 Hertz were rare (Vanderlaan et al. 2003). Calls tend to be clustered, with periods of silence between clusters (Vanderlaan et al. 2003). Gunshot bouts last 1.5 hours on average and up to seven hours (Parks et al. 2012). Blows are associated with ventilation and are generally inaudible underwater (Parks and Clark 2007). Up calls are 100 to 400 Hertz (Gillespie and Leaper 2001). Gunshots appear to be largely or exclusively male vocalization (Parks et al. 2005).

Smaller groups vocalize more than larger groups and vocalization is more frequent at night (Matthews et al. 2001). Moans are usually produced within 10 meters (33 feet) of the surface (Matthews et al. 2001). Up calls were detected year-round in Massachusetts Bay except July and August and peaking in April (Mussoline et al. 2012). Individuals remaining in the Gulf of Maine through winter continue to call, showing a strong diel pattern of up call and gunshot vocalizations from November through January possibly associated with mating (Bort et al. 2011; Morano et al. 2012; Mussoline et al. 2012). Estimated source levels of gunshots in non-surface active groups are 201 dB re: 1 µPa peak-to-peak (Hotchkin et al. 2011). While in surface active groups, females produce scream calls and males produce up calls and gunshot calls as threats to other males; calves (at least female calves) produce warble sounds similar top their mothers' screams (Parks et al. 2003; Parks and Tyack 2005). Source levels for these calls in surface active groups range from 137 to 162 dB re: 1 µPa-m (rms), except for gunshots, which are 174 to 192 dB re: 1 µPa-m (rms) (Parks and Tyack 2005). Up calls may also be used to reunite mothers with calves (Parks and Clark 2007). North Atlantic right whales shift calling frequencies, particularly of up calls, as well as increase call amplitude over both long and short term periods due to exposure to vessel noise (Parks et al. 2005; Parks et al. 2006; Parks and Clark 2007; Parks et al. 2007; Parks et al. 2010; Parks et al. 2011b; Parks et al. 2012), particularly the peak frequency (Parks et al. 2009). North Atlantic right whales respond to anthropogenic sound designed to alert whales to vessel presence by surfacing (Nowacek et al. 2003; Nowacek et al. 2004).

There is no direct data on the hearing range of Southern right whales. However, based on anatomical modeling, the hearing range for North Atlantic right whales is predicted to be from 10 Hertz to 22 kiloHertz with functional ranges probably between 15 Hertz to 18 kiloHertz (Parks et al. 2007).

9.15.4 Status

Southern right whales underwent severe decline due to whaling during the 18th and 19th centuries (NMFS 2015a). In general, Southern right whale populations appear to be increasing at a robust rate. Nonetheless, the current population estimate (15,000) is still much less than the estimated 60,000 pre-whaling estimate (NHT 2005). Southern right whales are currently subject to many of the same anthropogenic threats other large whales face. In the Southern Hemisphere, Southern right whales are by far the most vessel struck cetacean, with at least 56 reported instances; nearly four-fold higher than the second most struck large whale (Van Waerebeek et al. 2007). Additional threats include declines in water quality, pollutant exposure and near shore habitat degradation from development. Reproductive success is influenced by krill availability on the feeding grounds; therefore, climatic shifts that change krill abundance may hinder the recovery of Southern right whales (Seyboth et al. 2016). Because populations appear to be increasing in size, the species appears to be somewhat resilient to current threats, but it has not recovered to pre-exploitation abundance.

9.15.5 Critical Habitat

No critical habitat has been designated for the Southern right whale. NMFS cannot designate critical habitat in foreign waters.

9.15.6 Recovery Goals

NMFS has not prepared a Recovery Plan for the Southern right whale. In general, ESA-listed species which occur entirely outside U.S. jurisdiction are not likely to benefit from recovery plans (55 FR 24296; June 15, 1990).

9.16 Sperm Whale

The sperm whale is a widely distributed species found in all major oceans (Figure 46).

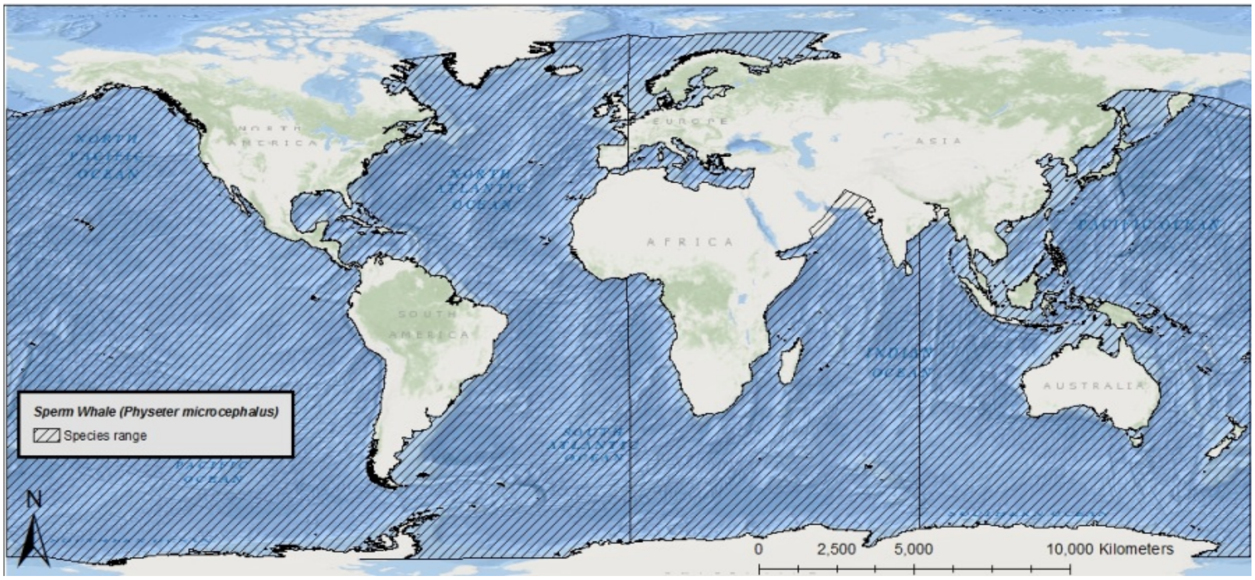

Figure 46: Map identifying the range of the endangered sperm whale.

Sperm whales are the largest toothed whale and distinguishable from other whales by its extremely large heard, which takes up to 25 to 35 percent of its total body length and a single blowhole asymmetrically situated on the left side of the head near the tip. The sperm whale was originally listed as endangered on December 2, 1970.

Information available from the recovery plan (NMFS 2010a), recent stock assessment reports (Carretta et al. 2017; Hayes et al. 2017; Muto et al. 2017), and status review (NMFS 2015b) were used to summarize the life history, population dynamics, and status of the species as follows.

9.16.1 Life History

The average lifespan of sperm whales is estimated to be at least 50 years (Whitehead 2009). They have a gestation period of one to one and a half years, and calves nurse for approximately two years. Sexual maturity is reached between seven and 13 years of age for females with an average calving interval for four to six years. Male sperm whales reach full sexual maturity in their twenties. Sperm whales mostly inhabit areas with a water depth of 600 meters (1,968 feet) or more, and are uncommon in waters less than 300 meters (984 feet) deep. They winter at low latitudes, where they calve and nurse, and summer at high latitudes, where they feed primarily on squid; other prey includes octopus and demersal fish (including teleosts and elasmobranchs).

9.16.2 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 sperm whale.

The sperm whale is the most abundant of the large whale species, with total abundance estimates between 200,000 and 1,500,000. The most recent estimate indicated a global population of between 300,000 and 450,000 individuals (Whitehead 2009). The higher estimates may be approaching population sizes prior to commercial whaling. There are no reliable estimates for sperm whale abundance across the entire Atlantic Ocean. However, estimates are available for two to three U.S. stocks in the Atlantic Ocean, the Northern Gulf of Mexico stock, estimated to consists of 763 individuals (N_{min}=560) and the North Atlantic stock, underestimated to consist of 2,288 individuals (N_{min}=1,815). There are insufficient data to estimate abundance for the Puerto Rico and U.S. Virgin Islands stock. In the northeast Pacific Ocean, the abundance of sperm whales was estimated to be between 26,300 and 32,100 in 1997. In the northeast Pacific Ocean, the abundance of sperm whales was estimated to be between 26,300 and 32,100 in 1997. In the eastern tropical Pacific Ocean, the abundance of sperm whales was estimated to be 22,700 (95 percent confidence intervals 14,800 to 34,600) in 1993. Population estimates are also available for two to three U.S. stocks that occur in the Pacific Ocean, the California/Oregon/Washington stock, estimated to consist of 2,106 individuals (N_{min}=1,332), and the Hawaii stock, estimated to consist of 3,354 individuals (N_{min}=2,539). There are insufficient data to estimate the population abundance of the North Pacific stock. We are aware of no reliable abundance estimates specifically for sperm whales in the South Pacific Ocean, and there is insufficient data to evaluate trends in abundance and growth rates of sperm whale populations at this time. There is insufficient data to evaluate trends in abundance and growth rates of sperm whales at this time.

Ocean-wide genetic studies indicate sperm whales have low genetic diversity, suggesting a recent bottleneck, but strong differentiation between matrilineally related groups (Lyrholm and Gyllensten 1998). Consistent with this, two studies of sperm whales in the Pacific Ocean indicate low genetic diversity (Mesnick et al. 2011; Rendell et al. 2012). Furthermore, sperm whales from the Gulf of Mexico, the western North Atlantic Ocean, the North Sea, and the Mediterranean Sea all have been shown to have low levels of genetic diversity (Engelhaupt et al. 2009). As none of the stocks for which data are available have high levels of genetic diversity, the species may be at some risk to inbreeding and 'Allee' effects, although the extent to which is currently unknown. Sperm whales have a global distribution and can be found in relatively deep waters in all ocean basins. While both males and females can be found in latitudes less than 40°, only adult males venture into the higher latitudes near the poles.

9.16.3 Vocalization and Hearing

Sound production and reception by sperm whales are better understood than in most cetaceans. Recordings of sperm whale vocalizations reveal that they produce a variety of sounds, such as clicks, gunshots, chirps, creaks, short trumpets, pips, squeals, and clangs (Goold 1999). Sperm whales typically produce short duration repetitive broadband clicks with frequencies below 100 Hertz to greater than 30 kiloHertz (Watkins 1977) and dominant frequencies between 1 to 6 kiloHertz and 10 to 16 kiloHertz. Another class of sound, "squeals," are produced with frequencies of 100 Hertz to 20 kiloHertz (e.g., Weir et al. 2007). The source levels of clicks can reach 236 dB re: 1 µPa at 1 meter, although lower source level energy has been suggested at around 171 dB re: 1 µPa at 1 m (Weilgart and Whitehead 1993; Goold and Jones 1995; Weilgart and Whitehead 1997; Mohl et al. 2003). Most of the energy in sperm whale clicks is concentrated at around 2 to 4 kiloHertz and 10 to 16 kiloHertz (Weilgart and Whitehead 1993; Goold and Jones 1995). The clicks of neonate sperm whales are very different from typical clicks of adults in that they are of low directionality, long duration, and low frequency (between 300 Hertz and 1.7 kiloHertz) with estimated source levels between 140 to 162 dB re: 1 µPa at 1 meter (Madsen et al. 2003). The highly asymmetric head anatomy of sperm whales is likely an adaptation to produce the unique clicks recorded from these animals (Norris and Harvey 1972).

Long, repeated clicks are associated with feeding and echolocation (Whitehead and Weilgart 1991; Weilgart and Whitehead 1993; Goold and Jones 1995; Weilgart and Whitehead 1997; Miller et al. 2004). Creaks (rapid sets of clicks) are heard most frequently when sperm whales are foraging and engaged in the deepest portion of their dives, with inter-click intervals and source levels being altered during these behaviors (Miller et al. 2004; Laplanche et al. 2005). Clicks are also used during social behavior and intragroup interactions (Weilgart and Whitehead 1993). When sperm whales are socializing, they tend to repeat series of group-distinctive clicks (codas), which follow a precise rhythm and may last for hours (Watkins and Schevill 1977). Codas are shared between individuals in a social unit and are considered to be primarily for intragroup communication (Weilgart and Whitehead 1997; Rendell and Whitehead 2004). Research in the South Pacific Ocean suggests that in breeding areas the majority of codas are produced by mature females (Marcoux et al. 2006). Coda repertoires have also been found to vary geographically and are categorized as dialects (Weilgart and Whitehead 1997; Pavan et al. 2000). For example, significant differences in coda repertoire have been observed between sperm whales in the Caribbean Sea and those in the Pacific Ocean (Weilgart and Whitehead 1997). Three coda types used by male sperm whales have recently been described from data collected over multiple years: these codas are associated with dive cycles, socializing, and alarm (Frantzis and Alexiadou 2008).

Our understanding of sperm whale hearing stems largely from the sounds they produce. The only direct measurement of hearing was from a young stranded individual from which auditory evoked potentials were recorded (Carder and Ridgway 1990). From this whale, responses support a hearing range of 2.5 to 60 kiloHertz and highest sensitivity to frequencies between 5 to 20 kiloHertz. Other hearing information consists of indirect data. For example, the anatomy of the sperm whale’s inner and middle ear indicates an ability to best hear high-frequency to ultrasonic hearing (Ketten 1992). The sperm whale may also possess better low-frequency hearing than other odontocetes, although not as low as many baleen whales (Ketten 1992). Reactions to anthropogenic sounds can provide indirect evidence of hearing capability, and several studies have made note of changes seen in sperm whale behavior in conjunction with these sounds. For example, sperm whales have been observed to frequently stop echolocating in the presence of underwater pulses made by echosounders and submarine sonar (Watkins and Schevill 1975; Watkins et al. 1985). In the Caribbean Sea, Watkins et al. (1985) observed that sperm whales exposed to 3.25 to 8.4 kiloHertz pulses (presumed to be from submarine sonar) interrupted their activities and left the area. Similar reactions were observed from artificial sound generated by banging on a boat hull (Watkins et al. 1985). André et al. (1997) reported that foraging whales exposed to a 10 kiloHertz pulsed signal did not ultimately exhibit any general avoidance reactions: when resting at the surface in a compact group, sperm whales initially reacted strongly, and then ignored the signal completely. Thode et al. (2007) observed that the acoustic signal from the cavitation of a fishing vessel's propeller (110 dB re: 1 μPa^2-s between 250 Hertz and one kiloHertz) interrupted sperm whale acoustic activity and resulted in the animals converging on the vessel. Sperm whales have also been observed to stop vocalizing for brief periods when codas are being produced by other individuals, perhaps because they can hear better when not vocalizing themselves (Goold and Jones 1995). Because they spend large amounts of time at depth and use low frequency sound, sperm whales are likely to be susceptible to low frequency sound in the ocean (Croll et al. 1999). Nonetheless, sperm whales are considered to be part of the mid-frequency marine mammal hearing group, with a hearing range between 150 Hertz and 160 kiloHertz (NOAA 2018).

9.16.4 Status

The sperm whale is endangered as a result of past commercial whaling. Although the aggregate abundance worldwide is probably at least several hundred thousand individuals, the extent of depletion and degree of recovery of populations are uncertain. Commercial whaling is no longer allowed, however, illegal hunting may occur at biologically unsustainable levels. Continued threats to sperm whale populations include ship strikes, entanglement in fishing gear, competition for resources due to overfishing, population, loss of prey and habitat due to climate change, and noise. The species' large population size shows that it is somewhat resilient to current threats.

9.16.5 Critical Habitat

No critical habitat has been designated for the sperm whale.

9.16.6 Recovery Goals

In response to the current threats facing the species, NMFS developed goals to recover sperm whale populations. These threats will be discussed in further detail in the *Environmental Baseline* section (Section 10) of this opinion. See the 2010 Final Recovery Plan for the sperm whale for complete downlisting/delisting criteria for both of the following recovery goals.

1. Achieve sufficient and viable populations in all ocean basins.

Ensure significant threats are addressed.

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).

A number of human activities have contributed to the status of populations of ESA-listed cetaceans in the action area. Some human activities are ongoing and appear to continue to affect cetacean populations in the action areas for this consultation. Some of these activities, most notably commercial whaling, occurred extensively in the past and continue at low levels that no longer appear to significantly affect cetacean populations, although the effects of past reductions in numbers persist today. The following discussion summarizes these impacts, which include climage change, oceanic temperature regimes, whaling and subsistence harvest, vessel strikes, whale watching, fisheries (fisheries interactions and aquaculture), pollution (marine debris, pesticides and contaminants, and hydrocarbons), aquatic nuisance species, sound (vessel sound and commercial shipping, aircraft, seismic surveys, and marine construction), military activities, and scientific research activities.

10.1 Climage Change

There is a large and growing body of literature on past, present, and future impacts of global climate change, exacerbated and accelerated by human activities. Effects of climate change include sea level rise, increased frequency and magnitude of severe weather events, changes in air and water temperatures, and changes in precipitation patterns, all of which are likely to impact ESA resources. NOAA's climate information portal provides basic background information on these and other measured or anticipated climate change effects (see https://www.climate.gov).

In order to evaluate the implications of different climate outcomes and associated impacts throughout the 21^{st} century, many factors have to be considered. The amount of future greenhouse gas emissions is a key variable. Developments in technology, changes in energy generation and land use, global and regional economic circumstances, and population growth must also be considered.

A set of four scenarios was developed by the Intergovernmental Panel on Climate Change (IPCC) to ensure that starting conditions, historical data, and projections are employed consistently across the various branches of climate science. The scenarios are referred to as representative concentration pathways (RCPs), which capture a range of potential greenhouse gas emissions pathways and associated atmospheric concentration levels through 2100 (IPCC 2014). The RCP scenarios drive climate model projections for temperature, precipitation, sea level, and other variables: RCP2.6 is a stringent mitigation scenario; RCP2.5 and RCP6.0 are intermediate scenarios; and RCP8.5 is a scenario with no mitigation or reduction in the use of fossil fuels. The IPCC future global climate predictions (2014 and 2018) and national and regional climate predictions included in the Fourth National Climate Assessment for U.S. states and territories (2018) use the RCP scenarios.

The increase of global mean surface temperature change by 2100 is projected to be 0.3 to 1.7 degrees Celsius under RCP2.6, 1.1 to 2.6 degrees Celsius under RCP 4.5, 1.4 to 3.1 degrees Celsius under RCP6.0, and 2.6 to 4.8 degrees Celsius under RCP8.5 with the Arctic region warming more rapidly than the global mean under all scenarios (IPCC 2014). The Paris

Agreement aims to limit the future rise in global average temperature to 2 degrees Celsius, but the observed acceleration in carbon emissions over the last 15 to 20 years, even with a lower trend in 2016, has been consistent with higher future scenarios such as RCP8.5 (Hayhoe et al. 2018).

The globally-averaged combined land and ocean surface temperature data, as calculated by a linear trend, show a warming of approximately 1.0 degree Celsius from 1901 through 2016 (Hayhoe et al. 2018). The IPCC Special Report on the Impacts of Global Warming (2018) (IPCC 2018) noted that human-induced warming reached temperatures between 0.8 and 1.2 degrees Celsius above pre-industrial levels in 2017, likely increasing between 0.1 and 0.3 degrees Celsius per decade. Warming greater than the global average has already been experienced in many regions and seasons, with most land regions experiencing greater warming than over the ocean (IPCC 2018). Annual average temperatures have increased by 1.8 degrees Celsius across the contiguous U.S. since the beginning of the 20th century with Alaska warming faster than any other state and twice as fast as the global average since the mid-20th century (Jay et al. 2018). Global warming has led to more frequent heatwaves in most land regions and an increase in the frequency and duration of marine heatwaves (IPCC 2018). Average global warming up to 1.5 degrees Celsius as compared to pre-industrial levels is expected to lead to regional changes in extreme temperatures, and increases in the frequency and intensity of precipitation and drought (IPCC 2018).

Several of the most important threats contributing to the extinction risk of ESA-listed species, particularly those with a calcium carbonate skeleton such as corals and mollusks as well as species for which these animals serve as prey or habitat, are related to global climate change. The main concerns regarding impacts of global climate change on coral reefs and other calcium carbonate habitats generally, and on ESA-listed corals and mollusks in particular, are the magnitude and the rapid pace of change in greenhouse gas concentrations (e.g., carbon dioxide and methane) and atmospheric warming since the Industrial Revolution in the mid-19th century. These changes are increasing the warming of the global climate system and altering the carbonate chemistry of the ocean [ocean acidification; (IPCC 2014)]. As carbon dioxide concentrations increase in the atmosphere, more carbon dioxide is absorbed by the oceans, causing lower pH and reduced availability of calcium carbonate. Because of the increase in carbon dioxide and other greenhouse gases in the atmosphere since the Industrial Revolution, ocean acidification has already occurred throughout the world's oceans, including in the Caribbean, and is predicted to increase considerably between now and 2100 (IPCC 2014).

The Atlantic Ocean appears to be warming faster than all other ocean basins except perhaps the southern oceans (Cheng et al. 2017). In the western North Atlantic Ocean surface temperatures have been unusually warm in recent years (Blunden and Arndt 2016). A study by (Polyakov et al. 2009) suggests that the North Atlantic Ocean overall has been experiencing a general warming trend over the last 80 years of 0.031±0.0006 degrees Celsius per decade in the upper 2,000 meters (6,561.7 feet) of the ocean. 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). Since the early 1980s, the annual minimum sea ice extent (observed in September each year) in the Arctic Ocean has decreased at a rate of 11 to 16 percent per decade (Jay, Reidmiller et al. 2018). 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, tropical storms, heat waves, and droughts (IPCC 2014).

Climate change has the potential to impact species abundance, geographic distribution, migration patterns, and susceptibility to disease and contaminants, as well as the timing of seasonal activities and community composition and structure (MacLeod et al. 2005; Robinson et al. 2005; Kintisch 2006; Learmonth et al. 2006; McMahon and Hays 2006; Evans and Bjørge 2013; IPCC 2014. Though predicting the precise consequences of climate change on highly mobile marine species is difficult (Simmonds and Isaac 2007), recent research has indicated a range of consequences already occurring. For example, in sea turtles, sex is determined by the ambient sand temperature (during the middle third of incubation) with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25 to 35 degrees Celsius (Ackerman 1997). Increases in global temperature could skew future sex ratios toward higher numbers of females (NMFS and USFWS 2007a; NMFS and USFWS 2007b; NMFS and USFWS 2013a; NMFS and USFWS 2013b; NMFS and USFWS 2015). These impacts will be exacerbated by sea level rise. The loss of habitat because of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as an increase in the frequency of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Antonelis et al. 2006; Baker et al. 2006).

Changes in the marine ecosystem caused by global climate change (e.g., ocean acidification, salinity, oceanic currents, dissolved oxygen levels, nutrient distribution) could influence the distribution and abundance of lower trophic levels (e.g., phytoplankton, zooplankton, submerged aquatic vegetation, crustaceans, mollusks, forage fish), ultimately affecting primary foraging areas of ESA-listed species including marine mammals, sea turtles, and fish. 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. They 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 turtles were predicted to gain core habitat area, whereas loggerhead turtles and blue whales were predicted to experience losses in available core habitat. McMahon and Hays (2006) predicted increased ocean temperatures will expand the distribution of leatherback 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 will be affected by climate change, with 47 percent predicted to experience unfavorable conditions (e.g., range contraction). (Willis-Norton et al. 2015) acknowledged there will be both habitat loss and gain, but overall climate change could result in a 15 percent loss of core pelagic habitat for leatherback turtles in the eastern South Pacific Ocean.

Similarly, climate-related changes in important prey species populations are likely to affect predator populations. For example, blue whales, as predators that specialize in eating krill, are likely to change their distribution in response to changes in the distribution of krill (Payne et al. 1986; Payne et al. 1990; Clapham et al. 1999). Pecl and Jackson (2008) predicted climate change will likely result in squid that hatch out smaller and earlier, undergo faster growth over shorter life-spans, and mature younger at a smaller size. This could have negative consequences for species such as sperm whales, whose diets can be dominated by cephalopods. For ESA-listed species that undergo long migrations, if either prey availability or habitat suitability is disrupted by changing ocean temperatures regimes, the timing of migration can change or negatively impact population sustainability (Simmonds and Eliott 2009).

This review provides some examples of impacts to ESA-listed species and their habitats that may occur as the result of climate change. While it is difficult to accurately predict the consequences of climate change to a particular species or habitat, a range of consequences are expected that are likely to change the status of the species and the condition of their habitats.

10.2 Oceanic Temperature Regimes

Oceanographic conditions in the Atlantic and Pacific Oceans can be altered due to periodic shifts in atmospheric patterns caused by the Southern oscillation in the Pacific Ocean, which leads to El Niño and La Niña events, the Pacific decadal oscillation, and the North Atlantic oscillation. These climatic events can alter habitat conditions and prey distribution for ESA-listed species in the action area (Beamish 1993; Mantua et al. 1997; Hare and Mantua 2001; Benson and Trites 2002; Stabeno et al. 2004; Mundy 2005; Mundy and Cooney 2005). For example, decade-scale climatic regime shifts have been related to changes in zooplankton in the North Atlantic Ocean (Fromentin and Planque 1996), and decadal trends in the North Atlantic oscillation (Hurrell 1995) can affect the position of the Gulf Stream (Taylor et al. 1998) and other circulation patterns in the North Atlantic Ocean that act as migratory pathways for various marine species, especially fish.

The North Atlantic oscillation is a large-scale, dynamic phenomenon that exemplifies the relationship between the atmosphere and the ocean. The North Atlantic oscillation has global significance as it affects sea surface temperatures, wind conditions, and ocean circulation of the North Atlantic Ocean (Stenseth et al. 2002). The North Atlantic oscillation is an alteration in the intensity of the atmospheric pressure difference between the semi-permanent high-pressure center over the Azores Islands and the sub-polar low-pressure center over Iceland (Stenseth et al. 2002). Sea-level atmospheric pressure in the two regions tends to vary in a “see-saw” pattern – when the pressure increases in Iceland it decreases in the Azores and vice-versa (i.e., the two systems tend to intensity or weaken in synchrony). The North Atlantic oscillation is the dominant mode of decadal-scale variability in weather and climate in the North Atlantic Ocean region (Hurrell 1995).

Since ocean circulation is wind and density driven, it is not surprising to find that the North Atlantic oscillation appears to have a direct effect on the position and strength of important North Atlantic Ocean currents. The North Atlantic oscillation influences the latitude of the Gulf Stream Current and accounts for a great deal of the interannual variability in the location of the current; in years after a positive North Atlantic oscillation index, the north wall of the Gulf Stream (south of New England) is located farther north (Taylor et al. 1998). Not only is the location of the Gulf Stream Current and its end-member, the North Atlantic Current, affected by the North Atlantic oscillation, but the strength of these currents is also affected. During negative North Atlantic oscillation years, the Gulf Stream System (i.e., Loop, Gulf Stream, and North Atlantic Currents) not only shifted southward but weakened, as witnessed during the predominantly negative North Atlantic oscillation phase of the 1960s; during the subsequent 25-year period of predominantly positive North Atlantic oscillation, the currents intensified to a record peak in transport rate, reflecting an increase of 25 to 33 percent (Curry and McCartney 2001). The location and strength of the Gulf Stream System are important, as this major current system is an essential part of the North Atlantic climate system, moderating temperatures and weather from the U.S. to Great Britain and even the Mediterranean Sea region. Pershing et al. (Pershing et al. 2001) also found that the upper slope-water system off the east coast of the U.S. was affected by the North Atlantic oscillation and was driven by variability in temperature and transport of the Labrador Current. During low North Atlantic oscillation periods, especially that seen in the winter of 1996, the Labrador Current intensified, which led to the advance of cold slope water along the continental shelf as far south as the mid-Atlantic Bight in 1998 (Pershing et al. 2001; Greene and Pershing 2003). Variability in the Labrador Current intensity is linked to the effects of winter temperatures in Greenland and its surroundings (e.g., Davis Strait, Denmark Strait), on sea-ice formation, and the relative balance between the formation of deep and intermediate water masses and surface currents.

A strong association has been established between the variability of the North Atlantic oscillation and changes affecting various trophic groups in North Atlantic marine ecosystems on both the eastern and western sides of the basin (Fromentin and Planque 1996; Drinkwater et al. 2003). For example, the temporal and spatial patterns of *Calanus* copepods (zooplankton) were the first to be linked to the phases of the North Atlantic oscillation (Fromentin and Planque 1996; Stenseth et al. 2002). When the North Atlantic oscillation index was positive, the abundance of *Calanus* copepods in the Gulf of Maine increased, with the inverse true in years when the North Atlantic oscillation index was negative (Conversi et al. 2001; Greene et al. 2003b). This pattern is opposite off the European coast (Fromentin and Planque 1996). Such a shift in copepod patterns has a tremendous significance to upper-trophic-level species, including the North Atlantic right whale, which feeds principally on *Calanus finmarchicus*. North Atlantic right whale calving rates are linked to the abundance of *Calanus finmarchicus*; when the abundance is high, the calving rate remains stable but fell in the late 1990s when the abundance of its favored copepod also declined (Greene et al. 2003b). When the North Atlantic oscillation index is low with subsequently warmer water temperatures off Labrador and the Scotian Shelf, recruitment of cod is higher; direct links to the North Atlantic oscillation phase have also been found for recruitment in the North Atlantic of herring, two tuna species, Atlantic salmon (*Salmo salar*), and swordfish (*Xiphias gladius*) (Drinkwater et al. 2003).

The Pacific decadal oscillation is the leading mode of variability in the North Pacific and operates over longer periods than either El Niño or La Niña/Southern Oscillation events and is capable of altering sea surface temperature, surface winds, and sea level pressure (Mantua and Hare 2002; Stabeno et al. 2004). During positive Pacific decadal oscillations, the northeastern Pacific experiences above average sea surface temperatures while the central and western Pacific Ocean undergoes below-normal sea surface temperatures (Royer 2005). Warm Pacific decadal oscillation regimes, as occurs in El Niño events, tends to decrease productivity along the U.S. west coast, as upwelling typically diminishes (Hare et al. 1999; Childers et al. 2005). Recent sampling of oceanographic conditions just south of Seward, Alaska has revealed anomalously cold conditions in the Gulf of Alaska from 2006 through 2009, suggesting a shift to a colder Pacific decadal oscillation phase. More research needs to be done to determine if the region is indeed shifting to a colder Pacific decadel oscillation phase in addition to what effects these phase shifts have on the dynamics of prey populations important to ESA-listed cetaceans throughout the Pacific action area. A shift to a colder decadal oscillation phase would be expected to impact prey populations, although the magnitude of this effect is uncertain.

The Indian Ocean Dipole, which is also known as the Indian Niño, is an irregular oscillation of sea surface temperature in which the western Indian Ocean becomes alternately warmer and then colder than the eastern part of the ocean (Saji et al. 1999). The Indian Ocean dipole, only identified recently in 1999, is one aspect of the general cycle of global climate, interacting with similar phenomena like the El Niño Southern Oscillation in the Pacific Ocean. As in the Pacific decadal oscillation and North Atlantic oscillation, the Indian Ocean dipole fluctuates between phases of positive, negative, and neutral conditions. During a positive Indian Ocean dipole, the western Indian Ocean experiences higher than normal sea surface temperature and greater precipitation while cooler sea surface temperature occur in the eastern Indian Ocean, often leading to droughts on land in the region (Saji et al. 1999). The negative phase of the Indian Ocean dipole brings about the opposite conditions, with warmer sea surface temperatures and greater precipitation in the eastern Indian Ocean and cooler and drier conditions in the western Indian Ocean. The Indian Ocean dipole also affects the strength of monsoons over the Indian subcontinent. An average of four positive and negative Indian Ocean dipole events occurs during each 30-year period, with each Indian Ocean dipole event lasting about six months. However, since 1980 there have been 12 positive Indian Ocean dipoles with no negative Indian Ocean dipole events from 1992 until late in 2010, when a strong negative event began (Nakamura et al. 2009). This strong negative Indian Ocean dipole event coupled with a strong La Niña event in the western Pacific Ocean to cause catastrophic flooding in parts of Australia. In 1998, an El

Niño even interacted with a positive Indian Ocean dipole event with devastating effect on Western Indian Ocean corals: 75 to 99 percent of live corals were lost in the western Indian Ocean during this event (Graham et al. 2006).

In addition to period variation in weather and climate patterns that affect oceanographic conditions in the action area, longer terms trends in climate change and/or variability also have the potential to alter habitat conditions suitable for ESA-listed species in the action area on a much longer time scale. For example, from 1906 through 2006, global surface temperatures have risen 0.74degrees Celsius and this trend is continuing at an accelerating pace. Twelve of the warmest years on record since 1850 have occurred since 1995 (Poloczanska et al. 2009). Possible effects of this trend in climate change and/or variability for ESA-listed marine species in the action area include the alteration of community composition and structure, changes to migration patterns or community structure, changes to species abundance, increased susceptibility to disease and contaminants, and altered timing of breeding and nesting (MacLeod et al. 2005; Robinson et al. 2005; Kintisch 2006; Learmonth et al. 2006; McMahon and Hays 2006). Climate change can influence reproductive success by altering prey availability, as evidenced by the low success of Northern elephant seals (*Mirounga angustirostris*) during El Niño periods (McMahon and Burton 2005) as well as data suggesting that sperm whale females have lower rates of conception following periods of unusually warm sear surface temperature (Whitehead et al. 1997). However, gaps in information and the complexity of climatic interactions complicate the ability to predict the effects that climate change and/or variability may have to these species from year to year in the action area (Kintisch 2006; Simmonds and Isaac 2007).

10.3 Whaling and Subsistence Harvesting

Large whale population numbers in the action area have historically been impacted by aboriginal hunting and early commercial exploitation, and some stocks were already reduced by 1864 (the beginning of the era of modern commercial whaling using harpoon guns as opposed to harpoons simply thrown by men). From 1864 through 1985, at least 2.4 million baleen whales (excluding minke whales and sperm whales) were killed (Gambell 1999). The large number of baleen whales harvested during the 1930s and 1940s has been shown to correspond to increased cortisol levels in earplugs collected from baleen whales, suggesting that anthropogenic activities, such as those associated with whaling, may contribute to increased stress levels in whales (Trumble et al. 2018). Prior to current prohibitions on whaling most large whale species were significantly depleted to the extent it was necessary to list them as endangered under the Endangered Species Preservation Act of 1966. In 1982, the International Whaling Commission issued a moratorium on commercial whaling beginning in 1986. There is currently no legal commercial whaling by International Whaling Commission Member Nations party to the moratorium; however, whales are still killed commercially by countries that field objections to the moratorium (i.e., Iceland and Norway). Presently three types of whaling take place: (1) aboriginal subsistence whaling to support the needs of indigenous people; (2) special permit whaling; and (3) commercial whaling conducted either under objection or reservation to the moratorium. The reported catch and catch limits of large whale species from aboriginal subsistence whaling, special permit whaling, and commercial whaling can be found on the International Whaling Commission's website at: https://iwc.int/whaling. The Japanese whaling fleet left the International Whaling Commission in December 2018 and plans to resume commercial whaling in July 2019.

Norway and Iceland take whales commercially at present, either under objection to the moratorium decision or under reservation to it. These countries establish their own catch limits but must provide information on those catches and associated scientific data to the International Whaling Commission. The Russian Federation has also registered an objection to the moratorium decision but does not exercise it. The moratorium is binding on all other members of the International Whaling Commission. Norway takes minke whales in the North Atlantic Ocean within its Exclusive Economic Zone, and Iceland takes minke whales and fin whales in the North Atlantic Ocean, within its Exclusive Economic Zone (IWC 2012a).

Under current International Whaling Commission regulations, aboriginal subsistence whaling is permitted for Denmark (Greenland, fin and minke whales, *Balaenoptera* spp.), the Russian Federation (Siberia, gray, and bowhead whales), St. Vincent and the Grenadines (Bequia, humpback whales) and the U.S. (Alaska, bowhead, and gray whales). It is the responsibility of national governments to provide the International Whaling Commission with evidence of the cultural and subsistence needs of their people. The Scientific Committee provides scientific advice on safe catch limits for such stocks (IWC 2012a). Based on the information on need and scientific advice, the International Whaling Commission then sets catch limits, recently in five-year blocks.

Scientific permit whaling has been conducted by Japan and Iceland. In Iceland, the stated overall objective of the research program was to increase understanding of the biology and feeding ecology of important cetacean species in Icelandic waters for improved management of living and marine resources based on an ecosystem approach. While Iceland state that its program was intended to strengthen the basis for conservation and sustainable use of cetaceans, it noted that it was equally intended to form a contribution to multi-species management of living resources in Icelandic waters. Although these whaling activities operate outside of the action area, the whales killed in these whaling expeditions are part of the populations of whales (e.g., fin, sei, and sperm) occurring within the action area for this consultation.

Most current whaling activities occur outside of the study areas, but within the overall action area. Regardless, prior exploitation is likely to have altered population structure and social cohesion of all whale species within the action area, such that effects on abundance and recruitment continued for years after harvesting has ceased. ESA-listed whale mortalities since 1985 resulting from these activities can be seen below in Table 17 (IWC 2017a; IWC 2017b; IWC 2017c).

Table 17. Endangered Species Act-listed whale mortalities as the result of whaling since 1985.

Species	Commercial Whaling	Scientific Research	Subsistence
Blue Whale	-- --	-- --	-- --
Bowhead Whale	-- --	-- --	1,650
Bryde’s Whale	634	734	-- --
False Killer Whale	-- --	-- --	-- --
Fin Whale	706	310	385
Gray Whale	-- --	-- --	3,907
Humpback Whale	-- --	-- --	123
North Atlantic Right Whale	-- --	-- --	-- --
North Pacific Right Whale	-- --	-- --	-- --
Sei Whale	-- --	1,563	3
Southern Right Whale	-- --	-- --	-- --
Sperm Whale	388	56	-- --

Many of the whaling numbers reported represent minimum catches, as illegal or underreported catches are not included. For example, recently uncovered Union of Soviet Socialists Republics catch records indicate extensive illegal whaling activity between 1948 and 1979 (Ivashchenko et al. 2014). Additionally, despite the moratorium on large-scale commercial whaling, catch of some of these species still occurs in the Atlantic, Pacific, and Southern Oceans whether it be under objection of the International Whaling Commission, for aboriginal subsistence purposes, or under International Whaling Commission scientific permit 1985 through 2013. Some of the whales killed in these fisheries are likely part of the same population of whales occurring within the action area for this consultation.

Historically, commercial whaling caused all of the large whale species to decline to the point where they faced extinction risks high enough to list them as endangered species. Since the end of large-scale commercial whaling, the primary threat to the species has been eliminated. Many whale species have not yet fully recovered from those historic declines. Scientists cannot determine if those initial declines continue to influence current populations of most large whale species in the Artic, Atlantic, Indian, Pacific, and Southern Oceans. For example, the North Atlantic right whale and North Pacific right whale have not recovered from the effects of commercial whaling and continue to face very high risks of extinction because of their small population sizes and low population growth rates. In contrast, populations of species such as the humpback whale have increased substantially from post-whaling population levels and appear to be recovering despite the impacts of vessel strikes, interactions with fishing gear, and increased levels of ambient sound.

10.4 Vessel Strikes

Vessel strikes are considered a serious and widespread threat to ESA-listed cetaceans (especially large whales) and are the most well-documented "marine road" interaction with large whales (Pirotta et al. 2019). This threat is increasing as commercial shipping lanes cross important breeding and feeding habitats and as whale populations recover and populate new areas or areas where they were previously extirpated (Swingle et al. 1993; Wiley et al. 1995). As vessels become faster and more widespread, an increase in vessel interactions with cetaceans is to be expected. The vast majority of commercial vessel strike mortalities of cetaceans are likely undocumented, as most may not be reported. Most whales killed by vessel strike end up sinking rather than washing up on shore. Kraus et al. (2005) estimated that 17 percent of vessel strikes are actually detected. Of 11 species of cetaceans known to be threatened by vessel strikes, fin whales are the mostly commonly struck species (Laist et al. 2001; Vanderlaan and Taggart 2007). While any vessel has the potential to hit whales, in most cases, lethal or severe injuries are caused by vessels 80 meters (262.5 feet) in length or greater, traveling 25.9 kilometers per hour (14 knots) or faster (Laist et al. 2001). Vessel traffic within the action areas can come from both private (e.g., commercial, recreational) and federal vessel (e.g., military, research), but traffic that is most likely to result in vessel strikes comes from commercial shipping.

The potential lethal effects of vessel strikes are particularly profound on species with low abundance. However, all whale species have the potential to be affected by vessel strikes. The latest five-year average mortalities and serious injuries related to vessel strikes for the ESA-listed cetacean stocks within U.S. waters likely to be found in the action areas and experience adverse effects as a result of the proposed action are given in Table 18 below (Carretta et al. 2016a; Henry et al. 2016; Carretta et al. 2017; Helker et al. 2017). Data are broken down by ocean basin/NMFS stock areas and represent only known mortalities and serious injuries. It is probable that more undocumented mortalities and serious injuries for these and other stocks found within the action areas have occurred.

Table 18. Five-year annual average mortalities and serious injuries related to vessel strikes for Endangered Species Act-listed marine mammals within the action area.

Species	Pacific Stock	Hawaii Stock	Alaska Stock	Gulf of Mexico Stock	Western North Atlantic Stock
Blue Whale	0.6	NA	NA	NA	0
Bowhead Whale	NA	NA	NA	NA	NA
Bryde's Whale	NA	NA	NA	0.8	NA

False Killer Whale – Main Hawaiian Island insular DPS	NA	NA	NA	NA	NA
Fin Whale	1.8	NA	0.4	NA	1.6
Gray Whale	0	NA	NA	NA	NA
Humpback Whale– Multiple ESA-listed DPSs	1	2.4	0.4	NA	NA
North Atlantic Right Whale	NA	NA	NA	NA	0.81
North Pacific Right Whale	0	NA	NA	NA	NA
Sei Whale	0	NA	NA	NA	NA
Southern Right Whale	NA	NA	NA	NA	NA
Sperm Whale	0	NA	0	0	0.2

DPS=Distinct Population Segment
NA=Not Applicable

10.5 Whale Watching

Whale watching is a rapidly-growing business with more than 3,300 operators worldwide, serving 13 million participants in 119 countries and territories (O'Connor et al. 2009). As of 2010, commercial whale watching was a one billion dollar global industry per year (Lambert et al. 2010). Private vessels may partake in this activity as well. NMFS has issued regulations and guidelines relevant to whale watching. As noted previously, many of the cetaceans considered in this opinion are highly migratory, so may also be exposed to whale watching activity occurring outside of the action area.

Although considered by many to be a non-consumptive use of marine mammals with economic, recreational, educational and scientific benefits, whale watching is not without potential negative impacts (reviewed in Parsons 2012). Whale watching has the potential to harass whales by altering feeding, breeding, and social behavior, or even injure them if the vessel gets too close or strikes the animal. Preferred habitats may be abandoned if disturbance levels are too high. Animals may also become more vulnerable to vessel strikes if they habituate to vessel traffic (Swingle et al. 1993; Wiley et al. 1995).

Several studies have examined the short-term effects of whale watching vessels on marine mammals (Watkins 1986; Corkeron 1995; Au and Green 2000; Felix 2001; Erbe 2002b; Magalhaes et al. 2002; Williams et al. 2002; Richter et al. 2003; Scheidat et al. 2004; Simmonds 2005). A whale's behavioral responses to whale watching vessels depended on the distance of the vessel from the whale, vessel speed, vessel direction, vessel sound, and the number of vessels. In some circumstances, whales do not appear to respond to vessels, but in other circumstances, whales change their vocalizations, surface time, swimming speed, swimming angle or direction, respiration rates, dive times, feeding behavior, and social interactions. Disturbance by whale watch vessels has also been noted to cause newborn calves to separate briefly from their mother's sides, which leads to greater energy expenditures by the calves (NMFS 2006).

Although numerous short-term behavioral responses to whale watching vessels were documented, little information is available on whether long-term negative effects result from whale watching (NMFS 2006). Christiansen et al. (2014) estimated that cumulative time minke whales spent with whale watching boats in Iceland to assess the biological significance of whale watching disturbances and found that, through some whales were repeatedly exposed to whale watching boats throughout the feeding season, the estimated cumulative time they spent with boats was very low. Christiansen et al. (2014) suggested that the whale watching industry, in its current state, is likely not having any long-term negative effects on vital rates.

It is difficult to precisely quantify or estimate the magnitude of the risks posed to marine mammals in general from vessel approaches associated with whale watching. Given the proposed research activities will occur primarily in focal areas (U.S. Navy training and testing activity areas or offshore energy and construction activity areas) of the Western Atlantic Ocean, Gulf of Mexico, Caribbean Sea, Sargasso Sea, Pacific Ocean, and the Gulf of Alaska, but may occur in international and foregin waters at distances to and esceeding 370 kilometers (200 nautical miles), few (if any) whale watching vessels will be expected to co-occur with the proposed action's research vessel.

10.6 Fisheries

Fisheries constitute an important and widespread use of the ocean resources throughout the action area. Fisheries can adversely affect fish populations, other species, and habitats. Direct effects of fisheries interactions on marine mammals include entanglement and entrapment, which can lead to fitness consequences or mortality as a result of injury or drowning. Indirect effects include reduced prey availability, including overfishing of targeted species, and destruction of habitat. Use of mobile fishing gear, such as bottom trawls, disturbs the seafloor and reduces structural complexity. Indirect impacts of trawls include increased turbidity, alteration of surface sediment, removal of prey (leading to declines in predator abundance), removal of predators, ghost fishing (i.e., lost fishing gear continuing to ensnare fish and other marine animals), and generation of marine debris. Lost gill nets, purse seines, and long-lines may foul and disrupt bottom habitats and have the potential to entangle or be ingested by marine mammals.

Fisheries can have a profound influence on fish populations. In a study of restrospective data, Jackson et al. (2001) concluded that ecological extinction caused by overfishing precedes all other pervasive human disturbance of coastal ecosystems, including pollution and anthropogenic climatic change. Marine mammals are known to feed on several species of fish that are harvested by humans (Waring et al. 2008). Thus, competition with humans for prey is a potential concern. Reductions in fish populations, whether natural or human-caused, may affect the survival and recovery of several populations.

10.6.1 Fisheries Interactions

Globally, 6.4 million tons of fishing gear is lost in the oceans every year (Wilcox et al. 2015). Entrapment and entanglement in fishing gear is a frequently documented source of human-caused mortality in cetaceans (see Dietrich et al. 2007). Materials entangled tightly around a body part may cut into tissues, enable infection, and severely compromise an individual's health (Derraik 2002). Entanglements also make animals more vulnerable to additional threats (e.g., predation and vessel strikes) by restricting agility and swimming speed. The majority of cetaceans that die from entanglement in fishing gear likely sink at sea rather than strand ashore, making it difficult to accurately determine the extent of such mortalities.

Cetaceans are also known to ingest fishing gear, likely mistaking it for prey, which can lead to fitness consequences and mortality. Necropsies of stranded whales have found that ingestion of net pieces, ropes, and other fishing debris has resulted in gastric impaction and ultimately death (Jacobsen et al. 2010). As with vessel strikes, entanglement or entrapment in fishing gear likely has the greatest impact on populations of ESA-listed species with the lowest abundance (e.g., Kraus et al. 2016). Nevertheless, all species of cetaceans may face threats from derelict fishing gear.

The latest five-year average mortalities and serious injuries related to fisheries interactions for the ESA-listed cetacean stocks within U.S. waters likely to be found in the action area are given in Table 19 below (Hayes et al. 2017; Henry et al. 2017). Data represent only known mortalities and serious injuries; more, undocumented moralities and serious injuries for these and other stocks found within the action area have likely occurred.

Table 19. Five-year mortalities and serious injuries related to fisheries interactions for Endangered Species Act-listed marine mammals within the action area.

Species	Pacific Stock	Hawaii Stock	Alaska Stock	Gulf of Mexico Stock	Western North Atlantic Stock
Blue Whale	0	0	NA	NA	NA
Bowhead Whale	0	NA	0.2	NA	NA
Bryde's Whale	NA	NA	NA	0	NA
False Killer Whale – Main Hawaiian Islands insular DPS	NA	0.1	NA	NA	NA

Fin Whale	0.2	0	0.2	NA	1.05
Gray Whale	0	NA	NA	NA	NA
Humpback Whale – Multiple ESA-listed DPSs	1.2	1.1	0.6	NA	NA
North Atlantic Right Whale	NA	NA	NA	NA	4.55
North Pacific Right Whale	0	NA	NA	NA	NA
Sei Whale	20	0.4	NA	NA	NA
Southern Right Whale	NA	NA	NA	NA	NA
Sperm Whale	1.7	0.7	2.2	NA	0.46

DPS=Distinct Population Segment
NA=Not Applicable

In addition to these direct impacts, cetaceans may also be subject to indirect impacts from fisheries. Marine mammals probably consume at least as much fish as is harvested by humans (Kenney et al. 1985). Many cetacean species (particularly fin and humpback whales) are known to feed on species of fish that are harvested by humans (Carretta et al. 2016b). Thus, competition with humans for prey is a potential concern. Reductions in fish populations, whether natural or human-caused, may affect the survival and recovery of ESA-listed cetacean populations. Even species that do not directly compete with human fisheries could be indirectly affected by fishing activities through changes in ecosystem dynamics. However, in general the effects of fisheries on cetaceans through changes in prey abundance remain unknown.

10.6.2 Aquaculture

Aquaculture has the potential to impact protected species via entanglement and/or other interaction with aquaculture gear (i.e., buoys, nets, and lines), introduction or transfer of pathogens, increased vessel traffic and noise, impacts to habitat and benthic organisms, and water quality (Lloyd 2003; Clement 2013; Price and Morris 2013; Price et al. 2017). Current data suggest that interactions and entanglements of ESA-listed marine mammals with aquaculture gear are rare (Price et al. 2017). This may be because worldwide the number and density of aquaculture farms are low, and thus there is a low probability of interactions, or because they pose little risk of ESA-listed marine mammals. Nonetheless, given that some aquaculture gear, such as that used in longline mussel farming, is similar to gear used in commercial fisheries, aquaculture may have impacts similar to fisheries and bycatch, as discussed above in Sections 10.6 and 10.6.1 respectively. There are very few reports of marine mammal interactions with aquaculture gear in the U.S. Atlantic and Pacific Oceans and outside the action area, although it is not always possible to determine if the gear animals become entangled in it from aquaculture or commercial fisheries (Price et al. 2017).

10.7 Pollution

Within the action areas, pollution poses a threat to ESA-listed marine mammals. Pollution can come in the form of marine debris, pesticides, contaminants, and hydrocarbons.

10.7.1 Marine Debris

Marine debris is an ecological threat that is introduced into the marine environment through ocean dumping, littering, or hydrologic transport of these materials from land-based sources (Gallo et al. 2018). Even natural phenomena, such as tsunamis and continental flooding, can cause large amounts of debris to enter the ocean environment (Watters et al. 2010). Marine debris has been discovered to be accumulating in gyres throughout the oceans. Marine mammals often become entangled in marine debris, including fishing gear (Baird et al. 2015). Despite debris removal and outreach to heighten public awareness, marine debris in the environment has not been reduced (NRC 2008) and continues to accumulate in the ocean and along shorelines within the action area.

Marine debris affects marine habitats and marine life worldwide, primarily by entangling or choking individuals that encounter it (Gall and Thompson 2015). Entanglement in marine debris can lead to injury, infection, reduced mobility, increased susceptibility to predation, decreased feeding ability, fitness consequences, and morality for ESA-listed species in the action area. Entanglement can also result in drowning for air breathing marine species including cetaceans. The ingestion of marine debris has been documented to result in blockage or obstruction of the digestive tract, mouth, and stomach lining of various species and can lead to serious internal injury or mortality (Derraik 2002). In addition to interference with alimentary processes, plastics lodged in the alimentary tract could facilitate the transfer of pollutants into the bodies of whales and dolphins (Derraik 2002). Data on marine debris in some locations of the action area is largely lacking; therefore, it is difficult to draw conclusions as to the extent of the problem and its impacts on populations of ESA-listed species.

Cetaceans are also impacted by marine debris, which includes: plastics, glass, metal, polystyrene foam, rubber, and derelict fishing gear (Baulch and Perry 2014; Li et al. 2016). Over half of cetacean species (including fin, sei, and sperm whales) are known to ingest marine debris (mostly plastic), with up to 31 percent of individuals in some populations containing marine debris in their guts and being the cause of death for up to 22 percent of individuals found stranded on shorelines (Baulch and Perry 2014).

Given the limited knowledge about the impacts of marine debris on marine mammals, it is difficult to determine the extent of the threats that marine debris poses to marine mammals. However, marine debris is consistently present and has been found in marine mammals in and near the action area. Fin whales in the Mediterranean Sea are exposed to high densities of microplastics on the feeding grounds, and in turn exposed to a higher oxidative stress because of the presence of plasticizers, an additive in plastics (Fossi et al. 2016). In 2008, two sperm whales stranded along the California coast, with an assortment of fishing related debris (e.g., net scraps, rope) and other plastics inside their stomachs (Jacobsen et al. 2010). One whale was emaciated, and the other had a ruptured stomach. It was suspected that gastric impactions was the cause of both deaths. Jacobsen et al. (2010) speculated the debris likely accumulated over many years, possibly in the North Pacific gyre that will carry derelict Asian fishing gear into eastern Pacific Ocean waters. In January and February 2016, 30 sperm whales stranded along the coast of the North Sea (in Germany, the Netherlands, Denmark, France, and Great Britain); of the 22 dissected specimens, nine had marine debris in their gastro-intestinal tracts. Most of it (78 percent) was fishing-related debris (e.g., nets, monofilament line) and the remainder (22 percent) was general debris (plastic bags, plastic buckets, agricultural foils) (Unger et al. 2016).

Plastic debris is a major concern because it degrades slowly and many plastics float. The floating debris is transported by currents throughout the oceans and has been discovered accumulating in oceanic gyres (Law et al. 2010). Additionally, plastic waste in the ocean chemically attracts hydrocarbon pollutants such as polychlorinated biphenyl and dichlorodiphenyltrichloroethane. Marine mammals can mistakenly consume these wastes containing elevated levels of toxins instead of their prey. It is expected that marine mammals may be exposed to marine debris over the course of the action although the risk of ingestion or entanglement and the resulting impacts are uncertain at the time of this consultation.

10.7.2 Pesticides and Contaminants

Exposure to pollution and contaminants have the potential to cause adverse health effects in marine species. Marine ecosystems receive pollutants from a variety of local, regional, and international sources, and their levels and sources are therefore difficult to identify and monitor (Grant and Ross 2002). Marine pollutants come from multiple municipal, industrial, and household as well as from atmospheric transport (Iwata 1993; Grant and Ross 2002; Garrett 2004; Hartwell 2004). 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 (Grant and Ross 2002; Garrett 2004; Hartwell 2004).

The accumulation of persistent organic pollutants, including polychlorinated-biphenyls, dibenzo-p-dioxins, dibenzofurans and related compounds, through trophic transfer may cause mortality and sub-lethal effects in long-lived higher trophic level animals (Waring et al. 2016), including immune system abnormalities, endocrine disruption, and reproductive effects (Krahn et al. 2007). Persistent organic pollutants may also facilitate disease emergence and lead to the creation of susceptible “reservoirs” for new pathogens in contaminated marine mammal populations (Ross 2002). 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 (Mearns 2001; Grant and Ross 2002).

Numerous factors can affect concentrations of persistent pollutants in marine mammals, such as age, sex and birth order, diet, and habitat use (Mongillo et al. 2012). In marine mammals, pollutant contaminant load for males increases with age, whereas females pass on contaminants to offspring during pregnancy and lactation (Addison and Brodie 1987; Borrell et al. 1995).

Pollutants can be transferred from mothers to juveniles at a time when their bodies are undergoing rapid development, putting juveniles at risk of immune and endocrine system dysfunction later in life (Krahn et al. 2009).

10.7.3 Hydrocarbons

Numerous small-scale vessel spills likely occur in the action area. A nationwide study examining vessel oil spills from 2002 through 2006 found that over 1.8 million gallons of oil were spilled from vessels in all U.S. waters (Dalton and Jin 2010). In this study, "vessel" included numerous types of vessels, including barges, tankers, tugboats, and recreational and commercial vessels, demonstrating that the threat of an oil spill can come from a variety of boat types. Below we review the effects of oil spills on marine mammals and sea turtles more generally. Much of what is known comes from studies of large oil spills such as the *Deepwater Horizon* oil spill since no information exists on the effects of small-scale oil spills within the action area.

Exposure to hydrocarbons released into the environment via oil spills and other discharges pose risks to marine species. Marine mammals are generally able to metabolize and excrete limited amounts of hydrocarbons, but exposure to large amounts of hydrocarbons and chronic exposure over time pose greater risks (Grant and Ross 2002). Acute exposure of marine mammals to petroleum products causes changes in behavior and may directly injure animals (Geraci 1990). The *Deepwater Horizon* oil spill in the Gulf of Mexico in 2010 led to the exposure of tens of thousands of marine mammals to oil, causing reproductive failure, adrenal disease, lung disease, and poor body condition.

Cetaceans have a thickened epidermis that greatly reduces the likelihood of petroleum toxicity from skin contact with oils (Geraci 1990), but they may inhale these compounds at the water's surface and ingest them while feeding (Matkin and Saulitis 1997). For example, as a result of the *Deepwater Horizon* oil spill, sperm whales could have been exposed to toxic oil components through inhalation, aspiration, ingestion, and dermal exposure. There were 19 observations of 33 sperm whales swimming in *Deepwater Horizon* surface oil or that had oil on their bodies bodies (Diaz 2015 as cited in Deepwater Horizon NRDA Trustees 2016). The effects of oil exposure likely included physical and toxicological damage to organ systems and tissues, reproductive failure, and death. Cetaceans may have experienced multiple routes of exposure at the same time, over intermittent timeframes and at varying rates, doses, and chemical compositions of oil based on observed impacts to bottlenose dolphins. Hydrocarbons also have the potential to impact prey populations, and therefore may affect ESA-listed species indirectly by reducing food availability.

As noted above, to our knowledge the past and present impacts of oil spills on ESA-listed species (blue, bowhead, Gulf of Mexico subspecies of Bryde's, Main Hawaiian Islands insular DPS of false killer, fin, Western North Pacific population of gray, Arabian Sea DPS of humpback, Cape Verde Islands/Northwest Africa DPS of humpback, Central America DPS of humpback, Mexico DPS of humpback, Western North Pacific DPS of humpback, North Atlantic right, North Pacific right, sei, Southern right, and sperm whale) within the action area are limited to those associated with small-scale vessel spills. Nevertheless, we consider the documented effects of oil spills outside the action area, such as the *Deepwater Horizon* oil spill, examples of the possible impacts that oil spill can have on ESA-listed species.

10.8 Aquatic Nuisance Species

Aquatic nuisance species are aquatic and terrestrial organisms, introduced into new habitats throughout the U.S. and other areas of the world, that produce harmful impacts on aquatic ecosystems and native species (http://www.anstaskforce.gov). They are also referred to as invasive, alien, or non-indigenous species. Invasive species have been referred to as one of the top four threats to the world's oceans (Raaymakers and Hilliard 2002; Raaymakers 2003; Terdalkar et al. 2005; Pughiuc 2010). Introduction of these species is cited as a major threat to biodiversity, second only to habitat loss (Wilcove et al. 1998). A variety of vectors are thought to have introduced non-native species including, but not limited to aquarium and pet trades, recreation, and ballast water discharges from ocean-going vessels. Common impacts of invasive species are alteration of habitat and nutrient availability, as well as altering species composition and diversity within an ecosystem (Strayer 2010). Shifts in the base of food webs, a common result of the introduction of invasive species, can fundamentally alter predator-prey dynamics up and across food chains (Moncheva and Kamburska 2002), potentially affecting prey availability and habitat suitability for ESA-listed species. They have been implicated in the endangerment of 48 percent of ESA-listed species (Czech and Krausman 1997).

10.9 Sound

The ESA-listed species that occur in the action area are regularly exposed to several sources of anthropogenic sounds. These include, but are not limited to maritime activities, aircraft, seismic surveys (exploration and research), and marine construction (dredging).Cetaceans generate and rely on sound to navigate, hunt, and communicate with other individuals and anthropogenic sound can interfere with these important activities (Nowacek et al. 2007). The ESA-listed species have the potential to be impacted by either increased levels of anthropogenic-induced background sound or high intensity, short-term anthropogenic sounds.

Anthropogenic sound in the action area may be generated by commercial and recreational vessels, sonar, aircraft, seismic surveys, in-water construction activities, wind farms, military activities, and other human activities. These activities occur to varying degrees throughout the year. The scientific community recognizes the addition of anthropogenic sound to the marine environment as a stressor that can possibly harm marine animals or significantly interfere with their normal activities (NRC 2005). The species considered in this opinion may be impacted by anthropogenic sound in various ways. Once detected, some sounds may produce a behavioral response, including but not limited to, changes in habitat to avoid areas of higher sound levels, changes in diving behavior, or (for cetaceans) changes in vocalization (MMC 2007).

Many researchers have described behavioral responses of marine mammals to sounds produced by boats and vessels, as well as other sound sources such as helicopters and fixed-wing aircraft, and dredging and construction (and Nowacek et al. 2007, reviewed in Gomez et al. 2016). Most observations have been limited to short-term behavioral responses, which included avoidance behavior and temporary cessation of feeding, resting, or social interactions; however, in terrestrial species habitat abandonment can lead to more long-term effects, which may have implications at the population level (Barber et al. 2010). Masking may also occur, in which an animal may not be able to detect, interpret, and/or respond to biologically relevant sounds. Masking can reduce the range of communication, particularly long-range communication, such as that for blue and fin whales. This can have a variety of implications for an animal's fitness including, but not limited to, predator avoidance and the ability to reproduce successfully (MMC 2007). Recent scientific evidence suggests that marine mammals, including several baleen whales, compensate for masking by changing the frequency, source level, redundancy, or timing of their signals, but the long-term implications of these adjustments are currently unknown (Parks 2003; McDonald et al. 2006; Parks 2009).

Despite the potential for these impacts to affect individual ESA-listed marine mammals, information is not currently available to determine the potential population level effects of anthropogenic sound levels in the marine environment (MMC 2007). For example, we currently lack empirical data on how sound impacts growth, survival, reproduction, and vital rates, nor do we understand the relative influence of such effects on the population being considered. As a result, the consequences of anthropogenic sound on ESA-listed marine mammals at the population or species scale remain uncertain, although recent efforts have made progress establishing frameworks to consider such effects (NAS 2017).

10.9.1 Vessel Sound and Commercial Shipping

Much of the increase in sound in the ocean environment is due to increased shipping, as vessels become more numerous and of larger tonnage (NRC 2003; Hildebrand 2009a; Mckenna et al. 2012). Commercial shipping continues a major source of low-frequency sound in the ocean, particularly in the Northern Hemisphere where the majority of vessel traffic occurs. Although large vessels emit predominantly low frequency sound, studies report broadband sound from large cargo vessels above 2 kiloHertz. The low frequency sounds from large vessels overlap with many mysticetes predicted hearing ranges (7 Hertz to 35 kiloHertz) (NOAA 2018) and may mask their vocalizations and cause stress (Rolland et al. 2012). The broadband sounds from large vessels may interfere with important biological functions of odontocetes, including foraging (Holt 2008; Blair et al. 2016). At frequencies below 300 Hertz, ambient sound levels are elevated by 15 to 20 dB when exposed to sounds from vessels at a distance (McKenna et al. 2013). Analysis of sound from vessels revealed that their propulsion systems are a dominant source of radiated underwater sound at frequencies less than 200 Hertz (Ross 1976). Additional sources of vessel sound include rotational and reciprocating machinery that produces tones and pulses at a constant rate. Other commercial and recreational vessels also operate within the action area and may produce similar sounds, although to a lesser extent given their much smaller size.

Individuals produce unique acoustic signatures, although these signatures may change with vessel speed, vessel load, and activities that may be taking place on the vessel. Peak spectral levels for individual commercial vessels are in the frequency band of 10 to 50 Hertz and range from 195 dB re: μPa^2-s at 1 meter for fast-moving (greater than 37 kilometers per hour [20 knots]) supertankers to 140 dB re: μPa^2-s at 1 meter for small fishing vessels (NRC 2003). Small boats with outboard or inboard engines produce sound that is generally highest in the mid-frequency (1 to 5 kiloHertz) range and at moderate (150 to 180 dB re: 1 μPa at 1 meter) source levels (Erbe 2002b; Gabriele et al. 2003; Kipple and Gabriele 2004). On average, sound levels are higher for the larger vessels, and increased vessel speeds result in higher sound levels. Measurements made over the period 1950 through 1970 indicated low frequency (50 Hertz) vessel traffic sound in the eastern North Pacific Ocean and western North Atlantic Ocean was increasing by 0.55 dB per year (Ross 1976; Ross 1993; Ross 2005). Whether or not such trends continue today is unclear. Most data indicate vessel sound is likely still increasing (Hildebrand 2009a). However, the rate of increase appears to have slowed in some areas (Chapman and Price 2011), and in some places, ambient sound including that produced by vessels appears to be decreasing (Miksis-Olds and Nichols 2016). Efforts are underway to better document changes in ambient sound (Haver et al. 2018), which will help provide a better understanding of current and future impacts of vessel sound on ESA-listed species.

Sonar systems are used on commercial, recreational, and military vessels and may also affect cetaceans (NRC 2003). Although little information is available on potential effects of multiple commercial and recreational sonars to cetaceans, the distribution of these sounds would be small because of their short durations and the fact that the high frequencies of the signals attenuate quickly in seawater (Nowacek et al. 2007). However, military sonar, particularly low frequency active sonar, often produces intense sounds at high source levels, and these may impact cetacean behavior (Southall et al. 2016). For further discussion of military sound on the ESA-listed species considered in this opinion, see Section 10.10.

10.9.2 Aircraft

Aircraft within the action area may consist of small commercial or recreational airplanes, helicopters, to large commercial airliners. These aircraft produce a variety of sounds that could potentially enter the water and impact marine mammals. While it is difficult to assess these impacts, several studies have documented what appear to be minor behavioral disturbances in response to aircraft presence (Nowacek et al. 2007).

10.9.3 Seismic Surveys

There are seismic survey activities involving towed airgun arrays that may occur within the action area. They are the primary exploration technique to locate oil and gas deposits, fault structure, and other geological hazards. These activities may produce noise that could impact ESA-listed cetaceans within the action area. These airgun arrays generate intense low-frequency sound pressure waves capable of penetrating the seafloor and are fired repetitively at intervals of ten to 20 seconds for extended periods (NRC 2003). Most of the energy from the airguns is directed vertically downward, but significant sound emission also extends horizontally. Peak sound pressure levels from airguns usually reach 235 to 240 dB at dominant frequencies of five to 300 Hertz (NRC 2003). Most of the sound energy is at frequencies below 500 Hertz, which is within the hearing range of baleen whales (Nowacek et al. 2007). In the U.S., all seismic surveys involving the use of airguns with the potential to take marine mammals are covered by incidental take authorizations under the MMPA, and if they involve ESA-listed species, undergo formal ESA section 7 consultation. In addition, the Bureau of Ocean Energy Management authorizes oil and gas activities in domestic waters as well as the National Science Foundation and U.S. Geological Survey funds and/or conducts these activities in domestic, international, and foreign waters, and in doing so, consults with NMFS to ensure their actions do not jeopardize the continued existence of ESA-listed species or adversely modify or destroy designated critical habitat. More information on the effects of these activities on ESA-listed species, including authorized takes, can be found in recent biological opinions.

There are five known high-energy and low-energy seismic surveys (Western Gulf of Alaska, Eastern North Pacific Ocean, Argentine Basin, Walvis Ridge off Namibia, and Admunsen Sea off Antarctica) for scientific research purposes that that will occur in the Atlantic, Pacific, and Southern Oceans in 2019 and 2020. These are funded by the National Science Foundation. Also, there are five known seismic surveys in the Atlantic Ocean funded by the oil and gas industry and permitted by the Bureau of Ocean Energy Management. Each of these surveys include a MMPA incidental take authorization and are each subject to a separate ESA section 7 consultation. Each of these finalized consultations resulted in a “no jeopardy” opinion.

10.9.4 Marine Construction

Marine construction in the action area that produces sound includes drilling, dredging, pile-driving, cable-laying, and explosions. These activities are known to cause behavioral disturbance and physical damage to marine mammals (NRC 2003). While most of these activities are coastal, offshore construction does occur.

10.10 Military Activities

The U.S. Navy conducts training, testing, and other military readiness activities on range complexes throughout coastal and offshore areas in the U.S. and on the high seas. The U.S. Navy’s activities are conducted off the coast of the Atlantic and Pacific Oceans and elsewhere throughout the world. The U.S. Navy’s Atlantic Fleet Training and Testing, Hawaii-Southern California Training and Testing, Mariana Islands Training and Testing, Northwest Training and Testing range complexes and Gulf of Alaska temporary maritime activities overlaps with the action area for Permit Nos. 20648, 21482, and 21938. During training, existing and established weapon systems and tactics are used in realistic situations to simulate and prepare for combat. Activities include: routine gunnery, missile, surface fire support, amphibious assault and landing, bombing, sinking, torpedo, tracking, and mine exercises. Testing activities are conducted for different purposes and include at-sea research, development, evaluation, and experimentation. The U.S. Navy performs testing activities to ensure that its military forces have the latest technologies and techniques available to them. The majority of the training and testing activities the U.S. Navy conducts in the action area are similar, if not identical to activities that have been occurring in the same locations for decades.

The U.S. Navy's activities produce sound and visual disturbance to marine mammals throughout the action area. Anticipated impacts from harassment due to the U.S. Navy's activities include changes from foraging, resting, milling, and other behavioral states that require low energy expenditures to traveling, avoidance, and behavioral states that require higher energy expenditures. Based on the currently available scientific information, behavioral responses that result from stressors associated with these training and testing activities are expected to be temporary and will not affect the reproduction, survival, or recovery of these species. Sound produced during U.S. Navy activities is also expected to result in instances of temporary and permanent threshold shifts to marine mammals. The U.S. Navy's activities constitute a federal action and take of ESA-listed marine mammals considered for these activities have previously undergone separate ESA section 7 consultation. Through these consultations with NMFS, the U.S. Navy has implemented monitoring and conservation measures to reduce the potential effects of underwater sound from activities on ESA-listed resources in the Atlantic and Pacific Oceans. Conservation measures include employing visual observers and implementing mitigation zones during activities using active sonar and explosives.

In addition to these testing and training activities, the U.S. Navy operates Surveillance Towed Array Sensor System Low Frequency Active sonar (SURTASS LFA) within the action area, which utilizes low frequency sounds to detect and monitor submarines. SURTASS LFA activities have a coherent low-frequency signal with a duty cycle of less than 20 percent, currently operating for a maximum of 255 hours per year for each of the four SURTASS LFA sonar systems. This equates to a maximum 1,020 hours for all systems annually or a total of 42.5 days per year for all sonar systems. However, the Navy recently published a 2018 Draft Supplemental Environmental Impact for proposed SURTASS LFA sonar training and testing activities from August 2019 through August 2026 (Navy 2018) which reduces the number of total transmission hours that are currently authorized under the 2017 National Defense Exemption. In Navy (2018), the Navy proposes 496 total transmission hours per year (20.6 days) across all SURTASS LFA sonar vessels, while years five and beyond would include an increase in LFA sonar transmit hours to 592 hours across all vessels per year (24.6 days). This compares to an approximate 21.9 million days per year for the world's shipping industry. Thus, SURTASS LFA sonar transmissions will make up a very small part of the human-caused sound pollution in the ocean.

The 2017 National Defense Exemption authorized the Navy to conduct the operation of SURTASS LFA sonar from August 2017 through 2022 in the non-polar region of the world's oceans (including within the action area). However, Navy (2018) proposes to only conduct SURTASS LFA sonar training and testing activities in the central and western North Pacific and eastern Indian Oceans from August 2019 through 2026. The ESA Section 7 consultation for the

Navy's proposed 2019 through 2026 SURTASS LFA training and testing activities is anticipated to conclude in August 2019.

10.11 Scientific Research Activities

Regulations for section 10(a)(1)(A) of the ESA allow issuance of permits authorizing take of certain ESA-listed species for the purposes of scientific research. Prior to the issuance of such a permit, the proposal must be reviewed for compliance with section 7 of the ESA. Scientific research permits issued by NMFS currently authorize studies of ESA-listed species in the Arctic, Atlantic, Indian, Pacific, and Southern Oceans, which extend into portions of the action areas for the proposed actions. Marine mammals have been the subject of field studies for decades. The primary objective of most of these field studies has generally been monitoring populations or gathering data for behavioral and ecological studies. Over time, NMFS has issued dozens of permits on an annual basis for various forms of "take" of marine mammals in the action area from a variety of research activities involving non-lethal "takes" of marine mammals, including aerial and vessel surveys, close approaches, photography, videography, behavioral observations, active acoustics, remote ultrasound, passive acoustic monitoring, biological sampling (i.e., biopsy, breath, fecal, sloughed skin), and tagging.

There have been numerous research permits issued since 2009 under the provisions of both the MMPA and ESA authorizing scientific research on marine mammals all over the world, including for research in the action areas. The consultations which took place on the issuance of these ESA scientific research permits each found that the authorized research activities will have no more than short-term effects and will not result in jeopardy to the species or adverse modification of designated critical habitat.

Scientific research activities similar to that which will be conducted under Permit Nos. 20648, 21482, and 21938 has and will continue to impact ESA-listed marine mammals within the action areas. Currently (as of May 8, 2019), there are at least 38 active research permits that may affect the ESA-listed marine mammals in the Arctic, Atlantic, Indian, Pacific, and Southern Oceans considered during this consultation (Permit Nos. 14327, 14450, 16239, 16632, 17312, 17845, 18059, 18438, 18528, 18529, 18537, 18786, 18824, 18890, 19091, 19225, 19257, 19309, 19315, 19436, 19592, 19655, 19706, 20311, 20465, 20466, 20605, 20951, 21114, 21238, 21348, 21371, 21485, 21585, 21678, 21856, 22141, and 22222). Of these permits, six currently authorize deep-implantable tags. Most permits authorize a smaller action area or region within an ocean basin, reducing the chance of repeated harqassment of individual animals by multiple researchers. Therefore, most of this research does not overlap in area or timing. Some spatial overlap exists for research on species with known feeding or breeding grounds, such as humpback whales. The primary objective of these studies is generally to monitor populations or gather data for behavioral and ecological studies. These research activities may directly or unintentionally result in harassment, stress, and injury. No mortalities are authorized for any animal or any age and no mortalities have been reported from the research permits currently active in the action areas.

Repeated disturbances of individual animals may occur within a year. However, all permits contain conditions requiring the permit holders to coordinate their research activities with the NMFS' regional offices and other permit holders and, to the extent possible, share data to avoid unnecessary duplication of effort and associated disturbance of cetaceans. In addition, many "take" numbers represent permitted research activities occurring over the entire range of the species or in areas outside the limits of the action areas for Permit Nos. 20648, 21482, and 21938. Nevertheless, the "take" numbers in the scientific research permits represent a worst-case scenario in the action area.

As detailed further below in our *Response Analysis*, cetaceans may respond to these research activities in a variety of ways including no obvious response, minor behavioral disturbances, avoidance and stress-related response, temporarily abandoning important behaviors such as feeding and breeding, and in rare cases whales may become injured, infected, and possibly even die when biological samples are taken or implantable tags are used (NMFS 2017b). The fact that multiple permitted "takes" of ESA-listed cetaceans are already permitted in the action area and are expected to continue to be permitted in the future means that research has the ability to contribute to or even exacerbate the stress response of cetaceans generated from other threats occurring in the action area.

Additional "take" is likely to be authorized in the future as additional permits are issued. It is noteworthy that although the numbers tabulated below (Section 11.3.1) represent the maximum number of "takes" authorized in a given year, monitoring and reporting indicate that the actual number of "takes" rarely approach the number authorized. Therefore, it is unlikely that the level of exposure indicated below (Section 11.3.1) has or will occur in the near term. However, our analysis assumes that these "takes" will occur since they have been authorized. It is also noteworthy that these "takes" are distributed across the Atlantic Ocean. Although marine mammals and sea turtles are generally wide-ranging, we do not expect many of the authorized "takes" to involve individuals that will also be "taken" under the proposed research activities.

10.12 Impact of the Baseline on Endangered Species Act-Listed Species

Collectively, the stressors described above have had, and likely continue to have, lasting impacts on the ESA-listed species considered in this consultation. Some of these stressors result in mortality or serious injury to individual animals (e.g., vessel strikes and whaling), whereas others result in more indirect (e.g., fishing that impacts prey availability) or non-lethal (e.g., whale watching) impacts. Assessing the aggregate impacts of these stressors on the species considered in this opinion is difficult and, to our knowledge, no such analysis exists. This becomes even more difficult considering that many of the species in this opinion are wide-ranging and subject to stressors in locations throughout and outside the action area.

We consider the best indicator of the aggregate impact of the *Environmental Baseline* on ESA-listed resources to be the status and trends of those species. As noted in Section 9, some of the species considered in this consultation are experiencing increases in population abundance, some are declining, and for others, their status remains unknown. Taken together, this indicates that the

Environmental Baseline is impacting species in different ways. The species experiencing increasing population abundances are doing so despite the potential negative impacts of the activities described in the *Environmental Baseline*. Therefore, while the *Environmental Baseline* may slow their recovery, recovery is not being prevented. For the species that may be declining in abundance, it is possible that the suite of conditions described in the *Environmental Baseline* is preventing their recovery. However, is also possible that their populations are at such low levels (e.g., due to historical commercial whaling) that even when the species' primary threats are removed, the species may not be able to achieve recovery. At small population sizes, species may experience phenomena such as demographic stochasticity, inbreeding depression, and Allee effects, among others, that cause their limited population size to become a threat in and of itself. A thorough review of the status and trends of each species is discussed in the *Status of Species Likely to be Adversely Affected* section (Section 9) of this opinion.

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 analysis section is organized following the stressor, exposure, response, and risk assessment framework.

In this section, we describe the potential stressors associated with the proposed action, the probability of individuals of ESA-listed species being exposed to these stressors based on the best scientific and commercial evidence available, and the probable responses to those individuals (given probable exposures) based on the available evidence. As described in Section 11.4, for any responses that would be expected to reduce an individual's fitness (i.e., growth, survival, annual reproductive success, or lifetime reproductive success), the assessment would consider the risk posed to the viability of the population(s) those individuals comprise and to the ESA-listed species those populations represent. For this consultation, we are particularly concerned about behavioral and stress-based physiological disruptions and potential unintentional mortality that may result in animals that fail to feed, reproduce, or survive because these responses are likely to have population-level consequences. The purpose of this assessment and, ultimately, of this consultation is to determine if it is reasonable to expect the proposed action to have effects on ESA-listed species that could appreciably reduce their likelihood of surviving and recovering in the wild.

11.1 Stressors Associated with the Proposed Action

Stressors are any physical, chemical, or biological entity that may induce an adverse response either in an ESA-listed species or their designated critical habitat. The issuance of Permit Nos. 20648, 21482, and 21938 will authorize several methods for research activities that may expose

ESA-listed marine mammals within the action areas to a variety of stressors. Each research activity presents a unique set of stressors, as further detailed below.

We have determined that the HDR Inc.'s and SEFSC's import and export of materials from ESA-listed cetacean species will have no effect on populations in the wild and will not discuss these research activities further in this opinion.

The potential stressors we expect to result from the proposed action are pollution, vessel strike, vessel noise, gear entanglement, aerial surveys, vessel surveys, active acoustics (i.e., playbacks and prey mapping), close approaches, biological sampling (i.e., biopsy sampling, breath sampling, fecal sampling, prey sampling, and sloughed skin sampling), and tagging.

Manned aerial surveys will expose cetaceans to aircraft noise and visual disturbance depending on the aircraft altitude. Unmanned aerial surveys present similar stressors, although given their much smaller size and quieter engines; the magnitude of these stressors is expected to be much smaller. Vessel surveys and close approaches will present a range of stressors including vessel traffic, discharge, and visual and auditory disturbances.

Behavioral observations and photography will follow close approaches, but will not present any additional stressors other than those associated with vessel surveys and close approaches by vessels and aircraft. Playbacks will present the stressor of acoustic disturbance as well as close approaches. Prey mapping will present the additional stressors as described for vessel surveys and close approaches, but for a longer duration than a typical vessel survey or close approach. Given their non-invasive nature, exhaled breath sampling, fecal sampling, prey sampling, sloughed skin sampling, and most documentation activities are not expected to produce any stressors aside from those associated with vessel surveys and close approaches by vessels and unmanned aircraft systems (in the case of some breath sampling).

Biological sampling (i.e., biopsy sampling, breath sampling, fecal sampling, prey sampling, sloughed skin sampling) can present the additional stressor of interaction with scientific equipment, if cetaceans happen to approach researchers during biological sampling. Biopsy sampling can carry the stressor of a closer vessel approach than is typical for other vessel survey activities (except tagging), direct physical contact with the animal, a minor puncture wound, and tissue collection. Suction-cup tagging will present the additional stressors of a very close approach and direct physical contacts to apply suction-cup tags and then the continued attachment of tags. Dart/barb and deep-implantable tagging will present the additional stressors of a very close approach and puncture wounds and then the continued attachment of tags.

11.2 Mitigation to Minimize or Avoid Exposure

The Permits and Conservation Division's proposed action requires mitigation measures to minimize potential adverse effects of the proposed research activities. Mitigation measures to minimize effects are also included in the researchers' permit applications. They are described previously in the *Description of the Proposed Action* (Section 3) and are considered throughout our *Exposure and Response Analysis*.

11.2.1 Permit No. 20648

Mitigation measures to minimize or avoid exposure of ESA-listed cetacean species to research activities proposed by Dr. Heidi Pearson (University of Alaska Southeast) are described below:

For all activities, animals will be approached at the maximum distance possible to obtain the required data. During all research activities, if the animals are observed to repeatedly display disturbance behaviors (e.g., avoidance of the research vessel, abrupt change in swim speed), the activity will cease. Animal reactions to the methods involving contact (i.e., suction-cup tagging, remote biopsy sampling) will be scored as none, low, moderate, or strong (after Weinrich et al. 1992; Pearson et al. 2017). If the majority of reactions are moderate to strong, the activity will cease. To avoid behavioral disruption to non-target species, onset of these contact activities will be delayed. Whenever possible, research activities will be coordinated with other cetacean researchers in the regions. This may involve conducting shared surveys, sharing research vessels, and sharing data and samples between researchers.

IACUC approval to conduct vessel surveys, photo-identification, and behavioral observation for humpback whales has been obtained from the University of Alaska Fairbanks (protocol #464648-12). Approval to include additional species and to conduct the activities described above is pending.

11.2.1.1 Vessel Surveys

The research vessel will slow down to a no-wake speed when animals are approached. Every effort will be made to avoid approaching animals head-on. The photo-identification record will be used to make every attempt to avoid unintentional repeated sampling of the same individual.

11.2.1.2 Biopsy Sampling

All biopsy tips will be stored in sterile plastic containers and disinfected with ethanol prior to each use. To obtain a successful biopsy sample, three biopsy attempts per day may be conducted on a single individual. Every attempt will be made to use the photo-identification record to ensure that a single individual is successfully biopsied a maximum of one time per day and contacted no more than three times per day for biopsy attempts.

11.2.1.3 Suction-cup Tagging

Suction-cups will be disinfected prior to each use. The target placement will be on the dorsal surface of the whale just forward of the dorsal fin and well behind the blowholes. If a tagging attempt is made on a mother, the tag will be positioned so that it does not interfere with nursing or mother-calf proximity during travel.

See Section 19.1 in Appendix A for the terms and conditions the Permits and Conservation Division propose to include in Permit No. 20648.

11.2.2 Permit No. 21482

Mitigation measures to minimize or avoid exposure of ESA-listed cetacean species to research activities proposed by Dr. Dan Engelhaupt (HDR, Inc.) are described further below:

11.2.2.1 Aerial Surveys

Aerial surveys will maintain distances from the animals in order to reduce any chance of disturbance. For aerial surveys using fixed-wing aircraft, researchers will fly at an altitude of 213.4 to 304.8 meters (700 to 1,000 feet), but a minimum altitude of 121.9 meters (400 feet) will be used for Hawaiian monk seals. The minimum altitude for other phocids and otariids will remain at 213.4 meters (700 feet). For aerial surveys using helicopters (primarily in Hawaii), researchers will maintain an altitude of 91.4 to 243.8 meters (300 to 800 feet) at speeds between stationary and 170 kilometers per hour (105.6 miles per hour). Deliberate circling by the aircraft at higher altitudes outside of Snell's cone during focal follows will reduce the amount of noise generated downward and minimizing the potential for disturbance. If any animals show a significant response to the aerial survey, the aircraft will immediately leave the vicinity and resume aerial survey efforts in another location.

Aerial surveys using unmanned aircraft systems will conduct a maximum of three approaches over an individual or group of animals per day. If an animal or group of animals show clear avoidance or agitated behavior from the overhead presence of the unmanned aircraft system, then the unmanned aircraft system will either climb to a less-disturbing altitude or disengage altogether if the behavior persists. The unmanned aircraft systems will not be operated in unsuitable weather conditions such as rain or wind above 22.2 kilometers per hour (12 knots).

11.2.2.2 Vessel Surveys

Research vessels will be operated by experienced driver and approach animals at a speed that matches that of the animal. Close approaches in the large or small research vessel, either following a specific trackline or random search pattern, will be aborted if an animal makes repeated attempts to allude the research vessel or if any difficulties arise that will prevent an attempt for identification of the species.

11.2.2.3 Biopsy Sampling

Biopsy sampling may occur on animals of both sexes, including adults and juveniles that are at least one year old. No calves will be biopsy sampled. Researchers will only obtain a single biopsy sample from an individual, and limit biopsy sampling to no more than three attempts per encounter. Tagged animals will be biopsy sampled when possible. Researchers will attempt biopsy sampling of all tagged individuals at the same time as tagging or immediately after tagging to keep the period of disturbance to a minimum. Biopsy samples will be collected from areas of the body that will not pose a significant risk of injury such as the sides of the animal, close behind the dorsal fin, and bottoms of the flukes for larger cetaceans.

Per requirements of Permit No. 21482, researchers must use sterile biopsy tips following the Institutional Animal Care and Use Committee (IACUC) approved protocol. Biopsy tips must be sterile before each use. For sterilization, biopsy tips must be cleaned with soap and water, soaked in ten percent bleach solution for at least 20 minutes, rinsed, and sterilized with gas or in an autoclave. Sterilized biopsy tips must be kept in individual sterilized packages until use, and any manipulation of the biopsy tips after sterilization must be conducted wearing gloves.

In the rare event that a sterile biopsy tip is not available, high-level disinfected tips may be used. For high-level disinfection, the biopsy tips must be cleaned with soap and water, soaked in a ten percent bleach solution for at least 20 minutes (or similar high-level disinfection solution [six percent hydrogen peroxide, two percent glutaraldehyde]), rinsed, allowed to air dry or dried with a sterile cloth, and then placed in sterile packaging until use. Disinfected biopsy tips must be kept in individual packages until use, and any manipulation of the tips must be conducted wearing gloves. High-level disinfection solutions will be changed weekly or per manufacturer directions.

If the biopsy tip becomes contaminated and is no longer sterile (e.g., missed attempt, contacts, seawater, physical contact) prior to use, a new sterile biopsy tip must be used. If a new, sterile biopsy tip is not available, the contaminated biopsy tip must be completely cleaned and disinfected following the IACUC or veterinary-approved protocol.

Biopsy sampling attempts will immediately cease in the event a close approach by the research vessel or a biopsy shot attempt elicits a strong behavioral reaction (e.g., breaching, high-energy behavior, or rapid evasion) (Clapham and Mattila 1993).

11.2.2.1 Suction-Cup Tagging

Tagging attempts will immediately cease in the event a close approach by the research vessel or a tagging shot elicits a strong behavioral reaction (e.g., breaching, high-energy behavior, or rapid evasion) (Clapham and Mattila 1993).

11.2.2.2 Dart/Barb and Deep-Implantable Tagging

Practices will be established and followed before deployment of dart/barb and/or deep-implantable tags to minimize physical damage and reduce the risk of infection around the tag site. Tags will be constructed from surgical-quality materials. Tag entry will be facilitated by tapered, bladed cutting tips to reduce blunt trauma. The tags will be thoroughly cleaned and sterilized with bleach and alcohol prior to use. When available tags will be autoclaved after cleaning with bleach and alcohol to ensure maximum sterilization. Tags may be partially coated with a broad-spectrm antibiotic mixed with long-term dispersant to allow for continual release of the antibiotic into the tag site. To reduce the possibility of infection, if a tag makes contact with non-sterile surfaces or seawater during a missed attempt, tags will be re-sterilized before being used again.

Darts will be sterilized using the following sequential methods:

- Darts scrubbed with soapy water using a pipe cleaner or small bottle brush;

- Darts rinsed with fresh water;
- Darts placed in ten percent diluted bleach solution for ten minutes or longer;
- Darts rinsed with fresh water;
- Darts soaked in acetone for ten minutes;
- Darts rinsed with sterile saline;
- Additional measures may include soaking in sterilized solution MetriCide or autoclaved prior to deployment; and
- Darts stored in sterile bags.

The implanted parts of the tags will be sterilized prior to first use under a veterinary-approved protocol. The primary method of sterilization is with ethylene oxide gas. If a tag or biopsy tip was used in a failed attempt, made contact with seawater, or was contaminated in the field, it will be disinfected prior to use following IACUC-approved methodology, which involves soaking in a ten percent bleach solution for at least 20 minutes, rinsing with water, soaking in isopropyl or ethyl alcohol and being allowed to air dry.

Per requirements of Permit No. 21482, researchers must use sterile invasive tag anchors (i.e., darts/barbs, pins, bolts, etc.) following the IACUC-approved protocol. If the tag anchors or implantable tag become contaminated and are no longer sterile (e.g., missed attempt, contacts, seawater, physical contact) prior to use, a new sterile tag anchor or implantable tag must be used. However, if new sterile tag anchors are not available, the researchers must cease tagging efforts until sterile alternatives are available. Researchers will document pre- and post-tagging with photography and videography to accurately record reactions. Tagging attempts will immediately cease in the event a close approach by the research vessel or a tagging shot elicits a strong behavioral reaction (e.g., breaching, high-energy behavior, or rapid evasion) (Clapham and Mattila 1993).

11.2.2.3 Planning and Coordination

Investigators will have a complex set of skills for each research method used during research activities and have substantial experience. Researchers will all be experts in the field and responsible for specific methods during research activities. Before each project begins, researcher’s roles as part of the team will be specified in a plan and will be coordinated daily by the designated leader. Co-Investigators will be chosen due to their expertise, prior experience, and extensive knowledge with proper implementation of research methods in the field and operating under previous scientific research permits issued by NMFS.

Research activities on bowhead whales will be vetted through the Alaska Eskimo Whaling Commission. Any existing data collected to date or in a collaborative or complementary fashion with other researchers will be used to reduce biopsy sampling/tagging effort that may overlap. Researchers will maintain open lines of communication with other researchers to ensure research activites will be complementary and not duplicative with past or ongoing efforts.

Terms and conditions in the permit will include mitigation measures to minimize harassment to all non-target ESA-listed species.

See Section 19.2 in Appendix B for the terms and conditions the Permits and Conservation Division propose to include in Permit No. 21482.

11.2.3 Permit No. 21938

Mitigation measures to minimize or avoid exposure of ESA-listed cetacean species to research activities proposed by the SEFSC are described further below:

Mitigation measures in place that help reduce the amount of time researchers will spend with animals include: (1) only trained and suitably authorized personnel will conducted research activities; (2) surveys will be carried out by at least three persons whenever possible; and (3) sightings will generally be curtailed if signs of distress (i.e., tail-slapping, forceful exhalations, sustained evasive behavior) are observed.

For localized studies, mitigation measures in place that help reduce the number of times an individual is harassed during biopsy attempts and that reduce the chances that the same individual is biopsied twice include: (1) biopsy samples are usually collected over a relatively short period of time (less than two months); (2) only trained, authorized personnel will conduct research activities and an attempt will be made to maintain the same people throughout the sampling period so that they will become familiar with the individual dolphins in the area; (3) an attempt will be made to obtain a photo-identification photograph of each animal that is biopsied; and (4) prior to biopsy attempts field personnel will try to look for biopsy wounds/scars on animals and they will attempt to recognize individuals previously biopsied either by the wound or scar from a previous biopsy or by the dorsal fin or other unique markings.

As recommended in Weller (2008), except for Number 3, efforts to "mitigate physical damage and infection caused by tagging [will] include: (1) use of surgical quality tag materials, (2) sterilization of tag components prior to deployment, (3) use of topical and long-dispersant antibiotics, and (4) use of tapered, bladed cutting tips at the entry point of the tag to reduce blunt trauma, minimize the unwanted introduction of epidermal cells and bacteria into the wound, and better control inward trajectory." For deep-implantable tags that the SEFSC proposes for large whales (e.g., Gulf of Mexico subspecies of Bryde's whales, sperm whales), care will be taken to place tags on the upper flank, which according to Robbins et al. (2013), should reduce the chances of broad localized swelling associated with tags. This is also a much better location for tag performance. If swelling does occur it could be resolved in less than one year. Care will be taken to keep tags contaminant-free during deployment. Anchors will never be re-used after contact with an animal without washing and decontamination. No antibiotic cream will be applied to the anchor prior to deployment, as the cream is unlikely to enter the skin in sufficient quantity to be of significant benefit in healing and may act as a lubricant to facilitate premature detachment.

The majority of tags will be deployed far offshore, so there will be little opportunity for dedicated post-tag monitoring. Post-tag observations will generally be limited to opportunistic sightings of tagged animals that can be recognized (e.g., tag present, dorsal fin, flukes, tag scar) during subsequent assessment surveys or during tagging efforts the same year or in subsequent years. For assessment surveys, observer training will include tag and tag scar recognition. If an animal that has potentially been tagged is observed, the chief scientist will be notified and, if possible, follow-up observations will be recorded and photographs taken of the animal. Similarly, during tagging operations as part of the protocols to avoid re-tagging, if any previously tagged animal is observed, observations will be recorded and photographs taken as part of post-tag monitoring.

See Section 19.3 in Appendix C for the terms and conditions the Permits and Conservation Division propose to include in Permit No. 21938.

As detailed above, the Permits and Conservation Division will require that individuals conducting the research activities under both permits possess qualifications commensurate with their roles and responsibilities. In accordance, the only personnel authorized to conduct the research activities will be the Principal Investigators at University of Alaska Southeast (Dr. Heidi Pearson), HDR, Inc. (Dr. Dan Engelhaupt), and SEFSC as well as Co-Investigators listed in the permit applications, and research assistants. We anticipate that requiring that the research activities be conducted by experienced personnel will further minimize impacts to the ESA-listed cetaceans that may be exposed to stressors, as these individuals should be able to recognize adverse responses and cease or modify their research activities accordingly.

11.3 Exposure and Response Analysis

The *Exposure Analysis* identifies, as possible, the number, age (or life stage), and gender of the ESA-listed individuals that are likely to be exposed to the stressors and the population(s) of sub-population(s) those individuals belong. The *Response Analysis* evaluates the available evidence to determine how individuals of those ESA-listed species are likely to respond given their probable exposure.

11.3.1 Exposure Analysis

In this section, we quantify the likely exposure of ESA-listed species to the activities and associated stressors that may result from the proposed action (Section 3). Table 2, Table 3, Table 4, and Table 5 specify the applicants' and the Permits and Conservation Division's proposed exposure to ESA-listed species associated with pollution, vessel strike, vessel noise, gear entanglement, aerial surveys, vessel surveys, active acoustics (i.e., playbacks and prey mapping), close approaches, biological sampling, and tagging. 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.

Dr. Heidi Pearson, Dr. Dan Engelhaupt, and SEFSC have explained the MMPA take number estimates in their permit applications for Permit Nos. 20648, 21482, and 21938, respectively.

Based on this explanation, our own evaluation of these numbers in comparison to Dr. Heidi Pearson, Dr. Dan Engelhaupt, SEFSC and other researchers' annual reports for similar species and research activities, and the conservative assumption that all MMPA take that the Permits and Conservation Division authorize *could* occur, we adopt the exposure of ESA-listed species that are reasonably certain to occur as the numbers of animals specified in Table 2, Table 3, Table 4, and Table 5 for specific research activities.

Under Permit No. 20648, Dr. Heidi Pearson plans to study large whales that are found in the Gulf of Alaska and Southeast Alaska, with a focus on the waters around Juneau, Alaska. These species include fin, gray, humpback, and sperm whales.

Dr. Heidi Pearson is planning to conduct 50 vessel surveys per year for the duration of this permit. Based on this planned effort and her previous research, Dr. Heidi Pearson is estimating the following annual takes through photo-identification, underwater photography or videography, behavioral observations, passive and active acoustics, photography and videography via unmanned aircraft system, breath sampling from the research vessel, sloughed skin sampling, and fecal sampling activities: 5,000 humpback whales (up to 100 individuals per vessel survey), 500 sperm whales (up to ten individuals per survey), 500 gray whales (up to ten individuals per survey), and 500 fin whales (up to ten individuals per survey). For unmanned aircraft system-based breath sampling, Dr. Heidi Pearson estimates sampling 50 humpback whales out of the aforementioned 5,000 per year, 30 of which will be sampled three times per day.

For remote biopsy sampling, Dr. Heidi Pearson would obtain samples from 50 individual humpback whales per year. Individuals would not be successfully sampled more than twice per day but may be resampled up to twice per year.

For suction-cup tagging, Dr. Heidi Pearson would approach a maximum of five individual humpback whales per day for tagging attempts. Up to three attempts on a given individual may be required to obtain a successful deployment (i.e., tag remains attached for more than one hour). Based on 30 days of sampling per year, a maximum of 150 humpback whales will be approached for tagging. An individual may be retagged up to two times during a given year.

Under Permit No. 21482, Dr. Dan Engelhaupt (HDR, Inc.) plans to study cetacean species that are encountered in the Arctic, Atlantic, Indian, Pacific, and Southern Oceans.

For vessel surveys, Dr. Dan Engelhaupt (HDR, Inc.) has requested takes on an annual basis that are high enough to conduct research activities each year. Researchers cannot be certain which species and the number of animals that will be encountered in the action area, and all species are of interest; therefore, they have requested more takes than will be needed for flexibility purposes.

For harassment takes, Dr. Dan Engelhaupt calculated 20 percent of known numbers from stock assessment reports within the area of research activities and then adjusted, in some cases, where take numbers are unreasonably high or low.

For biopsy sampling, Dr. Dan Engelhaupt (HDR, Inc.) plans to take up to 50 animals per species per year. Researchers will take 20 biopsy samples per year (three attempts per an individual) of

Western North Pacific population of gray whales and avoid resampling known individuals by utilizing identification techniques on the research vessel.

For suction-cup tagging, Dr. Dan Engelhaupt plans to annually tag ten individuals from small populations that include Gulf of Mexico subspecies of Bryde's whales, North Atlantic right whales, and North Pacific right whales.

For dart/barb tagging, Dr. Dan Engelhaupt plans to annualy tag ten individuals from small populations that include Gulf of Mexico subspecies of Bryde's whales.

For Western North Pacific population of gray whales, Dr. Dan Engelhaupt plans to limit tagging to ten suction-cup, ten dart/barb, or ten deep-implantable tags per year (30 total tags with three attempts per individual).

Under Permit No. 21938, the SEFSC plans to study cetacean species that are encountered in the western North Atlantic Ocean, Gulf of Mexico, and Caribbean Sea.

For vessel surveys, the SEFSC has requested takes on an annual basis that are high enough to conduct research activities each year. Researchers cannot be certain which species and the number of animals that will be encountered in the action area, and all species of interest; therefore, they have requested more takes than will be needed for flexibility purposes.

For takes by harassment, the SEFSC based their take calculations on previous survey experience in these regions. The expected takes represent the maximum number of animals for each species/genus that the SEFSC might approach in a given year with multiple large-vessel surveys, and multiple large-aircraft surveys. The expected takes were estimated by examining the current population sizes and the typical number of takes for each species/genus during previous surveys in the Atlantic, Caribbean, and Gulf of Mexico and extrapolating so that at least two large-vessel surveys, and four large-aircraft surveys would be covered in one year. This assumes a year with ideal funding circumstances in which multiple vessel and aircraft surveys and localized studies are possible.

The requested number of takes for biopsy sampling for each species was estimated as the maximum number of samples that could be reasonably collected during one year given potential sampling resources and was based on the abundance and typical behavior of the species, plus an additional 20% to account for unsuccessful sampling attempts. Researchers will take up to 40 biopsy samples per year (three attempts per an individual per day) of Northern Gulf of Mexico subspecies of Bryde's whale population and avoid resampling known individuals by utilizing identification techniques on the research vessel.

For suction-cup tagging, the SEFSC plans to annually tag up to 40 individuals of Gulf of Mexico subspecies of Bryde's whales.

For dart/barb tagging, the SEFSC plans to annualy tag up to 40 individuals of Gulf of Mexico subspecies of Bryde's whales.

For Gulf of Mexico subspecies of Bryde's whales, SEFSC plans to limit tagging to 20 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag) attached at one time and limit tagging attempts a maximum of 3 attempts to tag per day.

Having estimated or adopted the applicant's and Permits and Conservation Division's predicted exposure of certain numbers of ESA-listed cetaceans to research activities that will be authorized under Permit Nos. 20648, 21482, and 21938, we further consider the meaning of the numbers specified in Table 2, Table 3, Table 4, and Table 5. The columns titled *Number of Takes* and *Takes Per Animal Per Year* represent the maximum number of MMPA takes that will be authorized per year and the maximum number of intentional takes of the same individual. This exposure can be year-round, with the duration of each exposure ranging from a few seconds to several hours as described in Section 3.

For research activities on humpback whales that will be authorized under Permit Nos. 20648, 21482, and 21938, estimates of the number of individuals to be sampled are based on the location in which research activities will occur off the coast of Alaska (and Hawaii), British Columbia, Washington, Oregon, and California as well as the Atlantic Ocean (North Atlantic Ocean, Gulf of Mexico, and Caribbean Sea), but within these locations multiple DPSs of ESA-listed humpback whales can be found. To determine the exposure of individual humpback whale DPSs, we rely on NMFS internal guidance as derived from Wade et al. (2016) and NMFS (2016b). For Alaska, British Columbia, Washington, Oregon, and California, which in Wade et al. (2016) is composed of several smaller sub-locations, we use the percentage estimates from Wade et al. (2016) into the greater North Pacific Ocean (including Alaska, Washington, Oregon, California, and Hawaii) area from which Drs. Heidi Pearson and Dan Engelhaupt requested takes. For Permit No. 20648, the proportion of research activities in the Gulf of Alaska action area is unknown, as is the proportion of research activities in the Alaska, Washington, Oregon, California, and Hawaii action area for Permit No. 21482. We use each location specified in Wade et al. (2016) (Aleutian Islands/Bering Sea/Chukchi Sea/Beaufort Sea, Gulf of Alaska, and Southeast Alaska/Northern British Columbia) and the probability of encountering the DPS breakdown percentages across the larger Alaskan area. We recognize that these percentages sum to greater than 100 percent in some cases, but this overestimation is necessary in order to conservatively address uncertainty in the percentage estimates likely to be taken for each DPS and to protect the small, endangered Central America DPS, threatened Mexico DPS, endangered Western North Pacific DPS, and endangered Cape Verde Islands/Northwest Africa DPS of humpback whales. Furthermore, percentages are rounded up, as partial numbers of individuals were not acceptable in our calculations. The percentages are directly multiplied by the MMPA takes specified in Table 2, Table 3, Table 4, and Table 5 to estimate the number of individual humpback whales from each DPS that will be exposed to research activities under Permit Nos. 20648, 21482, and 21938. At this time, this method of estimating humpback whale DPS exposure represent the best available data and method given the granularity Dr. Heidi Pearson, Dr. Dan Engelhaupt (HDR, Inc.), and the SEFSC is able to project in their research activities.

Table 20. Probability of encountering humpback whales from each distinct population segment of humpback whales in the North Pacific Ocean in various feeding areas. Adapted from Wade et al. (2016).

Summer Feeding Areas	Western North Pacific Distinct Population Segment	Hawaii Distinct Population Segment	Mexico Distinct Population Segment	Central America Distinct Population Segment
Aleutian Islands, Bering Sea, Chukchi Sea, Beaufort Sea	4.4%	86.5%	11.3%	0%
Gulf of Alaska	0.5%	89.0%	10.5%	0%
Southeast Alaska, Northern British Columbia	0%	93.9%	6.1%	0%
Southern British Columbia, Washington	0%	52.9%	41.9%	14.7%
Oregon, California	0%	0%	89.6%	19.7%

Table 21. Probability of encountering humpback whales from each distinct population segment of humpback whales in the North Atlantic Ocean in various feeding areas.

Summer Feeding Areas	West Indies Distinct Population Segment	Cape Verde Islands/Northwest Africa Distinct Population Segment
Gulf of Maine	100%	0%
Gulf of St. Lawrence	100%	0%
Newfoundland/Labrador	100%	0%
Western Greenland	100%	0%
Iceland	97.5%	2.5%
Norwegian Sea	97.5%	2.5%
Northern Norway	97.5%	2.5%

Table 22. Probability of encountering humpback whales from each distinct population segment of humpback whales in the North Atlantic Ocean in various breeding areas.

Winter Breeding Areas	West Indies Distinct Population Segment	Cape Verde Islands/Northwest Africa Distinct Population Segment
Greater Antilles (Mouchoir Bank, Silver Bank, Navidad Bank, and Samana Bay)	100%	0%
Lesser Antilles (Anguilla, Saint Martin, Guadeloupe, Martinique, Saint Vincent and Grenadines) *From mid-March through late May or early June*	99.96%	0.04%
Cape Verde Islands	0%	100%

Given the Permits and Conservation Division's issuance and counting of takes as well as the researchers' inability to identify each individual animal in the field in real time, the *Number of Takes* presented in Table 2, Table 3, Table 4, and Table 5 represents the maximum number of individuals that may be exposed to the proposed research activities annually, although it is possible that individuals can be exposed more frequently than specified in *Takes Per Animal Per Year* (Table 2, Table 3, Table 4, and Table 5) in a given year for research activities under Permit Nos. 20648, 21482, and 21938. The Permits and Conservation 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. For example, if researchers sample an animal one day it will count as one individual taken under the MMPA permit. If the same individual were sampled on another day that same year without the researchers realizing it, it will be counted as a different individual taken under the MMPA permit. This will result in the total annual number of individuals exposed to the proposed research activities being less than in Table 2, Table 3, Table 4, and Table 5. This scenario also illustrates that researchers may unintentionally sample the same individual more than once in a single year, and thus may not be able to adhere to the number specified in the *Takes Per Animal Per Year* column. However, given the nature of fieldwork (unpredictability, reliance on equipment and personnel availability, and good weather for operations, etc.), the vast action area of Permit Nos. 20648, 21482, and 21938, and the range of most ESA-listed cetaceans, it is likely that many, if not all animals will only be sampled once or at most two or three times over the five-year permit timeline. For fairly small residential populations such as that of the Gulf of Mexico subspecies of Bryde's whale or the Main Hawaiian Islands insular DPS of false killer whales, there is an increased possibility that the same animal may be intentionally or unintentionally sampled more than once or multiple times in a given year. However, in these circumstances, researchers typically have well-established photo-identification catalogs and are able to readily identify the animals in the field and avoid repeat sampling, if necessary.

11.3.2 Response Analysis

Given the exposure detailed above, in this section we describe the range of responses among ESA-listed cetaceans that may result from the stressors associated with the research activities that will be authorized under Permit Nos. 20648, 21482, and 21938. These include stressors associated with the following activities: manned and unmanned aerial surveys, vessel surveys, close approaches, underwater photography and videography, behavioral observations, active acoustics (playbacks and prey mapping), biopsy sampling, and tagging. Based on a review of available information, this opinion determined which of these possible stressors will be discountable or insignificant and which may lead to lethal, sub-lethal (or physiological), or behavioral responses that might reduce the fitness of individuals. As discussed in Section 11, active acoustics (prey mapping), passive acoustic monitorings, as well as breath, fecal, prey, and sloughed skin sampling are not expected to produce any stressors themselves. Thus, no response to these research activities is expected beyond the response to the vessel surveys and close approaches needed to perform these research activities. Our response analysis considers and weighs evidence of adverse consequences, as well as evidence suggesting the absence of such consequences. In cases where data specific to a species (e.g., North Atlantic right whales) are unavailable, we rely on data from other species, including cetaceans, particularly large whales (i.e., mysticetes and sperm whales). We recognize that there can be species' specific responses, and even within species all individual animals do not respond to each stressor in the same way (e.g., Noren and Mocklin 2012). Examining the range of responses large whales exhibit to research activities allows us to incorporate the uncertainty that stems from intra- and inter-species response heterogeneity, and makes use of the best available science.

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 (Harrington and Veitch 1992; Lima 1998; Gill et al. 2001; Frid and Dill 2002; Frid 2003; Beale and Monaghan 2004; 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 a “fight or flight” response to more serious physiological changes resulting from chronic exposure to stressors. Stress responses can also lead to interruptions of essential behavioral or physiological events, alteration of an animal’s time budget, or some combination of these responses (Sapolsky et al. 2000; Frid and Dill 2002; Romero 2004; 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 (Feare 1976; Daan 1996; Bearzi 2000).

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 (Thomson and Geraci 1986; St. Aubin and Geraci 1988; St. Aubin et al. 1996; Gulland et al. 1999; Busch and Hayward 2009). 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 (Thomson and Geraci 1986; Kaufman and Kaufman 1994; Dierauf and Gulland 2001; Dierauf and Gulland 2001; Cattet et al. 2003; Elftman et al. 2007; Fonfara et al. 2007; Noda et al. 2007; Mancia et al. 2008; Busch and Hayward 2009; Dickens et al. 2010). 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; Herraez et al. 2007; Cowan and Curry 2008). 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 2001). Mammalian stress levels can vary by age, sex, season, and health status (Peters 1983; Hunt et al. 2006; Keay et al. 2006). In addition, smaller mammals tend to react more strongly to stress than larger mammals (Peters 1983; Hunt et al. 2006; Keay et al. 2006).

In sum, the common underlying stressor of a human disturbance caused by the research activities that will occur under Permit Nos. 20648, 21482, and 21938 may lead to a variety of stress-related responses. However, given the relatively short duration of the research activities (a few seconds to several hours) relative to marine mammal life histories (e.g., life expectancies of 15 to over 100 years), we do not anticipate these responses to result in negative fitness consequences. In addition to possibly causing a stress-related response, each research activity is likely to produce unique responses as detailed further below. For unintentional disturbance 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.

11.3.2.1 Manned Aerial Surveys

Responses to aerial surveys consist only of behavioral responses, which vary by species and aircraft type. As outlined below, behavioral responses to manned aerial surveys are likely more pronounced than to unmanned aerial surveys.

Manned aerial surveys that will be authorized under Permit Nos. 21482 and 21938 may cause visual disturbance or auditory disturbance (i.e., noise) that may affect ESA-listed cetaceans within the action areas. Cetacean responses to aircraft depend on the animals' behavioral state at the time of exposure (e.g., resting, socializing, foraging, or traveling) as well as the altitude and lateral distance of the aircraft to the animals (Luksenburg and Parsons 2009). The underwater and sound intensity from aircraft is less than produced by boats and visually, aircraft are more difficult for cetaceans to locate since they are not in the water and move rapidly (Richter et al.

2006). However, when aircraft fly below certain altitudes (about 500 meters [1,640.4 feet]), they have caused cetaceans to exhibit behavioral responses that might constitute a significant disruption of their normal behavioral patterns (Patenaude et al. 2002). Thus, aircraft flying at low altitude, at close lateral distances and above shallow water elicit stronger responses than aircraft flying higher, at greater lateral distances and over deep water (Patenaude et al. 2002; Smultea et al. 2008). The sensitivity to disturbance by aircraft may also differ among species (Wursig et al. 1998). Sperm whales have been observed to respond to a fixed-wing aircraft circling at altitudes of 245 to 335 meters (803.8 to 1,099.1 feet) by ceasing forward movement and moving closer together in a parallel flank-to-flank formation, a behavioral response interpreted as an agitation, distress, and/or defense reaction to the circling aircraft (Smultea et al. 2008). About 14 percent of bowhead whales, an ESA-listed species of cetacean, approached during aerial surveys exhibited short-term behavioral reactions (Patenaude et al. 2002). While all ESA-listed cetacean species exposed to aerial surveys may exhibit short-term behavioral reactions, data from Dr. Dan Engelhaupt and the SEFSC from past permits indicated only mild behavioral responses, if any. It is expected the aerial surveys using manned aircraft conducted during the proposed research activities will result in no reaction or only mild short-term behavioral reactions and not any long-term behavioral changes or reduction in fitness. Therefore, we conclude that the effects of disturbance on ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) that may result from this stressor (manned aerial surveys) are insignificant, and thus manned aerial surveys may affect, but are not likely to adversely affect these species.

Aerial surveys directed at cetaceans may also unintentionally disturb ESA-listed pinnipeds. However, as a condition in the permits, Dr. Dan Engelhaupt and SEFSC will not be authorized to conducted flights over pinniped haul-outs and rookeries, and thus any incidental disturbance will likely occur over water, or occur over one or a few individuals on land or sea ice. Potential responses to aircraft overflights by pinnipeds range from no response to temporary entry into the water. Born et al. (1999) conducted a systematic study on the response of ringed seals to aircraft disturbance; 302 of 5,040 hauled-out ringed seals (six percent) entered the water in response to a low-flying (150 meters [492.1 feet] altitude) twin-engine plane (Born et al. 1999). In Baffin Bay, Alaska, 44 bearded seals did not react to a twin-engine turboprop plane flying at 100 to 200 meters (328,1 to 656.2 feet) altitude (Finley and Renaud 1980). Burns and Frost (1979) report that bearded seals raise their heads but usually remain on ice unless an airplane passes directly overhead. Kelly et al. (1986) report that all ringed seals (N=13) subsequently returned to their lairs and hauled-out, after entering the water in response to anthropogenic disturbances. In two separate studies, some Steller sea lions have demonstrated awareness to fixed-wing aerial surveys at elevations between 195 to 250 meters (639.8 to 820.2 feet), but no Steller sea lions left the beach or stampeded (Snyder et al. 2001; Wilson et al. 2012). From Dr. Dan Engelhaupt's past research activities, ESA-listed pinnipeds appear to show minimal response to aerial surveys. In sum, we expect ESA-listed pinnipeds to either exhibit no response to aerial surveys or exhibit mild short-term behavioral reactions but do not expect any long-term behavioral changes or reduction in fitness. Therefore, we conclude that the effects of disturbance on ESA-listed pinnipeds that may result from this stressor (manned aerial surveys) are insignificant, and thus manned aerial surveys may affect, but are not likely to adversely affect these species.

11.3.2.2 Unmanned Aerial Surveys

Unmanned aerial surveys that will be authorized under Permit No. 20648, 21482, and 21938 may also cause visual or auditory disturbances to ESA-listed cetaceans. Despite being conducted at much lower altitudes than manned aerial surveys, the aircraft used to conduct unmanned aerial surveys will be much smaller and quieter, so less of a behavioral response might be expected. While the use of unmanned aerial systems to study cetaceans is in its infancy, current data support the notion that there is less disturbance and indicate that cetaceans exhibit no behavioral response to unmanned aerial systems. For example, Acevedo-Whitehouse et al. (2010) used unmanned aircraft systems at 13 meters (42.7 feet) over blue, gray, humpback, and sperm whales, and observed no avoidance behaviors. Koski et al. (2015) used unmanned aircraft systems over bowhead whales at 120 meters (393.7 feet) with no behavioral responses noted. NMFS' Southwest Fisheries Science Center used unmanned aerial systems over killer whales and found that at 35 meters (114.8 feet), there were no behavioral reactions (Durban et al. 2015). Three recent reviews covering the potential impacts of unmanned aerial systems on marine mammals found no data to indicate that ESA-listed cetaceans behaviorally respond to unmanned aircraft systems (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 unmanned aircraft systems were flown at a height of approximately 3.7 meters (12 feet) over the animals (NMFS 2017e). These responses consisted of mild, short-term changes in behavior such as cetaceans rolling over to view the unmanned aircraft systems, or "bucking" before returning to pre-exposure behavior.

Based on the available information, we anticipate that in most cases, there will be no response to unmanned aircraft systems, but in some cases, mild short-term behavioral responses could occur. Given the nature of these responses, we do not expect they will significantly disrupt the normal behavioral patterns of ESA-listed cetaceans. Therefore, we conclude that the effects of disturbance on ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) that may result from this stressor (unmanned aerial surveys) are insignificant, and thus unmanned aerial surveys may affect but are not likely to adversely affect these species.

11.3.2.3 Vessel Surveys, Close Approaches, and Documentation

Vessel surveys and close approaches conducted under the proposed permits will expose ESA-listed cetaceans within the action areas to vessel traffic, discharge, 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 research activities, responses to which are described in the subsections below.

Vessel surveys necessarily involve transit within the marine environment, and the transit of any research vessel in waters inhabited by cetaceans carries the risk of striking an animal. Responses to a vessel strike can involve death, serious injury, or minor, non-lethal injuries. The probability of a vessel collision and the associated response depends, in part, on the size and speed of the vessel. The majority of vessel strikes of large whales occur when vessels are traveling at speeds greater than approximately 18.5 kilometers per hour (10 knots), with vessels traveling faster, especially large vessels (80 meters [262.5 feet] or greater), being more likely to cause serious injury or death (Laist et al. 2001; Jensen and Silber 2004; Vanderlaan and Taggart 2007; Conn and Silber 2013).

The research vessels will be traveling at generally slow speeds, reducing the amount of noise produced by the propulsion system and the probability of vessel strikes (Kite-Powell et al. 2007; Vanderlaan and Taggart 2007). While ship strikes during research activities are possible, we are aware of only two instances of a research vessel striking a whale in thousands of hours at sea (Wiley et al. 2016). One of these strikes occurred within the action area for Permit No. 21938 and involved the NOAA research vessel (R/V) *Auk*. While transiting to port on April 9, 2009 in Massachusetts Bay, the R/V *Auk* struck a North Atlantic right whale (Wiley et al. 2016). A captain and mate each of whom had logged many hours of ship time during marine mammal research activities operated the vessel. The vessel was traveling at 36.5 kilometers per hour (19.7 knots), which, while not required for a vessel of its size (15 meters [49.2 feet]), is well above the 18.5 kilometers per hour (10 knots) restrictions that were active at the time within the area for larger vessels (greater than 19.8 meters [65 feet]). Winds were 37 to 42.6 kilometers per hour (20 to 23 knots) out of the northeast, and wave heights were approximately 1.3 meters (4.3 feet), not ideal conditions for spotting marine mammals. Six marine mammal observers were on the lookout when the mate spotted a whale approximately 9 meters (29.5 feet) in front of the vessel, which was subsequently seen by a marine mammal observer when the whale's fluke was directly in front of the vessel. There was not time to notify the captain, nor adjust course and speed; the North Atlantic right whale was struck. The North Atlantic right whale exhibited minor bleeding from seven to eight lacerations on the tip of its left fluke blade, which follow up photographs show eventually healed with the tip of the fluke falling off. After assessing the animal's condition, the R/V *Auk* departed approximately one hour following the initial strike, because at that point the animal appeared to be behaving normally. Since the event, the North Atlantic right whale has been seen at least 46 times, with the injury being fully healed by day 719 after the ship strike and the animal appearing to be healthy (Wiley et al. 2016).

The R/V *Auk* ship strike incident is an important reminder that even with well-trained marine mammal observers and vessel operators, all vessels, even research vessels, have the potential to strike cetaceans. In this particular instance, there were six dedicated marine mammal observers, but no indication of the animal's presence prior to the initial sighting within 9 meter (29.5 feet) of the vessel by the mate. We consider this event extremely rare given that only two instances of research vessel ship strikes have ever been reported over the years of cetacean research similar to the proposed actions under MMPA permits, neither of which appear to have been lethal (Wiley et al. 2016).

We generally expect the movement of marine mammals away from or parallel to the research vessels. Also, the researchers have not documented any vessel strikes on ESA-listed marine mammals during research activities. Given the rarity of ship strikes of large whales during research activities from historical data, the extensive experience of researchers at the University of Alaska Southeast, HDR, Inc., and SEFSC have in spotting cetaceans at sea and the fact that the researchers have not struck a large whale during past research activities, and the slow speeds (generally 18 kilometers per hour [10 knots]) at which they will operate when near animals, we believe the likelihood of a vessel strike from research vessel transits is extremely unlikely. As such, the potential for vessel strike from the research vessels is highly improbable. Therefore, we conclude that the effects on ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) that may result from this stressor (vessel strike) are discountable, and thus vessel transit associated with the proposed action may affect, but are not likely to adversely affect these species.

Discharges from research vessels in the form of leakages of fuel or oil are possible, though effects of any spills to ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) will be minimal, if they occur at all. The potential for fuel or oil leakages is extremely unlikely. An oil or fuel leak could 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 vessels is unlikely to cause widespread, high dose contamination (excluding the remote possibility of severe damage to the research vessel) that will impact ESA-listed cetaceans directly or pose hazards to their food sources. During vessel surveys, NOAA research vessels conform to requirements of 33 C.F.R. §151, the Federal Water Pollution Control Act, International Maritime Organization ballast water guidelines, and MOC Environmental Guideline ENV 09. Given the experience of the researchers and boat operators in conducting research activities and maintaining research vessels in the action areas, it is unlikely that spills or discharges will occur. If a discharge does occur, the amounts of leakage will be small, and would be expected to disperse quickly in the water and not affect cetaceans directly. Therefore, we conclude that the effects on ESA-listed cetaceans that may result from this stressor (discharge) are discountable and thus vessel discharges may affect but are not likely to adversely affect.

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 (Watkins et al. 1981; Hall 1982; Baker et al. 1983; Malme et al. 1983; Richardson et al. 1985; Au and Green 2000; Baumgartner and Mate 2003; Jahoda et al. 2003; Koehler 2006; Scheidat et al. 2006; Isojunno and Miller 2015). Changes in cetacean behavior can correspond to vessel speed, size, and distance from the whale, as well as the number and frequency of vessel approaches (Baker et al. 1988; Beale and Monaghan 2004). 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; Wursig et al. 1998; Gauthier and Sears 1999; Hooker et al. 2001; Lusseau 2004; Koehler 2006; Richter et al. 2006; Weilgart 2007). Observations of large whales indicate that cow-calf pairs, smaller groups, and groups with calves appear to be more responsive to close vessel approaches (Hall 1982; Bauer 1986; Bauer and Herman 1986; Clapham and Mattila 1993; 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 914.4 meters (3,000 feet) (Malme et al. 1983; Richardson et al. 1985) from the animals, 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).

We expect that the research vessels will not add significantly to the local noise environment in their operating area due to the propulsion and other noise characteristics of the vessel's machinery. Any contribution is likely small in the overall environment of regional ambient sound levels. A research vessel's transit past a marine mammal will be brief and is not likely to impact any individual's ability to feed, reproduce, or avoid predators. Brief interruptions in communication via masking are possible, but unlikely given the habits of marine mammals to move away from the research vessels, either as a result of engine noise, the physical presence of the research vessel, or both (Lusseau 2006). In addition, the research vessels will be traveling at relatively slow speeds, reducing the amount of noise produced by the propulsion system. The source levels of sounds that will be generated by research vessels (i.e., vessel noise) 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 2009b; NOAA 2018). Because the potential acoustic interference from engine noise will be undetectable or so minor that it could not be meaningfully be evaluated, we find that the effects to ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) from this potential stressor are insignificant and thus engine noise may affect, but is not likely to adversely affect these species.

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 the effects of close approaches by research vessels that will be authorized under Permit Nos. 20648, 21482, and 21938, with the exception of close approaches for tagging, to be minimal for several reasons. Researchers at the University of Alaska Southeast, HDR, Inc., and SEFSC have years of experience approaching cetaceans in a way that is designed to minimize disturbance and associated responses. Researchers will be on constant lookout for marine mammals, and thus, if non-target ESA-listed marine mammals are spotted, researchers will be able to avoid closely approaching them. Nonetheless, a close approach to these species can occur if researchers are unable to identify the marine mammal species or DPS from a distance. The source level of sounds that will be generated by research vessels are below that which can cause physical injury or temporary hearing threshold shifts, and they are unlikely to negatively affect cetaceans ability to hear mates and other conspecifics (Hildebrand 2009b; NOAA 2018). No long-term effects on behavior or fitness from disturbances caused by close approaches by research vessels have been documented by researchers at the University of Alaska Southeast, HDR, Inc., SEFSC, and more generally in the literature. Based on accounts from past research activities, responses documented in the literature, and the proposed research method for closely approaching cetaceans using a research vessel that incorporates measures to minimize impacts, 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 cetaceans to an extent that would create the likelihood of injury or impact fitness. As a result, we do not expect close approaches, with the exception of those required for tagging, to have fitness consequences for individual cetaceans. The anticipated response from the close approaches that will be required for tagging, which occur at much closer distances (within a few meters) are further discussed below. Therefore, we conclude that the effects on ESA-listed marine mammals that may result from this stressor (close approaches for research activities other than biopsying and tagging) are insignificant and thus these close approaches may affect but are not likely to adversely affect these species.

11.3.2.4 Photography and Videography

As noted previously, photography and videography will occur following close approaches, and as such, photography and videography is expected to produce the same responses as previously described in Section 11.3.2.3. Simply taking an animal's photograph or video is not expected to present any unique stressors that will cause additional responses. Photography and videography will not affect the fitness of individual cetaceans. Therefore, we conclude that the effects on ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) that may result from this stressor (photography and videography) are insignificant and thus photography and videography may affect, but is not likely to adversely affect these species.

11.3.2.5 Behavioral Observation

Observation of cetaceans will occur during research activities to increase the understanding of cetacean ecology and behavior as well as provide insight on the effects of anthropogenic disturbance on cetaceans. Behavioral observations will occur concurrently with other research activities including aerial surveys, vessel surveys, focal follows, active acoustics, biological sampling, and tagging. Given that observation itself does not present any unique stressors not already described in detail for aerial and vessel surveys and close approaches, we do not anticipate unique responses to observation. However, the duration of observations following biological sampling or tagging will generally be greater than during a typical vessel survey. As detailed in Section 3, most of the time the research vessel will be at distances no closer than approximately 50 meters (164 feet). If the individual were to exhibit an indication of disturbance, then the researchers will move away and take all possible actions to minimize such disturbance because such disruption of natural behavior invalidates their dataset. Thus, given the far distances from which most observation will occur, and the motivation of the researchers to minimize disturbing cetaceans during observations, we expect no effects on fitness as the result of observations. Therefore, we conclude that the effects on ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) that may result from this stressor (observation) are insignificant and thus observations may affect, but are not likely to adversely affect these species.

11.3.2.6 Active Acoustics – Playbacks

Acoustic disturbance as a result of the playback experiments can interrupt essential behaviors of ESA-listed marine mammal and sea turtle species such as foraging and breeding. The researchers will conduct the active acoustic playbacks in the waters of Hawaii on non-ESA-listed humpback whales, minke whales, spinner dolphins, pantropical spotted dolphins, bottlenose dolphins, false killer whales, melon-headed whales, pygmy killer whales, and short-finned pilot whales. ESA-listed blue whales, Main Hawaiian Islands insular DPS of false killer whales, fin whales, North Pacific right whales, sei whales, and sperm whales as well as Hawaiian monk seals and sea turtles may occur in the action area for active acoustic playbacks.

Potential effects of underwater sound from playbacks on marine mammals include injury, threshold shift, masking and behavioral disturbance (e.g., Richardson et al. 1995; Nowacek et al. 2007; Southall et al. 2007).

Marine mammal hearing is not suspected to be above 160 kiloHertz, but 200 kiloHertz is often used as the cutoff for high-frequency cetaceans. Specifically for low-frequency cetaceans, such as mysticetes, the generalized hearing range is estimated to range from 7 Hertz to 35 kiloHertz (NOAA 2018). Blue whales, being low-frequency cetaceans, are thought to have a hearing range between 7 Hertz to 35 kiloHertz, but no empirical data exists on blue whale hearing (NOAA 2018). Fin whales are also low-frequency cetaceans, thought to have a sensitivity to a broad range of frequencies between 10 Hertz and 12 kiloHertz and a maximum sensitivity to sounds in the 1 to 2 kiloHertz range (Cranford and Krysl 2015). No direct data exists on the hearing range of North Pacific right whales, but is predicted to be from 10 Hertz to 22 kiloHertz with functional ranges probably between 15 Hertz to 18 kiloHertz (Parks et al. 2007). Sei whales are also low frequency cetaceans and thought to have a hearing range of 7 Hertz to 35 kiloHertz (NOAA 2018). The generalized hearing range for mid-frequency cetaceans is thought to be between 150 Hertz to 160 kiloHertz, although data from Thomas et al. (1998) indicate a narrow range for false killer whales of 16 to 64 kiloHertz. Sperm whales are considered to be part of the mid-frequency hearing group and have a hearing range of 2.5 to 60 kiloHertz and highest sensitivity to frequencies between 5 to 20 kiloHertz (Carder and Ridgway 1990). Thus, the frequencies (20 Hertz to 40 kiloHertz) that will be used during the playback windows are likely audible to all ESA-listed species in the action area. Playback signals may potentially include (but not more than one) narrow band noise, 1/3 octave band noise, pure tones, frequency modulated tones, intermittent tones, and amplitude modulated tones. The active acoustic playbacks will have a maximum sound source level of approximately 170 dB re: 1 μPa (rms) and will have a maximum of one continuous 60-second duration.

Under Permit No. 21482, active acoustic playbacks will be targeted at the Hawaii DPS of humpback whales, which are not ESA-listed. Humpback whales prefer shallower coastal water during the breeding and calving season (Cartwright et al. 2012; Craig et al. 2014). In waters off Hawaii, Main Hawaiian Islands insular DPS of false killer whales live in social groups and prefer deep, offshore waters with a depth greater than 1,000 meters (3,280.8 feet) (Baird et al. 2008; Baird et al. 2010). While these two species do not prefer the same habitats, they may overlap temporally and associate temporarily. The researchers will have dedicated visual observers and conduct passive acoustic monitoring to shut-down the sound source and avoid unintentional exposure of non-target animals.

Nevertheless, even if one of these ESA-listed species were to be unintentionally exposed to playbacks, it will only be for 60 seconds or less. Furthermore, even within the 2,000 meter (6,561.7 feet) radius around the target animal(s) that will be continuously visually monitored by dedicated observers for non-target animals, the maximum source levels that a non-target individual can be exposed to (160 dB re: 1 μPa [rms]) are below that which is expected to cause temporary and/or permanent threshold shifts and injury in marine mammals (NMFS 2016d). The active acoustic playbacks will not occur if other non-target species of marine mammals and/or sea turtles are visually observed within the audible perimeter. While no temporary or permanent threshold shift onset studies have been done for sea turtles, maximum thresholds for cetaceans or fish are generally used, and as with marine mammals, these will not be exceded (Finneran and Jenkins 2012; Popper et al. 2014b). These sound source levels are also below that of typical humpback whale vocalizations (less than 170 dB re 1 μPa, Au, Pack et al. 2006), which during the breeding season are a common occurrence in waters off Hawaii. If such sound source levels disturb these animals, we would expect them to leave the area as the result of humpback whale vocalizations, which are more frequent and longer in duration than the proposed playbacks will be (Darling 2009). Thus, even if non-target ESA-listed species were to be exposed to sounds from playbacks, we find it highly unlikely that there will be any adverse effects, and thus discountable. Therefore, we expect no effects on fitness as the result of active acoustic playbacks.

Therefore, we conclude that the effects of disturbance on ESA-listed cetaceans (i.e., blue whales, Main Hawaiian Islands insular DPS of false killer whales, fin whales, North Pacific right whales, sei whales, and sperm whales) that may result from this stressor (active acoustic playbacks) are insignificant or discountable and thus active acoustic playbacks may affect, but are not likely to adversely affect these species.

11.3.2.7 Active Acoustics – Prey Mapping

Prey mapping will image prey fields, including while marine mammals utilize habitats for foraging. Most of the responses to prey mapping are associated with the vessel survey and observation described above. While prey mapping does present the unique stressors of sound used to map prey and close approaches to foraging cetaceans, we do not anticipate these will have significant impacts on cetaceans. Marine mammal hearing is suspected to not be above 160 kiloHertz, although 200 kiloHertz is often used as the cutoff for high-frequency cetaceans. For low-frequency cetaceans, such as mysticetes, the generalized hearing range is estimated to be from 7 Hertz to 35 kiloHertz. For mid-frequency cetaceans, such as false killer and killer whales, the generalized hearing range is 150 Hertz to 160 kiloHertz. The prey mapping equipment (echosounders) frequencies of 100 to 240 kiloHertz for imaging marine mammals and 38 to 200 kiloHertz for imaging prey fields are generally outside the predicted hearing ranges (7 Hertz to 35 kiloHertz) of low-frequency cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, and Southern right whales) (NOAA 2018), and thus, we do not anticipate a response to these sounds. The middle 120 kiloHertz frequency of the echosounders will be within the hearing range of mid-frequency cetaceans, such as the Main Hawaiian Island Insular DPS of false killer whales and sperm whales (150 Hertz to 160 kiloHertz) (NOAA 2018). However, as described below, the echosounders produce highly directional beams that are oriented towards the seafloor and will likely not ensonify non-target vertebrates. Active acoustics involving a multi-beam echosounder with signal frequencies of 200 kiloHertz were used to monitor the behavior of spinner dolphins (*Stenella longirostris*) in Hawaii while foraging and the researchers did not report behavioral responses by the animals to the sound source (Benoit-Bird and Au 2009). Spinner dolphins are considered mid-frequency cetaceans with predicted hearing ranges similar to false killer and sperm whales (NOAA 2018). Close approaches to actively feeding cetaceans can cause dense prey patches to break up or redistribute, but the amount of prey that will be disturbed will be insignificant compared to that which the animal consumes in any given mouthful and that is expected to be available in the action area.

Also, the ensonification of animals can be easily prevented (compared to playbacks) given the sonar's relatively narrow beam production and directionality, which is often oriented downward thus making it likely that air-breathing, non-target vertebrates will go undetected. Relative to the speaker, sound frequency output is much higher and characterized by lower power, rapid signal attenuation, and a much more limited spatial theater over which the research activities are conducted. Sound propagation, even when caused by narrow beam devices, often includes a strong spherical spreading component. The concentrated sound energy of narrow beam transducers are much higher in frequency and thus well above mysticete's hearing sensitivity, and attenuate rapidly further reducing their likelihood of affecting non-target ESA-listed cetacean species. Thus, we do not anticipate the unique stressors associated with prey mapping to affect the fitness of individuals. Therefore, we conclude that the effects on ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) that may result from this stressor (active acoustics – prey mapping) are insignificant and thus the use of active acoustics for prey mapping may affect, but is not likely to adversely affect these species.

11.3.2.8 Passive Acoustic Monitoring

The towed hydrophone arrays, bottom-mounted autonomous recorders, gliders, and sonobuoys for passive acoustic monitoring can come in direct contact with ESA-listed cetaceans. Entanglement is unlikely due to the hydrophone design and bottom-mounted autonomous recording devices fixed to buoys, as well as the fact that researchers monitor the equipment during deployment. The taut cables between the equipment and buoys will prevent entanglement and observers on research vessels will spot cetaceans prior to and during deployment of this equipment. Instances of ESA-listed cetacean entanglement events during research activities these hydrophone systems have not been reported. The potential for entanglements is considered highly unlikely and therefore discountable. Therefore, we conclude that this stressor (entanglement from passive acoustic monitoring) may affect, but is not likely to adversely affect ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales).

11.3.2.9 Biological Sampling

Under Permit Nos. 20648, 21482, and 21938, the University of Alaska Southeast, HDR, Inc., and SEFSC will be authorized to collect a variety of biological samples. The only stressors associated with breath, fecal, prey, and sloughed skin sampling will be those associated with a potential close vessel approach as described above. Exhaled breath sampling under Permit Nos. 20648 and 21938, done from a research vessel or unmanned aircraft system, will involve approaching animals closely (approximately 2 to 5 meters [6.6 to 16.4 feet]) than will typically be done for other research activities except for tagging and biopsy sampling. As a result, we anticipate the very close approaches associated with vessel-based and/or unmanned aerial system-based exhaled breath sampling may elicit a greater proportion of the more extreme responses noted above, such as momentary changes in swimming speed and orientation, diving, changes in surface and foraging behavior, and changes in respiratory patterns as described above.

11.3.2.10 Biopsy Sampling

Biopsy sampling will result in stressors from a minor puncture wound and tissue collection, and requires a very close approach. In general, it is difficult to distinguish between animals' reactions to these different stressors without explicit studies designed to isolate the response to individual stressors, which to our knowledge have not been conducted. As such, below we describe the range of responses, both physiological and behavioral, to the overall procedure of biopsy sampling, and where data are available, indicate possible responses to specific stressors.

Physiological responses of cetaceans to biopsy sampling may include the biopsy site wound and associated healing, a stress response, serious injury, or even death (reviewed in Noren and Mocklin 2012). Responses vary by species, biopsy tip dimensions, the draw weight of the sampling method, and the distance from which animals are sampled but most animals heal quickly, often within a month or less, and show no signs of infection (Noren and Mocklin 2012). In fact, for at least some large whale species (e.g., Southern right whale [*Eubalaena australis*]) immediately after sampling takes place, biopsy sites are hardly noticeable (Reeb and Best 2006). This is perhaps not surprising given that cetaceans have high rates of cell proliferation that enable them to heal from large shark-inflicted wounds within months (Corkeron et al. 1987; Lockyer and Morris 1990; Dwyer and Visser 2011).

Beyond the wound itself, biopsy sampling could cause a physiological stress response similar to that described in the beginning of this section, even if the biopsy dart does not successfully penetrate the animal's tissue. Such a response may involve the release of stress hormones, short-term weight loss, susceptibility to gastrointestinal parasitism, the liberation of glucose into the blood stream, impairment of the immune and nervous system, an elevated heart rate, body temperature, blood pressure, and alertness, muscle damage, and death. However, given the small size of wounds created by biopsy sampling and the short duration over which the sampling occurs, stress responses to remote biopsy sampling are likely minimal.

Finally, biopsy sampling could result in serious injury or death. However, in over 40 years of researchers collecting biopsy samples from cetaceans, we are aware of only one example of such an event: a common dolphin death following biopsy sampling in 2000 (Bearzi 2000). Several possible explanations exist for why this particular animal died including a dart stopper malfunction, the location of the biopsy wound, the thinness of the animal's blubber, the handling of the animal, and possibly this animal having a predisposition to catatonia and death during stressful events (Bearzi 2000). It is important to note that due to this animal's unusually thin blubber layer, the biopsy tip penetrated the animal's muscle, which is not the intent of biopsy sampling efforts.

While the above discussion indicates a range of physiological responses to biopsy sampling, only minor wounds and low-level stress responses are anticipated as the result of biopsy sampling that will be conducted under Permit Nos. 20648, 21482, and 21938. This is because all biopsy dart tips used will be (1) thoroughly sterilized before sampling, thus minimizing any chance of infection, (2) only penetrate 2.6 to 4 centimeters (1 to 1.6 inch), less than the typical thickness of most large cetacean's blubber (five to 10 centimeters; Lockyer et al. 1985). Biopsy dart tips will be fitted with an encircling cushioned stop to ensure recoil and prevent deeper penetration, and so will not penetrate any individual's muscle based on the anticipated thickness of the blubber layer of species to be sampled. Thus, biopsy dart tips are not expect to result in serious injury or death.

Cetaceans also exhibit a wide range of behavioral responses to biopsy sampling (reviewed in Noren and Mocklin 2012), and in some cases these are indistinguishable from those described below for penetrating tags (Reisinger et al. 2014). Most researchers report either no behavioral response or minor behavioral responses including changes in dive behavior, heading, or speed, and startle responses and tail flicks (Noren and Mocklin 2012). On occasion, researchers report similar low-level responses from animals nearby those being biopsied and to darts entering the water, suggesting that some observed responses are a general startle response and not necessarily due to being contacted by the biopsy dart (Gorgone et al. 2008; Noren and Mocklin 2012). From past research documented in annual reports, various researchers have observed responses to biopsy sampling ranging from no visible response to a 'startled' reaction sometimes followed by an animal swimming away or diving. On rare occasions (zero to six percent of animals biopsied), researchers have reported more severe behavioral responses such as flight response, breaching, multiple tail slaps, and/or numerous trumpet blows (Noren and Mocklin 2012). These more severe responses appear to coincide with instances where biopsy tips struck an unintended body part (e.g., dorsal fin) or when tips remain lodged in the animal (Weinrich et al. 1991; Weinrich et al. 1992; Gauthier and Sears 1999; Berrow et al. 2002). This being said, when darts remain in animals they do not appear to result in mortality, infection, or lasting behavioral changes (Clapham and Mattila 1993; Barrett-Lennard et al. 1996; Parsons et al. 2003).

For all of these responses, it is important to keep in mind that in many cases it is hard to distinguish the behavioral response to biopsy sampling from the response to the close vessel approach (Pitman 2003). Regardless, in most instances, animals return to pre-biopsying/close approach behavior quickly, usually within 30 seconds to three minutes (Noren and Mocklin 2012). In fact, biopsied individuals do not appear to avoid vessels during subsequent biopsy attempts (within one week to five months), and in many cases show the same or a lesser response to the second biopsying event (Best et al. 2005; Noren and Mocklin 2012).

A variety of factors influence how cetaceans respond behaviorally to biopsy sampling including the species, age and sex, behavioral context, location, methods and or equipment used, type and size of the boat, size of the biopsy dart, season, water depth, and sea state (Noren and Mocklin 2012). For example, a higher proportion of odontocetes respond to the biopsy sampling compared to mysticetes (Noren and Mocklin 2012). In some cases (Best et al. 2005), but not others (Weinrich et al. 1991), mothers and calves appear to be more sensitive to biopsy sampling than other age groups. Migrating humpback whales appear to be less responsive than those on the feeding grounds (Weinrich et al. 1991; Clapham and Mattila 1993). But on the feeding grounds, foraging humpback whales are less likely to respond than resting humpback whales (Weinrich et al. 1992).

The biopsy sampling may cause temporary stress, pain, wounding, and injury, with the potential for behavioral responses. The potential for serious injury and/or long-term effects on individuals from biopsy sampling is minimal. The biopsy darts will not contain any hazardous materials, and the penetration depth of the dart relative to the blubber depth and minimization measures (see *Description of the Proposed Action* [Section 3] and *Mitigation to Minimize or Avoid Exposure* [Section 11.2]) employed to prevent deeper penetration make it highly unlikely that serious injury will occur to target individuals.

Given the above overview of possible behavioral responses of cetaceans to biopsy sampling, and the mitigation measures proposed by the Permits and Conservation Division and the applicants (Section 11.2), we expect ESA-listed cetaceans to behaviorally respond to biopsy sampling by exhibiting short-term, minor to moderate changes in behavior. However, we do not expect these behavioral responses will significantly disrupt their normal behavioral patterns to an extent that it will create the likelihood of injury or impact any individuals' fitness.

In summary, of the large number of cetaceans that have been biopsy sampled in recent decades (probably in the tens of thousands), there has been only one documented case of an immediate fitness consequence associated with biopsy sampling (Bearzi 2000) and it was a small cetacean (i.e., dolphin), while large cetaceans (i.e., whales) will be targeted in the proposed actions that are the subject of this consultation. While studies on the delayed, long-term impacts of biopsy sampling are lacking, the available data suggests no effects to fitness (Best et al. 2005; Noren and Mocklin 2012). Also, the University of Alaska Southeast, HDR, Inc., and SEFSC have not observed any known injuries or other significant effects from biopsy sampling during the past 20 years. As such, we expect biopsy sampling to result in minor wounds, low-level stress responses, and temporary behavior changes, but we do not expect any individuals to experience reductions in fitness. Note that there is further discussion of effects from biopsy sampling and tagging below.

11.3.2.11 Breath Sampling

Exhaled breath sampling will occur during aerial and vessel surveys, and as such, carries all the stressors associated with aerial and vessel surveys described above. A very close approach is required for this research activity, and so we anticipate the previously mentioned responses to a very close approach including momentary changes in swimming speed and orientation, diving, surface and foraging behavior, and respiratory patterns. In addition, since sampling equipment will extend below the unmanned aerial system or from a long pole over and above the cetacean, it is possible that this activity may present the additional stressor of interaction with (i.e., contact) scientific equipment. Given that this is a relatively new technique, few data exist on the impacts of exhaled breath sampling on cetaceans, including possible interaction with sampling equipment. However, the technique was deliberately developed to provide an entirely non-invasive way to biologically sample free-ranging cetaceans with minimal impact (Hunt et al. 2013). We anticipate that researchers will make every effort not to contact animals, as doing so will result in contamination or possible loss of their sample or equipment. Furthermore, even if a cetacean were to contact the sampling equipment, it is unlikely to cause injury, although it can produce a response in a similar way as described for the initial suction-cup tag attachment. While we do not anticipate any contact between the sampling equipment and the animal, and thus no response from cetaceans to exhaled breath sampling, even if there were to be contact, we do not anticipate any effects to the fitness of individuals. Therefore, we conclude that the effects on ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) that may result from this stressor (breath sampling) are insignificant and thus breath sampling may affect, but is not likely to adversely affect these species.

11.3.2.12 Fecal Sampling

Fecal sampling will occur during vessel surveys and may affect ESA-listed cetaceans within the action areas. Fecal sampling is not expected to occur where cetaceans are, but rather in the path previously traveled by cetaceans. No approach to cetaceans will be made and the possibility that a cetacean surfaces at the same time and place as the fecal sample collection is remote. Nevertheless, if a cetacean were to approach researchers collecting a fecal sample, the sampling net or bag may present a stressor if the cetacean were to contact it. However, if a cetacean were to come near the net or bag, given its small size and form, it is very unlikely to injure the cetacean. Thus, we do not anticipate any response from cetaceans to fecal sampling, and as a result, no effects on the fitness of individual cetaceans. Therefore, we conclude that the effects on ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) that may result from this stressor (fecal sampling) are insignificant and thus fecal sampling may affect, but is not likely to adversely affect these species.

11.3.2.13 Prey Sampling

Prey sampling will occur during vessel surveys and may affect ESA-listed cetaceans within the action areas. Prey sampling is not expected to occur where cetaceans are, but rather in the path previously traveled by cetaceans. No approach to cetaceans will be made during collection of samples of prey and the possibility that a cetacean surfaces at the same time and place as the prey sample collection is remote. Nevertheless, if a cetacean were to approach researchers collecting a prey sample, the sampling net may present a stressor if the cetacean were to contact it. However, if a cetacean were to come near the net or bag, given its small size and form, it is very unlikely to injure the cetacean. Thus, we do not anticipate any response from cetaceans to prey sampling, and as a result, no effects on the fitness of individual cetaceans. Therefore, we conclude that the effects on ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) that may result from this stressor (prey sampling) are insignificant and thus prey sampling may affect, but is not likely to adversely affect these species.

11.3.2.14 Sloughed Skin Sampling

Sloughed skin sampling will occur during vessel surveys and may affect ESA-listed cetaceans within the action areas. Sloughed skin sampling is not expected to occur where cetaceans are, but rather in the path previously traveled by cetaceans. No approach to cetaceans will be made and the possibility that a cetacean surfaces at the same time and place as the sloughed skin sample collection is remote. Nevertheless, if a cetacean were to approach researchers collecting a sloughed skin sample, the sampling net may present a stressor if the cetacean were to interact with (i.e., contact). However, if a cetacean were to come near the net, given its small size and form, it is very unlikely to injure the cetacean. Thus, we do not anticipate any response from cetaceans to sloughed skin sampling, and as a result, no effects on the fitness of individual cetaceans. Therefore, we conclude that the effects on ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) that may result from this stressor (sloughed skin sampling) are insignificant and thus, sloughed skin sampling may affect, but is not likely to adversely affect these species.

11.3.2.15 Tagging

The University of Alaska Southeast, HDR, Inc., and SEFSC will be authorized to tag several ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) with either suction-cup, dart/barb, or deep-implantable tags. The University of Alaska Southeast, HDR, Inc., and SEFSC will be authorized to tag several ESA-listed cetacean species with suction-cup tags. The HDR, Inc., and SEFSC will be authorized to tag several ESA-listed cetacean species with dart/barb and/or deep-implantable tags. Dart/barb and/or suction-cup tagging carries the stressors and responses associated with very close approach (to within 5 meters [16.4 feet]), the initial attachment of the tag, and the continued attachment of tags, all of which have the potential to adversely affect cetaceans. Attachment of the tag will involve 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. Under Permit Nos. 20648, 21482, and 21938, transmitters on tags will be above the generalized hearing range of low-frequency cetaceans (7 Hertz to 35 kiloHertz) and mid-frequency (150 Hertz to 160 kiloHertz) cetaceans (e.g., VHF transmitters are 148 to 174 MegaHertz, satellite transmitters are 401.65 MegaHertz). We find that the effects of this stressor (transmitter on tags) are nonexistent to ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales), and thus the transmitter on suction-cup or dart/barb tags will not affect these species. Below we detail the range of physiological and behavioral responses to tags deployment and operations based on the timing of the response, from the initial tag deployment until the tag detaches.

11.3.2.16 Initial Tag Attachment

Concurrent with this response will be a response to the physical application of the suction-cup tag, or in the case of dart/barb and deep-implantable tags, tag penetration and puncture wounds. However, current research examining how cetaceans respond to tag attachments, regardless of type, does not usually distinguish between an animal'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 researchers 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 physical attachment of the tag.

Previous studies have found that cetaceans respond to suction-cup tag deployment (and missed attempts) in a variety of ways. In humpback whales, Goodyear (1989) 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 1989). Baird et al. (2000) observed only low (e.g., tail arch or rapid dive) to medium (e.g., tail flick) level reactions by humpback whales 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 the 28 that were successfully tagged and eight of the 14 that were unsuccessfully tagged). The remaining North Atlantic right whales reacted by lifting their heads or flukes, rolling, back arching, beating their flukes, or performing head lunges. In a review of 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 as described at the beginning of Section 11.3.2.16 is possible.

The behavioral responses cetaceans exhibit to the application of invasive tags, such as dart/barb and deep-implantable tags, are similar to those described for suction-cup tags and very close approaches (Walker et al. 2012). Furthermore, despite the difference in depth of penetration and size between dart/barb and deep-implantable tags, behavioral responses to deployment of dart/barb and deep-implantable tags, do not appear to drastically differ between the two tag types (Mate et al. 2007; Walker et al. 2012; Mate et al. 2016; Robbins et al. 2016; Szesciorka et al. 2016). 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; Walker et al. 2012; Mate et al. 2016; Szesciorka et al. 2016).

Given that dart/barb and deep-implantable tags penetrate the animal's tissue, a physiological response is expected. Anticipated reactions to these puncture wounds include minor pain, cell damage, and possible local inflammation, swelling, bleeding, blood clotting, hemorrhaging, and bruising (Weller 2008; Walker et al. 2012; Mate et al. 2016; Robbins et al. 2016; Szesciorka et al. 2016; NMFS 2017b). However, since dart/barb tags will be designed to not penetrate beyond the blubber layer or entirely through the dorsal fin, and the size of the puncture wounds will be small, very little bleeding, and no hemorrhaging, blood clotting, or bruising is expected to occur from these types of tags. While implantable tags create larger wounds and penetrate deeper (to the muscle-blubber interface), and so increase the risk of these more pronounced physiological responses (van der Hoop et al. 2013), current evidence suggests such responses are rare, even for deeper penetrating implantable tags (Weller 2008; Walker et al. 2012; Mate et al. 2016; Robbins et al. 2016; Szesciorka et al. 2016; NMFS 2017b). In addition, a stress response to the deployment of invasive tags is possible, but the available data indicates such a response will 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 (Weller 2008; Haulena 2016; NMFS 2016a). However, given that researchers at the HDR, Inc. and SEFSC will thoroughly sterilize all tags prior to deployment, infection is unlikely (see *Description of Proposed Action* and *Mitigation to Minimize or Avoid Exposure* sections for sterilization procedures). That said, tag sterilization does not preclude the possibility that a pathogen on the cetacean's skin could enter the body upon tag insertion (Weller 2008).

There is also a possibility that some dart/barb or deep-implantable tags may break upon impact or soon after, leaving parts of these tags (e.g., petals) in the animal with no tag attached. Future tag breakage is less likely given that recent tag modifications made by researchers have greatly reduced or eliminated tag breakage (Robbins et al. 2016; Szesciorka et al. 2016). Researchers have noted tag breakage and have consulted with tag manufacturers to modify tags in an effort to reduce and hopefully eliminate such tag breakage. 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, when tag breakage results in tag parts remaining in animals, there may be adverse impacts beyond the initial tagging event. In the permit application, the University of Alaska Southeast, HDR, Inc., and SEFSC report similar behavioral responses to initial tag deployments as those described above are noted based on work conducted under previous permits.

Based on this and the available information presented above, we expect behavioral responses to initial tag attachments (including unsuccessful attempts) to consist of brief, low-level to moderate behavioral responses. As a result, 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 and deep-implantable 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 attachment will affect the fitness of individual cetaceans. The potential consequences of continued tag attachment is discussed further below.

11.3.2.17 Continued Tag Attachment

Once tagged, cetaceans may respond both behaviorally and physiologically to the continued attachment of tags as well as hydrodynamic drag. For all types of tags, current studies suggest little to no measurable impact on cetacean behavior. In suction-cup tagged 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. This is not surprising given that the heaviest tags weigh only a fraction of a percent of the weight of a cetacean, and they have hydrodynamic designs to minimize drag (Aguilar 2009; Horwood 2009). In terms of size and weight, the tags proposed for use under Permit Nos. 20648, 21482, and 21938, are approximately equal to or less than the weight (see Section 3.6) of the tags previously authorized for use by Dr. Dan Engelhaupt and SEFSC, and will be expected to create the same or less hydrodynamic drag. In addition, the proportion of the tags to the animal's size and weight is such that the energetic demand on the animal will likely be insignificant. For deep-implantable tags, which penetrate deep and stay on longer than the dart/barb tags being proposed here, researchers also note that cetaceans appear to return to baseline behavior within minutes of the initial tagging event. Blue and humpback whales tagged with implantable tags, which are not proposed for use under this permit, appear to resume feeding soon after being tagged (Mate et al. 2007; Robbins et al. 2016). Robbins et al. (2016) reported that the median time it took humpback whales in the Gulf of Maine to recover behaviorally from being tagged with implantable tags was nine minutes. However, recovery times for some individuals were longer, lasting at least 4.5 hours for one individual, which appeared to be related to tag design flaws and the placement of the tag lower on the animal's body than is desired (Robbins et al. 2016).

This suggests that under some circumstances, at least some individuals (and/or species) exhibit more extended behavioral responses to tagging. However, all but one animal in the study observed on subsequent days appeared to resume species' typical behavior recovery times (Robbins et al. 2016). Thus, for most species and circumstances, behavioral response to continued attachment of tags is expected to be minor and short-term. These behavioral responses, for most species and circumstances, are in line with those described by researchers at the HDR, Inc. and SEFSC in their applications and annual reports from previous research activities.

While similar long-term behavioral responses are expected for the different tag types, tags 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 will be short-term and minimal (NMFS 2017b). For suction-cup tags, we expect that individuals will return to baseline behavior within a few minutes of attachment. We also anticipate little to no physiological response to the continued attachment of the suction-cup tag. As a result, we do not anticipate the continued attachment of suction-cup tags will affect the fitness of individual cetaceans. In contrast, dart/barb and deep-implantable 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 scarring and indentation (Hanson et al. 2008; Best et al. 2015; Calambokidis 2015; NMFS 2016a; Robbins et al. 2016; Szesciorka et al. 2016; Norman et al. in review).

Long-term impacts remain difficult to gauge (Mate et al. 2007). 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 different 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 suggest 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 through 2011). In 2005, ten years after tag deployment, the tag attachment remained embedded in the animal, with swelling less than 60 centimeters (23.6 inches) 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 animal was last seen in 2011 with a scar (closed wound) present at the tag site. The animal's calving history showed three calves, two were observed prior to, and one after, the swelling period (1999 through 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 a study on the effects of implantable tags on humpback whales in the Gulf of Maine, Robbins et al. (2016) examined the effects of implantable tags on vital rates of both males and females. For both sexes, there did not appear to be any effect on survival and many tagged females continued to successfully reproduce. However, tagging did appear to increase female's inter-birth intervals, with non-tagged females being nearly twice as likely to produce a calf compared to tagged females in the year following the initial tagging (or relevant year for non-tagged females). This suggests that implantable tagging may have an effect on pregnancy. Following this first year after tagging, tagged and non-tagged females appeared to be similarly likely to reproduce. Additional analyses investigating the effects of different tag models indicated that this impact on reproduction may have been due to a tag design flaw that lead to tag breakage and parts of the tag being left inside the animal after the tag detached. This flaw was recently addressed with fully-integrated (deep) implantable tags, and more recent data using these tags does not currently show the same negative effect on reproduction (Robbins et al. 2016; NMFS 2017a).

In examining the health effects and long-term impacts of implantable tags on large cetaceans in the Pacific Ocean, Calambokidis (2015) used photographs and sightings records to evaluate tag-site wound healing and tagging effects on survival. Data came from a variety of long-term studies on blue and gray whales, which were tagged with implantable tags between 1993 and

2008 for blue whales, and in 2011 and 2013 for gray whales. While no effect on re-sighting rate was found for blue whales, tagged gray whales appeared to be less likely to be seen in subsequent years as compared to a control group. When sighting data were used in Cormack-Jolly-Seber capture recapture models to examine the effects of tagging on survival, there was no unequivocal evidence to support a tagging effect on survival, but several of the top models included a negative effect of tagging. Given this and the small sample size, caution should be used when interpreting these results, but effects of tagging on gray whale survival appear to be possible.

Importantly, two of these studies involved implantable tags, and all involved much older tag technologies than will be used by researchers at the HDR, Inc. under Permit No. 21482 and SEFSC under Permit No. 21938. The University of Alaska Southeast will only be conducting suction-cup tagging. 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. 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 and tag deployment methods that will be used under Permit Nos. 20648, 21482, and 21938. 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 an individual from the Southern Resident DPS of killer whale.

In 2016, the death of an individual from the Southern Resident DPS of 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, although the Southern Resident DPS of killer whale presented in moderate to advanced decomposition at the time of necropsy (Haulena 2016; NMFS 2016c). This fungal infection contributed to illness in the animal and most likely contributed to its death. There were several factors in this case that may have predisposed this animal 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, placement of the tag lower on the body and near large blood vessels which increased the chance of fungal dissemination through the blood system, poor body condition, and possible immunosuppression.

The case of L95 is an important reminder that all invasive tags carry some risk of death, even if minimal. However, the circumstances that led to L95's death are extremely unlikely to occur under Permit Nos. 21482 and 21938 for several reasons. First, the HDR, Inc. and SEFSC will follow stringent sterilization methods as described in the application and the permit's terms and conditions. Second, the HDR, Inc. and SEFSC will not attempt to tag any individual that appears to be obviously emaciated, in poor health, demonstrating behavioral reactions that suggest a compromised status, or showing unusual wounds. Third, the HDR, Inc., and SEFSC will use the latest tag technologies, such as the deep-implantable tags to minimize chances of tag breakage. Finally, the HDR, Inc., and SEFSC will only be authorized to use invasive tags on large cetaceans, for which to date there are no records of tag-related mortalities (although see Calambokidis (2015) study on gray whales discussed above). Given these mitigation measures, we find it highly unlikely that the use of invasive tags will result in the death of any individual cetacean.

In summary, we expect ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm 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 and deep-implantable tags, we anticipate most wounds will heal with little to no complication and minimal scarring, with only a few animals exhibiting prolonged healing and scarring. Given recent advances in tagging technologies and the mitigation measures proposed by the Permits and Conservation Division and the University of Alaska Southeast, the HDR, Inc., and SEFSC, we find it unlikely that mortality or a reduction in fitness will 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 and under extenuating circumstances (e.g., L95). Thus, we find that effects to fitness to ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) from the invasive tags proposed here are not likely to occur.

11.4 Risk Analysis

In this section, we assess the consequences of the responses of the individuals that have been exposed to the stressors we have identified as adversely impacting ESA-listed cetaceans, the populations those individuals represent, and the species those populations comprise. Whereas the *Response Analysis* (Section 11.3.2) identified the potential responses of ESA-listed species to the proposed action, this section summarized our analysis of the expected risk to individuals, populations, and species given the expected exposure to the stressors (as described in Section 11.3.1) and the expected responses to those stressors (as described in Section 11.3.2).

We measure risk to individuals of endangered or threatened species based upon effects on the individual's "fitness," which may be indicated by changes to the individual's growth, survival, annual reproductive fitness, and lifetime reproductive success. When we do not expect ESA-listed animals exposed to an action's effects to experience reductions in fitness, we will 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 animals are not likely to experience reductions in their fitness, we will conclude our assessment. If, however, we conclude that individual animals are likely to experience reductions in fiteness, we will assess the consequences of those fitness reductions on the population(s) those individuals belong to.

As noted in the *Response Analysis* (Section 11.3.2), none of the research activities and associated mitigation measures to minimize exposure and associated responses as proposed, are expected to reduce the long-term fitness of any individual ESA-listed cetacean (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales). As such, the issuance of Permit Nos. 20648, 21482, and 21938 is not expected to present any risk to populations, DPSs, or species listed under the ESA.

12 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.

This section attempts to identify the likely future environmental changes and their impact on ESA-listed and their critical habitat in the action areas. This section is not meant to be a comprehensive socio-economic evaluation, but a brief outlook on future changes in the environment. Projections are based upon recognized organizations producing best-available information and reasonable rough-trend estimates of change stemming from these data. However, all changes are based upon projections that are subject to error and alteration by complex economic and social interactions.

During this consultation, we searched for information on future state, tribal, local, or private (non-Federal) actions reasonably certain to occur in the action areas. We conducted electronic searches of *Google* and other electronic search engines for other potential future state or private activities that are likely to occur in the action area. We are not aware of any non-Federal actions that are likely to occur in the action areas during the foreseeable future that were not considered in the *Environmental Baseline* (Section 10) of this opinion. Anthropogenic effects include climage change, oceanic temperature regimes, whaling and subsistence harvesting, vessel strikes, whale watching, fisheries (fisheries interactions and aquaculture), pollution (marine debris, pesticides and contaminants, and hydrocarbons), aquatic nuisance species, sound producing activities (vessel sound and commercial shipping, aircraft, seismic surveys, and marine construction), military activities, and scientific research activities, although some of these activities, would involve a federal nexus and thus be subject to future ESA section 7 consultation. 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. The best scientific and commercial data available provide little specific information on any long-term effects of these potential sources of disturbance on ESA-listed cetacean populations. Therefore, NMFS expects that the levels of interactions between human activities and marine mammals described in the environmental baseline will continue at similar levels into the foreseeable future. Movements towards the reduction of vessel strikes and fisheries interactions or greater protections of ESA-listed cetaceans from these anthropogenic effects may aid in abating the downward trajectory of some populations and lead to recovery of other populations.

13 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 12) to formulate the agency's biological opinion as to whether the proposed actions are likely to: (1) reduce appreciably the likelihood of both the survival and recovery of an 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 Likely to be Adversely Affected* (Section 9). For this consultation, the effects were determined to not likely adversely affect designated critical habitat; therefore only the risks to ESA-listed cetaceans (i.e., blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales) are analyzed in this section.

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 to the stressors associated with the research activities under Permit Nos. 20648, 21482, and 21938. These summaries integrate the exposure profiles presented previously with the results of our response analyses for each of the proposed actions considered in this opinion.

13.1 Blue Whale

No reduction in the distribution of blue whales from the Arctic, Atlantic, Indian, Pacific, and Southern Oceans are expected because of the research activities proposed for authorization under Permit Nos. 21482 and 21938.

The blue whale is endangered as a result of past commercial whaling. In the North Atlantic Ocean, at least 11,000 blue whales were taken from the late 19th to mid-20th centuries. In the North Pacific Ocean, at least 9,500 whales were killed between 1910 and 1965. Commercial whaling no longer occurs, but blue whales are affected by anthropogenic noise, threatened by ship strikes, entanglement in fishing gear, pollution, harassment due to whale watching, and reduced prey abundance and habitat degradation due to climate change. There are three stocks of blue whales designated in U.S. waters: the Eastern North Pacific Ocean (approximately 1,647 individuals [minimum number of individuals N_{min}=1,551]), the Central Pacific Ocean (approximately 133 individuals [N_{min}=63]), and Western North Atlantic Ocean (N_{min}=440). Current estimates indicate a growth rate of just under three percent per year for the Eastern North Pacific stock. An overall population growth rate for the species or growth rates for the two other individual U.S. stocks are not available at this time. Because populations appear to be increasing in size, the species appears to be somewhat resilient to current threats; however, the species has not recovered to pre-exploitation levels.

The Final Recovery Plan for the blue whale lists recovery objectives for the species. The following recovery objectives are relevant to the impacts of the proposed actions:

- Determine stock structure of blue whale populations occurring in United States waters and elsewhere.
- Estimate the size and monitor trends in abundance of blue whale populations.
- Identify and protected habitat essential to the survival and recovery of blue whale populations.
- Reduce or eliminate human-caused injury and mortality of blue whales.
- Minimize detrimental effects of directed vessel interactions with blue whales.
- Maximize efforts to acquire scientific information from dead stranded, and entangled blue whales.
- Coordinate state, federal, and international efforts to implement recovery actions for blue whales.

We do not expect any mortalities of blue whales from the proposed action. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual blue whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit Nos. 21482 and 21938, a total of 1,075 blue whales (not necessarily individuals) would be subject to research each year. Effects to individual blue whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb, fully-implantable, and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a blue whale. Behavioral and physiological responses that may be exhibited by blue whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual blue whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for blue whales. In conclusion, we believe the effects associated with the proposed actions are not expected to cause a reduction in the likelihood of survival and recovery of blue whales in the wild.

13.2 Bowhead Whale

No reduction in the distribution of bowhead whales from the Atlantic Ocean, Arctic Ocean, and Pacific Oceans are expected because of the research activities that will be authorized under Permit No. 21482.

The bowhead whale is endangered because of past commercial whaling. Prior to commercial whaling, thousands of bowhead whales existed. Global abundance declined to 3,000 by the 1920's. Bowhead whales may be killed under "aboriginal subsistence whaling" provisions of the International Whaling Commission. Additional threats include ship strikes, fisheries interactions (including entanglement), contaminants, and noise. The species' large population size and increasing trends indicate that it is resilient to current threats.

There are currently four or five recognized stocks of bowhead whales, the Western Arctic (or Bering-Chukchi-Beaufort) stock, the Okhotsk Sea stock, the Davis Strait and Hudson Bay stock (sometimes considered separate stocks), and the Spitsbergen stock (Rugh and Shelden 2009). The only stock thought to be found within U.S. waters is the Western Arctic stock. The 2011 ice-based abundance estimate puts this stock, the largest remnant stock, at over 16,892 (N_{min}=16,091) individuals. Current estimates indicate approximately 16,892 (N_{min}=16,091) bowhead whales in the Western Arctic stock, with an annual growth rate of 3.7 percent (Givens, Edmondson et al. 2013). While no quantitative estimates exist, the Davis Strait and Hudson Bay stock is also thought to be increasing (COSEWIC 2009). We could find no information on population trends for the Okhotsk Sea stock. Likewise, no information is available on the population trend for the Spitsbergen stock, but it is thought to be nearly extinct.

We do not expect any mortalities of bowhead whales from the proposed action. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual bowhead whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit No. 21482, 2,249 bowhead whales (not necessarily individuals) would be subject to research each year. Effects to individual bowhead whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb, fully-implantable, and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a bowhead whale. Behavioral and physiological responses that may be exhibited by bowhead whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual bowhead whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for bowhead whales. In conclusion, we believe the effects associated with the proposed action are not expected to cause a reduction in the likelihood of survival and recovery of bowhead whales in the wild.

13.3 Bryde's Whale – Gulf of Mexico Subspecies

No reduction in the distribution of Gulf of Mexico subspecies of Bryde's whales from the Atlantic Ocean are expected because of the research activities proposed for authorization under Permit Nos. 21482 and 21938.

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 subspecies of 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 subspecies of 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 subspecies of 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 subspecies of Bryde's whale population is so small size and has low genetic diversity, it is highly susceptible to further perturbations.

We do not expect any mortalities of Gulf of Mexico subspecies of Bryde's whale from the proposed action. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual Bryde's whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit Nos. 21482 and 21938, a total of 520 Gulf of Mexico Bryde's whales (not necessarily individuals) would be subject to research each year. Effects to individual Bryde's whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a Bryde's whale. Behavioral and physiological responses that may be exhibited by Bryde's whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual Bryde's whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for the Gulf of Mexico subspecies of Bryde's whale. In conclusion, we believe the effects associated with the proposed actions are not expected to cause a reduction in the likelihood of survival and recovery of the Gulf of Mexico subspecies of Bryde's whale in the wild.

13.4 False Killer Whale – Main Hawaiian Islands Insular Distinct Population Segment

No reduction in the distribution of Main Hawaiian Islands insular DPS of false killer whales from the Pacific Ocean is expected because of the research activities authorized under Permit No. 21482.

Recent, unpublished estimates of abundance for two time periods, 2000 to 2004 and 2006 to 2009, were 162 and 151 respectively. The minimum population estimate for the Main Hawaiian Islands insular DPS of false killer whale is the number of distinct individuals identified during the 2011 to 2014 photo-identification studies, or 92 false killer whales (Baird et al. 2015).

A current estimated population growth rate for the Main Hawaiian Islands insular DPS of false killer whales is not available at this time. Reeves et al. (2009) suggested that the population may have declined during the last two decades, based on sighting data collected near Hawaii using various methods between 1989 and 2007. A modeling exercise conducted by Oleson et al. (2010) evaluated the probability of actual or near extinction, defined as fewer than 20 animals, given measured, estimated, or inferred information on population size and trends, and varying impacts of catastrophes, environmental stochasticity and Allee effects. A variety of alternative scenarios were evaluated indicating the probability of decline to fewer than 20 animals within 75 years as greater than 20 percent. Although causation was not evaluated, all models indicated current declines at an average rate of negative nine percent since 1989.

We do not expect any mortalities of Main Hawaiian Islands insular DPS false killer whales from the proposed action. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual false killer whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit No. 21482, 280 Main Hawaiian Islands insular DPS false killer whales (not necessarily individuals) would be subject to research each year. Effects to individual false killer whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a blue whale. Behavioral and physiological responses that may be exhibited by false killer whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual false killer whales from the Main Hawaiian Islands insular DPS. As such, we do not anticipate the proposed research activities will impede the recovery objectives for the Main Hawaiian Islands insular DPS of false filler whales. In conclusion, we believe the effects associated with the proposed action are not expected to cause a reduction in the likelihood of survival and recovery of the Main Hawaiian Islands insular DPS of false killer whales in the wild.

13.5 Fin Whale

No reduction in the distribution of fin whales from the Arctic, Atlantic, Indian, Pacific, and Southern Oceans are expected because of the research activities authorized under Permit Nos. 20648, 21482 and 21938.

Of the three to seven stocks in the North Atlantic Ocean (approximately 50,000 individuals), one occurs in U.S. waters, where the best estimate of abundance is 1,618 individuals (N_{min}=1,234); however, this may be an underrepresentation as the entire range of stock was not surveyed (Palka 2012). There are three stocks in U.S. Pacific Ocean waters: Northeast Pacific [minimum 1,368 individuals], Hawaii (approximately 58 individuals [N_{min}=27]) and California/Oregon/Washington (approximately 9,029 [N_{min}=8,127] individuals) (Nadeem, Moore et al. 2016). The International Whaling Commission also recognizes the China Sea stock of fin whales, found in the Northwest Pacific Ocean, which currently lacks an abundance estimate (Reilly et al. 2013). Abundance data for the Southern Hemisphere stock are limited; however, there were assumed to be somewhat more than 15,000 in 1983 (Thomas et al. 2016).

Current estimates indicate approximately 10,000 fin whales in U.S. Pacific Ocean waters, with an annual growth rate of 4.8 percent in the Northeast Pacific stock and a stable population abundance in the California/Oregon/Washington stock (Nadeem et al. 2016). Overall population growth rates and total abundance estimates for the Hawaii stock, China Sea stock, western North Atlantic stock, and Southern Hemisphere fin whales are not available at this time.

The 2010 Final Recovery Plan for the fin whale lists recovery objectives for the species. The following recovery objectives are relevant to the impacts of the proposed actions:

- Achieve sufficient and viable population in all ocean basins.
- Ensure significant threats are addressed.

We do not expect any mortalities of fin whales from the proposed actions. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual fin whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit Nos. 20648, 21482, and 21938, a total of 3,906 fin whales (not necessarily individuals) would be subject to research each year. Effects to individual fin whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb, fully-implantable, and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a fin whale. Behavioral and physiological responses that may be exhibited by fin whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual fin whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for fin whales. In conclusion, we believe the effects associated with the proposed actions are not expected to cause a reduction in the likelihood of survival and recovery of fin whales in the wild.

13.6 Gray Whale – Western North Pacific Population

No reduction in the distribution of the Western North Pacific population of gray whales from the Arctic, Atlantic, and Pacific Oceans are expected because of the research activities authorized under Permit Nos. 20648 and 21482.

The Western North Pacific population of gray whale is endangered as a result of past commercial whaling and may still be hunted under "aboriginal subsistence whaling" provisions of the International Whaling Commission. Current threats include ship strikes, fisheries interactions (including entanglement), habitat degradation, harassment from whale watching, illegal whaling or resumed legal whaling, and noise.

The Western North Pacific population of gray whales has increased over the last ten years at an estimated rate of 3.3 percent. The Western North Pacific population was thought to be geographically isolated from the Eastern North Pacific population, but recent documentation of some gray whales moving between geographic areas in the Pacific Ocean indicate otherwise. Also, in recent years, gray whales have been sighted in the Eastern Atlantic Ocean and Mediterranean Sea, but it is unknown to which population those animals belong.

Photo-identification data collected between 1994 and 2011 on the Western North Pacific gray whale summer feeding ground off Sakhalin Island were used to calculate an abundance estimate of 140 whales for the non-calf population size in 2012 (Cooke et al. 2013). The minimum population estimate for the Western North Pacific stock is 135 individual gray whales on the summer feeding ground off Sakhalin Island. The current best growth rate estimate for the Western North Pacific gray whale stock is 3.3 percent annually.

There is currently no recovery plan for the Western North Pacific population of gray whale.

We do not expect any mortalities of gray whales comprising the Western North Pacific population from the proposed actions. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual gray whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit Nos. 20648 and 21482 a total of 3,550 gray whales from the Western North Pacific population (not necessarily individuals) would be subject to research each year. Effects to individual gray whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb, fully-implantable, and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a gray whale. Behavioral and physiological responses that may be exhibited by gray whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual gray whales from the Western North Pacific population. As such, we do not anticipate the proposed research activities will impede the recovery objectives for Western North Pacific gray whales. In conclusion, we believe the effects associated with the proposed actions are not expected to cause a reduction in the likelihood of survival and recovery of Western North Pacific gray whales in the wild.

13.7 Humpback Whale – Arabian Sea Distinct Population Segment

No reduction in the distribution of Arabian Sea DPS of humpback whales from the Indian Ocean are expected because of the research activities authorized under Permit No. 21482.

Humpback whales were originally listed as endangered as a result of past commercial whaling, and the five DPSs that remain listed (Cape Verde Islands/Northwest Africa, Western North Pacific, Central America, Arabian Sea, and Mexico) have likely not yet recovered from this. Prior to commercial whaling, hundreds of thousands of humpback whales existed. Global abundance declined to the low thousands by 1968, the last year of substantial catches (IUCN 2012). Humpback whales may be killed under “aboriginal subsistence whaling” and “scientific permit whaling” provisions of the International Whaling Commission. Additional threats include ship strikes, fisheries interactions (including entanglement), energy development, harassment from whaling watching noise, harmful algal blooms, disease, parasites, and climate change. The species’ large population size and increasing trends indicate that it is resilient to current threats, but the Arabian Sea DPS still faces a risk of extinction.

The global, pre-exploitation estimate for humpback whales is 1,000,000 (Roman and Palumbi 2003). The current abundance of the Arabian Sea DPS is 82. A population growth rate is currently unavailable for the Arabian Sea DPS humpback whale.

The 1991 Final Recovery Plan for the humpback whale lists recovery objectives for the species. The following recovery objectives are relevant to the impacts of the proposed action:

- Maintain and enhance habitats used by humpback whales currently or historically.
- Identify and reduce direct human-related injury and morality.
- Measure and monitor key population parameters.
- Improve administration and coordination of recovery program for humpback whales.

We do not expect any mortalities of Arabian Sea DPS humpback whales from the proposed action. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual humpback whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit No. 21482, a total of 640 Arabian Sea DPS humpback whales (not necessarily individuals) would be subject to research each year. Effects to individual humpback whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb, fully-implantable, and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a humpback whale. Behavioral and physiological responses that may be exhibited by humpback whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual Arabian Sea DPS humpback whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for Arabian Sea DPS humpback whales. In conclusion, we believe the effects associated with the proposed action are not expected to cause a reduction in the likelihood of survival and recovery of Arabian Sea DPS humpback whales in the wild.

13.8 Humpback Whale – Cape Verde Islands/Northwest Africa Distinct Population Segment

No reduction in the distribution of Cape Verde Islands/Northwest Africa DPS of humpback whales from the Atlantic Ocean are expected because of the research activities authorized under Permit Nos. 21482 and 21938.

The global, pre-exploitation estimate for humpback whales is 1,000,000 (Roman and Palumbi 2003). The current abundance of the Cape Verde Islands/Northwest Africa DPS is unknown (81 FR 62259), although Ryan et al. (2014) states that the best abundance estimate for the Cape Verde Islands/Northwest Africa DPS of humpback whales is 171 to 260 animals. A population growth rate is currently unavailable for the Cape Verde Islands/Northwest Africa DPS of humpback whales.

The 1991 Final Recovery Plan for the humpback whale lists recovery objectives for the species. The following recovery objectives are relevant to the impacts of the proposed actions:

- Maintain and enhance habitats used by humpback whales currently or historically.
- Identify and reduce direct human-related injury and morality.
- Measure and monitor key population parameters.
- Improve administration and coordination of recovery program for humpback whales.

We do not expect any mortalities of Cape Verde Islands/Northwest Africa DPS humpback whales from the proposed action. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual humpback whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit Nos. 21482 and 21938, a total of 1,745 Cape Verde Islands/Northwest Africa DPS humpback whales (not necessarily individuals) would be subject to research each year. Effects to individual humpback whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb, fully-implantable, and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a humpback whale. Behavioral and physiological responses that may be exhibited by humpback whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual Cape Verde Islands/Northwest Africa DPS humpback whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for Cape Verde Islands/Northwest Africa DPS humpback whales. In conclusion, we believe the effects associated with the proposed action are not expected to cause a reduction in the likelihood of survival and recovery of Cape Verde Islands/Northwest Africa DPS humpback whales in the wild.

13.9 Humpback Whale – Central America Distinct Population Segment

No reduction in the distribution of Central America DPS of humpback whales from the Pacific Ocean are expected because of the research activities authorized under Permit No. 21482.

The global, pre-exploitation estimate for humpback whales is 1,000,000 (Roman and Palumbi 2003). The current abundance of the Central America DPS is 411. A population growth rate is currently unavailable for the Central America DPS of humpback whales.

The 1991 Final Recovery Plan for the humpback whale lists recovery objectives for the species. The following recovery objectives are relevant to the impacts of the proposed action:

- Maintain and enhance habitats used by humpback whales currently or historically.
- Identify and reduce direct human-related injury and morality.
- Measure and monitor key population parameters.
- Improve administration and coordination of recovery program for humpback whales.

We do not expect any mortalities of Central America DPS humpback whales from the proposed action. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual humpback whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit No. 21482, 640 Central America DPS humpback whales (not necessarily individuals) would be subject to research each year. Effects to individual humpback whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb, fully-implantable, and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a humpback whale. Behavioral and physiological responses that may be exhibited by humpback whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual Central America DPS humpback whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for Central America DPS humpback whales. In conclusion, we believe the effects associated with the proposed action are not expected to cause a reduction in the likelihood of survival and recovery of Central America DPS humpback whales in the wild.

13.10 Humpback Whale – Mexico Distinct Population Segment

No reduction in the distribution of Mexico DPS of humpback whales from the Pacific Ocean are expected because of the research activities authorized under Permit Nos. 20648 and 21482.

The global, pre-exploitation estimate for humpback whales is 1,000,000 (Roman and Palumbi 2003). The current abundance of the Mexico DPS is unavailable. A population growth rate is currently unavailable for the Mexico DPS of humpback whales.

The 1991 Final Recovery Plan for the humpback whale lists recovery objectives for the species. The following recovery objectives are relevant to the impacts of the proposed actions:

- Maintain and enhance habitats used by humpback whales currently or historically.
- Identify and reduce direct human-related injury and morality.
- Measure and monitor key population parameters.
- Improve administration and coordination of recovery program for humpback whales.

We do not expect any mortalities of Mexico DPS humpback whales from the proposed actions. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual humpback whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit Nos. 20648 and 21482, a total of 1,553 Mexico DPS humpback whales (not necessarily individuals) would be subject to research each year. Effects to individual humpback whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb, fully-implantable, and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a humpback whale. Behavioral and physiological responses that may be exhibited by humpback whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual Mexico DPS humpback whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for Mexico DPS humpback whales. In conclusion, we believe the effects associated with the proposed actions are not expected to cause a reduction in the likelihood of survival and recovery of Mexico DPS humpback whales in the wild.

13.11 Humpback Whale – Western North Pacific Distinct Population Segment

No reduction in the distribution of Western North Pacific DPS of humpback whales from the Pacific Ocean are expected because of the research activities authorized under Permit Nos. 20648 and 21482.

The global, pre-exploitation estimate for humpback whales is 1,000,000 (Roman and Palumbi 2003). The current abundance of the Western North Pacific DPS is 1,059. A population growth rate is currently unavailable for the Western North Pacific DPS of humpback whales.

The 1991 Final Recovery Plan for the humpback whale lists recovery objectives for the species. The following recovery objectives are relevant to the impacts of the proposed actions:

- Maintain and enhance habitats used by humpback whales currently or historically.
- Identify and reduce direct human-related injury and morality.
- Measure and monitor key population parameters.
- Improve administration and coordination of recovery program for humpback whales

We do not expect any mortalities of Western North Pacific DPS humpback whales from the proposed actions. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual humpback whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit Nos. 20648 and 21482, a total of 668 Western North Pacific DPS humpback whales (not necessarily individuals) would be subject to research each year. Effects to individual humpback whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb, fully-implantable, and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a humpback whale. Behavioral and physiological responses that may be exhibited by humpback whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual Western North Pacific DPS humpback whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for Western North Pacific DPS humpback whales. In conclusion, we believe the effects associated with the proposed actions are not expected to cause a reduction in the likelihood of survival and recovery of Western North Pacific DPS humpback whales in the wild.

13.12 North Atlantic Right Whale

No reduction in the distribution of North Atlantic right whales from the Atlantic Ocean are expected because of the research activities authorized under Permit Nos. 21482 and 21938.

In the western North Atlantic Ocean, the species demonstrated overall growth rates of 2.6 percent over the period 1990 through 2010, despite two periods of increased mortality during that time span (Hayes et al. 2017). However, in most recent years, photo-identification data indicate the populations is now in decline (Kraus et al. 2016; Hayes et al. 2017).

As discussed previously (see Section 9.12), the North Atlantic right whale population is currently experiencing an unusual mortality event that appears to be related to both vessel strikes and entanglement in fishing gear (Daoust et al. 2017). Also, the North Atlantic right whale population has low female survival, male biased sex ratio, low calving success, and reduced prey availability that are contributing to the population's current decline.

The 2005 updated Recovery Plan for the North Atlantic right whale lists recovery objectives for the species. The following recovery objectives are relevant to the impacts of the proposed actions:

- The population ecology (range, distribution, age structure, and gender ratios, etc.) and vital rates (age-specific survival, age-specific reproduction, and lifetime reproductive success) of North Atlantic right whales are indicative of an increasing population.
- The population has increased for a period of 35 years at an average rate of increase equal to or greater than two percent per year.
- None of the known threats to North Atlantic right whales are known to limit the population's growth rate.
- Given current and projected threats and environmental conditions, the North Atlantic right whale population has not more than a one percent chance of quasi-extinction in one hundred years.

We do not expect any mortalities of North Atlantic right whales from the proposed actions. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual North Atlantic right whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging, or alter its behavior in some way. Under Permit Nos. 21482 and 21938, a total of 250 North Atlantic right whales (not necessarily individuals) would be subject to research each year. Effects to individual North atlantic right whales are expected to be short term (generally hours or days). Dart/barb and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a North Atlantic right whale. Behavioral and physiological responses that may be exhibited by North Atlantic right whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual North Atlantic right whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for North Atlantic right whales. In conclusion, we believe the effects associated with the proposed actions are not expected to cause a reduction in the likelihood of survival and recovery of North Atlantic right whales in the wild.

13.13 North Pacific Right Whale

No reduction in the distribution of North Pacific right whales from the Pacific Ocean are expected because of the research activities authorized under Permit No. 21482.

The North Pacific right whale remains one of the most endangered whale species in the world. Their abundance likely numbers fewer than 1,000 individuals. There are two currently recognized stocks of North Pacific right whales, a Western North Pacific stock that feeds primarily in the Sea of Okhotsk, and an Eastern North Pacific stock that feeds in eastern North Pacific Ocean waters off Alaska, Canada, and Russia. Several lines of evidence indicate a total population size of less than 100 for the Eastern North Pacific stock. Based on photo-identification from 1998 to 2013 (Wade et al. 2011) estimated 31 individuals, with a minimum population estimate of 26 individuals (Muto et al. 2017). Genetic data have identified 23 individuals based on samples collected between 1997 and 2011 (Leduc et al. 2012). The Western North Pacific stock is likely more abundant and was estimated to consist of 922 whales (95 percent confidence intervals 404 to 2,108) based on data collected in 1989, 1990, and 1992 (IWC 2001; Thomas et al. 2016). The population estimate for the Western North Pacific stock is likely in the low hundreds (Brownell Jr. et al. 2001). While there have been several sightings of Western North Pacific right whales in recent years, with one sighting identifying at least 77 individuals, these data have yet to be compiled to provide a more recent abundance estimate (Thomas et al. 2016). There is currently no information on the population trend of North Pacific right whales.

The 2013 Final Recovery Plan for the North Pacific right whale lists recovery objectives for the species. The following recovery objectives are relevant to the impacts of the proposed action:

- Achieve sufficient and viable populations in all ocean basins.
- Ensure significant threats are addressed.

We do not expect any mortalities of North Pacific right whales from the proposed action. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual North Pacific right whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit No. 21482, 200 North Pacific right whales (not necessarily individuals) would be subject to research each year. Effects to individual North Pacific right whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a North Pacific right whale. Behavioral and physiological responses that may be exhibited by North Pacific right whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual North Pacific right whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for North Pacific right whales. In conclusion, we believe the effects associated with the proposed action are not expected to cause a reduction in the likelihood of survival and recovery of North Pacific right whales in the wild.

13.14 Sei Whale

No reduction in the distribution of sei whales from the Atlantic, Indian, and Pacific Ocean are expected because of the research activities authorized under Permit Nos. 21482 and 21938.

Models indicate that total abundance declined from 42,000 to 8,600 individuals between 1963 and 1974 in the North Pacific Ocean. More recently, the North Pacific Ocean population was estimated to be 29,632 (95 percent confidence intervals 18,576 to 47,267) between 2010 and 2012 (IWC 2016, Thomas, Reeves et al. 2016). In the Southern Hemisphere, pre-exploitation abundance is estimated at 65,000 whales, with recent abundance estimated at 9,800 to 12,000 whales. Three relatively small stocks occur in U.S. waters: Nova Scotia (N=357, N_{min}=236), Hawaii (N=178, N_{min}=93), and Eastern North Pacific (N=519, N_{min}=374). Population growth rates for sei whales are not available at this time as there are little to no systematic survey efforts to study sei whales.

The 2001 Final Recovery Plan for the sei whale lists recovery objectives for the species. The following recovery objectives are relevant to the impacts of the proposed actions:

- Achieve sufficient and viable populations in all ocean basins.
- Ensure significant threats are addressed.

We do not expect any mortalities of sei whales from the proposed actions. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual sei whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit Nos. 21482 and 21938, a total of 638 sei whales (not necessarily individuals) would be subject to research each year. Effects to individual sei whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a sei whale. Behavioral and physiological responses that may be exhibited by sei whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual sei whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for sei whales. In conclusion, we believe the effects associated with the proposed actions are not expected to cause a reduction in the likelihood of survival and recovery of sei whales in the wild.

13.15 Southern Right Whale

No reduction in the distribution of Southern right whales from the Atlantic, Indian, Pacific, and Southern Ocean are expected because of the research activities authorized under Permit No. 21482.

In 2010, there were an estimated 15,000 Southern right whales worldwide; this is over twice the species estimate of 7,000 in 1997. The population structure of Southern right whales is uncertain, but some separation to the population level exists. Breeding populations can be delineated based on geographic region: South Africa, Aregentina, Brazil, Peru and Chile, Australia, and New Zealand. Population estimates for all of the breeding populations are not available. There are about 3,500 Southern right whales in the Australia breeding population, about 4,000 in Argentina, 4,100 in South Africa, and 2,169 in New Zealand. Other smaller Southern right whale populations occur off Tristan da Cunha, South Georgia, Namibia, Mozambique, and Uruguay, but not much is known about the population abundane of these groups.

The Australia, South Africa, and Argentina breeding stocks of Southern right whales are increasing at an estimated seven percent annually. The Brazil breeing population is increasing, while the status of the Peru and Chile breeding populations is unknown (NMFS 2015a). The New Zealand breeding population is showing signs of recovery; recent population modeling estimates the population growth rate at 5.6 percent (Davidson 2016). Juveniles in New Zealand show high apparent survival rates, between 0.87 and 0.95 percent (Carroll et al. 2016).

There is currently no recovery plan for the Southern right whale.

We do not expect any mortalities of Southern right whales from the proposed action. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual Southern right whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit No. 21482, 190 Southern right whales (not necessarily individuals) would be subject to research each year. Effects to individual Southern right whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb, fully-implantable, and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a Southern right whale. Behavioral and physiological responses that may be exhibited by Southern right whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual Southern right whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for Southern right whales. In conclusion, we believe the effects associated with the proposed action are not expected to cause a reduction in the likelihood of survival and recovery of Southern right whales in the wild.

13.16 Sperm Whale

No reduction in the distribution of sperm whales from the Arctic, Atlantic, Indian, Pacific, and Southern Oceans are expected because of the research activities authorized under Permit Nos. 20648, 21482, and 21938.

The sperm whale is the most abundant of the large whale species, with total abundance estimates between 200,000 and 1,500,000. The most recent estimate indicated a global population of between 300,000 and 450,000 individuals (Whitehead 2009). The higher estimates may be approaching population sizes prior to commercial whaling. There are no reliable estimates for sperm whale abundance across the entire Atlantic Ocean. However, estimates are available for two to three United States stocks in the Atlantic Ocean, the Northern Gulf of Mexico stock, estimated to consists of 763 individuals (N_{min}=560) and the North Atlantic stock, underestimated to consist of 2,288 individuals (N_{min}=1,815). There are insufficient data to estimate abundance for the Puerto Rico and U.S. Virgin Islands stock. In the northeast Pacific Ocean, the abundance of sperm whales was estimated to be between 26,300 and 32,100 in 1997. In the northeast Pacific Ocean, the abundance of sperm whales was estimated to be between 26,300 and 32,100 in 1997. In the eastern tropical Pacific Ocean, the abundance of sperm whales was estimated to be 22,700 (95 percent confidence intervals 14,800 to 34,600) in 1993. Population estimates are also available for two to three United States stocks that occur in the Pacific, the California/Oregon/Washington stock, estimated to consist of 2,106 individuals (N_{min}=1,332), and the Hawaii stock, estimated to consist of 3,354 individuals (N_{min}=2,539). There are insufficient data to estimate the population abundance of the North Pacific stock. We are aware of no reliable abundance estimates specifically for sperm whales in the South Pacific Ocean, and there is insufficient data to evaluate trends in abundance and growth rates of sperm whale populations at this time. There is insufficient data to evaluate trends in abundance and growth rates of sperm whales at this time.

The 2010 Final Recovery Plan for the sperm whale lists recovery objectives for the species. The following recovery objectives are relevant to the impacts of the proposed actions:

- Achieve sufficient and viable populations in all ocean basins.
- Ensure significant threats are addressed.

We do not expect any mortalities of sperm whales from the proposed actions. Although the effects analysis was done by separating the activities into distinct stressors, many of which alone are not likely to adversely affect individual sperm whales, the stressors often occur together (e.g., a whale cannot be tagged without being approached by a vessel). Considering the totality of the research activities, individual whales may experience stress, minor injury from tagging or the taking of a biopsy, or alter its behavior in some way. Under Permit Nos. 20648, 21482, and 21938, a total of 8,563 sperm whales (not necessarily individuals) would be subject to research each year. Effects to individual sperm whales are expected to be short term (generally hours or days). Any injury from biopsy is expected to heal within weeks. Dart/barb, fully-implantable, and suction cup tags are not expected to cause a hindrance to swimming because of the small size and mass of the tags compared to those of a sperm whale. Behavioral and physiological responses that may be exhibited by sperm whales upon tagging are expected to return to baseline within minutes of tag attachment. None of the research activities are expected to result in any fitness consequence for individual sperm whales. As such, we do not anticipate the proposed research activities will impede the recovery objectives for sperm whales. In conclusion, we believe the effects associated with the proposed actions are not expected to cause a reduction in the likelihood of survival and recovery of sperm whales in the wild.

14 CONCLUSION

After reviewing the current status of the ESA-listed species, the effects of the proposed action, any effects of interrelated and interdependent actions, and cumulative effects, it is NMFS's biological and conference opinion that the proposed action is not likely to jeopardize the continued existence of blue whales, bowhead whales, Gulf of Mexico subspecies of Bryde's whale, Main Hawaiian Islands insular DPS of false killer whales, fin whales, Western North Pacific population of gray whales, Arabian Sea DPS of humpback whales, Cape Verde Islands/Northwest Africa DPS of humpback whales, Central America DPS of humpback whales, Mexico DPS of humpback whales, Western North Pacific DPS of humpback whales, North Atlantic right whales, North Pacific right whales, sei whales, Southern right whales, and sperm whales.

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 (16 U.S.C. §1532(19)). "Harm" is further defined by regulation to include 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 (50 C.F.R. §222.102). "Harass" is further defined as an act that "creates 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). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

All research activities associated with the issuance of Permit Nos. 20648, 21482, and 21938 involve directed take for the purposes of scientific research. Therefore, NMFS does not expect the proposed action will incidentally take threatened or endangered species. However, we request that the Permits and Conservation Division report to us whether the MMPA-authorized take specified in Table 2, Table 3, Table 4, and Table 5 actually occurs and the actual numbers of take in comparison to the permitted MMPA take numbers at the expiration of the permit, as well as any available information on the response animals exhibited to those takes. Such information will be used to inform the *Environmental Baseline* and *Effects of the Action* for future consultations for Dr. Heidi Pearson, Dr. Dan Engelhaupt, HDR, Inc., and SEFSC, and other similar research activities permitted by the Permits and Conservation Division.

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).

We make the following conservation recommendations, which will provide information for future consultations involving the issuance of permits that may affect ESA-listed cetaceans.

1. **Effects of Invasive Tagging**

We recommend the Permits and Conservation Division require that all researchers conducting invasive tagging of cetaceans provide detailed information on the responses they have observed from their past research. Researchers should provide a high-level of detail in the application and supporting materials to inform recommendations related to minimizing impacts of invasive tagging on ESA-listed cetaceans.

2. **Results of Tagging**

We recommend the Permits and Conservation Division gather data from researchers conducting invasive tagging of cetaceans to provide detailed information on how many tags were successfully deployed, how many tags were unsuccessfully deployed, how many tags failed to transmit entirely, and how many tags were delayed and for how long in transmitting after deployment. This should be provided as part of the annual reporting.

3. **Aggregate Take Tracking**

We recommend that the Permits and Conservation Division develop a system for tracking and evaluating the extent of take issued and that which is realized for any given population of ESA-listed species. The Permits and Conservation Division's current permit tracking allows tracking of individual permit takes. For the purpose of understanding the extent of research at broad scales (e.g., number of research permits in a particular region), it remains difficult to quantify the extent of take each individual population of ESA-listed species may be subject to across permits for any given period of time. Such aggregate take tracking would be better enable us to evaluate the impacts of multiple, simultaneous research efforts on ESA-listed species.

4. **Reporting**

We recommend the Permits and Conservation Division tailor the required reporting for research permits to include information that would aid managers in protecting and conserving ESA-listed species. In requiring researchers to provide annual reports, the Permits and Conservation Division is positioned to collect unprecedented, nationwide data on ESA-listed species. We recommend that the Permits and Conservation Division continue to request information on the effects of research activities on ESA-listed cetaceans, and where possible, require applicants to provide quantitative data regarding the ipmacts of their research on species. We also recommend that the Permits and Conservation Division require at least basic behavioral response reports from all relatively new procedures that would be permitted. For the purposes of this consultation, this would include exhaled breath sampling because little information is available about how cetaceans respond to this procedure and the use of unmanned aircraft systems.

5. **Data Sharing**

We recommend the Permits and Conservation Division work to establish protocols for data sharing among all permit holders. While many researchers in the community collaborate, having a national standard for data sharing among all researchers permitted by the NMFS will reduce impacts to trust resources by minimizing duplicative research efforts. We recommend basic reporting information be required from each researcher including the species, location, number of individuals, and age, sex, and identity (if known) at the expiration of each permit. We recommend that this information be uploaded by the researchers to the Animal Telemetry Network. This information would further inform the tracking of impacts of multiple research activities on ESA-listed cetaceans.

6. **Designated Critical Habitat**

The Permits and Conservation Division should include conditions in the scientific research permits to avoid, to the maximum extent practicable, proposed or designated critical habitat for the Cook Inlet DPS of beluga whale, Main Hawaiian Islands insular DPS of false killer whale, Hawaiian monk seal, Southern Resident DPS of killer whale, North Atlantic right whale, North Pacific right whale, Arctic DPS of ringed seal, Western DPS of Steller sea lion, green turtle, hawksbill turtle, leatherback turtle, and Northwest Atlantic Ocean DPS of loggerhead turtle.

7. **Action Agency**

We recommend the SEFSC consult with the ESA Interagency Cooperation Division on the funding and/or carrying out of their research activities, in addition to the Permits and Conservation Division for the proposed issuance of scientific research permits, as they are also part of the same Federal agency that should 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.

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

17 REINITIATION NOTICE

This concludes formal consultation for Permits and Conservation Division proposed action to issue Permit Nos. 20648, 21482, and 21938. 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.

18 REFERENCES

Aburto, A., et al. (1997). Behavioral responses of blue whales to active signals. San Diego, CA, Naval Command, Control and Ocean Surveillance Center, RDT&E Division**:** 95.

Acevedo-Whitehouse, K., et al. (2010). "A novel non-invasive tool for disease surveillance of free-ranging whales and its relevance to conservation programs." Animal Conservation **13**(2): 217-225.

Ackerman, R. A. (1997). The nest environment and the embryonic development of sea turtles. The Biology of Sea Turtles. P. L. M. Lutz, J. A. . Boca Raton, CRC Press**:** 83-106.

Addison, R. F. and P. F. Brodie (1987). "Transfer of organochlorine residues from blubber through the circulatory system to milk in the lactating grey seal Halichoerus grypus." Canadian Journal of Fisheries and Aquatic Sciences **44**: 782-786.

Aguilar, A. (2009). Fin Whale: *Balaenoptera physalus*. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen. San Diego, Academic Press**:** 1091-1097.

Albert, D. J. (2011). "What's on the mind of a jellyfish? A review of behavioural observations on Aurelia sp. jellyfish." Neuroscience & Biobehavioral Reviews **35**(3): 474-482.

Alter, E. S., et al. (2012). "Gene flow on ice: the role of sea ice and whaling in shaping Holarctic genetic diversity and population differentiation in bowhead whales (*Balaena mysticetus*)." Ecol Evol **2**(11): 2895-2911.

Andersen, S. M., et al. (2012). "Behavioural responses of harbour seals to human-induced disturbances." Aquatic Conservation: Marine and Freshwater Ecosystems **22**(1): 113-121.

André, M., et al. (1997). "Sperm whale (*Physeter macrocephalus*) behavioural responses after the playback of artificial sounds." Report of the International Whaling Commission **47**: 499-504.

Andrews, R., et al. (2014). Improving attachments of remotely-deployed dorsal fin- mounted tags: Tissue structure, hydrodynamics, in situ performance, and tagged-animal follow-up. Fifth International Biologging Science Symposium. Strasbourg, France**:** 53.

Andrews, R. C., et al. (2015). Improving attachments of remotely-deployed dorsal fin-mounted tags: tissue structure, hydrodynamics, in situ performance, and tagged-animal follow-up, Final Technical Report for the Office of Naval Research.

Antonelis, G. A., et al. (2006). "Hawaiian monk seal (*Monachus schauinslandi*): status and conservation issues." Atoll Research Bulletin **543**: 75-101.

Apprill, A., et al. (2017). "Extensive Core Microbiome in Drone-Captured Whale Blow Supports a Framework for Health Monitoring." mSystems **2**(5).

Archer, F. I., et al. (2013). "Mitogenomic phylogenetics of fin whales (Balaenoptera physalus spp.): genetic evidence for revision of subspecies." PLoS One **8**(5): e63396.

Arnbom, T. (1987). "Individual identification of sperm whales." Report of the International Whaling Commission **37**: 201-204.

Attard, C. R. M., et al. (2010). "Genetic diversity and structure of blue whales (*Balaenoptera musculus*) in Australian feeding aggregations." Conservation Genetics **11**(6): 2437-2441.

Au, W., et al. (2001). "High-frequency harmonics and source level of humpback whale songs." Journal of the Acoustical Society of America **110**(5 Part 2): 2770.

Au, W. W. L., et al. (1974). "Measurement of echolocation signals of the Atlantic bottlenose dolphin, Tursiops truncatus Montagu in open waters." Journal of the Acoustical Society of America **56**(4): 1280-1290.

Au, W. W. L. and M. Green (2000). "Acoustic interaction of humpback whales and whale-watching boats." Marine Environmental Research **49**(5): 469-481.

Au, W. W. L., et al. (2006). "Acoustic properties of humpback whale songs." Journal of the Acoustical Society of America **120**(2): 1103-1110.

Au, W. W. L., et al. (1993). "Transmission beam pattern of a false killer whale. (Pseudorca crassidens)." Journal of the Acoustical Society of America **93**(4 Pt.2): 2358-2359. the 2125th Meeting of the Acoustical Society of American. Ottawa, Canada. 2317-2321 May.

Au, W. W. L., et al. (2000). Hearing by whales and dolphins. New York, Springer-Verlag.

Baird, R. W., et al. (2000). Sub-surface and night-time behavior of humpback whales off Maui, Hawaii: A preliminary report, Hawaiian Islands Humpback Whale National Marine Sanctuary**:** 19.

Baird, R. W., et al. (2012). "Range and primary habitats of Hawaiian insular false killer whales: An assessment to inform determination of "critical habitat"." Endangered Species Research.

Baird, R. W., et al. (2013). LIMPET tagging of Hawaiian odontocetes: assessing reproduction and estimating survival of tagged and non-tagged individuals. Presentation at Workshop on Impacts of Cetacean Tagging: a review of follow up studies and approaches, Dunedin, NZ, 8 Dec 2013.

Baird, R. W., et al. (2015). "False killer whales and fisheries interactions in Hawaiian waters: Evidence for sex bias and variation among populations and social groups." Marine Mammal Science **31**(2): 579-590.

Baker, C. S. and P. J. Clapham (2004). "Modelling the past and future of whales and whaling." Trends in Ecology and Evolution **19**(7): 365-371.

Baker, C. S., et al. (1983). The impact of vessel traffic on the behavior of humpback whales in southeast Alaska: 1982 season, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, National Marine Mammal Laboratory**:** 86.

Baker, C. S., et al. (1988). "Humpback whales of Glacier Bay, Alaska." Whalewatcher **22**(3): 13-17.

Baker, J. D., et al. (2006). "Potential effects of sea level rise on the terrestrial habitats of endangered and endemic megafauna in the Northwestern Hawaiian Islands." Endangered Species Research **2**: 21-30.

Barber, J. R., et al. (2010). "The costs of chronic noise exposure for terrestrial organisms." Trends in Ecology and Evolution **25**(3): 180-189.

Barlow, J., et al. (1995). U.S. marine mammal stock assessments: guidelines for preparation, background and a summary of the 1995 assessments. U. S. D. o. Commerce.

Barlow, J. and B. L. Taylor (2005). "Estimates of sperm whale abundance in the northeastern temperate Pacific from a combined acoustic and visual survey." Marine Mammal Science **21**(3): 429-445.

Barrett-Lennard, L. G., et al. (1996). "A cetacean biopsy system using lightweight pneumatic darts, and its effect on the behavior of killer whales." Marine Mammal Science **12**(1): 14-27.

Bauer, G. B. (1986). The behavior of humpback whales in Hawaii and modifications of behavior induced by human interventions, University of Hawaii. **Ph.D.:** 314.

Bauer, G. B. and L. M. Herman (1986). Effects of vessel traffic on the behavior of humpback whales in Hawaii. Honolulu, Hawaii, National Oceanic and Atmospheric Administration, National Marine Fisheries Service**:** 151.

Baulch, S. and C. Perry (2014). "Evaluating the impacts of marine debris on cetaceans." Mar Pollut Bull **80**(1-2): 210-221.

Baumgartner, M. F., et al. (2011). "Diel vertical migration behavior of Calanus finmarchicus and its influence on right and sei whale occurrence." Marine Ecology Progress Series **423**: 167-184.

Baumgartner, M. F. and B. R. Mate (2003). "Summertime foraging ecology of North Atlantic right whales." Marine Ecology Progress Series **264**: 123-135.

Beale, C. M. and P. Monaghan (2004). "Human disturbance: People as predation-free predators?" Journal of Applied Ecology **41**: 335-343.

Beamish, R. J. (1993). "Climate and exceptional fish production off the west coast of North American." Canadian Journal of Fisheries and Aquatic Sciences **50**(10): 2270-2291.

Bearzi, G. (2000). "First report of a common dolphin (*Delphinus delphis*) death following penetration of a biopsy dart." Journal of Cetacean Research and Management **2**(3): 217-222.

Bennet, D. H., et al. (1994). Effects of Underwater Sound Simulating the Intermediate Scale Measurement System on Fish and Zooplankton of Lake Pend Orielle, Idaho. Moscow, Idaho, Department of Fish and Wildlife Resources, College of Forestry, Wildlife and Range Sciences, University of Idaho.

Benoit-Bird, K. J. and W. W. L. Au (2009). "Cooperative prey herding by the pelagic dolphin, Stenella longirostris." Journal of the Acoustical Society of America **125**(1): 125-137.

Benson, A. and A. W. Trites (2002). "Ecological effects of regime shifts in the Bering Sea and eastern North Pacific Ocean." Fish and Fisheries **3**(2): 95-113.

Berchok, C. L., et al. (2006). "St. Lawrence blue whale vocalizations revisited: Characterization of calls detected from 1998 to 2001." Journal of the Acoustical Society of America **120**(4): 2340-2354.

Berrow, S. D., et al. (2002). "Organochlorine concentrations in resident bottlenose dolphins (Tursiops truncatus) in the Shannon estuary, Ireland." Marine Pollution Bulletin **44**(11): 1296-1303.

Best, P. B. (2001). "Distribution and population separation of Bryde's whale Balaenoptera edeni off southern Africa." Marine Ecology Progress Series **220**: 12.

Best, P. B., et al. (2001). "Right whales: Worldwide status." The Journal of Cetacean Research and Management (Special Issue) **2**.

Best, P. B., et al. (2015). "Tag retention, wound healing, and subsequent reproductive history of southern right whales following satellite-tagging." Marine Mammal Science **31**(2): 520-539.

Best, P. B., et al. (2005). "Biopsying southern right whales: Their reactions and effects on reproduction." Journal of Wildlife Management **69**(3): 1171-1180.

Best, P. B. and H. Ruther (1992). "Aerial photogrammetry of southern right whales, Eubalaena australis." Journal of Zoology **228**(4): 595-614.

Bettridge, S., et al. (2015). Status review of the humpback whale (Megaptera novaeangliae) under the Endangered Species Act, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center**:** 263.

Biedron, I. S., et al. (2005). Counter-calling in North Atlantic right whales (*Eubalaena glacialis*). Sixteenth Biennial Conference on the Biology of Marine Mammals. San Diego, California**:** 35.

Bigg, M. A. (1982). "An assessment of killer whale (Orcinus orca) stocks off Vancouver Island, British Columbia." Report of the International Whaling Commission **32**: 655-666.

Blair, H. B., et al. (2016). "Evidence for ship noise impacts on humpback whale foraging behaviour." Biol Lett **12**(8).

Blunden, J. and D. S. Arndt (2016). "State of the Climate in 2015." Bulletin of the American Meteorological Society **97**(8).

Borge, T., et al. (2007). "Genetic variation in Holocene bowhead whales from Svalbard." Mol Ecol **16**(11): 2223-2235.

Born, E. W., et al. (1999). "Escape responses of hauled out ringed seals (*Phoca hispida*) to aircraft disturbance." Polar Biology **21**(3): 171-178.

Borrell, A., et al. (1995). "Age trends and reproductive transfer of organochlorine compounds in long-finned pilot whales from the Faroe Islands." Environmental Pollution **88**(3): 283-292.

Bort, J., et al. (2015). "North Atlantic right whale *Eubalaena glacialis* vocalization patterns in the central Gulf of Maine from October 2009 through October 2010." Endangered Species Research **26**(3): 271-280.

Bort, J. E., et al. (2011). North Atlantic right whale (*Eubalaena glacialis*) acoustic activity on a potential wintering ground in the Central Gulf of Maine. 19th Biennial Conference on the Biology of Marine Mammals. Tampa, Florida**:** 38.

Boswell, K. M., et al. (2016). "Are spatial and temporal patterns in Lynn Canal overwintering Pacific herring related to top predator activity?" Canadian Journal of Fisheries and Aquatic Sciences **73**(9): 1307-1318.

Bradford, A. L., et al. (2012). Line-transect abundance estimates of false killer whales (Pseudorca crassidens) in the Pelagic Region of the Hawaiian Exclusive Economic Zone and in the insular waters of the northwestern Hawaiian Islands**:** 31.

Branch, T. A. (2007). "Abundance of Antarctic blue whales south of 60 S from three complete circumpolar sets of surveys."

Brownell Jr., R. L., et al. (2001). "Conservation status of North Pacific right whales." Journal of Cetacean Research and Management(Special Issue 2): 269-286.

Buck, J. R. and P. L. Tyack (2000). "Response of gray whales to low-frequency sounds." Journal of the Acoustical Society of America **107**(5): 2774.

Buckland, S. T., et al. (2001). Introduction to Distance Sampling. Oxford, United Kingdom, Oxford University Press.

Burdin, A. M., et al. (2013). Status of western gray whales off northeastern Sakhalin Island, Russia in 2012. Jeju, Korea, IWC Scientific Committee**:** 9.

Burgess, W. C. (2009). "The Acousonde: A miniature autonomous wideband recorder." The Journal of the Acoustical Society of America **125**.

Burns, J. J. and K. J. Frost (1979). The natural history and ecology of the bearded seal, Erignathus barbatus. Environmental Assessment of the Alaskan Continental Shelf, Final Reports. **19:** 311-392.

Burtenshaw, J. C., et al. (2004). "Acoustic and satellite remote sensing of blue whale seasonality and habitat in the Northeast Pacific." Deep-Sea Research II **51**: 967-986.

Busch, D. S. and L. S. Hayward (2009). "Stress in a conservation context: A discussion of glucocorticoid actions and how levels change with conservation-relevant variables." Biological Conservation **142**(12): 2844-2853.

Calambokidis, J. (2015). Examination of health effects and long-term impacts of deployments of multiple tag types on blue, humpback, and gray whales in the eastern North Pacific. Annual Report, Office of Naval Research, Marine Mammal Program, Annual Report.

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

Calambokidis, J. F., E.; Douglas, A.; Schlender, L.; Jessie Huggins, J. (2009). Photographic identification of humpback and blue whales off the US West Coast: Results and updated abundance estimates from 2008 field season. Olympia, Washington, Cascadia Research**:** 18.

Caldwell, M. C., et al. (1990). Review of the signature-whistle hypothesis for the Atlantic bottlenose dolphin. The Bottlenose Dolphin. S. L. R. R. Reeves. San Diego, Academic Press**:** 199-234.

Carder, D. A. and S. Ridgway (1990). "Auditory brainstem response in a neonatal sperm whale." Journal of the Acoustic Society of America **88**(Supplement 1): S4.

Carretta, J. V., et al. (2017). “U.S. Pacific marine mammal stock assessments: 2016.”

Carretta, J. V., et al. (2016a). Sources of human-related injury and mortality for U.S. Pacific west coast marine mammal stock assessments, 2010-2014. La Jolla, California, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Carretta, J. V., et al. (2016b). "U.S. Pacific marine mammal stock assessments: 2015."

Carroll, E. L., et al. (2016). "First direct evidence for natal wintering ground fidelity and estimate of juvenile survival in the New Zealand southern right whale Eubalaena australis." PLoS One **11**(1): e0146590.

Carroll, G. M., et al. (1989). Ice entrapped gray whales near Point Barrow, Alaska: Behavior, respiration patterns, and sounds. Eighth Biennial Conference on the Biology of Marine Mammals. Asilomar Conference Center, Pacific Grove, California**:** 10.

Caswell, H., et al. (1999). "Declining survival probability threatens the North Atlantic right whale." Proceedings of the National Academy of Sciences **96**(6): 3308-3313.

Cattet, M. R. L., et al. (2003). "Physiologic responses of grizzly bears to different methods of capture." Journal of Wildlife Diseases **39**(3-Jan): 649-654.

Chapman, N. R. and A. Price (2011). "Low frequency deep ocean ambient noise trend in the Northeast Pacific Ocean." Journal of the Acoustical Society of America **129**(5): EL161-EL165.

Charif, R. A., et al. (2002). "Estimated source levels of fin whale (Balaenoptera physalus) vocalizations: Adjustments for surface interference." Marine Mammal Science **18**(1): 81-98.

Cheng, L., et al. (2017). "Improved estimates of ocean heat content from 1960 to 2015." Science Advances **3**(3): e1601545.

Childers, A. R., et al. (2005). "Seasonal and interannual variability in the distribution of nutrients and chlorophyll a across the Gulf of Alaska shelf: 1998-2000." Deep-Sea Research II **52**: 193-216.

Cholewiak, D., et al. (2018). "Communicating amidst the noise: modeling the aggregate influence of ambient and vessel noise on baleen whale communication space in a national marine sanctuary." Endangered Species Research **36**: 59-75.

Christiansen, F., et al. (2014). "Inferring energy expenditure from respiration rates in minke whales to measure the effects of whale watching boat interactions." Journal of Experimental Marine Biology and Ecology **459**: 96-104.

Christie, K. S., et al. (2016). "Unmanned aircraft systems in wildlife research: current and future applications of a transformative technology." Frontiers in Ecology and the Environment **14**(5): 241-251.

Clapham, P. J. and D. K. Mattila (1993). "Reactions of humpback whales to skin biopsy sampling on a West-Indies breeding ground." Marine Mammal Science **9**(4): 382-391.

Clapham, P. J., et al. (1999). "Baleen whales: Conservation issues and the status of the most endangered populations." Mammal Review **29**(1): 35-60.

Clark, C. W. (1982). "The acoustic repertoire of the southern right whale, a quantitative analysis." Animal Behaviour **30**(4): 1060-1071.

Clark, C. W., et al. (2002). "Vocal activity of fin whales, Balaenoptera physalus, in the Ligurian Sea." Marine Mammal Science **18**(1): 286-295.

Clark, C. W. and R. A. Charif (1998). "Acoustic monitoring of large whales to the west of Britain and Ireland using bottom mounted hydrophone arrays, October 1996-September 1997." JNCC Report No. 281.

Clark, C. W. and P. J. Clapham (2004). "Acoustic monitoring on a humpback whale (Megaptera novaeangliae) feeding ground shows continual singing into late spring." Proceedings of the Royal Society of London Series B Biological Sciences **271**(1543): 1051-1057.

Clark, C. W., et al. (2009). "Acoustic masking in marine ecosystems: Intuitions, analysis, and implication." Marine Ecology Progress Series **395**: 201-222.

Clark, C. W. and G. J. Gagnon (2004). "Low-frequency vocal behaviors of baleen whales in the North Atlantic: Insights from Integrated Undersea Surveillance System detections, locations, and tracking from 1992 to 1996." Journal of Underwater Acoustics (USN) **52**(3): 48.

Clement, D. (2013). Effects on Marine Mammals. Ministry for Primary Industries. Literature review of ecological effects of aquaculture. Report prepared by Cawthron Institute. Nelson, New Zealand.

Coakes, A. K. and H. Whitehead (2004). "Social structure and mating system of sperm whales off northern Chile." Canadian Journal of Zoology **82**(8): 1360-1369.

Cole, T. V. N., et al. (2013). "Evidence of a North Atlantic right whale *Eubalaena glacialis* mating ground." Endangered Species Research **21**(1): 55-64.

Conn, P. B. and G. K. Silber (2013). "Vessel speed restrictions reduce risk of collision-related mortality for North Atlantic right whales." Ecosphere **4**(4): art43.

Constantine, R. (2001). "Increased avoidance of swimmers by wild bottlenose dolphins (Tursiops truncatus) due to long-term exposure to swim-with-dolphin tourism." Marine Mammal Science **17**(4): 689-702.

Conversi, A., et al. (2001). "Seasonal and interannual dynamics of Calanus finmarchicus in the Gulf of Maine (Northeastern US shelf) with reference to the North Atlantic Oscillation." Deep Sea Research Part Ii: Topical studies in Oceanography 48(41-43)519-530.

Cooke, J. G., et al. (2013). Population assessment of the Sakhalin gray whale aggregation. Jeju, Korea, IWC Scientific Committee**:** 12.

Corkeron, P., R.M. Pace III, and S.M. Van Parijs (in review). "Population structure of humpback whales in the southeastern Caribbean: an update." IWC Scientific Committee.

Corkeron, P. J. (1995). "Humpback whales (Megaptera novaeangliae) in Hervey Bay, Queensland: Behaviour and responses to whale-watching vessels." Canadian Journal of Zoology **73**(7): 1290-1299.

Corkeron, P. J., et al. (1987). "Interactions between bottlenose dolphins and sharks in Moreton Bay, Queensland [Australia]." Aquatic Mammals **13**(3): 109-113.

Cosens, S. E., et al. (2006). Numbers of bowhead whales (*Balaena mysticetus*) in the eastern Canadian Arctic, based on aerial surveys in August 2002, 2003 and 2004, International Whaling Commission.

COSEWIC (2002). "COSEWIC assessment and update status report on the blue whale Balaenoptera musculus (Atlantic population, Pacific population) in Canada." vi + 32.

COSEWIC (2009). Assessment and Update Status Report on the Bowhead Whale *Balaena mysticetus*: Bering-Chukchi-Beaufort population and Eastern Canada-West Greenland population in Canada Committee on the Status of Endagered Wildlife in Canada.

Cowan, D. E. and B. E. Curry (1998). Investigation of the potential influence of fishery-induced stress on dolphins in the eastern tropical pacific ocean: Research planning, National Marine Fisheries Service, Southwest Fisheries Science Center.

Cowan, D. E. and B. E. Curry (2002). Histopathological assessment of dolphins necropsied onboard vessels in the eastern tropical pacific tuna fishery, National Marine Fisheries Service, Southwest Fisheries Science Center.

Cowan, D. E. and B. E. Curry (2008). "Histopathology of the alarm reaction in small odontocetes." Journal of Comparative Pathology **139**(1): 24-33.

Crane, N. L. and K. Lashkari. (1996). "Sound production of gray whales, Eschrichtius robustus, along their migration route: A new approach to signal analysis." Journal of the Acoustical Society of America **100**(3): 1878-1886.

Cranford, T. W. and P. Krysl (2015). "Fin whale sound reception mechanisms: Skull vibration enables low-frequency hearing." PLoS One **10**(1): e116222.

Croll, D. A., et al. (2002). "Only male fin whales sing loud songs." Nature **417**: 809.

Croll, D. A., et al. (2001). "Effect of anthropogenic low-frequency noise on the foraging ecology of Balaenoptera whales." Animal Conservation **4**(1): 13-27.

Croll, D. A., et al. (1999). "Marine vertebrates and low frequency sound." Technical report for LFA EIS, 28 February 1999. Marine Mammal and Seabird Ecology Group, Institute of Marine Sciences, University of California Santa Cruz. 437p.

Cummings, W. C. and P. O. Thompson (1971a). "Gray whales, Eschrichtius robustus, avoid the underwater sounds of killer whales, Orcinus orca." Fishery Bulletin **69**(3): 525-530.

Cummings, W. C. and P. O. Thompson (1971b). "Underwater sounds from the blue whale, Balaenoptera musculus." Journal of the Acoustical Society of America **50**(4B): 1193-1198.

Cummings, W. C. and P. O. Thompson (1994). "Characteristics and seasons of blue and finback whale sounds along the U.S. west coast as recorded at SOSUS stations." Journal of the Acoustical Society of America **95**: 2853.

Cummings, W. C., et al. (1968). "Underwater sounds of migrating gray whales, Eschrichtius glaucus (Cope)." Journal of the Acoustical Society of America **44**(5): 1278-1281.

Curry, R. G. and M. S. McCartney (2001). "Ocean gyre circulation changes associated with the North Atlantic Oscillation." Journal of Physical Oceanography **31**(12): 3374-3400.

Czech, B. and P. R. Krausman (1997). "Distribution and causation of species endangerment in the United States." Science **277**(5329): 1116-1117.

D'Vincent, C. G., et al. (1985). "Vocalization and coordinated feeding behavior of the humpback whale in southeastern Alaska." Scientific Reports of the Whales Research Institute **36**: 41-47.

Daan, N. (1996). Multispecies assessment issues for the North Sea. American Fisheries Society Symposium 20. E.K.Pikitch, D.D.Huppert and M.P.Sissenwine. Seattle, Washignton**:** 126-133.

Dahlheim, M. E., et al. (1984). Sound production by the gray whale and ambient noise levels in Laguna San Ignacio, Baja California Sur, Mexico. The Gray Whale, Eschrichtius robustus. M. L. J. S. L. S. S. Leatherwood. New York, Academic Press**:** 511-542.

Dahlheim, M. E. and D. K. Ljungblad (1990). Preliminary hearing study on gray whales (Eschrichtius robustus) in the field. Sensory Abilities of Cetaceans: Laboratory and Field Evidence. J. A. T. R. A. Kastelein. New York, Plenum Press**:** 335-346.

Dalton, T. and D. Jin (2010). "Extent and frequency of vessel oil spills in US marine protected areas." Marine Pollution Bulletin **60**(11): 1939-1945.

Danielsdottir, A. K., et al. (1991). "Preliminary studies on genetic variation at enzyme loci in fin whales (Balaenoptera physalus) and sei whales (Balaenoptera borealis) form the North Atlantic." Report of the International Whaling Commission **Special Issue 13**: 115-124.

Daoust, P.-Y., et al. (2017). Incident Report: North Atlantic Right Whale Mortality Event in the Gulf of St. Lawrence, 2017, Collaborative Report Produced by: Canadian Wildlife Health Cooperative, Marine Animal Response Society, and Fisheries and Oceans Canada.**:** 224.

Darling, J. (2009). Song. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen. San Diego, Academic Press**:** 1053-1056.

Davidson, A. (2016). Population dynamics of the New Zealand southern right whale (Eubalaena australis), University of Otago.

Davis, G. E., et al. (2017). "Long-term passive acoustic recordings track the changing distribution of North Atlantic right whales (*Eubalaena glacialis*) from 2004 to 2014." Scientific Reports **7**(1): 13460.

Deepwater Horizon NRDA Trustees (2016). Deepwater Horizon Oil Spill: Final Programmatic Damage Assessment and Restoration Plan (PDARP) and Final Programmatic Environmental Impact Statement, NOAA**:** 1.659.

Derraik, J. G. B. (2002). "The pollution of the marine environment by plastic debris: a review." Marine Pollution Bulletin **44**(9): 842-852.

Devine, L., et al. (2017). Chemical and Biological Oceanographic Conditions in the Estuary and Gulf of St. Lawrence During 2015., Canadian Science Advisory Secretariat**:** 53.

Dickens, M. J., et al. (2010). "Stress: An inevitable component of animal translocation." Biological Conservation **143**(6): 1329-1341.

Dierauf, L. and M. Gulland (2001). Marine mammal unusual mortality events. CRC Handbook of Marine Mammal Medicine, CRC Press**:** 69-81.

Dietrich, K. S., et al. (2007). Best practices for the collection of longline data to facilitate research and analysis to reduce bycatch of protected species., NOAA Technical Memorandum NMFS-OPR-35. 101p. Report of a workshop held at the International Fisheries Observer Conference Sydney, Australia, November 8,.

Doney, S. C., et al. (2012). "Climate change impacts on marine ecosystems." Marine Science **4**.

Drinkwater, K. F., et al. (2003). "The response of marine ecosystems to climate variability associated with the North Atlantic oscillation." Geophysical Monograph **134**: 211-234.

Dunlop, R. A., et al. (2008). "Non-song acoustic communication in migrating humpback whales (*Megaptera novaeangliae*)." Marine Mammal Science **24**(3): 613-629.

Durban, J. W., et al. (2015). "Photogrammetry of killer whales using a small hexacopter launched at sea." Journal of Unmanned Vehicle Systems **3**(3): 131-135.

DWHTrustees (2016). *Deepwater Horizon* Oil Spill: Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement, Deepwater Horizon Natural Resource Damage Assessment Trustees. **http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan**.

Dwyer, S. L. and I. N. Visser (2011). "Cookie cutter shark (Isistius sp.) bites on cetaceans, with particular reference to killer whales (orca) (Orcinus orca)." Aquatic Mammals **37**(2): 111-138.

Edds-Walton, P. L. (1997). "Acoustic communication signals of mysticete whales." Bioacoustics-the International Journal of Animal Sound and Its Recording **8**: 47-60.

Edds, P. L. (1988). "Characteristics of finback *Balaenoptera physalus* vocalizations in the St. Lawrence estuary." Bioacoustics **1**: 131-149.

Elftman, M. D., et al. (2007). "Corticosterone impairs dendritic cell maturation and function." Immunology **122**(2): 279-290.

Engelhaupt, D., et al. (2009). "Female philopatry in coastal basins and male dispersion across the North Atlantic in a highly mobile marine species, the sperm whale (*Physeter macrocephalus*)." Mol Ecol **18**(20): 4193-4205.

Epperly, S., et al. (2002). Analysis of sea turtle bycatch in the commercial shrimp fisheries of southeast U.S. waters and the Gulf of Mexico. NOAA Technical Memorandum, U.S. Department of Commerce 88.

Erbe, C. (2002a). Hearing abilities of baleen whales., Defence R&D Canada – Atlantic report CR 2002-065. Contract Number: W7707-01-0828. 40pp.

Erbe, C. (2002b). "Underwater noise of whale-watching boats and potential effects on killer whales (Orcinus orca), based on an acoustic impact model." Marine Mammal Science **18**(2): 394-418.

Eskesen, G., et al. (2009). "Stress level in wild harbour porpoises (*Phocoena phocoena*) during satellite tagging measured by respiration, heart rate and cortisol." Journal of the Marine Biological Association of the United Kingdom **89**(5): 885-892.

Evans, P. G. H. and A. Bjørge (2013). "Impacts of climate change on marine mammals." Marine Climate Change Impacts Parternship: Science Review: 134-148.

Feare, C. J. (1976). "Desertion and abnormal development in a colony of Sooty Terns infested by virus-infected ticks." Ibis **118**: 112-115.

Felix, F. (2001). Observed changes of behavior in humphack whales during whalewatching encounters off Ecuador. 14th Biennial Conference on the Biology of Marine Mammals. Vancouver, Canada**:** 69.

Figueiredo, L. (2014). "Bryde’s Whale (Balaenoptera edeni) Vocalizations from Southeast Brazil." Aquatic Mammals **40**(3): 225-231.

Figueiredo, L. D., et al. (2014). "Site fidelity of Bryde's whales (Balaenoptera edeni) in Cabo Frio region, southeastern Brazil, through photoidentification technique." Brazilian Journal of Aquatic Science and Technology **18**(2): 59-64.

Finley, K. J. and W. E. Renaud (1980). "Marine mammals inhabiting the Baffin Bay North Water in winter." Arctic **33**(4): 724-738.

Finneran, J. J. and A. K. Jenkins (2012). Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis. San Diego, California, Department of Navy.

Fonfara, S., et al. (2007). "The impact of stress on cytokine and haptoglobin mRNA expression in blood samples from harbour porpoises (Phocoena phocoena)." Journal of the Marine Biological Association of the United Kingdom **87**(1): 305-311.

Fortune, S. M. E., et al. (2013). "Energetic requirements of North Atlantic right whales and the implications for species recovery." Marine Ecology Progress Series **478**: 253-272.

Fortune, S. M. E., et al. (2012). "Growth and rapid early development of North Atlantic right whales (*Eubalaena glacialis*)." Journal of Mammalogy **93**(5): 1342-1354.

Fossi, M. C., et al. (2016). "Fin whales and microplastics: The Mediterranean Sea and the Sea of Cortez scenarios." Environmental Pollution **209**: 68-78.

Frankham, R. (2005). "Genetics and extinction." Biological Conservation **126**(2): 131-140.

Frantzis, A. and P. Alexiadou (2008). "Male sperm whale (Physeter macrocephalus) coda production and coda-type usage depend on the presence of conspecifics and the behavioural context." Canadian Journal of Zoology **86**(1): 62-75.

Frasier, T. R., et al. (2013). "Postcopulatory selection for dissimilar gametes maintains heterozygosity in the endangered North Atlantic right whale." Ecology and Evolution **3**(10): 3483-3494.

Frazer, L. N. and E. Mercado III (2000). "A sonar model for humpback whale song." IEEE Journal of Oceanic Engineering **25**(1): 160-182.

Frere, C. H., et al. (2010). "Thar she blows! A novel method for DNA collection from cetacean blow." PLoS ONE **5**(8): e12299.

Frid, A. (2003). "Dall's sheep responses to overflights by helicopter and fixed-wing aircraft." Biological Conservation **110**(3): 387-399.

Frid, A. and L. Dill (2002). "Human-caused disturbance stimuli as a form of predation risk." Conservation Ecology **6**(1).

Friedlaender, A. S., et al. (2009). "Diel changes in humpback whale Megaptera novaeangliae feeding behavior in response to sand lance Ammodytes spp. behavior and distribution." Marine Ecology Progress Series **395**: 91-100.

Fromentin, J.-M. and B. Planque (1996). "*Calanus* and environment in the eastern North Atlantic. II. Influence of the North Atlantic Oscillation on *C. finmarchicus* and *C. helgolandicus*." Marine Ecology Progress Series **134**: 111-118.

Fujiwara, M. and H. Caswell (2001). "Demography of the endangered North Atlantic right whale." Nature **414**(6863): 537-541.

Fulling, G. L., et al. (2003). "Abundance and distribution of cetaceans in outer continental shelf waters of the US Gulf of Mexico." Fishery Bulletin **101**(4): 923-932.

Gabriele, C., et al. (2003). Underwater acoustic monitoring and estimated effects of vessel noise on humpback whales in Glacier Bay, Alaska. Fifteenth Biennial Conference on the Biology of Marine Mammals. Greensboro, North Carolina**:** 56-57.

Gabriele, C. M. and A. S. Frankel. (2002). Surprising humpback whale songs in Glacier Bay National Park. Alaska Park Science: Connections to Natural and Cultural Resource Studies in Alaska's National Parks. p.17-21.

Gabriele, C. M., et al. (2017). "Natural history, population dynamics, and habitat use of humpback whales over 30 years on an Alaska feeding ground." Ecosphere **8**(1): e01641.

Gall, S. C. and R. C. Thompson (2015). "The impact of debris on marine life." Marine Pollution Bulletin **92**(1-2): 170-179.

Gallo, F., et al. (2018). "Marine litter plastics and microplastics and their toxic chemicals components: the need for urgent preventive measures." Environmental Sciences Europe **30**(1).

Gambell, R. (1999). The International Whaling Commission and the contemporary whaling debate. Conservation and Management of Marine Mammals. J. R. R. R. R. T. Jr. Washington, Smithsonian Institution Press**:** 179-198.

Garrett, C. (2004). Priority Substances of Interest in the Georgia Basin - Profiles and background information on current toxics issues. Technical Supporting Document, Canadian Toxics Work Group Puget Sound/Georgia Basin International Task Force**:** 402.

Garrison, L. P., et al. (2010). "Habitat and abundance of cetaceans in Atlantic Ocean continental slope waters off the eastern USA." Journal of Cetacean Research and Management **11**(3): 267-277.

Gauthier, J. and R. Sears (1999). "Behavioral response of four species of balaenopterid whales to biopsy sampling." Marine Mammal Science **15**(1): 85-101.

Gendron, D., et al. (2014). "Long-term individual sighting history database: an effective tool to monitor satellite tag effects on cetaceans." Endangered Species Research.

Geraci, J. R. (1990). "Physiological and toxic effects on cetaceans." Pp. 167-197 *In:* Geraci, J.R. and D.J. St. Aubin (eds), Sea Mammals and Oil: Confronting the Risks. Academic Press, Inc.

Gero, S., et al. (2014). "Behavior and social structure of the sperm whales of Dominica, West Indies." Marine Mammal Science **30**(3): 905-922.

Giese, M. (1996). "Effects of human activity on Adelie penguin (Pygoscelis adeliae) breeding success." Biological Conservation **75**: 157-164.

Gill, J. A., et al. (2001). "Why behavioural responses may not reflect the population consequences of human disturbance." Biological Conservation **97**: 265-268.

Gillespie, D. and R. Leaper (2001). Report of the Workshop on Right Whale Acoustics: Practical Applications in Conservation, Woods Hole, 8-9 March 2001. London, International Whaling Commission Scientific Committee**:** 23.

Givens, G. H., et al. (2013). Estimate of 2011 abundance of the Bering-Chukchi-Beaufort Seas bowhead whale population. Jeju, Korea, IWC Scientific Committee**:** 30.

Goldbogen, J. A., et al. (2006). "Kinematics of foraging dives and lunge-feeding in fin whales." Journal of Experimental Biology **209**(7): 1231-1244.

Gomez, C., et al. (2016). "A systematic review on the behavioural responses of wild marine mammals to noise: The disparity between science and policy." Canadian Journal of Zoology **94**(12): 801-819.

Goodyear, J. D. (1989b). Night behavior and ecology of humpback whales (Megaptera novaeangliae) in the western North Atlantic. Moss Landing Marine Laboratories, San Jose State University. **M.S.:** 78.

Goold, J. C. (1999). "Behavioural and acoustic observations of sperm whales in Scapa Flow, Orkney Islands." Journal of the Marine Biological Association of the United Kingdom **79**(3): 541-550.

Goold, J. C. and S. E. Jones (1995). "Time and frequency domain characteristics of sperm whale clicks." Journal of the Acoustical Society of America **98**(3): 1279-1291.

Gordon, J. C. D. (1990). "A simple photographic techinque for measuring the length of whales from boats at sea." Report of the International Whaling Commission **40**: 581-588.

Gorgone, A., et al. (2008). "Modeling response of target and nontarget dolphins to biopsy darting." Journal of Wildlife Management **72**(4): 926-932.

Graham, N. A. J., et al. (2006). "Dynamic fragility of oceanic coral reef ecosystems." Proceedings of the National Academy of Sciences of the United States of America **103**(22): 8425-8429.

Grant, S. C. H. and P. S. Ross (2002). Southern Resident killer whales at risk: toxic chemicals in the British Columbia and Washington environment. Canadian Technical Report of Fisheries and Aquatic Sciences 2412. Sidney, B.C., Fisheries and Oceans Canada.**:** 124.

Greene, C. H. and A. J. Pershing (2003). "The flip-side of the North Atlantic Oscillation and modal shifts in slope-water circulation patterns." Limnology and Oceanography **48**(1): 319-322.

Greene, C. H., et al. (2003). "Trans-Atlantic responses of *Calanus finmarchicus* populations to basin-scale forcing associated with the North Atlantic Oscillation." Progress in Oceanography **58**(2-4): 301-312.

Greer, A. W. (2008). "Trade-offs and benefits: Implications of promoting a strong immunity to gastrointestinal parasites in sheep." Parasite Immunology **30**(2): 123–132.

Grieve, B. D., et al. (2017). "Projecting the effects of climate change on *Calanus finmarchicus* distribution within the U.S. Northeast Continental Shelf." Scientific Reports **7**(1): 6264.

Gulland, F. M. D., et al. (1999). "Adrenal function in wild and rehabilitated Pacific harbor seals (Phoca vitulina richardii) and in seals with phocine herpesvirus-associated adrenal necrosis." Marine Mammal Science **15**(3): 810-827.

Hall, J. D. (1982). Prince William Sound, Alaska: Humpback whale population and vessel traffic study. Juneau, Alaska, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Alaska Fisheries Science Center, Juneau Management Office**:** 14.

Hamilton, P. K., et al. (1998). "Age structure and longevity in North Atlantic right whales *Eubalaena glacialis* and their relation to reproduction." Marine Ecology Progress Series **171**: 285-292.

Hammond, P. S., et al. (1990). "Individual recognition of cetaceans: Use of photo-identification and other techniques to estimate population parameters." Report of the International Whaling Commission **Special Issue 12**.

Hanson, M. B., et al. (2008). Re-sightings, healing, and attachment performance of remotely-deployed dorsal fin-mounted tags on Hawaiian odontocetes. Kihei, Hawaii, Pacific Scientific Review Group.

Hare, S. R. and N. J. Mantua (2001). An historical narrative on the Pacific Decadal Oscillation, interdecadal climate variability and ecosystem impacts. CIG Publication No. 160 University of Washington**:** 18.

Hare, S. R., et al. (1999). "Inverse production regimes: Alaska and West Coast Pacific salmon." Fisheries **24**(1): 6-14.

Harrington, F. H. and A. M. Veitch (1992). "Calving success of woodland caribou exposed to low-level jet fighter overflights." Arctic **45**(3): 213-218.

Hartwell, S. I. (2004). "Distribution of DDT in sediments off the central California coast." Marine Pollution Bulletin **49**(4): 299-305.

Hatch, L. T., et al. (2012). "Quantifying loss of acoustic communication space for right whales in and around a US. National Marine Sanctuary." Conservation Biology **26**(6): 983-994.

Haulena, M. (2016). Final Report AHC Case: 16-1760. Abbotsford, British Columbia, Animal Health Care Centre, Ministry of Agriculture of British Columbia.

Haver, S. M., et al. (2018). "Monitoring long-term soundscape trends in U.S. Waters: The NOAA/NPS Ocean Noise Reference Station Network." Marine Policy **90**: 6-13.

Hayes, S. A., et al. (2017). US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2016. Woods Hole, Massachusetts, Northeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Hayhoe, K., et al. (2018). "In *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* (Reidmiller, D.R., et al. [eds.])." U.S. Global Change Research Program, Washington, DC, USA.

Hazel, J., et al. (2007). "Vessel speed increases collision risk for the green turtle Chelonia mydas." Endangered Species Research **3**: 105-113.

Hazen, E. L., et al. (2009). "Fine-scale prey aggregations and foraging ecology of humpback whales Megaptera novaeangliae." Marine Ecology Progress Series **395**: 75-89.

Hazen, E. L., et al. (2012). "Predicted habitat shifts of Pacific top predators in a changing climate." Nature Climate Change **3**(3): 234-238.

Heenehan, H., J.E. Stanistreet, P.J. Corkeron, L. Bouveret, J. Chalifour, G.E. Davis, A. Henriquez, J.J. Kiszka, L. Kline, C. Reed, O. Shamir-Reynoso, F. Vedie, W. De Wolf, P. Hoetijes, and S.M. Van Parijs (in review). "Caribbean Sea soundscapes: monitoring humpback whales, biological sounds, geological events, and anthropogenic impacts of vessel noise." Frontiers.

Helker, V. T., et al. (2017). Human-Caused Mortality and Injury of NMFS-Managed Alaska Marine Mammal Stocks, 2011-2015. NOAA Technical Memorandum. Seattle, Washington, Alaska Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Deparatment of Commerce.

Helweg, D. A., et al. (1992). Humpback whale song: Our current understanding. Marine Mammal Sensory Systems. J. A. Thomas, R. A. Kastelein and A. Y. Supin. New York, Plenum Press**:** 459-483.

Henry, A. G., et al. (2017). Serious Injury and Mortality Determinations for Baleen Whale Stocks along the Gulf of Mexico, United States East Coast, and Atlantic Canadian Provinces, 2011-2015. Woods Hole, Massachusetts, Northeast Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Henry, A. G., et al. (2016). Serious Injury and Mortality Determinations for Baleen Whale Stocks along the Gulf of Mexico, Atlantic Canadian Provinces, 2010-2014. Woods Hole, Massachusetts, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Northeast Fisheries Science Center.

Herraez, P., et al. (2007). "Rhabdomyolysis and myoglobinuric nephrosis (capture myopathy) in a striped dolphin." Journal of Wildlife Diseases **43**(4): 770-774.

Hildebrand, J. A. (2009a). "Anthropogenic and natural sources of ambient noise in the ocean." Marine Ecology Progress Series **395**: 5-20.

Hildebrand, J. A. (2009b). "Metrics for characterizing the sources of ocean anthropogenic noise." Journal of the Acoustical Society of America **125**(4): 2517.

Hildebrand, J. A., et al. (2011). Passive Acoustic Monitoring for Marine Mammals in the SOCAL Naval Training Area 2010-2011, Inter-American Tropical Tuna Commission**:** 66.

Hildebrand, J. A., et al. (2012). Passive Acoustic Monitoring for Marine Mammals in the SOCAL Naval Training Area 2011-2012. Marine Physical Laboratory, Scripps Institution of Oceanography, University of California San Diego. **MPL Technical Memorandum 537**.

Hodge, K. B., et al. (2015). "North Atlantic right whale occurrence near wind energy areas along the mid-Atlantic U.S. coast: Implications for management." Endangered Species Research **28**(3): 225-234.

Hoelzel, A. R. (1992). "Conservation genetics of whales and dolphins." Molecular Ecology **1**(2): 119-125.

Hogg, C. J., et al. (2009). "Determination of steroid hormones in whale blow: It is possible." Marine Mammal Science **25**(3): 605-618.

Holt, M. M. (2008). Sound exposure and Southern Resident killer whales (*Orcinus orca*): A review of current knowledge and data gaps. NOAA Technical Memorandum, U.S. Department of Commerce**:** 59.

Hooker, S. K., et al. (2001). "Behavioral reactions of northern bottlenose whales (Hyperoodon ampullatus) to biopsy darting and tag attachment procedures." Fishery Bulletin **99**(2): 303-308.

Horwood, J. (2009). Sei Whale: *Balaenoptera borealis*. Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig and J. G. M. Thewissen. San Diego, Academic Press**:** 1091-1097.

Hotchkin, C. F., et al. (2011). Source level and propagation of gunshot sounds produced by North Atlantic right whales (Eubalanea glacialis) in the Bay of Fundy during August 2004 and

2005. Nineteenth Biennial Conference on the Biology of Marine Mammals. Tampa, Florida**:** 136.

Houser, D. S., et al. (2001). "A bandpass filter-bank model of auditory sensitivity in the humpback whale." Aquatic Mammals **27**(2): 82-91.

Hubard, C. W., et al. (2004). "Seasonal abundance and site fidelity of bottlenose dolphins (Tursiops truncatus) in Mississippi Sound." Aquatic Mammals **30**(2): 299-310.

Huijser, L. A. E., et al. (2018). "Population structure of North Atlantic and North Pacific sei whales (Balaenoptera borealis) inferred from mitochondrial control region DNA sequences and microsatellite genotypes." Conservation Genetics.

Hunt, K. E., et al. (2006). "Analysis of fecal glucocorticoids in the North Atlantic right whale (Eubalaena glacialis)." Gen Comp Endocrinol **148**(2): 260-272.

Hunt, K. E., et al. (2013). "Overcoming the challenges of studying conservation physiology in large whales: a review of available methods." Conserv Physiol **1**(1): cot006.

Hunt, K. E., et al. (2014). "Detection of steroid and thyroid hormones via immunoassay of North Atlantic right whale (Eubalaena glacialis) respiratory vapor." Marine Mammal Science **30**(2): 796-809.

Hurrell, J. W. (1995). "Decadal trends in the North Atlantic Oscillation: Regional temperatures and precipitation." Science **269**: 676-679.

IPCC (2014). Climate change 2014: Impacts, adaptation, and vulnerability. IPCC Working Group II contribution to AR5, Intergovernmental Panel on Climate Change.

IPCC (2018). "Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, Maycock, M. Tignor, and T. Waterfield (eds.)]." World Meteorological Organization, Geneva, Switzerland: 32pp.

Isojunno, S. and P. J. O. Miller (2015). "Sperm whale response to tag boat presence: biologically informed hidden state models quantify lost feeding opportunities." Ecosphere **6**(1).

IUCN (2012). "The IUCN red list of threatened species. Version 2012.2." from http://www.iucnredlist.org.

Ivashchenko, Y. V., et al. (2014). "Distribution of Soviet catches of sperm whales Physeter macrocephalus in the North Pacific." Endangered Species Research **25**(3): 249-263.

Iwata, H., S. Tanabe, N. Sakai, and R. Tatsukawa (1993). "Distribution of persistent organochlorines in the oceanic air and surface seawater and the role of ocean on their global transport and fate." Environmental Science and Technology **27**: 1080-1098.

IWC (2001). "Report of the workshop on the comprehensive assessment of right whales." Journal of Cetacean Research and Management (Special Issue) **2**: 1-60.

IWC (2007). "Whale population estimates." from http://www.iwcoffice.org/conservation/estimate.htm Accessed 3/06/09.

IWC (2012a). "International Whaling Commission: Whaling." from http://www.iwcoffice.org/whaling.

IWC (2012b). Report of the IWC Workshop on the Assessment of Southern Right Whales. Panama City, Panama, IWC Scientific Committee**:** 39.

IWC (2016). "Report of the Scientific Committee." Journal of Cetacean Research and Management (Supplement) **17**.

IWC (2017a). Aboriginal subsistence whaling catches since 1985, International Whaling Commission.

IWC (2017b). Catches under objection or under reservation since 1985, International Whaling Commission.

IWC (2017c). Special permit catches since 1985, International Whaling Commission.

Jackson, J., et al. (2001). "Historical overfishing and the recent collapse of coastal ecosystems." Science **293**(5530): 629-638.

Jacobsen, J. K., et al. (2010). "Fatal ingestion of floating net debris by two sperm whales (Physeter macrocephalus)." Marine Pollution Bulletin **60**(5): 765-767.

Jahoda, M., et al. (2003). "Mediterranean fin whale's (Balaenoptera physalus) response to small vessels and biopsy sampling assessed through passive tracking and timing of respiration." Marine Mammal Science **19**(1): 96-110.

Jaquet, N. (2006). "A simple photogrammetric technique to measure sperm whales at sea." Marine Mammal Science **22**(4): 862-879.

Jay, A., et al. (2018). "In: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]." U.S. Global Change Research Program, Washington, DC, USA: 33-71.

Jefferson, T. A., et al. (2015). Marine Mammals of the World: A Comprehensive Guide to Their Identification. London, United Kingdom, Academic Press.

Jenner, C. M. J. C. B. V. S. C. S. K. M. M. C. A. L. M. M. C. D. (2008). Mark recapture analysis of pygmy blue whales from the Perth Canyon, Western Australia 2000-2005. Santiago, Chile, International Whaling Commission Scientific Committee**:** 9.

Jensen, A. S. and G. K. Silber (2004). Large whale ship strike database, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources**:** 37.

Johnson, C., et al. (2017). Optical, Chemical, and Biological Oceanographic Conditions on the Scotian Shelf and in the Eastern Gulf of Maine in 2015, Fisheries and Oceans Canada, Science Advisory Secretariat**:** 53.

Johnson, M. P. and P. L. Tyack (2003). "A digital acoustic recording tag for measuring the response of wild marine mammals to sound." IEEE Journal of Oceanic Engineering **28**(1): 3-12.

Jones, M. L. and S. L. Swartz (2002). Gray whale, Eschrichtius robustus. Encyclopedia of Marine Mammals. W. F. P. B. W. J. G. M. Thewissen. San Diego, California, Academic Press**:** 524-536.

Kanda, N., et al. (2006). "Genetic characteristics of western North Pacific sei whales, Balaenoptera borealis, as revealed by microsatellites." Marine Biotechnology **8**(1): 86-93.

Kanda, N., et al. (2011). Stock identity of sei whales in the central North Pacific based on microsatellite analysis of biopsy samples obtained from IWC/Japan joint cetacean sighting survey in 2010. Tromso, Norway, IWC Scientific Committee**:** 4.

Kanda, N., et al. (2013). Microsatellite DNA analysis of sei whales obtained from the 2010-2012 IWC-POWER. Jeju, Korea, IWC Scientific Committee**:** 6.

Kanda, N., et al. (2014). Long distant longitudinal migration of southern right whales suspected from mtDNA and microsatellite DNA analysis on JARPA and JARPAII biopsy samples, Paper SC.

Kanda, N., et al. (2015). Genetic study on JARPNII and IWC-POWER samples of sei whales collected widely from the North Pacific at the same time of the year. San Diego, California, IWC Scientific Committee**:** 9.

Katona, S. K. and J. A. Beard (1990). "Population size, migrations and feeding aggregations of the humpback whale (Megaptera novaeangliae) in the western North Atlantic Ocean." Report of the International Whaling Commission **12**: 295-305.

Kaufman, G. A. and D. W. Kaufman (1994). "Changes in body-mass related to capture in the prairie deer mouse (Peromyscus maniculatus)." Journal of Mammalogy **75**(3): 681-691.

Keay, J. M., et al. (2006). "Fecal glucocorticoids and their metabolites as indicators of stress in various mammalian species: A literature review." Journal of Zoo and Wildlife Medicine **37**(3): 234-244.

Kelly, B. P., et al. (1986). Ringed seal winter ecology and effects of noise disturbance. Outer Continental Shelf Environmental Assessment Program. Final Reports of Principal Investigators. Anchorage, Alaska, Minerals Management Service, Alaska Outer Continental Shelf Office. **61:** 447-536.

Kennedy, A. S. and P. J. Clapham (2018). "From Whaling to Tagging: The Evolution of North Atlantic Humpback Whale Research in the West Indies." Marine Fisheries Review **79**(2): 23-37.

Kennedy, A. S., et al. (2014). "Local and migratory movements of humpback whales (Megaptera novaeangliae) satellite-tracked in the North Atlantic Ocean." Canadian Journal of Zoology **92**(1): 18-Sep.

Kenney, R. D. (2009). Right whales: *Eubalaena glacialis, E. japonica,* and *E. australis*. Encyclopedia of Marine Mammals. W. F. Perrin, B. Würsig and J. G. M. Thewissen. San Diego, California, Academic Press**:** 962-972.

Kenney, R. D., et al. (1985). Calculation of standing stocks and energetic requirements of the cetaceans of the northeast United States Outer Continental Shelf., NOAA Technical Memorandum NMFS-F/NEC-41. 99pp.

Kenney, R. D., et al. (1995). "Cetaceans in the Great South Channel, 1979-1989: Right whale (*Eubalaena glacialis*)." Continental Shelf Research **15**(4/5): 385-414.

Kerosky, S. M., et al. (2012). "Bryde's whale seasonal range expansion and increasing presence in the Southern California Bight from 2000-2010." Deep Sea Research Part I: Oceanographic Research Papers **65**: 125-132.

Ketten, D. R. (1992). The cetacean ear: Form, frequency, and evolution. Marine Mammal Sensory Systems. J. A. T. R. A. K. A. Y. Supin. New York, Plenum Press**:** 53-75.

Ketten, D. R. (1992). The marine mammal ear: Specializations for aquatic audition and echolocation. The Evolutionary Biology of Hearing. D. B. Webster, R. R. Fay and A. N. Popper (eds.). Springer-Verlag, New York, NY. p.717-750.

Ketten, D. R. (1997). "Structure and function in whale ears." Bioacoustics **8**: 103-135.

Ketten, D. R. (1998). Marine Mammal Auditory Systems: A Summary of Audiometroc and Anatomical Data and its Implications for Underwater Acoustic Impacts. NOAA Technical Memorandum, U.S. Department of Commerce**:** 74.

Ketten, D. R. and D. C. Mountain (2014). Inner ear frequency maps: First stage audiograms of low to infrasonic hearing in mysticetes. Fifth International Meeting on the Effects of Sounds in the Ocean on Marine Mammals (ESOMM - 2014). Amsterdam, The Netherlands**:** 41.

Kintisch, E. (2006). "As the seas warm: Researchers have a long way to go before they can pinpoint climate-change effects on oceangoing species." Science **313**: 776-779.

Kinzey, D., et al. (2000). Marine mammal data collection procedures on research ship line-transect surveys by the Southwest Fisheries Science Center, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center**:** 37.

Kipple, B. and C. Gabriele (2004). Underwater noise from skiffs to ships. Fourth Glacier Bay Science Symposium. S. M. J. F. G. Piatt.

Kipple, B. and C. Gabriele (2007). Underwater noise from skiffs to ships. Fourth Glacier Bay Science Symposium**:** 172-175.

Kite-Powell, H. L., et al. (2007). Modeling the effect of vessel speed on right whale ship strike risk, NMFS.

Knowlton, A. R., et al. (1994). "Reproduction in North Atlantic right whales (*Eubalaena glacialis*)." Canadian Journal of Zoology **72**(7): 1297-1305.

Koehler, N. (2006). Humpback whale habitat use patterns and interactions with vessels at Point Adolphus, southeastern Alaska. Fairbanks, Alaska, University of Alaska, Fairbanks. **M.S.:** 64.

Koski, W. R., et al. (2015). "Evaluation of UAS for photographic re-identification of bowhead whales, Balaena mysticetus." Journal of Unmanned Vehicle Systems **3**(1): 22-29.

Krahn, M. M., et al. (2007). "Persistent organic pollutants and stable isotopes in biopsy samples (2004/2006) from Southern Resident killer whales (*Orcinus orca*)." Marine Pollution Bulletin **54**(12): 1903-1911.

Krahn, M. M., et al. (2009). "Effects of age, sex and reproductive status on persistent organic pollutant concentrations in ‘‘Southern Resident” killer whales." Marine Pollution Bulletin.

Kraus, S. D., et al. (2005). "North Atlantic right whales in crisis." Science **309**(5734): 561-562.

Kraus, S. D., et al. (2007). High investment, low return: The strange case of reproduction in *Eubalaena glacialis*. The Urban Whale: North Atlantic Right Whales at the Crossroads. S. D. Kraus and R. M. Rolland. Cambridge, Massachusetts, Harvard University Press**:** 172-199.

Kraus, S. D., et al. (2016). "Recent Scientific Publications Cast Doubt on North Atlantic Right Whale Future." Frontiers in Marine Science **3**(137).

Kraus, S. D. and R. M. Rolland (2007). Right whales in the urban ocean. The Urban Whale: North Atlantic Right Whales at the Crossroads. S. D. Kraus and R. M. Rolland. Cambridge, Harvard University Press**:** Jan-38.

LaBrecque, E., et al. (2015). "3. Biologically Important Areas for Cetaceans Within U.S. Waters – Gulf of Mexico Region." Aquatic Mammals **41**(1): 30-38.

Lacy, R. C. (1997). "Importance of Genetic Variation to the Viability of Mammalian Populations." Journal of Mammalogy **78**(2): 320-335.

Laist, D. W., et al. (2001). "Collisions between ships and whales." Marine Mammal Science **17**(1): 35-75.

Lambert, E., et al. (2010). "Sustainable whale-watching tourism and climate change: Towards a framework of resilience." Journal of Sustainable Tourism **18**(3): 409-427.

Lambertsen, R. H. (1987). "A biopsy system for large whales and its use for cytogenetics." Journal of Mammalogy **68**(2): 443-445.

Lande, R. (1991). "Applications of genetics to management and conservation of cetaceans." Report of the International Whaling Commission **Special Issue 13**: 301-311.

Laplanche, C., et al. (2005). Sperm whales click focussing: Towards an understanding of single sperm whale foraging strategies. Nineteenth Annual Conference of the European Cetacean Society. La Rochelle, France**:** 56.

Law, K. L., et al. (2010). "Plastic accumulation in the North Atlantic subtropical gyre." Science **329**(5996): 1185-1188.

Learmonth, J. A., et al. (2006). "Potential effects of climate change on marine mammals." Oceanography and Marine Biology: an Annual Review **44**: 431-464.

Leduc, R. G., et al. (2002). "Genetic differences between western and eastern gray whales (Eschrichtius robustus)." Journal of Cetacean Research and Management **4**(1): 1-5.

LeDuc, R., et al. (2005). "Genetic analyses (mtDNA and microsatellites) of Okhotsk and Bering/Chukchi/Beaufort Seas populations of bowhead whales." Journal of Cetacean Research and Management **7**(2): 107.

Leduc, R. G., et al. (2008). "Mitochondrial genetic variation in bowhead whales in the western Arctic." Journal of Cetacean Research and Management **10**(2): 93-97.

Leduc, R. G., et al. (2012). "Genetic analysis of right whales in the eastern North Pacific confirms severe extirpation risk." Endangered Species Research **18**(2): 163-167.

Li, W. C., et al. (2016). "Plastic waste in the marine environment: A review of sources, occurrence and effects." Sci Total Environ **566-567**: 333-349.

Lima, S. L. (1998). "Stress and decision making under the risk of predation." Advances in the Study of Behavior **27**: 215-290.

Lloyd, B. D. (2003). Potential effects of mussel farming on New Zealand's marine mammals and seabirds: A discussion paper, Department of Conservation.

Lockyer, C. (1984). "Review of baleen whale (Mysticeti) reproduction and implications for management." Report of the International Whaling Commission **Special Issue 6**: 27-50.

Lockyer, C. H., et al. (1985). "Body condition in terms of anatomical and biochemical assessment of body fat in North Atlantic fin and sei whales." Canadian Journal of Zoology **63**(10): 2328-2338.

Lockyer, C. H. and R. J. Morris (1990). "Some observations on wound healing and persistence of scars in Tursiops truncatus." Report of the International Whaling Commission **Special Issue 12**: 113-118.

Lodi, L., et al. (2015). "Bryde's whale (Cetartiodactyla: Balaenopteridae) occurrence and movements in coastal areas of southeastern Brazil." Zoologia **32**(2): 171-175.

Luksenburg, J. and E. Parsons (2009). The effects of aircraft on cetaceans: implications for aerial whalewatching. Proceedings of the 61st Meeting of the International Whaling Commission.

Lusseau, D. (2004). "The hidden cost of tourism: Detecting long-term effects of tourism using behavioral information." Ecology and Society **9**(1): 2.

Lusseau, D. (2006). "The short-term behavioral reactions of bottlenose dolphins to interactions with boats in Doubtful Sound, New Zealand." Marine Mammal Science **22**(4): 802-818.

Lyrholm, T. and U. Gyllensten (1998). "Global matrilineal population structure in sperm whales as indicated by mitochondrial DNA sequences." Proceedings of the Royal Society B-Biological Sciences **265**(1406): 1679-1684.

Lysiak, N. S. J., et al. (2018). "Characterizing the Duration and Severity of Fishing Gear Entanglement on a North Atlantic Right Whale (Eubalaena glacialis) Using Stable Isotopes, Steroid and Thyroid Hormones in Baleen." Frontiers in Marine Science **5**.

M. Hardy (personal communication to D. Fauquier on October 5, 2017). North Atlantic right whale entanglement. Dieppe, New Brunswick, Canada, Hardy, M., Aquatic Resources Division (Science), Fisheries and Oceans Canada.

MacLean, S. A. (2002). Occurrence, behavior and genetic diversity of bowhead whales in the western Sea of Okhotsk, Russia, Texas A&M University.

MacLeod, C. D. (2009). "Global climate change, range changes and potential implications for the conservation of marine cetaceans: A review and synthesis." Endangered Species Research **7**(2): 125-136.

MacLeod, C. D., et al. (2005). "Climate change and the cetacean community of north-west Scotland." Biological Conservation **124**(4): 477-483.

Madsen, P. T., et al. (2003). "Sound production in neonate sperm whales." Journal of the Acoustical Society of America **113**(6): 2988-2991.

Magalhaes, S., et al. (2002). "Short-term reactions of sperm whales (Physeter macrocephalus) to whale-watching vessels in the Azores." Aquatic Mammals **28**(3): 267-274.

Malik, S., et al. (1999). "Assessment of mitochondrial DNA structuring and nursery use in the North Atlantic right whale (*Eubalaena glacialis*)." Canadian Journal of Zoology **77**(8): 1217-1222.

Malik, S., et al. (2000). "Analysis of mitochondrial DNA diversity within and between north and south Atlantic right whales." Marine Mammal Science **16**(3): 545-558.

Malme, C. I., et al. (1983). Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior. Final report for the period of 7 June 1982 - 31 July 1983. Anchorage, Alaska, Department of the Interior, Minerals Management Service, Alaska OCS Office**:** 64.

Malme, C. I., et al. (1986). Behavioral responses of gray whales to industrial noise: Feeding observations and predictive modeling., Final Report for the Outer Continental Shelf Environmental Assessment Program, Research Unit 675. 207pgs.

Mancia, A., et al. (2008). "A transcriptomic analysis of the stress induced by capture-release health assessment studies in wild dolphins (Tursiops truncatus)." Molecular Ecology **17**(11): 2581-2589.

Mann, J. (1999). "Behavioral sampling methods for cetaceans: A review and critique." Marine Mammal Science **15**(1): 102-122.

Mantua, N. J. and S. R. Hare (2002). "The Pacific decadal oscillation." Journal of Oceanography **58**(1): 35-44.

Mantua, N. J., et al. (1997). "A Pacific interdecadal climate oscillation with impacts on salmon production." Bulletin of the American Meteorological Society **78**(6): 1069-1079.

Marcoux, M., et al. (2006). "Coda vocalizations recorded in breeding areas are almost entirely produced by mature female sperm whales (Physeter macrocephalus)." Canadian Journal of Zoology **84**(4): 609-614.

Marine Mammal Commission (2016). Development and Use of UASs by the National Marine Fisheries Service for Surveying Marine Mammals. Bethesda, Maryland, Marine Mammal Commission.

Marques, T. A., et al. (2011). "Estimating North Pacific right whale Eubalaena japonica density using passive acoustic cue counting." Endangered Species Research **13**(3): 163-172.

Martin, K. J., et al. (2012). "Underwater hearing in the loggerhead turtle (*Caretta caretta*): A comparison of behavioral and auditory evoked potential audiograms." Journal of Experimental Biology **215**(17): 3001-3009.

Mate, B., et al. (2007). "The evolution of satellite-monitored radio tags for large whales: One laboratory's experience." Deep Sea Research Part II: Topical Studies in Oceanography **54**(3): 224-247.

Mate, B. R., et al. (2016). Baleen (Blue and Fin) Whale Tagging in Southern California in Support of Marine Mammal Monitoring Across Multiple Navy Training Areas. Final Report. . Pearl Harbor, Hawaii, Submitted to Naval Facilities Engineering Command Pacific under

Contract Nos. N62470-10-D-3011, Task Order KB29, and Contract No. N62470-15-D-8006, Task Order KB01, issued to HDR, Inc.

Matkin, C. O. and E. Saulitis (1997). "Restoration notebook: killer whale (*Orcinus orca*)." Exxon Valdez Oil Spill Trustee Council, Anchorage, Alaska.

Matthews, J. N., et al. (2001). "Vocalisation rates of the North Atlantic right whale (*Eubalaena glacialis*)." Journal of Cetacean Research and Management **3**(3): 271–282.

Matthews, L. P., et al. (2014). "Remote acoustic monitoring of North Atlantic right whales (*Eubalaena glacialis*) reveals seasonal and diel variations in acoustic behavior." PLoS ONE **9**(3): e91367.

Maybaum, H. L. (1990). "Effects of a 3.3 kHz sonar system on humpback whales, *Megaptera novaeangliae*, in Hawaiian waters." EOS **71**: 92.

Mayo, C. A., et al. (2018). "Distribution, demography, and behavior of North Atlantic right whales (Eubalaena glacialis) in Cape Cod Bay, Massachusetts, 1998-2013." Marine Mammal Science.

McCauley, R. and C. Jenner (2010). "Migratory patterns and estimated population size of pygmy blue whales (Balaenoptera musculus brevicauda) traversing the Western Australian coast based on passive acoustics." IWC SC/62/SH26.

McCordic, J. A., et al. (2016). "Calls of North Atlantic right whales *Eubalaena glacialis* contain information on individual identity and age class." Endangered Species Research **30**: 157-169.

McDonald, M. A., et al. (2001). "The acoustic calls of blue whales off California with gender data." Journal of the Acoustical Society of America **109**(4): 1728-1735.

McDonald, M. A., et al. (2009). "Worldwide decline in tonal frequencies of blue whale songs." Endangered Species Research **9**(1): 13-21.

McDonald, M. A., et al. (1995). "Blue and fin whales observed on a seafloor array in the northeast Pacific." Journal of the Acoustical Society of America **98**(2 Part 1): 712-721.

McDonald, M. A., et al. (2005). "Sei whale sounds recorded in the Antarctic." Journal of the Acoustical Society of America **118**(6): 3941-3945.

McDonald, M. A., et al. (2006). "Biogeographic characterisation of blue whale song worldwide: Using song to identify populations." Journal of Cetacean Research and Management **8**(1): 55-65.

Mcdonald, M. A., et al. (2006). "Increases in deep ocean ambient noise in the Northeast Pacific west of San Nicolas Island, California." Journal of the Acoustical Society of America **120**(2): 711-718.

McDonald, M. A. and S. E. Moore (2002). "Calls recorded from North Pacific right whales (*Eubalaena japonica*) in the eastern Bering Sea." Journal of Cetacean Research and Management **4**(3): 261-266.

Mckenna, M. F., et al. (2012). "Underwater radiated noise from modern commercial ships." Journal of the Acoustical Society of America **131**(2): 92-103.

McKenna, M. F., et al. (2013). "Relationship between container ship underwater noise levels and ship design, operational and oceanographic conditions." Scientific Reports **3**: 1760.

McLeod, B. A., et al. (2010). "DNA profile of a sixteenth century western North Atlantic right whale (*Eubalaena glacialis*)." Conservation Genetics **11**(1): 339-345.

McLeod, B. A. and B. N. White (2010). "Tracking mtDNA heteroplasmy through multiple generations in the North Atlantic right whale (*Eubalaena glacialis*)." Journal of Heredity **101**(2): 235-239.

McMahon, C. R. and H. R. Burton (2005). "Climate change and seal survival: Evidence for environmentally mediated changes in elephant seal, Mirounga leonina, pup survival." Proceedings of the Royal Society of London Series B Biological Sciences **272**(1566): 923-928.

McMahon, C. R. and G. C. Hays (2006). "Thermal niche, large-scale movements and implications of climate change for a critically endangered marine vertebrate." Global Change Biology **12**(7): 1330-1338.

McSweeney, D. J., et al. (1989). "North Pacific humpback whale songs - a comparison of southeast Alaskan feeding ground songs with Hawaiian wintering ground songs." Marine Mammal Science **5**(2): 139-148.

Mearns, A. J. (2001). Long-term contaminant trends and patterns in Puget Sound, the Straits of Juan de Fuca, and the Pacific Coast. 2001 Puget Sound Research Conference. T. Droscher. Olympia, Washington, Puget Sound Action Team.

Mellinger, D. K. and C. W. Clark (2003). "Blue whale (*Balaenoptera musculus*) sounds from the North Atlantic." Journal of the Acoustical Society of America **114**(2): 1108-1119.

Mesnick, S. L., et al. (2011). "Sperm whale population structure in the eastern and central North Pacific inferred by the use of single-nucleotide polymorphisms, microsatellites and mitochondrial DNA." Mol Ecol Resour **11 Suppl 1**: 278-298.

Meyer-Gutbrod, E. and C. Greene (2014). "Climate-Associated Regime Shifts Drive Decadal-Scale Variability in Recovery of North Atlantic Right Whale Population." Oceanography **27**(3).

Meyer-Gutbrod, E., et al. (2018). "Marine Species Range Shifts Necessitate Advanced Policy Planning: The Case of the North Atlantic Right Whale." Oceanography **31**(2).

Meyer-Gutbrod, E. L. and C. H. Greene (2018). "Uncertain recovery of the North Atlantic right whale in a changing ocean." Global Change Biology **24**(1): 455–464.

Miksis-Olds, J. L. and S. M. Nichols (2016). "Is low frequency ocean sound increasing globally?" J Acoust Soc Am **139**(1): 501-511.

Miller, L. J., et al. (2013). "Population abundance and habitat utilization of bottlenose dolphins in the Mississippi Sound." Aquatic Conservation: Marine and Freshwater Ecosystems **23**(1): 145-151.

Miller, P. J. O., et al. (2004). "Sperm whale behaviour indicates the use of echolocation click buzzes 'creaks' in prey capture." Proceedings of the Royal Society of London Series B Biological Sciences **271**(1554): 2239-2247.

MMC (2007). Marine mammals and noise: A sound approach to research and management, Marine Mammal Commission.

Mohl, B., et al. (2003). "The monopulsed nature of sperm whale clicks." Journal of the Acoustical Society of America **114**(2): 1143-1154.

Moncheva, S. P. and L. T. Kamburska (2002). Plankton stowaways in the Black Sea - Impacts on biodiversity and ecosystem health. Alien marine organisms introduced by ships in the Mediterranean and Black seas. Istanbul, Turkey, CIESM Workshop Monographs**:** 47-51.

Mongillo, T. M., et al. (2012). "Predicted polybrominated diphenyl ether (PBDE) and polychlorinated biphenyl (PCB) accumulation in southern resident killer whales." Marine Ecology Progress Series **453**: 263-277.

Moore, J. E. and R. Merrick (2011). Guidelines for assessing marine mammal stocks: Report of the GAMMS III Workshop, February 15-18, 2011. La Jolla, California, Dept. of Commerce.

Moore, S. E. and J. T. Clark (2002). "Potential impact of offshore human activities on gray whales (*Eschrichtius robustus*)." Journal of Cetacean Research and Management **4**(1): 19-25.

Morano, J. L., et al. (2012). "Acoustically detected year-round presence of right whales in an urbanized migration corridor." Conservation Biology **26**(4): 698-707.

Mullin, K. D. and G. L. Fulling (2003). "Abundance of cetaceans in the southern U.S. North Atlantic Ocean during summer 1998." Fishery Bulletin **101**(3): 603-613.

Mullin, K. D. and G. L. Fulling (2004). "Abundance of cetaceans in the oceanic northern Gulf of Mexico, 1996-2001." Marine Mammal Science **20**(4): 787-807.

Mullner, A., et al. (2004). "Exposure to ecotourism reduces survival and affects stress response in hoatzin chicks (Opisthocomus hoazin)." Biological Conservation **118**: 549-558.

Mundy, P. R. (2005). The Gulf of Alaska: Biology and Oceanography. Fairbanks, Alaska Sea Grant College Program, University of Alaska.

Mundy, P. R. and R. T. Cooney (2005). Physical and biological background. The Gulf of Alaska: Biology and oceanography. P. R. Mundy. Fairbanks, Alaska, Alaska Sea Grant College Program, University of Alaska**:** 15-23.

Mussoline, S. E., et al. (2012). "Seasonal and diel variation in North Atlantic right whale up-calls: Implications for management and conservation in the northwestern Atlantic Ocean." Endangered Species Research **17**(1-Jan): 17-26.

Muto, M. M., et al. (2016). "Alaska Marine Mammal Stock Assessments, 2015."

Muto, M. M., et al. (2017). Alaska Marine Mammal Stock Assessments, 2016. Seattle, Washington, Alaska Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Nachtigall, P. E. and A. Y. Supin. (2008). "A false killer whale adjusts its hearing when it echolocates. (Pseudorca crassidens)." Journal of Experimental Biology **211**(11): 1714-1718.

Nadeem, K., et al. (2016). "Integrating population dynamics models and distance sampling data: A spatial hierarchical state-space approach." Ecology **97**(7): 1735-1745.

Nakamura, N., et al. (2009). "Mode shift in the Indian Ocean climate under global warming stress." Geophysical Research Letters **36**.

NAS (2017). Approaches to Understanding the Cumulative Effects of Stressors on Marine Mammals. Washington, District of Columbia, National Academies of Sciences, Engineering, and Medicine. The National Academies Press**:** 146.

Navy (2018). Draft Supplemental Environmental Impact Statement/Supplemental Overseas Environmental Impact Statement for Surveillance Towed Array Sensor System Low Frequency (SURTASS LFA) Sonar, U.S. Department of Navy.

Nedelec, S. L., et al. (2014). "Anthropogenic noise playback impairs embryonic development and increases mortality in a marine invertebrate." Sci Rep **4**: 5891.

NHT (2005). Southern right whale recovery plan 2005-2010, Australian Government Department of the Environment and Heritage.

NMFS (1991). Final recovery plan for the humpback whale (*Megaptera novaeangliae*). Silver Spring, Maryland, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources.

NMFS (1998). Recovery plan for the blue whale (Balaenoptera musculus). R. L. R. L. P. J. C. B. J. Reeves and G. K. Silber. Silver Spring, Maryland, National Oceanic and Atmospheric Administration, National Marine Fisheries Service**:** 42.

NMFS (2001). Marine Fisheries Stock Assessment Improvement Plan. Report of the National Marine Fisheries Service National Task Force for Improving Fish Stock Assessments.**:** 69 pp.

NMFS (2006). Biological Opinion on the issuance of Section 10(a)(1)(A) permits to conduct scientific research on the southern resident killer whale (Orcinus orca) distinct population segment and other endangered or threatened species. Seattle, Washington, Northwest Regional Office, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerice**:** 92.

NMFS (2010a). Final recovery plan for the sperm whale (Physeter macrocephalus). Silver Spring, Maryland, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources.

NMFS (2010b). Recovery plan for the fin whale (Balaenoptera physalus). Silver Spring, Maryland, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources**:** 121.

NMFS (2010c). "Status Review of Hawaiian Insular False Killer Whales (*Pseudorca crassidens*) under the Endangered Species Act."

NMFS (2011a). "Fin whale (*Balaenoptera physalus*) 5-Year Review: Evaluation and Summary."

NMFS (2011b). Final recovery plan for the sei whale (Balaenoptera borealis). Silver Spring, Maryland, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources**:** 107.

NMFS (2012a). "5-Year Review North Pacific Right Whale (*Eubalaena japonica*)."

NMFS (2012b). Sei whale (Balaenoptera borealis). 5-year review: Summary and evaluation, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources**:** 21.

NMFS (2013a). Draft recovery plan for the North Pacific right whale (Eubalaena japonica). Silver Spring, Maryland, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources.

NMFS (2013b). Leatherback Sea Turtle (Dermochelys coriacea) 5-Year Review: Summary and Evaluation. N. a. USFWS.

NMFS (2015a). Southern right whale (Eubalaena australis) 5-year Review: Summary and Evaluation. Silver Spring, Maryland, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce**:** 56.

NMFS (2015b). Sperm whale (Physeter macrocephalus) 5-year review: Summary and evaluation, National Marine Fisheries Service, Office of Protected Resources.

NMFS (2016a). Cetacean Research at the AFSC's Marine Mammal Laboratory. Silver Spring, Maryland, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

NMFS (2016b). Occurrence of Endangered Species Act (ESA) Listed Humpback Whales off Alaska, Alaska Region, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

NMFS (2016c). Southern Resident Killer Whale (*Orcinus orca*) Stranding Event Expert Review Summary, September 21, 2016. Silver Spring, Maryland, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

NMFS (2016d). West Coast Region's Endangered Species Act implementation and considerations about "take" given the September 2016 humpback whale DPS status review and species-wide revision of listings, West Coast Region, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

NMFS (2017a). Biological and Conference Opinion on the Issuance of Permit No. 18786-01 to the Marine Mammal Health and Stranding Response Program and Implementation of the Marine Mammal Health and Stranding Response Program (2017 Reinitiation). Silver Spring, Maryland, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

NMFS (2017b). Biological and Conference Opinion on the Issuance of Permit No. 20465 to NMFS Alaska Fisheries Science Center Marine Mammal Laboratory for Research on Cetaceans. Silver Spring, Maryland, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

NMFS (2017c). North Atlantic Right Whale (*Eubalaena glacialis*) 5-Year Review: Summary and Evaluation. Gloucester, Massachusetts, Greater Atlantic Regional Fisheries Office, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

NMFS (2017d). "North Pacific Right Whale (*Eubalaena japonica*) Five Year Review: Summary and Evaluation." 39.

NMFS (2017e). Report: Drones for Whale Research Documented reactions of whales to drone overflights. Silver Spring, Maryland, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

NMFS and USFWS (2007a). 5-year review: Summary and evaluation, green sea turtle (*Chelonia mydas*), National Oceanic and Atmospheric Administration, National Marine Fisheries Service and U.S. Fish and Wildlife Service.

NMFS and USFWS (2007b). Loggerhead sea turtle (*Caretta caretta*) 5-year review: Summary and evaluation. Silver Spring, Maryland, National Marine Fisheries Service and U.S. Fish and Wildlife Service**:** 67.

NMFS and USFWS (2013a). Hawksbill sea turtle (*Eretmochelys imbricata*) 5-year review: Summary and evaluation Silver Spring, Maryland, National Marine Fisheries Service and U.S. Fish and Wildlife Service**:** 92.

NMFS and USFWS (2013b). Leatherback sea turtle (*Dermochelys coriacea*) 5-year review: Summary and evaluation. Silver Spring, Maryland, National Marine Fisheries Service and U.S. Fish and Wildlife Service**:** 93.

NMFS and USFWS (2015). Kemp's ridley sea turtle (*Lepidochelys kempii*) 5-year review: Summary and evaluation. Silver Spring, Maryland, National Marine Fisheries Service and U.S. Fish and Wildlife Service**:** 63.

NOAA (2013). Draft guidance for assessing the effects of anthropogenic sound on marine mammals: acoustic threshold levels for onset of permanent and temporary threshold shifts, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

NOAA (2018). Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. Silver Spring, Maryland, Office of Protected Resources, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Noda, K., et al. (2007). "Relationship between transportation stress and polymorphonuclear cell functions of bottlenose dolphins, Tursiops truncatus." Journal of Veterinary Medical Science **69**(4): 379-383.

Noren, D. P. and J. A. Mocklin (2012). "Review of cetacean biopsy techniques: Factors contributing to successful sample collection and physiological and behavioral impacts." Marine Mammal Science **28**(1): 154-199.

Norman, S. A., et al. (in review). "Quantitative assessment of wound healing of tagged gray (*Eschrichtius robustus*) and blue (*Balaenoptera musculus*) whales in the eastern North Pacific using long term series of photographs." Marine Mammal Science.

Norris, K. S. and G. W. Harvey (1972). A theory for the function of the spermaceti organ of the sperm whale. Animal Orientation and Navigation. S. R. Galler**:** 393-417.

Nowacek, D., et al. (2003). North Atlantic right whales (Eubalaena glacialis) ignore ships but respond to alarm signal. Environmental Consequences of Underwater Sound (ECOUS) Symposium. San Antonio, Texas.

Nowacek, D. P., et al. (2016). "Studying cetacean behaviour: new technological approaches and conservation applications." Animal Behaviour.

Nowacek, D. P., et al. (2004). "North Atlantic right whales (Eubalaena glacialis) ignore ships but respond to alerting stimuli." Proceedings of the Royal Society of London Series B Biological Sciences **271**(1536): 227-231.

Nowacek, D. P., et al. (2007). "Responses of cetaceans to anthropogenic noise." Mammal Review **37**(2): 81-115.

NRC (2003). Ocean Noise and Marine Mammals. Washington, District of Columbia, National Research Council of the National Academies of Science. The National Academies Press.

NRC (2005). Marine mammal populations and ocean noise. Determining when noise causes biologically significant effects. Washington, District of Columbia, National Research Council of the National Academies of Science. The National Academies Press.

NRC (2008). Tackling marine debris in the 21st Century. Washington, District of Columbia, National Research Council of the National Academies of Science. The National Academies Press**:** pp. 224.

O'Connor, S., et al. (2009). Whale Watching Worldwide: Tourism numbers, expenditures and expanding economic benefits, a special report from the International Fund for Animal Welfare. Yarmouth, Massachusetts, International Fund for Animal Welfare.

Ohsumi, S. and S. Wada (1974). "Status of whale stocks in the North Pacific, 1972." Report of the International Whaling Commission **24**: 114-126.

Oleson, E. M., et al. (2010). Status review of Hawaiian insular false killer whales (Pseudorca crassidens) under the Endangered Species Act, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Pacific Islands Fisheries Science Center**:** 237.

Oleson, E. M., et al. (2007a). "Blue whale visual and acoustic encounter rates in the Southern California Bight." Marine Mammal Science **23**(3): 574-597.

Oleson, E. M., et al. (2007b). "Behavioral context of call production by eastern North Pacific blue whales." Marine Ecology Progress Series **330**: 269-284.

Oleson, E. M., et al. (2007c). "Temporal separation of blue whale call types on a southern California feeding ground." Animal Behaviour **74**(4): 881-894.

Pace, R. M. and R. L. Merrick (2008). "Northwest Atlantic Ocean habitats important to the conservation of North Atlantic right whales (Eubalaena glacialis)." Northeast Fisheries Science Center Reference Document(7-Aug): 30.

Pace, R. M., et al. (2017). "State-space mark-recapture estimates reveal a recent decline in abundance of North Atlantic right whales." Ecology and Evolution: doi: 10.1002/ece1003.3406.

Palka, D. (2012). "Cetacean abundance estimates in US northwestern Atlantic Ocean waters from summer 2011 line transect survey."

Palsboll, P. J. and F. Larsen (1991). Evolution of the mitochondrial genome in the North Atlantic minke whale, Balaenoptera acutorostrata. Ninth Biennial Conference on the Biology of Marine Mammals. Chicago, Illinois**:** 52.

Parks, S. E. (2003). "Response of North Atlantic right whales (Eubalaena glacialis) to playback of calls recorded from surface active groups in both the North and South Atlantic." Marine Mammal Science **19**(3): 563-580.

Parks, S. E. (2009). Assessment of acoustic adaptations for noise compensation in marine mammals, Office of Naval Research**:** 3.

Parks, S. E. and C. W. Clark (2007). Acoustic communication: Social sounds and the potential impacts of noise. The Urban Whale: North Atlantic Right Whales at the Crossroads. S. D. K. R. Rolland. Cambridge, Massahusetts, Harvard University Press**:** 310-332.

Parks, S. E., et al. (2005). North Atlantic right whales shift their frequency of calling in response to vessel noise. Sixteenth Biennial Conference on the Biology of Marine Mammals. San Diego, California**:** 218.

Parks, S. E., et al. (2007). "Short- and long-term changes in right whale calling behavior: The potential effects of noise on acoustic communication." Journal of the Acoustical Society of America **122**(6): 3725-3731.

Parks, S. E., et al. (2005). "The gunshot sound produced by male North Atlantic right whales (Eubalaena glacialis) and its potential function in reproductive advertisement." Marine Mammal Science **21**(3): 458-475.

Parks, S. E., et al. (2012). "Characteristics of gunshot sound displays by North Atlantic right whales in the Bay of Fundy." Journal of the Acoustical Society of America **131**(4): 3173-3179.

Parks, S. E., et al. (2011a). "Dangerous dining: Surface foraging of North Atlantic right whales increases risk of vessel collisions." Biology Letters **8**(1): 57-60.

Parks, S. E., et al. (2011b). "Individual right whales call louder in increased environmental noise." Biology Letters **7**(1): 33-35.

Parks, S. E., et al. (2011c). "Sound production behavior of individual North Atlantic right whales: Implications for passive acoustic monitoring." Endangered Species Research **15**(1): 63-76.

Parks, S. E., et al. (2010). "Changes in vocal behavior of individual North Atlantic right whales in increased noise." Journal of the Acoustical Society of America **127**(3 Pt 2): 1726.

Parks, S. E., et al. (2007). "Anatomical predictions of hearing in the North Atlantic right whale." The Anatomical Record **290**(6): 734-744.

Parks, S. E., et al. (2003). Sound production by North Atlantic right whales in surface active groups. Fifteenth Biennial Conference on the Biology of Marine Mammals. Greensboro, North Carolina**:** 127.

Parks, S. E., et al. (2006). "Acoustic Communication in the North Atlantic Right Whale (*Eubalaena glacialis*) and Potential Impacts of Noise." EOS, Transactions, American Geophysical Union **87**(36): Ocean Sci. Meet. Suppl., Abstract OS53G-03.

Parks, S. E. and P. L. Tyack (2005). "Sound production by North Atlantic right whales (*Eubalaena glacialis*) in surface active groups." Journal of the Acoustical Society of America **117**(5): 3297-3306.

Parks, S. E., et al. (2009). "Variability in ambient noise levels and call parameters of North Atlantic right whales in three habitat areas." Journal of the Acoustical Society of America **125**(2): 1230-1239.

Parks, S. E. and S. M. Van Parijs (2015). Acoustic Behavior of North Atlantic Right Whale (*Eubalaena glacialis*) Mother-Calf Pairs, Office of Naval Research.

Parsons, E. C. M. (2012). "The Negative Impacts of Whale-Watching." Journal of Marine Biology **2012**: 1-9.

Parsons, K., et al. (2003). "Comparing two alternative methods for sampling small cetaceans for molecular analysis." Marine Mammal Science **19**(1): 224-231.

Patenaude, N. J., et al. (2007). "Mitochondrial DNA diversity and population structure among southern right whales (Eubalaena australis)." Journal of Heredity **98**(2): 147-157.

Patenaude, N. J., et al. (2002). "Aircraft sound and disturbance to bowhead and beluga whales during spring migration in the Alaskan Beaufort Sea." Marine Mammal Science **18**(2): 309-335.

Patterson, B. and G. R. Hamilton (1964). Repetitive 20 cycle per second biological hydroacoustic signals at Bermuda. Marine Bio-acoustics. W N Tavolga ed. Pergamon Press Oxford. p.125-145. Proceedings of a Symposium held at the Lerner Marine Laboratory Bimini Bahamas April.

Pavan, G., et al. (2000). "Time patterns of sperm whale codas recorded in the Mediterranean Sea 1985-1996." Journal of the Acoustical Society of America **107**(6): 3487-3495.

Payne, K. (1985). "Singing in humpback whales." Whalewatcher **19**(1): 3-6.

Payne, K., et al. (1983). Progressive changes in the songs of humpback whales (*Megaptera novaeangliae*): A detailed analysis of two seasons in Hawaii. Communication and Behavior of Whales. R. Payne. Boulder, CO, Westview Press**:** 9-57.

Payne, P. M., et al. (1986). "The distribution of the humpback whale, Megaptera novaeangliae, on Georges Bank and in the Gulf of Maine in relation to densities of the sand eel, Ammodytes americanus." Fishery Bulletin **84**(2): 271-277.

Payne, P. M., et al. (1990). "Recent fluctuations in the abundance of baleen whales in the southern Gulf of Maine in relation to changes in prey abundance." Fishery Bulletin **88**(4): 687-696.

Payne, R. and D. Webb. (1971). "Orientation by means of long range acoustic signaling in baleen whales." Annals of the New York Academy of Sciences **188**(1): 110-141.

Payne, R. S. and S. Mcvay (1971). "Songs of humpback whales. Humpbacks emit sounds in long, predictable patterns ranging over frequencies audible to humans." Science **173**(3997): 585-597.

Pearson, H. C., et al. (2017). "Testing and deployment of C-VISS (Cetacean-borne Video camera and Integrated Sensor System) on wild dolphins." Marine Biology **164**: 42.

Pecl, G. T. and G. D. Jackson (2008). "The potential impacts of climate change on inshore squid: Biology, ecology and fisheries." Reviews in Fish Biology and Fisheries **18**: 373-385.

Perryman, W. L. and M. S. Lynn (1994). "Examination of stock and school structure of striped dolphin (Stenella coeruleoalba) in the eastern Pacific from aerial photogrammetry." Fishery Bulletin **92**(1): 122-131.

Pershing, A. J., et al. (2001). "Oceanographic responses to climate in the Northwest Atlantic." Oceanography **14**(3): 76-82.

Peters, R. H. (1983). The Implications of Body Size, Cambridge University Press.

Petrochenko, S. P., et al. (1991). "Sounds, souce levels, and behavior of gray whales in the Chukotskoe Sea." Sov. Phys. Acoust. **37**(6): 622-624.

Pettis, H. M. and P. K. Hamilton (2015). North Atlantic Right Whale Consortium 2015 Annual Report Card, North Atlantic Right Whale Consortium.

Pettis, H. M. and P. K. Hamilton (2016). North Atlantic Right Whale Consortium 2016 Annual Report Card, North Atlantic Right Whale Consortium.

Pettis, H. M., et al. (2017). North Atlantic Right Whale Consortium 2017 Annual Report Card, North Atlantic Right Whale Consortium.

Pettis, H. M., et al. (2017). "Body condition changes arising from natural factors and fishing gear entanglements in North Atlantic right whales *Eubalaena glacialis*." Endangered Species Research **32**: 237-249.

Piniak, W. E., et al. (2016). "Hearing in the Juvenile Green Sea Turtle (*Chelonia mydas*): A Comparison of Underwater and Aerial Hearing Using Auditory Evoked Potentials." PLoS One **11**(10): e0159711.

Piniak, W. E. D., et al. (2012). "Hearing sensitivity of hatchling leatherback sea turtles (*Dermochelys coriacea*)." Thirty Second Annual Symposium on Sea Turtle Biology and Conservation.

Pitman, R. L. (2003). "Good whale hunting." Natural History **December 2003/January 2004**: 24-26, 28.

Poloczanska, E. S., et al. (2009). Vulnerability of marine turtles in climate change. Advances in Marine Biology. New York, Academic Press. **56:** 151-211.

Polyakov, I. V., et al. (2009). "North Atlantic warming: patterns of long-term trend and multidecadal variability." Climate Dynamics **34**(3-Feb): 439-457.

Popper, A. N., et al. (2014a). "Does man-made sound harm fishes?" Journal of Ocean Technology **9**(1): 11-20.

Popper, A. N., et al. (2014b). ASA S3/SC1.4 TR-2014 Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI, Springer International Publishing.

Price, C. S., et al. (2017). Protected Species Marnine Aquaculture Interactions, NOAA Technical Memorandum 85.

Price, C. S. and J. A. Morris (2013). "Marine cage culture and the environment: Twenty-first century science informing a sustainable industry."

Pughiuc, D. (2010). "Invasive species: Ballast water battles." Seaways.

Punt, A. E., et al. (2006). "Reconciling data on the trends and abundance of North Atlantic humpback whales within a population modelling framework." Journal of Cetacean Research and Management **8**(2): 145-159.

Raaymakers, S. (2003). "The GEF/UNDP/IMO global ballast water management programme integrating science, shipping and society to save our seas." Proceedings of the Institute of Marine Engineering, Science and Technology Part B: Journal of Design and Operations(B4): 2-10.

Raaymakers, S. and R. Hilliard (2002). Harmful aquatic organisms in ships' ballast water - Ballast water risk assessment. Alien marine organisms introduced by ships in the Mediterranean and Black seas. Istanbul, Turkey, CIESM Workshop Monographs**:** 103-110.

Rankin, S., et al. (2005). "Vocalisations of Antarctic blue whales, *Balaenoptera musculus intermedia*, recorded during the 2001/2002 and 2002/2003 IWC/SOWER circumpolar cruises, Area V, Antarctica." Journal of Cetacean Research and Management **7**(1): 13-20.

Ratnaswamy, M. J. and H. E. Winn (1993). "Photogrammetric estimates of allometry and calf production in fin whales, Balaenoptera physalus." Journal of Mammalogy **74**(2): 323-330.

Reeb, D. and P. B. Best (2006). "A biopsy system for deep-core sampling of the blubber of southern right whales, Eubalaena australis." Marine Mammal Science **22**(1): 206-213.

Reeves, R. R., et al. (2002). "Humpback whale (Megaptera novaeangliae) occurrence near the Cape Verde Islands, based on American 19th century whaling records." Journal of Cetacean Research and Management **4**(3): 235-253.

Reeves, R. R., et al. (2009). "Evidence of a possible decline since 1989 in false killer whales (Pseudorca crassidens) around the main Hawaiian Islands." Pacific Science **63**(2): 253-261.

Reeves, R. R., et al. (2011). "Insights from whaling logbooks on whales, dolphins, and whaling in the Gulf of Mexico." Gulf of Mexico Science **29**(1): 41-67.

Reilly, S. B., et al. (2013). "*Balaenoptera physalus*. The IUCN Red List of Threatened Species." The IUCN Red List of Threatened Species 2013: e.T2478A44210520.

Reiner, F., et al. (1996). "Cetaceans of the Cape Verde archipelago." Marine Mammal Science **12**(3): 10.

Reisinger, R. R., et al. (2014). "Satellite tagging and biopsy sampling of killer whales at subantarctic Marion Island: Effectiveness, immediate reactions and long-term responses." PLoS One **9**(10): e111835.

Rendell, L., et al. (2012). "Can genetic differences explain vocal dialect variation in sperm whales, Physeter macrocephalus?" Behav Genet **42**(2): 332-343.

Rendell, L. and H. Whitehead (2004). "Do sperm whales share coda vocalizations? Insights into coda usage from acoustic size measurement." Animal Behaviour **67**(5): 865-874.

Rice, A. N., et al. (2014). "Potential Bryde's whale (Balaenoptera edeni) calls recorded in the northern Gulf of Mexico." Journal of the Acoustical Society of America **135**(5).

Rice, D. W. (1998). "Marine mammals of the world.: Systematics and distribution." Special Publication Number 4. The Society for Marine Mammalogy, Lawrence, Kansas.

Richardson, W. J., et al. (1995). Marine mammals and noise, Academic Press, Inc., San Diego, CA. ISBN 0-12-588440-0 (alk. paper). 576pp.

Richardson, W. J., et al. (1995). Assessment of potential impact of small explosions in the Korea Strait on marine animals and fisheries, LGL Ltd. Environmental Research Associates, BBN Systems and Technologies.

Richardson, W. J., et al., Eds. (1985). Behavior, disturbance responses and distribution of bowhead whales (*Balaena mysticetus*) in the eastern Beaufort Sea, 1980-84: A summary. Bryan, Texas, LGL Ecological Research Associates, Inc.

Richardson, W. J., et al. (1995). Marine Mammals and Noise. San Diego, California, Academic Press, Inc.

Richter, C., et al. (2006). "Impacts of commercial whale watching on male sperm whales at Kaikoura, New Zealand." Marine Mammal Science **22**(1): 46-63.

Richter, C. F., et al. (2003). "Sperm whale watching off Kaikoura, New Zealand: Effects of current activities on surfacing and vocalisation patterns." Science for Conservation **219**.

Ridgway, S. H., et al. (1969). "Hearing in the giant sea turtle, Chelonoa mydas." Proceedings of the National Academies of Science **64**.

Rivers, J. A. (1997). "Blue whale, Balaenoptera musculus, vocalizations from the waters off central California." Marine Mammal Science **13**(2): 186-195.

Robbins, J., et al. (2016). Evaluating Potential Effects of Satellite Tagging in Large Whales: A Case Study with Gulf of Maine Humpback Whales, Report to the National Fish and Wildlife Foundation Grant #23318.

Robbins, J., et al. (2015). "Apparent survival of North Atlantic right whales after entanglement in fishing gear." Biological Conservation **191**: 421-427.

Robinson, R. A., et al. (2005). Climate change and migratory species. BTO Research Report 414. Norfolk, U.K. , Defra Research, British Trust for Ornithology**:** 306.

Rohrkasse-Charles, S., et al. (2011). Social context of gray whale Eschrichtius robustus sound activity. Nineteenth Biennial Conference on the Biology of Marine Mammals. Tampa, Florida**:** 255.

Rolland, R. M., et al. (2012). "Evidence that ship noise increases stress in right whales." Proc Biol Sci **279**(1737): 2363-2368.

Rolland, R. M., et al. (2016). "Health of North Atlantic right whales *Eubalaena glacialis* over three decades: From individual health to demographic and population health trends." Marine Ecology Progress Series **542**: 265-282.

Rolland, R. M., et al. (2017). "Fecal glucocorticoids and anthropogenic injury and mortality in North Atlantic right whales *Eubalaena glacialis*." Endangered Species Research **34**: 417-429.

Roman, J. and J. J. Mccarthy (2010). "The whale pump: Marine mammals enhance primary productivity in a coastal basin." PLoS One **5**(10): e13255.

Roman, J. and S. R. Palumbi (2003). "Whales before whaling in the North Atlantic." Science **301**(5632): 508-510.

Romero, L. M. (2004). "Physiological stress in ecology: lessons from biomedical research." Trends in Ecology and Evolution **19**(5): 249-255.

Root-Gutteridge, H., et al. (2018). "A lifetime of changing calls: North Atlantic right whales, Eubalaena glacialis, refine call production as they age." Animal Behaviour **137**: 21-34.

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

Rosel, P. E., Peter Corkeron, Laura Engleby, Deborah Epperson, Keith D. Mullin, Melissa S. Soldevilla, Barbara L. Taylor (2016). Status Review of Bryde's Whales (Balaenoptera edeni) in the Gulf of Mexico under the Endangered Species Act. Lafayette, Louisiana, NMFS Southeast Fisheries Science Center.

Rosel, P. E. and L. A. Wilcox (2014). "Genetic evidence reveals a unique lineage of Bryde's whales in the northern Gulf of Mexico." Endangered Species Research **25**(1): 19-34.

Rosenbaum, H. C., et al. (2000a). "Utility of North Atlantic right whale museum specimens for assessing changes in genetic diversity." Conservation Biology **14**(6): 1837-1842.

Rosenbaum, H. C., et al. (2000b). "World-wide genetic differentiation of Eubalaena: Questioning the number of right whale species." Molecular Ecology **9**(11): 1793-1802.

Rosenbaum, H. C., et al. (1997). "An effective method for isolating DNA from historical specimens of baleen." Molecular Ecology **6**(7): 677-681.

Ross, D. (1976). Mechanics of Underwater Noise. New York, Pergamon Press.

Ross, D. (1993). "On ocean underwater ambient noise." Acoustics Bulletin **18**: 8-May.

Ross, D. (2005). "Ship Sources of Ambient Noise." IEEE Journal of Oceanic Engineering **30**(2): 257-261.

Ross, P. S. (2002). "The role of immunotoxic environmental contaminants in facilitating the emergence of infectious diseases in marine mammals." Human and Ecological Risk Assessment **8**(2): 277-292.

Roulin, A., et al. (2012). "High source levels and small active space of high-pitched song in bowhead whales (*Balaena mysticetus*)." PLoS One **7**(12): e52072.

Royer, T. C. (2005). "Hydrographic responses at a coastal site in the northern Gulf of Alaska to seasonal and interannual forcing." Deep-Sea Research Part Ii-Topical Studies in Oceanography **52**(1-2): 267-288.

Rugh, D., et al. (2003). "A review of bowhead whale (*Balaena mysticetus*) stock identity." Journal of Cetacean Research and Management **5**(3): 267-280.

Rugh, D. J. and K. E. W. Shelden (2009). Bowhead whale, Balaena mysticetus. Encyclopedia of Marine Mammals. W. F. P. B. W. J. G. M. Thewissen. San Diego, Academic Press**:** 131-133.

Ryan, C., et al. (2014). "An abundance estimate for humpback whales Megaptera novaeangliae breeding around Boa Vista, Cape Verde Islands." Zoologia Caboverdiana **5**(1): 20-28.

Saji, N. H., et al. (1999). "A dipole mode in the tropical Indian Ocean." Nature **401**(6751): 360-363.

Salisbury, D. P., et al. (2016). "Right whale occurrence in the coastal waters of Virginia, U.S.A.: Endangered species presence in a rapidly developing energy market." Marine Mammal Science **32**(2): 508-519.

Samaran, F., et al. (2010). "Source level estimation of two blue whale subspecies in southwestern Indian Ocean." Journal of the Acoustical Society of America **127**(6): 3800-3808.

Samuel, Y., et al. (2005). "Underwater, low-frequency noise in a coastal sea turtle habitat." Journal of the Acoustical Society of America **117**(3): 1465-1472.

Sapolsky, R. M., et al. (2000). "How do glucocorticoids influence stress responses? Integrating permissive, suppressive, stimulatory, and preparative actions." Endocrine Reviews **21**(1): 55-89.

Schaeff, C. M., et al. (1997). "Comparison of genetic variability of North and South Atlantic right whales (*Eubalaena*), using DNA fingerprinting." Canadian Journal of Zoology **75**(7): 1073-1080.

Scheidat, M., et al. (2004). "Behavioural responses of humpback whales (Megaptera novaeangliae) to whalewatching boats near Isla de la Plata, Machalilla National Park, Ecuador." Journal of Cetacean Research and Management **6**(1): 63-68.

Scheidat, M., et al. (2006). Harbour porpoise (Phocoena phocoena) abundance in German waters (July 2004 and May 2005). St. Kitts and Nevis, West Indies, International Whaling Commission Scientific Committee**:** 11.

Schevill, W. E., et al. (1964). The 20-cycle signals and Balaenoptera (fin whales). Marine Bio-acoustics. W. N. Tavolga. Lerner Marine Laboratory, Bimini, Bahamas, Pergamon Press**:** 147-152.

Seyboth, E., et al. (2016). "Southern Right Whale (Eubalaena australis) Reproductive Success is Influenced by Krill (Euphausia superba) Density and Climate." Scientific Reports **6**.

Shelden, K. E. W. and D. J. Rugh (1995). "The bowhead whale, *Balaena mysticetus*: Its historic and current status." Marine Fisheries Review **57**(3-4): 1-20.

Silber, G. K. (1986). "The relationship of social vocalizations to surface behavior and aggression in the Hawaiian humpback whale (*Megaptera novaeangliae*)." Canadian Journal of Zoology **64**(10): 2075-2080.

Simao, S. M. and S. C. Moreira (2005). "Vocalizations of a female humpback whale in Arraial do Cabo (Rj, Brazil)." Marine Mammal Science **21**(1): 150-153.

Simmonds, M. P. (2005). Whale watching and monitoring: some considerations. Cambridge, United Kingdom, Unpublished paper submitted to the Scientific Committee of the International Whaling Commission SC/57/WW5.

Simmonds, M. P. and W. J. Eliott (2009). "Climate change and cetaceans: Concerns and recent developments." Journal of the Marine Biological Association of the United Kingdom **89**(1): 203-210.

Simmonds, M. P. and S. J. Isaac (2007). "The impacts of climate change on marine mammals: Early signs of significant problems." Oryx **41**(1): 19-26.

Širović, A., et al. (2014). "Bryde's whale calls recorded in the Gulf of Mexico." Marine Mammal Science **30**(1): 399-409.

Širović, A., et al. (2007). "Blue and fin whale call source levels and propagation range in the Southern Ocean." Journal of the Acoustical Society of America **122**(2): 1208-1215.

Širović, A., et al. (2012). "Temporal separation of two fin whale call types across the eastern North Pacific." Marine Biology **160**(1): 47-57.

Smith, C. E., et al. (2016). "Assessment of known impacts of unmanned aerial systems (UAS) on marine mammals: data gaps and recommendations for researchers in the United States." Journal of Unmanned Vehicle Systems **4**(1): 31-44.

Smith, J. N., et al. (2008). "Songs of male humpback whales, Megaptera novaeangliae, are involved in intersexual interactions." Animal Behaviour **76**(2): 467-477.

Smith, T. D., et al. (1999). "An ocean-basin-wide mark-recapture study of the North Atlantic humpback whale (Megaptera novaeangliae)." Marine Mammal Science **15**(1): 11689.

Smultea, M. A., et al. (2008). "An unusual reaction and other observations of sperm whales near fixed-wing aircraft." Gulf and Caribbean Research **20**: 75-80.

Smultea, M. A., et al. (2009). Aerial survey monitoring for marine mammals and sea turtles in conjunction with US Navy major training events off San Diego, California, 15-21 October and 15-18 November 2008, final report. Pearl Harbor, Hawaii, Naval Facilities Engineering Command Pacific, EV2 Environmental Planning.

Snyder, G. M., et al. (2001). "Counting Steller sea lion pups in Alaska: An evaluation of medium-format, color aerial photography." Marine Mammal Science **17**(1): 136-146.

Solan, M., et al. (2016). "Anthropogenic sources of underwater sound can modify how sediment-dwelling invertebrates mediate ecosystem properties." Sci Rep **6**: 20540.

Soldevilla, M. S., et al. (2014). "Passive acoustic monitoring on the North Atlantic right whale calving grounds." Endangered Species Research **25**(2): 115-140.

Sole, M., et al. (2016). "Evidence of Cnidarians sensitivity to sound after exposure to low frequency noise underwater sources." Sci Rep **6**: 37979.

Southall, B. L., et al. (2007). "Marine mammal noise exposure criteria: initial scientific recommendations." Aquatic Mammals **33**(4): 411-521.

Southall, B. L., et al. (2016). "Experimental field studies to measure behavioral responses of cetaceans to sonar." Endangered Species Research **31**: 293-315.

Spielman, D., et al. (2004). "Most species are not driven to extinction before genetic factors impact them." Proc Natl Acad Sci U S A **101**(42): 15261-15264.

Sremba, A. L., et al. (2012). "Circumpolar diversity and geographic differentiation of mtDNA in the critically endangered Antarctic blue whale (Balaenoptera musculus intermedia)." PLoS One **7**(3): e32579.

St. Aubin, D. J. and J. R. Geraci (1988). "Capture and handling stress suppresses circulating levels of thyroxine (T4) and triiodothyronine (T3) in beluga whale, Delphinapterus leucas." Physiological Zoology **61**(2): 170-175.

St. Aubin, D. J., et al. (1996). "Dolphin thyroid and adrenal hormones: Circulating levels in wild and semidomesticated *Tursiops truncatus*, and influence of sex, age, and season." Marine Mammal Science **12**(1): 1-13.

Stabeno, P. J., et al. (2004). "Meteorology and oceanography of the northern Gulf of Alaska." Continental Shelf Research **24-Jan**(8-Jul): 859-897.

Stafford, K. M., et al. (1998). "Long-range acoustic detection and localization of blue whale calls in the northeast Pacific Ocean (*Balaenoptera musculus*)." Journal of the Acoustical Society of America **104**(6): 3616-3625.

Stafford, K. M. and S. E. Moore (2005). "Atypical calling by a blue whale in the Gulf of Alaska." Journal of the Acoustical Society of America **117**(5): 2724-2727.

Stafford, K. M., et al. (2001). "Geographic and seasonal variation of blue whale calls in the North Pacific (*Balaenoptera musculus*)." Journal of Cetacean Research and Management **3**(1): 65-76.

Stenseth, N. C., et al. (2002). "Ecological effects of climate fluctuations." Science **297**(5585): 1292-1296.

Stevick P.T., L. B., N. Gandilhon, C. Rinaldi, R. Rinaldi, F. Broms, C. Carlson, A. Kennedy, N. Ward, and F. Wenzel (2018). "Migratory destinations and timing of humpback whales in the southeastern Caribbean differ from those off the Dominican Republic." Journal of Cetacean Research Management **18**: 127-133.

Stevick, P. T., et al. (2016). "There and back again: Multiple and return exchange of humpback whales between breeding habitats separated by an ocean basin." Journal of the Marine Biological Association of the United Kingdom.

Stimpert, A. K., et al. (2007). "'Megapclicks': Acoustic click trains and buzzes produced during night-time foraging of humpback whales (Megaptera novaeangliae)." Biology Letters **3**(5): 467-470.

Stimpert, A. K., et al. (2012). "Tagging young humpback whale calves: methodology and diving behavior." Endangered Species Research **19**(1): 11-17.

Strayer, D. L. (2010). "Alien species in fresh waters: Ecological effects, interactions with other stressors, and prospects for the future." Freshwater Biology **55**: 152-174.

Surrey-Marsden, C., et al. (2017). North Atlantic Right Whale Calving Area Surveys: 2015/2016 Results. NOAA Technical Memorandum. St. Petersburg, Florida, Southeast Regional Office, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Sutherland, W. J. and N. J. Crockford (1993). "Factors affecting the feeding distribution of red breasted geese, Branta ruficollis, wintering in Romania." Biological Conservation **63**: 61-65.

Swingle, W. M., et al. (1993). "Appearance of juvenile humpback whales feeding in the nearshore waters of Virginia." Marine Mammal Science **9**(3): 309-315.

Szesciorka, A. R., et al. (2016). "Testing tag attachments to increase the attachment duration of archival tags on baleen whales." Animal Biotelemetry **4**(1).

Taylor, A. H., et al. (1998). "Gulf Stream shifts following ENSO events." Nature **393**: 68.

Tennessen, J. B. and S. E. Parks (2016). "Acoustic propagation modeling indicates vocal compensation in noise improves communication range for North Atlantic right whales." Endangered Species Research **30**: 225-237.

Terdalkar, S., et al. (2005). "Bio-economic risks of ballast water carried in ships, with special reference to harmful algal blooms." Nature, Environment and Pollution Technology **4**(1): 43-47.

Tershy, B. R. (1992). "Body size, diet, habitat use, and social behavior of Balaenoptera whales in the Gulf of California." Journal of Mammalogy **73**(3): 477-486.

Thode, A., et al. (2007). "Observations of potential acoustic cues that attract sperm whales to longline fishing in the Gulf of Alaska." Journal of the Acoustical Society of America **122**(2): 1265-1277.

Thomas, J. A., et al. (1998). "Underwater audiogram of a false killer whale (*Pseudorca crassidens*)." Journal of the Acoustical Society of America **84**(3): 936-940.

Thomas, J. A., et al. (1990). "Underwater audiogram of a Hawaiian monk seal (*Monachus schauinslandi*)." Journal of the Acoustical Society of America **87**(1): 417-420.

Thomas, P. O., et al. (2016). "Status of the world's baleen whales." Marine Mammal Science **32**(2): 682-734.

Thompson, P. O., et al. (1986). "Sounds, source levels, and associated behavior of humpback whales, Southeast Alaska." Journal of the Acoustical Society of America **80**(3): 735-740.

Thompson, P. O., et al. (1996). "Underwater sounds of blue whales, Balaenoptera musculus, in the Gulf of California, Mexico." Marine Mammal Science **12**(2): 288-293.

Thompson, P. O., et al. (1992). "20-Hz pulses and other vocalizations of fin whales, *Balaenoptera physalus*, in the Gulf of California, Mexico." Journal of the Acoustical Society of America **92**(6): 3051-3057.

Thompson, T. J., et al. (1979). Mysticete sounds. Behavior of Marine Animals: Current Perspectives in Research Vol. 3: Cetaceans. H. E. Winn and B. L. Olla. New York, NY, Plenum Press**:** 403-431.

Thomson, C. A. and J. R. Geraci (1986). "Cortisol, aldosterone, and leukocytes in the stress response of bottlenose dolphins, Tursiops truncatus." Canadian Journal of Fisheries and Aquatic Sciences **43**(5): 1010-1016.

Thomson, D. H. and W. J. Richardson (1995). Marine mammal sounds. Marine Mammals and Noise. W. J. Richardson, C. R. J. Greene, C. I. Malme and D. H. Thomson. San Diego, Academic Press**:** 159-204.

Trygonis, V., et al. (2013). "Vocalization characteristics of North Atlantic right whale surface active groups in the calving habitat, southeastern United States." Journal of the Acoustical Society of America **134**(6): 4518.

Tyack, P. (1983). "Differential response of humpback whales, Megaptera novaeangliae, to playback of song or social sounds." Behavioral Ecology and Sociobiology **13**(1): 49-55.

Tyack, P. L. (1999). Communication and cognition. Biology of Marine Mammals. J. E. R. I. S. A. Rommel. Washington, Smithsonian Institution Press**:** 287-323.

Tyack, P. L. and C. W. Clark (2000). Communication and acoustic behavior of dolphins and whales. Hearing by Whales and Dolphins. W. W. L. A. A. N. P. R. R. Fay. New York, Springer-Verlag**:** 156-224.

Tyson, R. B., et al. (2012). "Synchronous mother and calf foraging behaviour in humpback whales Megaptera novaeangliae: Insights from multi-sensor suction cup tags." Marine Ecology Progress Series **457**: 209-220.

Tyson, R. B. and D. P. Nowacek (2005). Nonlinear dynamics in North Atlantic right whale (Eubalaena glacialis) vocalizations. Sixteenth Biennial Conference on the Biology of Marine Mammals. San Diego, California**:** 286.

Tyson, R. B., et al. (2007). "Nonlinear phenomena in the vocalizations of North Atlantic right whales (*Eubalaena glacialis*) and killer whales (*Orcinus orca*)." Journal of the Acoustical Society of America **122**(3): 1365-1373.

U.S. Navy (2010). Annual Range Complex Exercise Report 2 August 2009 to 1 August 2010 U.S. Navy Southern California (SOCAL) Range Complex and Hawaii Range Complex (HRC).

U.S. Navy (2012). Marine Species Monitoring for the U.S. Navy’s Southern California Range Complex- Annual Report 2012. Pearl Harbor, HI, U.S. Pacific Fleet, Environmental Readiness Division, U.S. Department of the Navy.

Unger, B., et al. (2016). "Large amounts of marine debris found in sperm whales stranded along the North Sea coast in early 2016." Marine Pollution Bulletin **112**(1): 134-141.

van der Hoop, J., et al. (2017). "Entanglement is a costly life-history stage in large whales." Ecol Evol **7**(1): 92-106.

van der Hoop, J., et al. (2013). "Assessment of management to mitigate anthropogenic effects on large whales." Conservation Biology **27**(1): 121-133.

van Waerebeek, K., et al. (2007). "Vessel collisions with small cetaceans worldwide and with large whales in the Southern Hemisphere, an initial assessment." Latin American Journal of Aquatic Mammals **6**(1): 43-69.

van Blaricom, G. R., et al. (1993). "Discovery of withering syndrome among black abalone Haliotis cracherodii Leach, 1814, populations at San Nicolas Island, California. ." Journal of Shellfish Research **12**: 185-188.

Vanderlaan, A. S. and C. T. Taggart (2007). "Vessel collisions with whales: the probability of lethal injury based on vessel speed." Marine Mammal Science **23**(1): 144-156.

Vanderlaan, A. S. M., et al. (2003). "Characterization of North Atlantic right whale (*Eubalaena glacialis*) sounds in the Bay of Fundy." IEEE Journal of Oceanic Engineering **28**(2): 164-173.

Wada, S. and K.-I. Numachi (1991). "Allozyme analyses of genetic differentiation among the populations and species of the Balaenoptora." Report of the International Whaling Commission **Special Issue 13**: 125-154.

Wade, C. P. a. P. (in review). "Abundance and population structure of humpback whales on their West Indies breeding grounds." IWC Scientific Committee **SC/67b/AWMP WP13**.

Wade, P. R. and R. P. Angliss (1997). Guidelines for assessing marine mammal stocks: Report of the GAMMS Workshop April 3-5, 1996, Seattle, Washington, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources**:** 93.

Wade, P. R., et al. (2011). "The world's smallest whale population?" Biology Letters **7**(1): 83-85.

Wade, P. R., et al. (2016). Estimates of abundance and migratory destination for North Pacific humpback whales in both summer feeding areas and winter mating and calving areas. International Whaling Commission Scientific Committee**:** SC/66b/IA/21.

Walker, B. G., et al. (2005). "Physiological and behavioral differences in magellanic Penguin chicks in undisturbed and tourist-visited locations of a colony." Conservation Biology **19**(5): 1571-1577.

Walker, K. A., et al. (2012). "A review of the effects of different marking and tagging techniques on marine mammals." Wildlife Research **39**(1): 15-30.

Waring, G. T., et al. (2008). U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2007. Woods Hole, Massachusetts, National Marine Fisheries Service Northeast Fisheries Science Center**:** 388.

Waring, G. T., et al. (2016). US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2015. Woods Hole, Massachusetts, National Marine Fisheries Service Northeast Fisheries Science Center 501.

Watkins, W. A. (1977). "Acoustic behavior of sperm whales." Oceanus **20**: 50-58.

Watkins, W. A. (1981). "Activities and underwater sounds of fin whales (*Balaenoptera physalus*)." Scientific Reports of the Whales Research Institute Tokyo **33**: 83-118.

Watkins, W. A. (1986). "Whale Reactions to Human Activities in Cape-Cod Waters." Marine Mammal Science **2**(4): 251-262.

Watkins, W. A., et al. (1985). "Sperm whale acoustic behaviors in the southeast Caribbean." Cetology **49**: 1-15.

Watkins, W. A., et al. (1981). "Radio tracking of finback (Balaenoptera physalus), and humpback (Megaptera novaeangliae) whales in Prince William Sound, Alaska, USA." Deep Sea Research Part I: Oceanographic Research Papers **28**(6): 577-588.

Watkins, W. A. and W. E. Schevill (1975). "Sperm whales (Physeter catodon) react to pingers." Deep Sea Research and Oceanogaphic Abstracts **22**(3): 123-129 +121pl.

Watkins, W. A. and W. E. Schevill (1977). "Spatial distribution of Physeter catodon (sperm whales) underwater." Deep Sea Research **24**(7): 693-699.

Watkins, W. A., et al. (1987). "The 20-Hz signals of finback whales (Balaenoptera physalus)." Journal of the Acoustical Society of America **82**(6): 1901-1912.

Watters, D. L., et al. (2010). "Assessing marine debris in deep seafloor habitats off California." Marine Pollution Bulletin **60**: 131-138.

Weilgart, L. and H. Whitehead (1993). "Coda communication by sperm whales (*Physeter macrocephalus*) off the Galápagos Islands." Canadian Journal of Zoology **71**(4): 744-752.

Weilgart, L. S. (2007). "The impacts of anthropogenic ocean noise on cetaceans and implications for management." Canadian Journal of Zoology **85**: 1091-1116.

Weilgart, L. S. and H. Whitehead (1997). "Group-specific dialects and geographical variation in coda repertoire in South Pacific sperm whales." Behavioral Ecology and Sociobiology **40**(5): 277-285.

Weinrich, M. T., et al. (1991). "Behavioural responses of humpback whales (*Megaptera novaeangliae*) in the southern Gulf of Maine to biopsy sampling." Reports of the International Whaling Commission (Special Issue 13): 91-97.

Weinrich, M. T., et al. (1992). "Behavioral reactions of humpback whales Megaptera novaeangliae to biopsy procedures." Fishery Bulletin **90**(3): 588-598.

Weir, C. R., et al. (2007). "The burst-pulse nature of 'squeal' sounds emitted by sperm whales (*Physeter macrocephalus*)." Journal of the Marine Biological Association of the U.K. **87**(1): 39-46.

Weirathmueller, M. J., et al. (2013). "Source levels of fin whale 20 Hz pulses measured in the Northeast Pacific Ocean." Journal of the Acoustical Society of America **133**(2): 741-749.

Weller, D. W. (2008). Report of the large whale tagging workshop, Marine Mammal Commission.

Weller, D. W., et al. (2009). "Birth-Intervals and Sex Composition of Western Gray Whales Summer."

Wenzel, F. W., et al. (2009). "Current knowledge on the distribution and relative abundance of humpback whales (Megaptera novaeangliae) off the Cape Verde Islands, eastern North Atlantic." Aquatic Mammals **35**(4): 502-510.

Whitehead, H. (1983). "Structure and stability of humpback whale groups off Newfoundland." Canadian Journal of Zoology **61**(6): 1391-1397.

Whitehead, H. (2009). Sperm whale: Physeter macrocephalus. Encyclopedia of Marine Mammals. W. F. P. B. W. J. G. M. Thewissen. San Diego, Academic Press**:** 1091-1097.

Whitehead, H., et al. (1997). "Past and distant whaling and the rapid decline of sperm whales off the Galapagos Islands. (Physeter macrocephalus)." Conservation Biology **11**(6): 1387-1396.

Whitehead, H. and L. Weilgart (1991). "Patterns of visually observable behaviour and vocalizations in groups of female sperm whales." Behaviour **118**(3/4): 275-295.

Whitt, A. D., et al. (2013). "North Atlantic right whale distribution and seasonal occurrence in nearshore waters off New Jersey, USA, and implications for management." Endangered Species Research **20**(1): 59-69.

Wiggins, S. M., et al. (2005). "Blue whale (Balaenoptera musculus) diel call patterns offshore of southern California." Aquatic Mammals **31**(2): 161-168.

Wilcove, D. S., et al. (1998). "Quantifying threats to imperiled species in the United States." BioScience **48**(8): 607-615.

Wilcox, C., et al. (2015). "Understanding the sources and effects of abandoned, lost, and discarded fishing gear on marine turtles in northern Australia." Conservation Biology **29**(1): 198-206.

Wiley, D. N., et al. (1995). "Stranding and mortality of humpback whales, *Megaptera novaeangliae*, in the mid-Atlantic and southeast United States, 1985-1992." Fishery Bulletin **93**(1): 196-205.

Wiley, D. N., et al. (2016). "Vessel strike mitigation lessons from direct observations involving two collisions between noncommercial vessels and North Atlantic right whales (Eubalaena glacialis)." Marine Mammal Science.

Willi, Y., et al. (2006). "Limits to the Adaptive Potential of Small Populations." Annual Review of Ecology, Evolution, and Systematics **37**(1): 433-458.

Williams, R. M., et al. (2002). "Behavioural responses of killer whales (Orcinus orca) to whale-watching boats: Opportunistic observations and experimental approaches." Journal of Zoology **256**(2): 255-270.

Williamson, M. J., et al. (2016). "The effect of close approaches for tagging activities by small research vessels on the behavior of humpback whales (*Megaptera novaeangliae*)." Marine Mammal Science.

Willis-Norton, E., et al. (2015). "Climate change impacts on leatherback turtle pelagic habitat in the Southeast Pacific." Deep Sea Research Part II: Topical Studies in Oceanography **113**: 260-267.

Wilson, K., et al. (2012). "Effects of research disturbance on the behavior and abundance of Steller sea lions (*Eumetopias jubatus*) at two rookeries in Alaska." Marine Mammal Science **28**(1): E58-E74.

Winn, H. E., et al. (1970). Sounds of the humpback whale. Proceedings of the 7th Annual Conference on Biological Sonar and Diving Mammals. Stanford Research Institute Menlo Park CA. p.39-52.

Wisdom, S., et al. (1999). Development of sound production in gray whales, Eschrichtius robustus. Thirteenth Biennial Conference on the Biology of Marine Mammals. Wailea, Maui, Hawaii**:** 203-204.

Wisdom, S., et al. (2001). "Development of behavior and sound repertoire of a rehabilitating gray whale calf. (Eschrichtius robustus)." Aquatic Mammals **27**(3): 239-255.

Withrow, D. and R. Angliss (1992). "Length frequency of bowhead whales from spring aerial photogrammetric surveys in 1985, 1986, 1989 and 1990." Report of the International Whaling Commission **42**: 463-467.

Wursig, B. and T. A. Jefferson (1990). "Methods of photo-identification for small cetaceans." Report of the International Whaling Commission **Special Issue 12**: 43-52.

Wursig, B., et al. (1998). "Behaviour of cetaceans in the northen Gulf of Mexico relative to survey ships and aircraft." Aquatic Mammals **24**(1): 41-50.

Yuen, M. M. L., et al. (2007). "The perception of complex tones by a false killer whale (Pseudorca crassidens)." Journal of the Acoustical Society of America **121**(3): 1768-1774.

Zoidis, A. M., et al. (2008). "Vocalizations produced by humpback whale (*Megaptera novaeangliae*) calves recorded in Hawaii." The Journal of the Acoustical Society of America **123**(3): 1737-1746.

19 APPENDICES

19.1 Appendix A – Draft Permit No. 20468

The text below was taken directly from the proposed permit provided to us in the consultation initiation package from the Permits and Conservation Division. The final permit may have minor changes that will not affect this opinion.

Permit No. 20648

Expiration Date: February 15, 2024
Reports Due: May 15, annually

PERMIT TO TAKE PROTECTED SPECIES[4] FOR SCIENTIFIC PURPOSES

I. Authorization

This permit is issued to Heidi Pearson, Ph.D., University of Alaska Southeast, 11120 Glacier Hwy, AND 1, Juneau, AK 99801, (hereinafter "Permit Holder"), pursuant to the provisions of the Marine Mammal Protection Act of 1972 as amended (MMPA; 16 U.S.C. 1361 *et seq.*); the regulations governing the taking and importing of marine mammals (50 CFR Part 216); the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq*.); and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226).

II. Abstract

The objectives of the permitted activity, as described in the application, is to advance knowledge of the behavior, ecology, and movement patterns of cetaceans inhabiting the Gulf of Alaska with a focus on Southeast Alaska. Specifically, the study aims to: 1) contribute to the on-going long-term studies of humpback whales and killer whales by examining parameters such as population trends, health, foraging ecology, and social strategies; 2) provide baseline data on the behavior and ecology of sperm whales, Dall's porpoise, harbor porpoise, and Pacific white-sided dolphins; and 3) assess behavioral and physiological baselines and responses of cetaceans to anthropogenic factors such as vessel traffic and environmental factors such as prey availability and climate change.

III. Terms and Conditions

The activities authorized herein must occur by the means, in the areas, and for the purposes set forth in the permit application, and as limited by the Terms and Conditions specified in this permit, including appendices and attachments. Permit noncompliance constitutes a violation and is grounds for permit modification, suspension, or revocation, and for enforcement action.

A. Duration of Permit

[4] "Protected species" include species listed as threatened or endangered under the ESA, and marine mammals.

1. Personnel listed in Condition C.1 of this permit (hereinafter "Researchers") may conduct activities authorized by this permit through January 31, 2024. This permit may be extended by the Director, National Marine Fisheries Service (NMFS) Office of Protected Resources or the Chief, Permits and Conservation Division (hereinafter Permits Division), pursuant to applicable regulations and the requirements of the MMPA and ESA.

2. 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:

   a. If serious injury or mortality[5] of protected species occurs.

   b. If authorized take[6] is exceeded in any of the following ways:

      i. More animals are taken than allowed in Table 1 of Appendix 1.
      ii. Animals are taken in a manner not authorized by this permit.
      iii. Protected species other than those authorized by this permit are taken.

   c. Following incident reporting requirements at Condition E.2.

3. The Permit Holder may continue to possess biological samples[7] acquired[8] under this permit after permit expiration without additional written authorization provided a copy of this permit is kept with the samples and they are maintained as specified in this permit.

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[5] This permit does not allow for unintentional serious injury and mortality caused by the presence or actions of researchers. This includes, but is not limited to: deaths of dependent young by starvation following research-related death of a lactating female, or deaths resulting from infections related to sampling procedures. Note that for marine mammals, a serious injury is defined by regulation as any injury that will likely result in mortality.

[6] By regulation, a take under the MMPA means 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, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild. Under the ESA, a take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to do any of the preceding.

[7] Biological samples include, but are not limited to: carcasses (whole or parts); and any tissues, fluids, or other specimens from live or dead protected species; except feces, urine, and spew collected from the water or ground.

[8] Authorized methods of sample acquisition are specified in Appendix 1.

B. Number and Kinds of Protected Species, Locations and Manner of Taking

1. The table in Appendix 1 outlines the authorized species and stock or distinct population segment (DPS) authorized; number of animals to be taken; number of animals from which parts may be received, imported and exported; and the manner of take, locations, and time period.

2. Researchers working under this permit may collect images (e.g., photographs, video) and audio recordings in addition to the photo-identification or behavioral photo-documentation authorized in Appendix 1 as needed to document the permitted activities, provided the collection of such images or recordings does not result in takes.

3. The Permit Holder may use visual images and audio recordings collected under this permit, including those authorized in Table 1 of Appendix 1, in printed materials (including commercial or scientific publications) and presentations provided the images and recordings are accompanied by a statement indicating that the activity was conducted pursuant to NMFS ESA/MMPA Permit No. 20648. This statement must accompany the images and recordings in all subsequent uses or sales.

4. The Chief, Permits Division may grant written approval for personnel performing activities not essential to achieving the research objectives (e.g., a documentary film crew) to be present, provided:

   a. The Permit Holder submits a request to the Permits Division specifying the purpose and nature of the activity, location, approximate dates, and number and roles of individuals for which permission is sought.

   b. Non-essential personnel/activities will not influence the conduct of permitted activities or result in takes of protected species.

   c. Persons authorized to accompany the Researchers for the purpose of such non-essential activities will not be allowed to participate in the permitted activities.

d. The Permit Holder and Researchers do not require compensation from the individuals in return for allowing them to accompany Researchers.

5. Researchers must comply with the following conditions related to the manner of taking:

Counting and Reporting Takes

a. Count and report a take of a cetacean regardless of whether you observe a behavioral response to the permitted activity.

b. For all approaches[9] in water and attempts to remotely biopsy and tag, count and report 1 take per cetacean per day.

c. For pinnipeds, you will count 1 take per animal per day for those animals that react to the research activities in these ways:
- movements of twice the animal's body length or more,
- changes of direction greater than 90 degrees, or
- retreats (flushes) to the water.

d. If all of your Level A biopsy or tagging attempts on a single day are unsuccessful but do not make contact with the animal, count the take against your Level B harassment take row.

e. If any of your Level A attempts on a single day are unsuccessful but make contact with the animal, count the take for the day against your sampling or tagging take row.

f. During Unmanned Aircraft System (UAS) surveys, count 1 take per cetacean approached per day, regardless of the number of passes.

General

g. Researchers must approach animals cautiously and retreat if behaviors indicate the approach may interfere with reproduction, feeding, or other vital functions.

[9] An "approach" is defined as a continuous sequence of maneuvers involving a vessel or equipment, including drifting, directed toward a cetacean or group of cetaceans closer than 100 yards for baleen and sperm whales and 50 yards for all other cetaceans.

h. Researchers must immediately terminate efforts if animals exhibit avoidance and/or evasive behaviors.

i. Where females with calves are authorized to be taken, Researchers:

   i. Must immediately terminate efforts if there is any evidence that the activity may be interfering with pair-bonding or other vital functions;

   ii. Must not position the research vessel between the mother and calf;

   iii. Must approach mothers and calves gradually to minimize or avoid any startle response;

   iv. Must discontinue an approach if a calf is actively nursing; and

   v. Must, if possible, sample the calf first to minimize the mother's reaction when sampling mother/calf pairs.

<u>Aerial Surveys</u>

Unmanned Aircraft Systems (UAS)

j. Aerial flights must not be conducted over pinnipeds on land.

k. Researchers are authorized to use a vertical take-off and landing unmanned aircraft system (UAS).

l. UAS must be flown at an altitude of 100 feet (~ 30 m). Descents for breath exhalate (blow) sampling must be no lower than 10 feet (~ 3 m).

<u>Remote Biopsy, Breath Collection, Skin Swabbing, and Suction-Cup Tagging</u>

m. Researchers may attempt (discharge/fire) a biopsy procedure on an animal 3 times a day, and attempt tagging (deploy) or skin-swabbing procedure on an animal 5 times in one day.

n. A biopsy, breath sample, or tag attachment attempt must be discontinued if an animal exhibits repetitive, strong, adverse reactions to the activity or vessel.

o. Researchers must use sterile biopsy tips following the protocol provided in Appendix 3.

p. Researchers may biopsy sample humpback and killer whale adults, juveniles, and calves greater than approximately 6 months old.

q. Before attempting to biopsy/tag/swab-sample an individual, Researchers must take reasonable measures (e.g., compare photo-identifications) to avoid unintentional repeated sampling of any individual.

r. Researchers must not attempt to biopsy or tag a cetacean anywhere forward of the pectoral fin.

Active Acoustics

Echosounders

s. The received level of echosounder exposure for prey mapping studies must not exceed Level B harassment guidelines following the current acoustic thresholds in the 2018 NMFS Technical Guidance.

Non-target Species

t. This permit does not authorize takes of any protected species not identified in Appendix 1, including those species under the jurisdiction of the United States Fish and Wildlife Service (USFWS). Should other protected species be encountered during the research activities authorized under this permit, researchers must exercise caution and remain a safe distance from the animal(s) to avoid take, including harassment.

C. Qualifications, Responsibilities, and Designation of Personnel

1. At the discretion of the Permit Holder, the following Researchers may participate in the conduct of the permitted activities in accordance with their qualifications and the limitations specified herein:

    a. Principal Investigator – Heidi Pearson, Ph.D.

    b. Co-Investigators – See Appendix 2 for list of names and corresponding activities.

    c. Research Assistants – personnel identified by the Permit Holder or Principal Investigator and qualified to act pursuant to Conditions C.2, C.3, and C.4 of this permit.

2. Individuals conducting permitted activities must possess qualifications commensurate with their roles and responsibilities. The roles and responsibilities of personnel operating under this permit are as follows:

    a. The Permit Holder is ultimately responsible for activities of individuals operating under the authority of this permit. Where the Permit Holder is an institution/facility, the Responsible Party is the person at the institution/facility who is responsible for the supervision of the Principal Investigator.

    b. The Principal Investigator (PI) is the individual primarily responsible for the taking, import, export and related activities conducted under the permit. This includes coordination of field activities of all personnel working under the permit. The PI must be on site during activities conducted under this permit unless a Co-Investigator named in Condition C.1 is present to act in place of the PI.

    c. Co-Investigators (CIs) are individuals who are qualified to conduct activities authorized by the permit, for the objectives described in the application, without the on-site supervision of the PI. CIs assume the role and responsibility of the PI in the PI's absence.

d. Research Assistants (RAs) are individuals who work under the direct and on-site supervision of the PI or a CI. RAs cannot conduct permitted activities in the absence of the PI or a CI.

3. Personnel involved in permitted activities must be reasonable in number and essential to conduct of the permitted activities. Essential personnel are limited to:

   a. Individuals who perform a function directly supportive of and necessary to the permitted activity (including operation of vessels or aircraft essential to conduct of the activity),

   b. Individuals included as backup for those personnel essential to the conduct of the permitted activity, and

   c. Individuals included for training purposes.

4. Persons who require state or Federal licenses or authorizations (e.g., veterinarians, pilots – including UAS operators) to conduct activities under the permit must be duly licensed/authorized and follow all applicable requirements when undertaking such activities.

5. Permitted activities may be conducted aboard vessels or aircraft, or in cooperation with individuals or organizations, engaged in commercial activities, provided the commercial activities are not conducted simultaneously with the permitted activities.

6. The Permit Holder cannot require or receive direct or indirect compensation from a person approved to act as PI, CI, or RA under this permit in return for requesting such approval from the Permits Division.

7. The Permit Holder may add CIs by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct

and oversee the activities authorized under this permit. If a CI will only be responsible for a subset of permitted activities, the request must also specify the activities for which they would provide oversight.

8. Submit requests to add CIs or change the PI by one of the following:

   a. The online system at https://apps.nmfs.noaa.gov;

   b. An email attachment to the permit analyst for this permit; or

   c. A hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910; phone (301)427-8401; fax (301)713-0376.

D. Possession of Permit

1. This permit cannot be transferred or assigned to any other person.

2. The Permit Holder and persons operating under the authority of this permit must possess a copy of this permit when engaged in a permitted activity.

3. A duplicate copy of this permit must accompany or be attached to the container, package, enclosure, or other means of containment in which a protected species or protected species part is placed for purposes of storage, transit, supervision or care.

E. Reporting

1. The Permit Holder must submit incident and annual reports containing the information and in the format specified by the Permits Division.

   a. Reports must be submitted to the Permits Division by one of the following:

      i. The online system at https://apps.nmfs.noaa.gov;
      ii. An email attachment to the permit analyst for this permit; or
      iii. A hard copy mailed or faxed to the Chief, Permits Division.

b. You must contact your permit analyst for a reporting form if you do not submit reports through the online system.

2. Incident Reporting

a. If a serious injury or mortality occurs, or authorized takes have been exceeded as specified in Condition A.2, the Permit Holder must:
   i. Contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than 2 business days of the incident;
   ii. Submit a written report within 2 weeks of the incident as specified below; and
   iii. Receive approval from the Permits Division before resuming work. The Permits Division may grant authorization to resume permitted activities based on review of the incident report and in consideration of the Terms and Conditions of this permit.

b. The incident report must include 1) a complete description of the events, and 2) identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceeding authorized take.

3. Annual reports describing activities conducted during the previous permit year (from February 15 to February 14) must:

a. Be submitted by May 15 each year for which the permit is valid, and

b. Include a tabular accounting of takes and a narrative description of activities and their effects.

c. Include data on disturbance rates of marine mammals specific to UAS operations. Details should include, but not be limited to: species, altitude and angle of approach, context of exposure (e.g., behavioral states), and observed behavioral responses to the UAS.

4. A joint annual/final report including a discussion of whether the objectives were achieved must be submitted by May 15, or, if the research concludes prior to permit expiration, within 90 days of completion of the research. This report is in lieu of the previously required separate final report.

5. Research results must be published or otherwise made available to the scientific community in a reasonable period of time. Copies of technical reports,

conference abstracts, papers, or publications resulting from permitted research must be submitted the Permits Division upon request.

F. Notification and Coordination

1. 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.

1. The Permit Holder must ensure written notification of planned field work for each project is provided to the NMFS Regional Office listed below at least two weeks prior to initiation of each field trip/season.

   a. Notification must include the following:

      i. Locations of the intended field study and/or survey routes;

      ii. Estimated dates of activities; and

      iii. Number and roles of participants (for example: PI, CI, boat driver, Research Assistant "in training").

   b. Notification must be sent to the following Assistant Regional Administrator for Protected Resources:

      Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802-1668; phone (907)586-7235; fax (907)586-7012;

2. Researchers must coordinate their activities with other permitted researchers to avoid unnecessary disturbance of animals or duplication of efforts. Contact the Regional Office listed above for information about coordinating with other Permit Holders.

G. Observers and Inspections

1. NMFS may review activities conducted under this permit. At the request of NMFS, the Permit Holder must cooperate with any such review by:

    a. Allowing an employee of NOAA or other person designated by the Director, NMFS Office of Protected Resources to observe and document permitted activities; and

    b. Providing all documents or other information relating to the permitted activities.

H. Modification, Suspension, and Revocation

1. Permits are subject to suspension, revocation, modification, and denial in accordance with the provisions of subpart D [Permit Sanctions and Denials] of 15 CFR Part 904.

2. The Director, NMFS Office of Protected Resources may modify, suspend, or revoke this permit in whole or in part:

    a. In order to make the permit consistent with a change made after the date of permit issuance with respect to applicable regulations prescribed under Section 103 of the MMPA and Section 4 of the ESA;

    b. In a case in which a violation of the terms and conditions of the permit is found;

    c. In response to a written request[10] from the Permit Holder; and

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[10] The Permit Holder may request changes to the permit related to: the objectives or purposes of the permitted activities; the species or number of animals taken; and the location, time, or manner of taking or importing protected species. Such requests must be submitted in writing to the Permits Division in the format specified in the application instructions.

d. If NMFS determines that the application or other information pertaining to the permitted activities (including, but not limited to, reports pursuant to Section E of this permit and information provided to NOAA personnel pursuant to Section G of this permit) includes false information.

3. Issuance of this permit does not guarantee or imply that NMFS will issue or approve subsequent permits or amendments for the same or similar activities requested by the Permit Holder, including those of a continuing nature.

I. Penalties and Permit Sanctions

1. A person who violates a provision of this permit, the MMPA, ESA, or the regulations at 50 CFR 216 and 50 CFR 222-226 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the MMPA, ESA, and 15 CFR Part 904.

2. The NMFS Office of Protected Resources shall be the sole arbiter of whether a given activity is within the scope and bounds of the authorization granted in this permit.

    a. The Permit Holder must contact the Permits Division for verification before conducting the activity if they are unsure whether an activity is within the scope of the permit.

    b. Failure to verify, where the NMFS Office of Protected Resources subsequently determines that an activity was outside the scope of the permit, may be used as evidence of a violation of the permit, the MMPA, the ESA, and applicable regulations in any enforcement actions.

J. Acceptance of Permit

1. In signing this permit, the Permit Holder:

    a. Agrees to abide by all terms and conditions set forth in the permit, all restrictions and relevant regulations under 50 CFR Parts 216, and 222-226, and all restrictions and requirements under the MMPA, and the ESA;

b. Acknowledges that the authority to conduct certain activities specified in the permit is conditional and subject to authorization by the Office Director; and

c. Acknowledges that this permit does not relieve the Permit Holder of the responsibility to obtain any other permits, or comply with any other Federal, State, local, or international laws or regulations.

________________________________ ____________________

Donna S. Wieting Date Issued

Director, Office of Protected Resources

National Marine Fisheries Service

________________________________ ____________________

Heidi Pearson, Ph.D. Date Effective

Assistant Professor, University of Alaska Southeast

Permit Holder

Appendix 1: Tables Specifying the Kinds of Protected Species, Locations, and Manner of Taking

Table 1. Annual Takes of Male and Female Marine Mammals Authorized during Unmanned Aerial and Vessel Surveys in Waters of the Gulf of Alaska with a focus on the Alexander Archipelago of Southeast Alaska, particularly near Juneau, Alaska.

APPS Line #	Species	Listing Unit /Stock	Life Stage	# of Takes[11]	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
1	Dolphin, Pacific white-sided	North Pacific stock	All	15000	100	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	Survey activities, excluding tagging and skin-swabs
2			Adult/ Juvenile	900	10			Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	Survey activities with tagging, excluding skin-swabs

[11] Takes = the **maximum** number of animals, not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

Table 1. Annual Takes of Male and Female Marine Mammals Authorized during Unmanned Aerial and Vessel Surveys in Waters of the Gulf of Alaska with a focus on the Alexander Archipelago of Southeast Alaska, particularly near Juneau, Alaska.									
APPS Line #	Species	Listing Unit /Stock	Life Stage	# of Takes[11]	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
3			Adult/ Juvenile	50	10			Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Observation, monitoring; Observations, behavioral; Other; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	Other = sample, skin swab
4	Porpoise, Dall's	Alaska stock	All	2500	100	Harass/ Sampling	Survey, aerial/vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	Survey activities, excluding tagging and skin-swabs
5			Adult/ Juvenile	300	10			Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL);	Survey activities with tagging, excluding skin-swabs

Table 1. Annual Takes of Male and Female Marine Mammals Authorized during Unmanned Aerial and Vessel Surveys in Waters of the Gulf of Alaska with a focus on the Alexander Archipelago of Southeast Alaska, particularly near Juneau, Alaska.									
APPS Line #	Species	Listing Unit /Stock	Life Stage	# of Takes[11]	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
								Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	
6				50	10			Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Other; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	Other = sample, skin swab
7	Porpoise, harbor	Range-wide (Southeast Alaska and Gulf of Alaska stocks)	All	2500	1	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	Survey activities, excluding tagging and skin-swabs
8			Adult/ Juvenile	300	1			Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey;	Survey activities with

Table 1. Annual Takes of Male and Female Marine Mammals Authorized during Unmanned Aerial and Vessel Surveys in Waters of the Gulf of Alaska with a focus on the Alexander Archipelago of Southeast Alaska, particularly near Juneau, Alaska.									
APPS Line #	Species	Listing Unit /Stock	Life Stage	# of Takes[11]	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
								Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	tagging, excluding skin-swabs
9			Adult/ Juvenile	50	10			Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Other; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	Other = sample, skin-swab
10	Sea lion, Steller	Range-wide (Eastern U.S. DPS and NMFS Endangered Western U.S. DPS)	All	500	10	Harass	Survey, vessel	Incidental disturbance	

Table 1. Annual Takes of Male and Female Marine Mammals Authorized during Unmanned Aerial and Vessel Surveys in Waters of the Gulf of Alaska with a focus on the Alexander Archipelago of Southeast Alaska, particularly near Juneau, Alaska.									
APPS Line #	Species	Listing Unit /Stock	Life Stage	# of Takes[11]	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
11	Seal, harbor	Range-wide (Alaska stocks)	All	500	10	Harass	Survey, vessel	Incidental disturbance	
12	Whale, fin	Northeast Pacific stock (NMFS Endangered)	All	500	50	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	
13	Whale, gray	Range-wide (Eastern North Pacific and NMFS Endangered Western North Pacific stocks)	All	500	50	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	
14	Whale, humpback	Range-wide (NMFS Endangered)	All	5000	100	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey;	Survey activities, excluding

Table 1. Annual Takes of Male and Female Marine Mammals Authorized during Unmanned Aerial and Vessel Surveys in Waters of the Gulf of Alaska with a focus on the Alexander Archipelago of Southeast Alaska, particularly near Juneau, Alaska.									
APPS Line #	Species	Listing Unit /Stock	Life Stage	# of Takes[11]	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
								Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	biopsy and tagging
15	Whale, humpback	Range-wide (NMFS Endangered/ Threatened)	All	50	10	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Tracking; Underwater photo/videography	Survey activities with biopsy, excluding tagging
16			All	450	10			Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal;	Survey activities with tagging, excluding biopsy

Table 1. Annual Takes of Male and Female Marine Mammals Authorized during Unmanned Aerial and Vessel Surveys in Waters of the Gulf of Alaska with a focus on the Alexander Archipelago of Southeast Alaska, particularly near Juneau, Alaska.									
APPS Line #	Species	Listing Unit /Stock	Life Stage	# of Takes[11]	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
								Tracking; Underwater photo/videography	
17	Whale, killer	Range-wide	All	5000	100	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	Survey activities, excluding biopsy and tagging
18	Whale, killer	Range-wide	All	50	10	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Tracking; Underwater photo/videography	Survey activities with biopsy, excluding tagging
19				450	10			Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Instrument, suction-cup (e.g., VHF,	Survey activities with tagging,

Table 1. Annual Takes of Male and Female Marine Mammals Authorized during Unmanned Aerial and Vessel Surveys in Waters of the Gulf of Alaska with a focus on the Alexander Archipelago of Southeast Alaska, particularly near Juneau, Alaska.									
APPS Line #	Species	Listing Unit /Stock	Life Stage	# of Takes[11]	Takes Per Animal	Take Action	Observe/Collect Method	Procedures	Details
								TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Tracking; Underwater photo/videography	excluding biopsy
20	Whale, minke	Alaska stock	All	500	50	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	
21	Whale, sperm	North Pacific stock (NMFS Endangered)	All	500	50	Harass/ Sampling	Survey, aerial/ vessel	Acoustic, passive recording; Acoustic, sonar for prey mapping; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	

Appendix 2: NMFS-Approved Personnel and Authorized Recipients for Permit No. 20648.

The following individuals are approved to act as Co-Investigators pursuant to the terms and conditions under Section C (Qualifications, Responsibilities, and Designation of Personnel) of this permit.

Name of Co-Investigator	Activities
Dr. Heidi Pearson	All research activities, except UAS piloting, biopsy sampling, and suction-cup tagging of humpback and killer whales
Ms. Jan Straley	All research activities, except UAS piloting
Mr. John Moran	All research activities, except UAS piloting
Mr. Chris Pearson	All research activities, except biopsy sampling and suction-cup tagging of humpback and killer whales
Dr. Shannon Atkinson	Level B sampling only

Biological samples authorized for collection or acquisition in Table 1 of Appendix 1 may be transferred to the following Authorized Recipients for the specified disposition, consistent with Condition B.6 of the permit:

Authorized Recipient	Sample Type	Disposition
Shannon Atkinson, University of Alaska Fairbanks, Juneau, AK	Blubber, skin, blow, and fecal samples	Analysis (samples consumed in analysis)

19.2 Appendix B – Draft Permit No. 21482

The text below was taken directly from the proposed permit provided to us in the consultation initiation package from the Permits and Conservation Division. The final permit may have minor changes that will not affect this opinion.

Permit No. 21482

Expiration Date: July 31, 2024
Reports Due: January 31, annually

PERMIT TO TAKE PROTECTED SPECIES[12] FOR SCIENTIFIC PURPOSES

I. Authorization

This permit is issued to Dan Engelhaupt, Ph.D., 4173 Ewell Road, Virginia Beach, Virginia, 23455, (hereinafter "Permit Holder;), pursuant to the provisions of the Marine Mammal Protection Act of 1972 as amended (MMPA; 16 U.S.C. 1361 *et seq*.); the regulations governing the taking and importing of marine mammals (50 CFR Part 216); the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq*.); the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226); and the Fur Seal Act of 1966 (16 U.S.C. 1151 *et seq*.).

II. Abstract

The objective of the permitted activity, as described in the application, is to further the understanding of how marine mammals may respond to anthropogenic activities, while contributing to cetacean and pinniped conservation by collecting critical baseline and exposure data required to inform long-term management.

III. Terms and Conditions

The activities authorized herein must occur by the means, in the areas, and for the purposes set forth in the permit application, and as limited by the Terms and Conditions specified in this permit, including appendices and attachments. Permit noncompliance constitutes a violation and is grounds for permit modification, suspension, or revocation, and for enforcement action.

A. Duration of Permit

[12] "Protected species" include species listed as threatened or endangered under the ESA, and marine mammals.

1. Personnel listed in Condition C.1 of this permit (hereinafter "Researchers") may conduct activities authorized by this permit through October 31, 2023. This permit may be extended by the Director, National Marine Fisheries Service (NMFS) Office of Protected Resources or the Chief, Permits and Conservation Division (hereinafter Permits Division), pursuant to applicable regulations and the requirements of the MMPA and ESA.

2. 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:

   a. If serious injury or mortality[13] of protected species occurs.

   b. If authorized take[14] is exceeded in any of the following ways:

      i. More animals are taken than allowed in Tables 1 and 2 of Appendix 1.
      ii. Animals are taken in a manner not authorized by this permit.
      iii. Protected species other than those authorized by this permit are taken.

   c. Following incident reporting requirements at Condition E.2.

   d. For Gulf of Mexico Bryde's whale research, annual authorization must be obtained in writing from the Permits Division prior to each year's research activities.

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[13] This permit does not allow for unintentional serious injury and mortality caused by the presence or actions of researchers of Appendix 1. This includes, but is not limited to: deaths of dependent young by starvation following research-related death of a lactating female; or deaths resulting from infections related to sampling procedures or invasive tagging. Note that for marine mammals, a serious injury is defined by regulation as any injury that will likely result in mortality.

[14] By regulation, a take under the MMPA means 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, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild. Under the ESA, a take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to do any of the preceding.

i. Authorization may include modifying the number of takes and types of research activities you are authorized. Authorization will be based on evaluating the following:

A. All submitted Gulf of Mexico Bryde's whale annual research reports including all research proposed on Gulf of Mexico Bryde's whales by authorized permit holders for the upcoming year (January – December) (see Condition E.6);

B. Findings from annual coordination meetings (see Condition F.4); and

C. Recovery priorities and status updates.

ii. Authorization may be denied or delayed if the Gulf of Mexico Bryde's whale research annual report has not been received by December 31st and approved as complete by January 31st.

iii. Authorization does not guarantee or imply that NMFS will authorize subsequent years' activities or the same take numbers and activities.

3. The Permit Holder may continue to possess biological samples[15] acquired[16] under this permit after permit expiration without additional written authorization provided a copy of this permit is kept with the samples and they are maintained as specified in this permit.

B. Number and Kinds of Protected Species, Locations and Manner of Taking

[15] Biological samples include, but are not limited to: carcasses (whole or parts); and any tissues, fluids, or other specimens from live or dead protected species; except feces, urine, and spew collected from the water or ground.
[16] Authorized methods of sample acquisition are specified in Appendix 1.

1. The tables in Appendix 1 outline the authorized species and stock or distinct population segment (DPS) authorized; number of animals to be taken; number of animals from which parts may be received, imported and exported; and the manner of take, locations, and time period.

2. Researchers working under this permit may collect images (e.g., photographs, video) and audio recordings in addition to the photo-identification or behavioral photo-documentation authorized in Appendix 1 as needed to document the permitted activities, provided the collection of such images or recordings does not result in takes.

3. The Permit Holder may use visual images and audio recordings collected under this permit, including those authorized in Tables 1 and 2 of Appendix 1, in printed materials (including commercial or scientific publications) and presentations provided the images and recordings are accompanied by a statement indicating that the activity was conducted pursuant to NMFS ESA/MMPA Permit No. 21482. This statement must accompany the images and recordings in all subsequent uses or sales.

4. The Chief, Permits Division may grant written approval for personnel performing activities not essential to achieving the research objectives (e.g., a documentary film crew) to be present, provided:

    a. The Permit Holder submits a request to the Permits Division specifying the purpose and nature of the activity, location, approximate dates, and number and roles of individuals for which permission is sought.

    b. Non-essential personnel/activities will not influence the conduct of permitted activities or result in takes of protected species.

    c. Persons authorized to accompany the Researchers for the purpose of such non-essential activities will not be allowed to participate in the permitted activities.

    d. The Permit Holder and Researchers do not require compensation from the individuals in return for allowing them to accompany Researchers.

5. Researchers must comply with the following conditions related to the manner of taking:

Counting and Reporting Takes

a. Count and report a take of a cetacean or pinniped following the guidance below regardless of whether you observe a behavioral response to the permitted activity.

b. During unmanned aircraft system (UAS) and manned aerial surveys flown at an altitude lower than 1,000 feet, count and report 1 take per cetacean or pinniped observed per day, regardless of the number of passes.

c. For all cetacean approaches[17] in water and attempts to remotely biopsy or tag, count and report 1 take per cetacean per day.

   i. If all Level A harassment biopsy or tagging attempts on a single day are unsuccessful and do not make contact with the animal, count the take against your Level B harassment take row.

   ii. If any Level A harassment attempts on a single day are unsuccessful but do make contact with the animal, count the take for the day against your sampling or tagging take row.

d. For pinnipeds in the water: count and report 1 take per day for any pinniped that Researchers approach within 50 yards

   i. Do not count pinnipeds that approach Researchers.

   ii. Do not count takes of pinnipeds when transiting between

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[17] An "approach" is defined as a continuous sequence of maneuvers involving a vessel, equipment, or researcher's body, including drifting, directed toward a cetacean or group of cetaceans closer than 100 yards for baleen and sperm whales and 50 yards for all other cetaceans and pinnipeds.

research locations.

e. Count and report 1 take per cetacean or pinniped per day for animals observed during sound playback trials.

General

f. Approach animals cautiously and retreat if behaviors indicate that the approach may interfere with reproduction, feeding, or other vital functions.

g. Where females with calves are authorized to be taken:

i. Immediately terminate efforts if animals exhibit signs that the activity may be interfering with pair-bonding or other vital functions;

ii. Do not position the research vessel between the mother and calf;

iii. Approach mothers and calves gradually to minimize or avoid any startle response;

iv. Discontinue an approach if a calf is actively nursing; and

v. Whenever possible, sample the calf first to minimize the mother's reaction when sampling mother/calf pairs.

Aerial Surveys

h. Aerial flights must not be conducted over pinnipeds on land.

Manned Aerial Surveys

i. Researchers must conduct manned aerial surveys (fixed-wing and rotary/helicopter) at an altitude of 700 feet or higher. The aircraft may descend to no lower than 400 feet for photo-identification.

Unmanned Aircraft Systems (UAS)

j. Researchers may use vertical take-off and landing unmanned aircraft systems (UAS).

k. Researchers must operate UAS at an altitude of 50 feet or higher for cetaceans and 100 feet or higher for pinnipeds. The UAS may descend to no lower than 20 feet for photogrammetry and 6 feet for breath sampling.

Active Acoustic Playbacks

l. Playback studies must be limited to 1 minute in duration, not exceed 170 dB re 1 µPa at 1 meter, and must not be broadcast to animals closer than 25 meters.

m. A playback sequence must be discontinued if an animal exhibits repetitive strong adverse reactions to the playback activity or the vessel.

Acoustics Non-targets

n. Playbacks must not be initiated and must be immediately shut down if non-target protected species (i.e., marine mammal or sea turtle) are observed within 500 m of the sound source, except where authorized for playbacks in Appendix 1.

Underwater Filming/Photography

o. No more than 2 snorkelers/divers may be in the water at one time during research. Contact the NMFS Permits Division for approval of additional snorkelers/diver(s).

p. Research Assistants may be snorkelers/divers and conduct underwater activities only if they are trained photographers, videographers, or safety divers.

q. Terminate an underwater approach if a cetacean exhibits adverse or evasive changes in behavior.

Research in Washington State and/or Research on Humpback Whales in Hawaii

r. Vessels engaged in research activities in Washington State inland waters and Hawaii must fly a clearly visible triangular pennant at all times. The pennant must be yellow with minimum dimensions of 18"H x 26"L and with the permit number displayed in 6" high black numerals.

Killer Whales in Washington State inland waters

s. To the maximum extent possible, no more than one marine research vessel may be within 200 yards of the same individual or group of Southern Resident killer whales at the same time.

t. UAS activities must be separated by at least 5 miles and may not target the same Southern Resident killer whale individuals or groups of animals concurrently.

u. To comply with ESA regulations (50 CFR 224.103) prohibiting vessel approaches within 200 yards of killer whales in the inland waters of Washington without a permit, this permit authorizes approaches within 200 yards of killer whales for scientific research. Take numbers are not required under this permit for these approaches between 200 to 50 yards. Takes are required for approaches within 50 yards of killer whales, and must be counted and reported as indicated at Condition B.5.c. See Condition E.3 for additional reporting requirements.

General Conditions for Remote Procedures (Biopsy sampling and Tagging)

v. Researchers may attempt (deploy or discharge/fire) each procedure on an animal up to 3 times a day.

w. Discontinue an attempt to biopsy sample or tag if an animal exhibits repetitive, strong, adverse reactions to the activity or vessel.

Data Collection and Sharing

x. To the maximum extent possible, Researchers must collect photos or high-resolution video simultaneously when biopsy sampling, and tagging to identify the individual and the sampling or tagging location on each individual.

Protocol Modifications

y. The Permit Holder or Principal Investigator (PI) must notify the Permits Division before implementing any change to protocols to determine if additional authorization is required. This may include, but is not limited to:

i. Modifications to sterilization or Institutional Animal Care and Use Committee (IACUC) requirements,

ii. Increases in a biopsy tip's size or depth of penetration, or

iii. Increases in a tag's mass, footprint, or number of anchors.

Biopsy Sampling

Biopsy Sterilization and Disinfection

z. Biopsy tips must be sterile[18] before every use. Sterilization must follow your IACUC approved protocol.

i. As a last resort during the same field trip, Researchers can reuse contaminated[19] biopsy tips that are cleaned and high-level disinfected[20] (versus sterile). High level disinfection[21] may include 10% bleach or similar high-level disinfection solution[22] (e.g., 6% hydrogen peroxide or 2% glutaraldehyde) for at least 20 minutes.

[18] Sterilization = destroys or eliminates all forms of microbial life and is carried out by physical or chemical methods (CDC 2008). These methods must follow the IACUC-approved protocol for sterilization (e.g., gas or cold sterilization).
[19] Contaminated = e.g., missed attempt, contacts seawater, physical contact, etc.

[20] Disinfection = eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects usually by liquid chemicals (CDC 2008).
[21] High level disinfection can destroy all microbes, with the exception some bacterial spores.
[22] FDA 2015. FDA-Cleared Sterilants and High Level Disinfectants with General Claims for Processing Reusable Medical and Dental Devices - March 2015. Available online here: https://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/ReprocessingofReusableMedicalDevices/ucm437347.htm

Biopsy Target Animals and Age-classes

aa. Researchers may biopsy sample adults and juveniles greater than approximately 1 year old and females accompanied by these calves. However, Researchers must not biopsy sample a calf less than approximately 1 year old or a female accompanied by a calf less than 1 year old.

bb. Before attempting to biopsy sample an individual, Researchers must take reasonable measures (e.g., compare photo-identifications) to avoid repeated takes of any individual.

Biopsy Sampling Location and Frequency

cc. Do not attempt to biopsy sample a cetacean anywhere forward (cranial) of the pectoral fin.

dd. Animals may be biopsy sampled 2 times per year.

Tagging

ee. Authorized tag types include:

i. Suction-cup tags;

ii. Dart/barb tags; and

ii. Fully-implantable tags.

Tagging Sterilization

ff. Invasive tag anchors (darts, pins, bolts, etc.), and fully-implantable tags must be sterile[2] before every use. Sterilization must follow your IACUC approved protocol.

i. Researchers must cease tagging efforts if all sterile tag anchors or fully-implantable tags are contaminated[23].

gg. Handling or manipulation of the sterile tag anchors or deep-implant tags before deployment should be performed with sterile surgical gloves or other sterilized equipment.

Tagging Target Animals and Age-classes

hh. Dart/barb tags are not authorized for Southern Resident killer whales.

ii. Fully-implantable tags are not authorized for Cook Inlet beluga whales, Gulf of Mexico Bryde's whales, Main Hawaiian Islands false killer whales, minke whales, North Atlantic right whales, North Pacific right whales, and Southern Resident killer whales.

jj. Where authorized in Appendix 1, Researchers may tag adults and juveniles greater than approximately 1 year old and females accompanied by calves greater than approximately 1 year old. However, Researchers must not tag a calf less than approximately 1 year old or a female accompanied by a calf less than 1 year old.

kk. Before attempting to tag an individual, Researchers must take reasonable measures (e.g., compare photo-identifications) to avoid unintentional repeated takes of any individual.

ll. Avoid invasive tagging of animals in obviously poor health or exhibiting species-specific body condition parameters indicating compromised health such as, but not limited to:

i. Noticeable reductions in body mass in the post-cranial region (i.e., exhibiting a nuchal fat pad depression);

ii. Prominent vertebral column;

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[23] Contaminated = e.g., missed attempt, contacts seawater, physical contact, etc.

iii. Visible ribs;

iv. Excessive skin lesions, parasites or cyamids;

v. Behaving abnormally;

vi. Obviously pregnant; or

vii. Immunocompromised populations or otherwise compromised individuals.

Tagging Location and Frequency

mm. Avoid tagging a cetacean anywhere forward (cranial) of the pectoral fin or below (ventral) the lateral vertebral processes.

nn. Researchers may deploy up to 2 tags at one time on the same animal with the exception that only one unit is a dart/barb or fully-implantable tag.

oo. Researchers may tag animals up to 2 times per year with dart/barb tags.

pp. Researchers must not intentionally re-tag an individual animal with a fully-implantable tag within the same permit year.

Post-tag Monitoring

qq. Researchers must make reasonable efforts to opportunistically monitor animals instrumented with invasive tags (dart/barb and fully-implantable) through tracking and resightings (photographic/video or genetic) to assess:

i. The location on the body and condition of the tag (including breakage);

ii. Tag wound reaction and healing (e.g., severity of swelling, depressions, and coloration);

iii. Animal health and behavior;

iv. Fecundity (presence of calf); and

v. Survival.

rr. Results of post-tag monitoring must be provided in annual reports as indicated in Conditions at E.3.

<u>For Gulf of Mexico Bryde's Whales</u>

ss. The Permit Holder must receive written authorization from the Permits Division prior to conducting research activities that will result in take of Gulf of Mexico Bryde's whales (see Condition A.2.c).

tt. For biopsy sampling, each individual Gulf of Mexico Bryde's whale may be biopsy sampled once per year. Also see Condition F.4 for requirements to send a subsample of the biopsy to the SEFSC.

uu. For tagging, each individual Gulf of Mexico Bryde's whale may receive no more than two tags (one dart/barb tag and one suction-cup tag) per year.

i. Both tags may be attached at the same time or during separate events.

ii. Known individuals that have been dart tagged must not be intentionally dart tagged a second time within the same calendar year.

vv. Researchers may biopsy sample and tag an individual on the same day.

For North Atlantic right whales

ww. Researchers must report information on tagged whales to the Permits Division and the Marine Mammal Health and Stranding Response Program (MMHSRP) following Permit Condition E.7.

Non-target Species

xx. This permit does not authorize takes of any protected species not identified in Appendix 1, including those species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS). Should Researchers encounter other protected species during the activities authorized under this permit, exercise caution and remain a safe distance from the animal(s) to avoid take, including harassment.

6. The Permit Holder must comply with the following conditions and the regulations at 50 CFR 216.37, for biological samples acquired or possessed under authority of this permit.

a. The Permit Holder is ultimately responsible for compliance with this permit and applicable regulations related to the samples unless the samples are permanently transferred according to NMFS regulations governing the taking and importing of marine mammals (50 CFR 216.37) and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR 222.308).

b. Samples must be maintained according to accepted curatorial standards and must be labeled with a unique identifier (e.g., alphanumeric code) that is connected to on-site records with information identifying the following:

i. Species and, where known, age and sex;

ii. Date of collection, acquisition, or import;

iii. Type of sample (e.g., blood, skin, bone);

iv. Origin (i.e., where collected or imported from); and

v. Legal authorization for original sample collection or import.

c. Biological samples belong to the Permit Holder and may be temporarily transferred to Authorized Recipients identified in Appendix 2 without additional written authorization, for analysis or curation related to the objectives of this permit. The Permit Holder remains responsible for the samples, including any reporting requirements.

d. The Permit Holder may request approval of additional Authorized Recipients for analysis and curation of samples related to the permit objectives by submitting a written request to the Permits Division specifying the following:

i. Name and affiliation of the recipient;

ii. Address of the recipient;

iii. Types of samples to be sent (species, tissue type); and

iv. Type of analysis or whether samples will be curated.

e. Sample recipients must have authorization pursuant to 50 CFR 216.37 prior to permanent transfer of samples and transfers for purposes not related to the objectives of this permit.

f. Samples cannot be bought or sold, including parts transferred pursuant to 50 CFR 216.37.

g. After meeting the permitted objectives, the Permit Holder may continue to possess and use samples acquired under this permit, without additional written authorization, provided the samples are maintained as specified in the permit and findings are discussed in the annual reports (See Condition E.3).

C. Qualifications, Responsibilities, and Designation of Personnel

1. At the discretion of the Permit Holder, the following Researchers may participate in the conduct of the permitted activities in accordance with their qualifications and the limitations specified herein:

   a. Principal Investigator – Dan Engelhaupt, Ph.D.

   b. Co-Investigators – See Appendix 2 for list of names and corresponding activities.

   c. Research Assistants – personnel identified by the Permit Holder or Principal Investigator and qualified to act pursuant to Conditions C.2, C.3, and C.4 of this permit.

2. Individuals conducting permitted activities must possess qualifications commensurate with their roles and responsibilities. The roles and responsibilities of personnel operating under this permit are as follows:

   a. The Permit Holder is ultimately responsible for activities of individuals operating under the authority of this permit. Where the Permit Holder is an institution/facility, the Responsible Party is the person at the institution/facility who is responsible for the supervision of the Principal Investigator.

   b. The Principal Investigator (PI) is the individual primarily responsible for the taking, import, export and related activities conducted under the permit. This includes coordination of field activities of all personnel working under the permit. The PI must be on site during activities conducted under this permit unless a Co-Investigator named in Condition C.1 is present to act in place of the PI.

   c. Co-Investigators (CIs) are individuals who are qualified to conduct activities authorized by the permit, for the objectives described in the application, without the on-site supervision of the PI. CIs assume the role and responsibility of the PI in the PI's absence.

d. Research Assistants (RAs) are individuals who work under the direct and on-site supervision of the PI or a CI. RAs cannot conduct permitted activities in the absence of the PI or a CI.

3. Personnel involved in permitted activities must be reasonable in number and essential to conduct of the permitted activities. Essential personnel are limited to:

   a. Individuals who perform a function directly supportive of and necessary to the permitted activity (including operation of vessels or aircraft essential to conduct of the activity),

   b. Individuals included as backup for those personnel essential to the conduct of the permitted activity, and

   c. Individuals included for training purposes.

4. Persons who require state or Federal licenses or authorizations (e.g., pilots – including UAS operators) to conduct activities under the permit must be duly licensed/authorized and follow all applicable requirements when undertaking such activities.

5. Permitted activities may be conducted aboard vessels or aircraft, or in cooperation with individuals or organizations, engaged in commercial activities, provided the commercial activities are not conducted simultaneously with the permitted activities.

6. The Permit Holder cannot require or receive direct or indirect compensation from a person approved to act as PI, CI, or RA under this permit in return for requesting such approval from the Permits Division.
7. The Permit Holder may add CIs by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit. If a CI will only be responsible for a subset of permitted activities, the request must also specify the activities for which they would provide oversight.

8. Submit requests to add CIs or change the PI by one of the following:

a. The online system at https://apps.nmfs.noaa.gov;

b. An email attachment to the permit analyst for this permit; or

c. A hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910; phone (301)427-8401; fax (301)713-0376.

D. Possession of Permit

1. This permit cannot be transferred or assigned to any other person.

2. The Permit Holder and persons operating under the authority of this permit must possess a copy of this permit when:

   a. Engaged in a permitted activity.
   b. A protected species is in transit incidental to a permitted activity.

   c. A protected species taken under the permit is in the possession of such persons.

3. A duplicate copy of this permit must accompany or be attached to the container, package, enclosure, or other means of containment in which a protected species or protected species part is placed for purposes of storage, transit, supervision or care.

E. Reporting

1. The Permit Holder must submit incident and annual reports containing the information and in the format specified by the Permits Division.

   a. Reports must be submitted to the Permits Division by one of the following:

      i. The online system at https://apps.nmfs.noaa.gov;

      ii. An email attachment to the permit analyst for this permit; or

      iii. A hard copy mailed or faxed to the Chief, Permits Division.

b. You must contact your permit analyst for a reporting form if you do not submit reports through the online system.

c. You must submit with the annual report data on disturbance rates of marine mammals specific to UAS operations. Details should include, but not be limited to: species, altitude and angle of approach, context of exposure (e.g., behavioral states), and observed behavioral responses to the UAS.

2. Incident Reporting

a. If a serious injury or mortality occurs, or authorized takes have been exceeded as specified in Conditions A.2 and B.6, the Permit Holder must:

i. Contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than 2 business days of the incident;

ii. Submit a written report within 2 weeks of the incident as specified below; and

iii. Receive approval from the Permits Division before resuming work. The Permits Division may grant authorization to resume permitted activities based on review of the incident report and in consideration of the Terms and Conditions of this permit.

b. The incident report must include 1) a complete description of the events, and 2) identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceeding authorized take.

3. Annual reports describing activities conducted during the previous permit year (from January 1 through December 31) must:

a. Be submitted by March 31 each year for which the permit is valid, and

b. Include a tabular accounting of takes and a narrative description of activities and their effects.

c. Include data on disturbance rates of marine mammals specific to UAS operations. Details should include, but not be limited to: species, altitude and angle of approach, context of exposure (e.g., behavioral states), and observed behavioral responses to the UAS.

d. Provide data on Southern Resident killer whale behavioral responses to approaches between 200 and 50 yards, and within 50 yards.

e. Include results of post-tag monitoring as described in B.5.rr.

4. A joint annual/final report including a discussion of whether the objectives were achieved must be submitted by October 31, 2024, or, if the research concludes prior to permit expiration, within 90 days of completion of the research.

5. Research results must be published or otherwise made available to the scientific community in a reasonable period of time. Copies of technical reports, conference abstracts, papers, or publications resulting from permitted research must be submitted the Permits Division upon request.

6. For the purposes of monitoring and annual reauthorization of Gulf of Mexico Bryde's whale research, the Permit Holder must submit a separate annual report to the Permits Division on research conducted on this sub-species for January – December, by December 31st of each year. Details should include, but are not limited to:

a. Date, location, number, and type of takes;

b. Identification of individuals when possible;

c. Status and disposition of biopsy samples including field number and dates samples were entered in the genetics database;

d. Success rate of biopsy and tagging attempts;

e. Post-tag monitoring (See Condition B.5.qq) and retention time of any tags;

f. Progress made toward meeting your objective(s), including a narrative summary, citing any reports, publications, and presentations that resulted;

g. Future field plans (including proposed dates, number and type of takes, and objectives) and funding levels for the next 3 years; and

h. Descriptions of opportunistically observed human interactions or other observations (e.g., health, behavior, etc.) that may be of management interest or concern.

7. To assist in monitoring the NARW population and current unusual mortality event, any time Researchers dart tag a NARW, they must report the tagging to the Permits Division and the MMHSRP (nmfs.mmhsrp.headquarters@noaa.gov) within 24 hours. The notification must include:

a. Date tagging occurred;

b. Location tagging took place (latitude and longitude);

c. Identification of the individual NARW (if known at the time, or provide within 1 week of individual identification);

d. Location of the tag on the body; and

e. Photograph(s) of the tag placement.

F. Notification and Coordination

1. 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.

3. The Permit Holder must ensure written notification of planned field work for each project is provided to the NMFS Regional Offices listed below at least two weeks prior to initiation of each field trip/season.

a. Notification must include the following:

   i. Locations of the intended field study and/or survey routes;

   ii. Estimated dates of activities; and

   iii. Number and roles of participants (for example: PI, CI, Research Assistant "in training").

b. Notification must be sent to the following Assistant Regional Administrators for Protected Resources as applicable to the location of your activity:

   For activities in AK; Arctic Ocean; and Bering, Beaufort, and Chukchi Seas: Alaska Region, NMFS, P.O. Box 21668, Juneau, AK 99802-1668; phone (907)586-7235; fax (907)586-7012;

   For activities in WA, OR, and CA:

   West Coast Region, NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, CA 90802-4213; phone (562)980-4005; fax (562)980-4027

   Email (*preferred*): WCR.research.notification@noaa.gov;

   For activities in HI, American Samoa, Guam, and Northern Mariana Islands:

   Pacific Islands Region, NMFS, 1845 Wasp Blvd., Building 176, Honolulu, HI 96818; phone (808)725-5000; fax (808)973-2941

   Email *(preferred)*: Jeff Walters (Jeff.Walters@noaa.gov) and Nicole Davis (Nicole.Davis@noaa.gov);

   For activities in NC, SC, GA, FL, AL, MS, LA, TX, PR, and USVI:

   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; and

For activities in ME, VT, NH, MA, NY, CT, NJ, DE, RI, MD, and VA: Greater Atlantic Region, NMFS, 55 Great Republic Drive, Gloucester, MA 01930; phone (978)281-9328; fax (978)281-9394

Email (*preferred*): NMFS.GAR.permit.notification@noaa.gov.

4. Researchers must coordinate their activities with other permitted researchers to avoid unnecessary disturbance of animals or duplication of efforts. Contact the applicable Regional Offices listed above for information about coordinating with other Permit Holders.

4. In addition, for Gulf of Mexico Bryde's whale research:

a. For all research permits authorizing takes of Gulf of Mexico Bryde's whales combined, no more than the entire population (currently estimated at 33 whales) may be intentionally taken twice per year by biopsy sampling and tagging.

i. Individuals may only be intentionally biopsy sampled a maximum of once per year.

ii. No more than 2 tags (1 suction-cup or 1 dart/barb tag) may be attached at one time to an animal in the same calendar year.

b. Researchers must comply with recommendations provided by the SERO to coordinate research, including additional measures deemed necessary to minimize unnecessary duplication, harassment, or other adverse impacts from multiple permit holders.

c. Researchers (including the Responsible Party, PI, and/or CIs) proposing to conduct research on Gulf of Mexico Bryde's whales must participate in that year's Bryde's whale annual research coordination meeting convened by the SERO and the Permits Division.

d. The Gulf of Mexico Bryde's whale research coordination meetings will include, but are not limited to, discussions regarding the following aspects of the research:

i. Geographic location and seasonality of sampling sites;

ii. Type of takes (e.g., UAS surveys, biopsy sampling, tagging);

iii. Numbers of takes, by type;

iv. Takes of known individuals through photo-identification or genetics;

v. Laboratory analyses; and

vi. Final disposition and repository of samples.

e. The Permit Holder must coordinate their activities with other permitted researchers before and during Gulf of Mexico Bryde's whale field research to avoid unnecessary disturbance of these 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 for procedures that may result in take.

f. 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.

g. A skin sub-sample from each biopsy collected must be sent to the SEFSC for inclusion in a database of genetic identification of individuals in the population.

G. Observers and Inspections

1. NMFS may review activities conducted under this permit. At the request of NMFS, the Permit Holder must cooperate with any such review by:

a. Allowing an employee of NOAA or other person designated by the Director, NMFS Office of Protected Resources to observe and document permitted activities; and

b. Providing all documents or other information relating to the permitted activities.

H. Modification, Suspension, and Revocation

1. Permits are subject to suspension, revocation, modification, and denial in accordance with the provisions of subpart D [Permit Sanctions and Denials] of 15 CFR Part 904.

2. The Director, NMFS Office of Protected Resources may modify, suspend, or revoke this permit in whole or in part:

   a. In order to make the permit consistent with a change made after the date of permit issuance with respect to applicable regulations prescribed under Section 103 of the MMPA and Section 4 of the ESA;

   b. In a case in which a violation of the terms and conditions of the permit is found;

   c. In response to a written request[24] from the Permit Holder;

   d. If NMFS determines that the application or other information pertaining to the permitted activities (including, but not limited to, reports pursuant to Section E of this permit and information provided to NOAA personnel pursuant to Section G of this permit) includes false information; and

3. Issuance of this permit does not guarantee or imply that NMFS will issue or approve subsequent permits or amendments for the same or similar activities requested by the Permit Holder, including those of a continuing nature.

I. Penalties and Permit Sanctions

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[24] The Permit Holder may request changes to the permit related to: the objectives or purposes of the permitted activities; the species or number of animals taken; and the location, time, or manner of taking or importing protected species. Such requests must be submitted in writing to the Permits Division in the format specified in the application instructions.

1. A person who violates a provision of this permit, the MMPA, ESA, or the regulations at 50 CFR 216 and 50 CFR 222-226 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the MMPA, ESA, and 15 CFR Part 904.

2. The NMFS Office of Protected Resources shall be the sole arbiter of whether a given activity is within the scope and bounds of the authorization granted in this permit.

   a. The Permit Holder must contact the Permits Division for verification before conducting the activity if they are unsure whether an activity is within the scope of the permit.

   b. Failure to verify, where the NMFS Office of Protected Resources subsequently determines that an activity was outside the scope of the permit, may be used as evidence of a violation of the permit, the MMPA, the ESA, and applicable regulations in any enforcement actions.

J. Acceptance of Permit

1. In signing this permit, the Permit Holder:

   a. Agrees to abide by all terms and conditions set forth in the permit, all restrictions and relevant regulations under 50 CFR Parts 216, and 222-226, and all restrictions and requirements under the MMPA, and the ESA;

   b. Acknowledges that the authority to conduct certain activities specified in the permit is conditional and subject to authorization by the Office Director; and

   c. Acknowledges that this permit does not relieve the Permit Holder of the responsibility to obtain any other permits, or comply with any other Federal, State, local, or international laws or regulations.

______________________________	__________________
Donna S. Wieting Director, Office of Protected Resources National Marine Fisheries Service	Date Issued
______________________________	__________________
Dan Engelhaupt, Ph.D. Program Manager, HDR Permit Holder	Date Effective

Appendix 1: Tables Specifying the Kinds of Protected Species, Locations, and Manner of Taking

Table 1. <u>Atlantic Ocean</u> annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.

Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
1	Cetacean, unidentified	All	20,000	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
2	Dolphin, Atlantic spotted; Range-wide	All	10,296	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
3		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 1. <u>Atlantic Ocean</u> annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
4		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time
5		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
6	Dolphin, Atlantic white-sided; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
7		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy Sampling.
8		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
9		All	12674	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
10	Dolphin, bottlenose; Range-wide	All	27530	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
11		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
12		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
						(VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	suction cup tag at the same time.
13		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
14	Dolphin, clymene; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial	Biopsy sampling.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
						(VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	
15		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
16		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
17		All	1565	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
18	Dolphin, common, short-beaked; Range-wide	All	24149	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
19		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
20		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
21		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
22	Dolphin, Fraser's; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
23		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy Sampling.
24		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
						(VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	
25		All	750	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
26	Dolphin, pantropical spotted;	All	7702	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
27	Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
28		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
29		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
						(VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	suction cup tag at the same time.
30	Dolphin, Risso's; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
31		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
32		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
33		All	4414	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
34	Dolphin, rough-toothed;	All	250	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
35	Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
36		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
37		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
38	Dolphin, spinner; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
39		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
40		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time
41		All	648	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
42	Dolphin, striped; Range-wide	All	19558	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B sampling.
43		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
44		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
45		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
46	Dolphin, unidentified	All	15000	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
47	Dolphin, white-beaked; Range-wide	All	401	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
48		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
49		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
50		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
51	Porpoise, harbor; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
52		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
53		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
54		All	17811	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
55	Seal, gray; Range-wide	All	300	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL);	Incidental disturbance during Level B aerial and vessel surveys.
56	Seal, harbor; Range-wide	All	300	1	Harass		

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
57	Seal, harp; Range-wide	All	150	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	Incidental disturbance during Level B aerial and vessel surveys.
58	Seal, hooded; Range-wide	All	150	1	Harass		
59	Whale, Blainville's beaked; Range-wide	All	147	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
60		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
61		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
62		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
63	Whale, blue;	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample,	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
	Range-wide (NMFS Endangered)					fecal; Sample, skin and blubber biopsy; Underwater photo/videography	
64		All	150	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
65		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
66		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging. No more than 5 individuals per year would be tagged with both an implantable tag and suction cup tag at the same time.
67		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
68	Whale, Bryde's; Range-wide	Adult/ Juvenile	20	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
69		Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tags.
70		Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time
71		All	200	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
72	Whale, Cuvier's beaked; Range-wide	All	154	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
73		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
74		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
75		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.

Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
76	Whale, dwarf sperm; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
77		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction-cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
78		All	125	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
79		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
80	Whale, false killer; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
81		All	156	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
82		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
83		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
84	Whale, fin; Range-wide (NMFS Endangered)	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
85		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
86		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial	Fully-implantable tags. No more than 5 individuals per year would be tagged with both an implantable

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
						(VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	tag and suction cup tag at the same time.
87		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
88		All	797	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
89	Whale, Gervais' beaked;	All	147	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
90	Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
91		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
92		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
93	Whale, humpback; Cape Verde / Northwest Africa DPS (NMFS Endangered)	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
94		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample,	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
						fecal; Sample, skin and blubber biopsy; Underwater photo/videography	
95		All	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
96		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
97		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging, No more than 5 individuals per year would be tagged with both an implantable tag and suction cup tag at the same time.
98	Whale, humpback; West Indes DPS	All	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys. US East coast work.
99		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time. US East coast work.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
100		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging. US East coast work.
101		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. US East coast work.
102		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial	Fully-implantable tagging, No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
						(VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	the same time. US East coast work.
103	Whale, humpback; West Indes DPS; and Cape Verde Islands DPS (NMFS Endangered)	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. Caribbean.
104		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging. Caribbean.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
105		All	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys. Caribbean.
106		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time. Caribbean.
107		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging, No more than 5 individuals per year would be tagged with both an implantable tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
108	Whale, killer; Range-wide	All	160	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
109		Adult/ Juvenile	110	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
110		Adult/ Juvenile	110	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
111		Adult/ Juvenile	110	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
112	Whale, melon-headed;	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial	Biopsy sampling.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
	Range-wide					(VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	
113		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
114		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
115		All	750	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
116	Whale, minke; Range-wide	All	1798	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
117		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial	Biopsy sampling.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
						(VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	
118		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
119		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
120	Whale, northern bottlenose; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
121		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
						(VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	suction cup tag at the same time.
122		All	150	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
123		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
124	Whale, pilot, long-finned; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
125		All	2524	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
126		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
127		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
128	Whale, pilot, short-finned; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
129		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
130		All	5079	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
131		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. <u>Atlantic Ocean</u> annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
132	Whale, pygmy killer; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
133		All	300.	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
134		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
135		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
136	Whale, pygmy sperm;	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample,	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
	Range-wide					fecal; Sample, skin and blubber biopsy; Underwater photo/videography	
137		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
138		All	300	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
139		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
140	Whale, right, North Atlantic;	Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video;	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
	Range-wide (NMFS Endangered)					Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	
141		All	150	1	Harass	Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
142		Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 1. Atlantic Ocean annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Sargasso Sea. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
143	Whale, sei; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
144	(NMFS Endangered)	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
145		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
146		All	78	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
147	Whale, Sowerby's beaked; Range-wide	All	141	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
148		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
149		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
150		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
151	Whale, sperm; Range-wide (NMFS Endangered)	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
152		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
153		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
154		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
155		All	1394	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
156	Whale, True's beaked; Range-wide	All	141	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
157		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
158		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
159		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
160	Whale, unidentified pilot; N/A	All	5000	1	Harass	Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
1	Cetacean, unidentified; N/A	All	10,000	1	Harass	Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
2	Dolphin, bottlenose; Range-wide	All	1,101	2	Harass	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
3		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
4		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
5		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
6	Dolphin, common, long-beaked;	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy Sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
7	Range-wide	All	5410	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
8		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
9		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
10	Dolphin, common, short-beaked;	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
11	Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
12		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
13		All	82243	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
14	Dolphin, dusky;	All	250	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
15	Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
16		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
17		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
18	Dolphin, Fraser's; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
19		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
20		All	2046	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
21		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
22	Dolphin, northern right whale; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
23		All	1667	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
24		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
25		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
26	Dolphin, Pacific white-sided;	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
27	Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
28		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
29		All	10762	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
30	Dolphin, pantropical spotted;	All	1796	2	Harass	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
31	Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
32		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
33		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
34	Dolphin, Risso's; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
35		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
36		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authoriz ed Take	Takes Per Animal	Take Action	Procedures	Details
37		All	1730	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
38	Dolphin, rough-toothed;	All	1742	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
39	Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
40		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
41		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
42	Dolphin, southern right whale;	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
43	Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
44		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
45		All	100	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
46	Dolphin, spinner; Range-wide	All	671	2	Harass	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
47		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
48		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
49		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
50	Dolphin, striped; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
51		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
52		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
53		All	4811	2	Harass	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
54	Dolphin, unidentified; N/A	All	7500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
55	Dolphin, unidentified lagenorhynchine; N/A	All	5000	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
56	Dolphin, unidentified stenelline; N/A	All	5000	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
57	Narwhal; Range-wide	All	150	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
58		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
59		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
60		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
61	Porpoise, Dall's; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
62		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
63		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
64		All	25080	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
65	Porpoise, finless;	All	300	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
66	Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
67		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
68		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
69	Porpoise, harbor; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
70		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
71		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
72		All	33815	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
73	Porpoise, spectacled;	All	300	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
74	Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
75		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
76		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
77	Porpoise, unidentified phocoenidae; N/A	All	5000	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
78	Sea lion, California; Range-wide	All	47600	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	Incidental disturbance during vessel and aerial surveys.
79	Sea lion, Steller; Eastern Stock	All	14445	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
80	Sea lion, Steller; Western Stock (NMFS Endangered)	All	8473	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	
81	Seal, bearded; Range-wide	All	250	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	
82	Seal, Guadalupe fur; Range-wide	All	1482	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	

Table 2. <u>Pacific and Indian Oceans</u> annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
83	Seal, harbor; Range-wide	All	42851	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	
84	Seal, Hawaiian monk; Hawaiian Islands (NMFS Endangered)	All	233	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	Incidental disturbance during vessel and aerial surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
85	Seal, northern elephant; Range-wide	All	24800	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	
86	Seal, Northern fur; Range-wide	All	132629	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	
87	Seal, ribbon; Range-wide	All	9800	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
88	Seal, ringed; Range-wide	All	250	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	
89	Seal, spotted; Range-wide	All	250	1	Harass	Count/survey; Incidental disturbance; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	
90	Whale, Andrew's beaked;	All	300	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
91	Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
92		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
93		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
94	Whale, Antarctic minke; Range-wide	All	300	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
95		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
96		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
97		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
98	Whale, Arnoux's beaked; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
99		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
100		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.

Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
101		All	300	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
102	Whale, Baird's beaked;	All	250	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
103	Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
104		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
105		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
106	Whale, beluga; Cook Inlet Stock (NMFS Endangered)	All	62	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
107	Whale, beluga; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging. Does not include Cook Inlet Stock.
108		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. Does not include Cook Inlet Stock.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
109		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. Does not include Cook Inlet Stock. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
110		All	12807	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
111	Whale, Blainville's beaked; Range-wide	All	575	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
112		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
113		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
114		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
115	Whale, blue; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
116	(NMFS Endangered)	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
117		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
118		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.
119		All	600	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
120	Whale, bowhead;	All	2109	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
121	Range-wide (NMFS Endangered)	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
122		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
123		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
124		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully-implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.
125	Whale, Bryde's; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
126		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
127		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
128		All	94	1	Harass	Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
129	Whale, Cuvier's beaked; Range-wide	All	3600	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
130		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
131		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
132		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
133	Whale, Deraniyagala's beaked; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
134		Adult/ Juvenile	30	2	Harass/ Sampling	Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
135		All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
136		Adult/ Juvenile	50	2	Harass/ Sampling	Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
137	Whale, dwarf sperm; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
138		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
139		All	3654	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
140		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
141	Whale, Eden's; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
142		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
143		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
144		All	250	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
145	Whale, false killer; Hawaii Insular (NMFS	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

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Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
146	Endangered)	All	170	2	Harass	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
147		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
148		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
149	Whale, false killer; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. Excludes MHI Endangered stock.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
150		All	354	2	Harass	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys. Excludes MHI Endangered stock.
151		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging. Excludes MHI Endangered stock.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
152		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. Excludes MHI Endangered stock. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
153	Whale, fin; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
154	(NMFS Endangered)	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time
155		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.
156		All	1784	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
157		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
158	Whale, ginkgo-toothed beaked; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
159		All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
160		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
161		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
162	Whale, gray; Eastern North	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
163	Pacific Stock	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
164		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.
165		All	3826	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
166		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
167	Whale, gray; Western North Pacific (Korean)	All	3000	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Level B surveys.
168		Adult/ Juvenile	20	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
169		Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
170		Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
171		Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.
172	Whale, Gray's beaked; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
173		All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
174		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
175		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
176	Whale, Hector's beaked; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
177		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
178		All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authoriz ed Take	Takes Per Animal	Take Action	Procedures	Details
179		Adult/ Juvenil e	50	2	Harass/ Samplin g	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
180	Whale, Hubbs' beaked;	Adult/ Juvenil e	50	2	Harass/ Samplin g	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
181	Range-wide	All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
182		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
183		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
184	Whale, humpback;	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	International waters. Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
185	Arabian Sea DPS (NMFS Endangered)	Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
186		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
187		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authoriz ed Take	Takes Per Animal	Take Action	Procedures	Details
188		Adult/ Juvenil e	30	1	Harass/ Samplin g	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
189	Whale, humpback; Central America DPS (NMFS	Adult/ Juvenil e	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	International waters. Level B surveys.
190		Adult/ Juvenil e	50	1	Harass/ Samplin g	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
191	Endangered)	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
192		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
193		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
194	Whale, humpback; Mexico DPS (NMFS Threatened)	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	International waters. Level B surveys.
195		Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
196		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
197		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
198		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
199	Whale, humpback; Mexico DPS (NMFS Threatened); and	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Research in CA and OR. Level B surveys.
200		Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
201	Central America DPS (NMFS Endangered)	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
202		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
203		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
204	Whale, humpback; Mexico DPS (NMFS Threatened);	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Research in WA and Canada. Level B surveys.
205		Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
206	Central America DPS (NMFS Endangered); and Hawaii DPS	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
207		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
208		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
209	Whale, humpback; Mexico DPS (NMFS Threatened);	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Research in AK. Level B surveys.
210		Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
211	Central America DPS (NMFS Endangered); Western North Pacific DPS (NMFS	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
212		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
213	Endangered); and Hawaii DPS	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
214	Whale, humpback; Range-wide Non-listed DPSs	Adult/ Juvenile	700	1	Harass	Acoustic, active playback/broadcast; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Worldwide. Level B surveys and audiometry experiments in Hawaii
215		Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
216		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
217		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
218		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
219	Whale, humpback;	Adult/ Juvenile	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	International waters. Level B surveys.
220	Western North Pacific DPS (NMFS	Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
221	Endangered)	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
222		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals would be with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
223		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals would be with both a implantable tag and suction cup tag at the same time.
224	Whale, killer; Southern Resident Stock (NMFS Endangered)	All	75	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
225	Whale, killer; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
226		All	692	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
227		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
228		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
229	Whale, Lesser beaked; Range-wide	All	300	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
230		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
231		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
232		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
233	Whale, Longman's beaked; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
234		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
235		All	202	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
236		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
237	Whale, melon-headed; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
238		All	1590	2	Harass	Acoustic, active playback/broadcast; ; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
239		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
240		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
241	Whale, Mesoplodon beaked;	All	205	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
242	CA/OR/WA Stocks	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
243		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
244		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time
245	Whale, minke; Range-wide	Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
246		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No implantable tags, no more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
247		All	400	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
248		Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
249	Whale, Omura's;	All	300	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
250	Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
251		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
252		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
253	Whale, Perrin's beaked;	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
254	Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
255		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
256		All	300	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
257	Whale, pilot, long-finned; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
258		All	150	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
259		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
260		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. <u>Pacific and Indian Oceans</u> annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
261	Whale, pilot, short-finned; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
262		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
263		All	1922	2	Harass	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
264		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, active playback/broadcast; Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
265	Whale, pygmy beaked; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
266		All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
267		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
268		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
269	Whale, pygmy killer; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
270		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
271		All	1192	1	Harass	Acoustic, active playback/broadcast; Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
272		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
273	Whale, pygmy right;	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.

Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
274	Range-wide	All	150	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
275		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
276		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
277	Whale, pygmy sperm; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
278		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
279		All	1544	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
280		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
281	Whale, right, North Pacific;	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
282	Range-wide (NMFS Endangered)	Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
283		Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
284		All	150	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
285	Whale, right, southern; Range-wide (NMFS Endangered)	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
286		All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
287		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
288		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
289		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.
290	Whale, sei; Range-wide (NMFS	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
291	Endangered)	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart and suction cup tag at the same time.
292		All	300	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
293		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
294	Whale, Shepherd's beaked; Range-wide	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
295		All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
296		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
297		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
298	Whale, southern bottlenose; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
299		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
300		All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
301		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
302	Whale, sperm; Range-wide (NMFS Endangered)	Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
303		All	1729	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
304		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
305		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
306		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Fully implantable tagging. No more than 5 individuals per year would be tagged with both a implantable tag and suction cup tag at the same time.
307	Whale, Stejneger's beaked; Range-wide	Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.

Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
308		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
309		All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
310		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
311	Whale, strap-toothed; Range-wide	Adult/ Juvenile	50	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
312		All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
313		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.
314		Adult/ Juvenile	30	1	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
315	Whale, True's beaked; Range-wide	Adult/ Juvenile	1000	2	Harass	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Level B surveys.
316		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
317		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
318		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
319	Whale, unidentified baleen; N/A	All	250	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
320	Whale, unidentified beaked; N/A	All	100	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Cross Seamount beaked whale. Level B surveys.
321		Adult/ Juvenile	50	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Cross Seamount beaked whale. Biopsy sampling.
322		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Cross Seamount beaked whale. Suction cup tagging.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
323		Adult/ Juvenile	30	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Cross Seamount beaked whale. Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time.
324	Whale, unidentified bowhead or right; N/A (NMFS Endangered)	All	50	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
325	Whale, unidentified fin/sei; N/A (NMFS Endangered)	All	100	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
326	Whale, unidentified Kogia (dwarf/pygmy sperm); N/A	All	100	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. Pacific and Indian Oceans annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
327	Whale, unidentified Mesoplodon; N/A	All	100	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
328	Whale, unidentified narwal or beluga; N/A	All	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
329	Whale, unidentified pilot; N/A	All	500	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 2. <u>Pacific and Indian Oceans</u> annual takes of male and female marine mammals during aerial and vessel surveys. Areas include U.S., international, and foreign waters of the Pacific Ocean, Indian Ocean, and Gulf of Alaska. Activities include direct takes and incidental harassment to non-target marine mammals during directed research. Some animals may be taken multiple times per year during surveys.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
330	Whale, unidentified rorqual; N/A	All	200	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
331	Whale, unidentified toothed; N/A	All	200	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.

Table 3. Gulf of Mexico Bryde's whale research. Takes of male and females during aerial and vessel surveys. Annual take numbers and activities are contingent upon annual authorization per Condition A.2.c., and must have a separate authorization accompanying this permit each year. See additional Permit Conditions starting at F.4 for research coordination requirements for this species.							
Line	Species; Stock/ Listing Unit	Life stage	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
1	Whale, Bryde's; Gulf of Mexico subspecies (NMFS Endangered)	All	200	1	Harass	Collect, sloughed skin; Count/survey; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, fecal; Underwater photo/videography	Level B surveys.
2		Adult/ Juvenile	20	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
3		Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL);	Suction cup tagging.

						Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	
4		Adult/ Juvenile	10	2	Harass/ Sampling	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Import/export/receive, parts; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Sample, skin and blubber biopsy; Underwater photo/videography	Dart tagging. No more than 5 individuals per year would be tagged with both a dart tag and suction cup tag at the same time

Appendix 2: NMFS-Approved Personnel and Authorized Recipients for Permit No. 21482.

The following individuals are approved personnel pursuant to the terms and conditions under Section C (Qualifications, Responsibilities, and Designation of Personnel).

Activity	PI	Co-Investigators (CIs)														
	D. Engelhaupt	K. Ampela	J. Aschettino	B. Branstetter	L. Blair	S. Childerhouse	M. Cotter	M. Deakos	A. Engelhaupt	T. Jefferson	J. Mobley	A. Mooney	T. Pusser	M. Richlen	A. Stimpert	S. Yin
Photograph, photo-id, video, or photogrammetry	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Underwater photograph or video	X		X					X	X							
Behavioral observations, count/survey, tracking	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Passive acoustics recording	X		X	X		X	X	X	X	X	X	X	X	X	X	X
Active acoustics-Behavioral observation Audiometry				X												
UAS pilot							X									
Collect fecal sample, sloughed skin, or prey remains	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Remote Biopsy Sampling	X		X			X	X	X		X			X	X		X
Suction-cup tagging	X		X			X						X		X	X	

Dart/barb tagging	X		X			X										
Implantable tagging						X										

Biological samples authorized for collection or acquisition in Tables 1 and 2 of Appendix 1 may be transferred to the following Authorized Recipients for the specified disposition, consistent with Condition B.6 of the permit:

<table>
<tr><th>Authorized Recipient</th><th>Sample Type</th><th>Disposition</th></tr>
<tr><td>Patty Rosel, Ph.D.
NOAA Southeast Fisheries Science Center, Lafayette, LA</td><td rowspan="3">Blubber biopsy and skin</td><td rowspan="3">Genetic and molecular analysis</td></tr>
<tr><td>Scott Baker, Ph.D.
Oregon State University, Corvallis, OR</td></tr>
<tr><td>Per Palsboll, Ph.D.
University of Groningen, Groningen, Netherlands</td></tr>
<tr><td>Nick Kellar, Ph.D.
NOAA Southwest Fisheries Science Center,
La Jolla, CA</td><td>Blubber biopsy and skin</td><td>Stress hormone analysis</td></tr>
<tr><td>Danielle Waples, Ph.D.
Duke University, Beaufort, NC</td><td>Blubber biopsy and skin</td><td>Stable isotope analysis</td></tr>
</table>

Appendix 3: NOAA Office of National Marine Sanctuaries (ONMS) Sanctuary and Monument Permit Contact Information.

Site	Mailing Address	Contact Numbers	Permit Contact(s)
ONMS Headquarters Office Silver Spring, Maryland	NOAA Office of National Marine Sanctuaries 1305 East-West Highway (N/NMS2) SSMC4 Silver Spring, MD 20910	wk 240-533-0605 fax 301-713-0404 wk 240-533-0679 fax 301-713-0404	Vicki Wedell Vicki.Wedell@noaa.gov
Channel Islands National Marine Sanctuary	Channel Islands Nat'l Marine Sanctuary University of California Santa Barbara Ocean Science Education Building 514, MC 6155 Santa Barbara, CA 93106	wk 805-893-6424 cell 805-705-1790 wk 805-893-6435	Sean Hastings Sean.Hastings@noaa.gov Jackie Buhl Jackie.Buhl@noaa.gov
Cordell Bank National Marine Sanctuary	Cordell Bank National Marine Sanctuary P.O. Box 159 Olema, CA 94950	wk 415-464-5265 fax 415-663-0315	Lilli Ferguson Lilli.Ferguson@noaa.gov
Florida Keys National Marine Sanctuary	Florida Keys National Marine Sanctuary 33 East Quay Road Key West, FL 33040	wk 305-809-4714 fax 305-293-5011	Joanne Delaney Joanne.Delaney@noaa.gov
Flower Garden Banks National Marine Sanctuary	Flower Garden Banks National Marine Sanctuary 4700 Avenue U, Building 216 Galveston, TX 77551	wk 409-621-5151 x 111 fax 409-621-1316	Emma Hickerson (Research permits) Emma.Hickerson@noaa.gov
Gray's Reef National Marine Sanctuary	Gray's Reef National Marine Sanctuary 10 Ocean Science Circle Savannah, GA 31411	wk 912-598-2382 fax 912-598-2367	Kimberly Roberson Kimberly.Roberson@noaa.gov
Greater Farallones National Marine Sanctuary *(Including Monterey Bay National Marine Sanctuary Northern Management Area)*	Greater Farallones National Marine Sanctuary 991 Marine Drive The Presidio San Francisco, CA 94129	wk 415-970-5255 fax 415-561-6616 wk 415-970-5247 fax 415-561-6616	Max Delaney Max.Delaney@noaa.gov Karen Reyna (Alternate contact) Karen.Reyna@noaa.gov

Site	Mailing Address	Contact Numbers	Permit Contact(s)
Hawai‘ian Islands Humpback Whale National Marine Sanctuary	Hawai‘ian Islands Humpback Whale National Marine Sanctuary 6600 Kalaniana’ole Highway, Suite 301 Honolulu, HI 96825	wk 808-397-2651 x 251 fax 808-397-2650	Malia Chow Malia.Chow@noaa.gov
Monitor National Marine Sanctuary	*Monitor* National Marine Sanctuary c/o The Mariners’ Museum 100 Museum Drive Newport News, VA 23606	wk 757-591-7333	Tane Casserley Tane.Casserley@noaa.gov
Monterey Bay National Marine Sanctuary	Monterey Bay National Marine Sanctuary 99 Pacific Street, Building 455A Monterey, CA 93940	wk 831-647-1286 fax 831-647-4250	Sophie DeBeukelaer Sophie.DeBeukelaer@noaa.gov
National Marine Sanctuary of American Samoa	National Marine Sanctuary of American Samoa P.O. Box 4318 Pago Pago, AS 96799	wk 684-633-6500 x 226 cell 684-252-9786 fax 684-633-7355	Joseph Paulin Joseph.Paulin@noaa.gov
Olympic Coast National Marine Sanctuary	Olympic Coast National Marine Sanctuary 115 East Railroad Avenue, Suite 301 Port Angeles, WA 98362	wk 360-406-2076 fax 360-457-8496	George Galasso George.Galasso@noaa.gov
Papahānaumokuākea Marine National Monument	Papahānaumokuākea Marine National Monument NOAA/IRC NOS/ONMS/PMNM 1845 Wasp Boulevard, Building 176 Honolulu, HI 96818	wk 808-725-5805 fax 808-455-3093 wk 808-725-5831 fax 808-455-3093 wk 808-725-5823 fax 808-455-3093	Tia Brown Tia.Brown@noaa.gov Justin Rivera Justin.Rivera@noaa.gov Pua Borges-Smith (Alternate contact) Pua.Borges-Smith@noaa.gov
Stellwagen Bank National Marine Sanctuary	Stellwagen Bank National Marine Sanctuary 175 Edward Foster Road Scituate, MA 02066	wk 203-882-6515 fax 203-882-6572 wk 781-545-8026 x 207 fax 781-545-8036	Alice Stratton Alice.Stratton@noaa.gov Ben Cowie-Haskell (Alternate contact) Ben.Haskell@noaa.gov
Thunder Bay National Marine Sanctuary	Thunder Bay National Marine Sanctuary 500 West Fletcher Street Alpena, MI 49707	wk 989-356-8805 x 16 fax 989-354-0144	Russ Green Russ.Green@noaa.gov

Appendix 4: Protected Species Parts Annual Report Form

Reports may be submitted:

a. Through the online system at https://apps.nmfs.noaa.gov;

b. By email attachment to the permit analyst for this permit: or

c. By hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Suite 13705, Silver Spring, MD 20910; phone (301)427-8401; fax (301)713-0376.

The following is only an EXAMPLE of the report form. If you do not intend to submit your report online, please contact your permit analyst for an electronic report form to fill out and return.

Date: ______________________ Reporting Period: ______________________________

Permit Number: _____________ Permit Holder's Name: ____________________________

Contact Name: ___________________ Contact Email: ______________________________

Contact Phone #: __________________

(Contact = person submitting report)

Part I: Tables.

1. Enter information on the actual number of animals of each species from which parts were received, imported, or exported during this reporting period according to the tables in

your permit. For unidentified cetaceans/pinnipeds, please provide an overall summary of the total number of cetaceans/pinnipeds imported, exported, and/or received. Then, use additional rows to provide the total number of animals by species (not the number of samples) that were imported, exported or received during the current reporting period. You only need to report for those species you obtained samples from during the reporting period. Please note you will report on the number of samples in the Sample Table that follows.

Note: Please contact your permit analyst for an electronic version of the table or use the on-line report system.

2. You must also provide more specific information in the table below. Please note that you need to document the legal collection and legal receipt of each sample acquired under your permit. Fill out the table below with specific information about samples imported, exported, or received during this reporting period. If you have your own tracking table that you would like to submit instead, you may attach it to the report.

Reporting information for samples obtained or exported during this reporting period.						
Date of activity	Type of activity (e.g., import)	Species (common and scientific name)	Type and number of samples	Sample origin (e.g., subsistence)	Where and when was sample originally collected and under what legal authority?	Where/who are you getting the samples from? Or where/who did you send them to? Include NMFS permit if applicable

Part II: Narrative. Provide responses to the following, as applicable:

1. Describe any problems or unforeseen events encountered during the permitted activities and any steps taken or proposed to resolve such problems.

2. Describe steps taken to coordinate the permitted activities with other permit holders.

3. Summarize any preliminary findings. Did you accomplish the goals of your permitted activities?

4. Indicate any additional findings, results, or information you would like to report or comment on.

5. List titles of reports, publications, etc. resulting from this reporting period. Attach copies of any final documents as available. If these documents are not yet available, indicate when you anticipate that they will be completed and submitted. When reports and publications are available, send to the Chief, Permits Division, and include the permit number in subject line

6. During this reporting period did you import or export samples? If yes, please provide copies of the following (as applicable):

a. Foreign collection and transfer/transport authorizations;

b. Foreign CITES export permits;

c. United States CITES import permits; and

d. Cleared wildlife declaration forms (FWS Form 3-177) for each import.

19.3 Appendix C – Draft Permit No. 21938

The text below was taken directly from the proposed permit provided to us in the consultation initiation package from the Permits and Conservation Division. The final permit may have minor changes that will not affect this opinion.

Permit No. 21938

Expiration Date: April 30, 2024
Reports Due: March 31st, annually

PERMIT TO TAKE PROTECTED SPECIES[25] FOR SCIENTIFIC PURPOSES

I. Authorization

This permit is issued to National Marine Fisheries Service (NMFS) Southeast Fisheries Science Center (SEFSC), 75 Virginia Beach Drive, Miami, Florida 33149, (hereinafter "Permit Holder"), [Responsible Party: Theophilus Brainerd, Ph.D.], pursuant to the provisions of the Marine Mammal Protection Act of 1972 as amended (MMPA; 16 U.S.C. 1361 *et seq.*); the regulations governing the taking and importing of marine mammals (50 CFR Part 216); the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*); and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226).

II. Abstract

[25] "Protected species" include species listed as threatened or endangered under the ESA, and marine mammals.

The objectives of the permitted activity, as described in the application, are to meet the mandates of the MMPA and ESA through the study of marine mammals: 1) stock structure, size estimates, habitat, and geographic range; 2) movement, ranging patterns, and diving behavior; 3) vocalization patterns and the ambient acoustic environment; 4) reproductive and health status; 5) types and origin of prey; 6) levels of anthropogenic chemical contaminants, and 7) behaviors to certain anthropogenic activities.

III. Terms and Conditions

The activities authorized herein must occur by the means, in the areas, and for the purposes set forth in the permit application, and as limited by the Terms and Conditions specified in this permit, including appendices and attachments. Permit noncompliance constitutes a violation and is grounds for permit modification, suspension, or revocation, and for enforcement action.

A. Duration of Permit

1. Personnel listed in Condition C.1 of this permit (hereinafter "Researchers") may conduct activities authorized by this permit through April 30, 2024. This permit may be extended by the Director, National Marine Fisheries Service (NMFS) Office of Protected Resources or the Chief, Permits and Conservation Division (hereinafter Permits Division), pursuant to applicable regulations and the requirements of the MMPA and ESA.

2. 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:

    a. If serious injury or mortality[26] of protected species occurs.

[26] This permit does not allow for unintentional serious injury and mortality caused by the presence or actions of researchers as authorized in Tables 1-3 of Appendix 1. This includes, but is not limited to: deaths of dependent young by starvation following research-related death of a lactating female; deaths resulting from infections related to sampling procedures or invasive tagging; and deaths or injuries sustained by animals attempting to avoid researchers. Note that for marine mammals, a serious injury is defined by regulation as any injury that will likely result in mortality.

d. If authorized take[27] is exceeded in any of the following ways:

iv. More animals are taken than allowed in Tables 1-3 of Appendix 1.

v. Animals are taken in a manner not authorized by this permit.

vi. Protected species other than those authorized by this permit are taken.

e. Following incident reporting requirements at Condition E.2.

f. For Gulf of Mexico Bryde's whale research, annual authorization must be obtained in writing from the Permits Division prior to each year's research activities.

i. Authorization may include modifying the number of takes and types of research activities you are authorized. Authorization will be based on evaluating the following:

A. All submitted Gulf of Mexico Bryde's whale annual research reports including all research proposed on Gulf of Mexico Bryde's whales by authorized permit holders for the upcoming year (January – December) (see Condition E.6);

B. Findings from annual coordination meetings (see Condition F.4); and

C. Recovery priorities and status updates.

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[27] By regulation, a take under the MMPA means 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, or the doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal; and feeding or attempting to feed a marine mammal in the wild. Under the ESA, a take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to do any of the preceding.

ii. Authorization may be denied or delayed if the Gulf of Mexico Bryde's whale research annual report has not been received by December 31st and approved as complete by January 31st.

iii. Authorization does not guarantee or imply that NMFS will authorize subsequent years' activities or the same take numbers and activities.

3. The Permit Holder may continue to possess biological samples[28] acquired[29] under this permit after permit expiration without additional written authorization provided a copy of this permit is kept with the samples and they are maintained as specified in this permit.

B. Number and Kinds of Protected Species, Locations and Manner of Taking

1. The tables in Appendix 1 outline the authorized species and stock or distinct population segment (DPS) authorized; number of animals to be taken; number of animals from which parts may be received, imported and exported; and the manner of take, locations, and time period.

2. Researchers working under this permit may collect images (e.g., photographs, video) and audio recordings in addition to the photo-identification or behavioral photo-documentation authorized in Appendix 1 as needed to document the permitted activities, provided the collection of such images or recordings does not result in takes.

3. The Permit Holder may use visual images and audio recordings collected under this permit, including those authorized in Tables 1-3 of Appendix 1, in printed materials (including commercial or scientific publications) and presentations provided the images and recordings are accompanied by a statement indicating that the activity was conducted pursuant to NMFS ESA/MMPA Permit No. 21938. This statement must accompany the images and recordings in all subsequent uses or sales.

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[28] Biological samples include, but are not limited to: carcasses (whole or parts); and any tissues, fluids, or other specimens from live or dead protected species; except feces, urine, and spew collected from the water or ground.
[29] Authorized methods of sample acquisition are specified in Appendix 1.

4. The Chief, Permits Division may grant written approval for personnel performing activities not essential to achieving the research objectives (e.g., a documentary film crew) to be present, provided:

   d. The Permit Holder submits a request to the Permits Division specifying the purpose and nature of the activity, location, approximate dates, and number and roles of individuals for which permission is sought.

   e. Non-essential personnel/activities will not influence the conduct of permitted activities or result in takes of protected species.

   f. Persons authorized to accompany the Researchers for the purpose of such non-essential activities will not be allowed to participate in the permitted activities.

   d. The Permit Holder and Researchers do not require compensation from the individuals in return for allowing them to accompany Researchers.

5. Researchers must comply with the following conditions related to the manner of taking:

<u>Counting and Reporting Takes</u>

   d. Count and report a take of a cetacean following the guidance below regardless of whether you observe a behavioral response to the permitted activity.

   e. During unmanned aircraft system (UAS) and manned aerial surveys flown at an altitude lower than 1,000 feet, count and report 1 take per cetacean observed per day, regardless of the number of passes.

f. For all cetacean approaches[30] in water and attempts to remotely biopsy and tag, count and report 1 take per cetacean per day.

i. If all Level A harassment biopsy or tagging attempts on a single day are unsuccessful and do not make contact with the animal, count the take against your Level B harassment take row.

ii. If any Level A harassment attempts on a single day are unsuccessful but do make contact with the animal, count the take for the day against your sampling or tagging take row.

General Mitigation

d. Approach animals cautiously and retreat if behaviors indicate that the approach may interfere with reproduction, feeding, or other vital functions.

e. Where females with calves are authorized to be taken:

i. Immediately terminate efforts if animals exhibit signs that the activity may be interfering with pair-bonding or other vital functions;

ii. Do not position the research vessel between the mother and calf;

iii. Approach mothers and calves gradually to minimize or avoid any startle response;

[30] An "approach" is defined as a continuous sequence of maneuvers involving a vessel, equipment, or researcher's body, including drifting, directed toward a cetacean or group of cetaceans closer than 100 yards for baleen and sperm whales and 50 yards for all other cetaceans.

iv. Discontinue an approach if a calf is actively nursing; and

v. Whenever possible, sample the calf first to minimize the mother's reaction when sampling mother/calf pairs.

Aerial Surveys

f. Aerial flights must not be conducted over pinnipeds on land.

Manned Aerial Surveys

g. Researchers must conduct manned aerial surveys at an altitude of 600 feet or higher. The aircraft may descend to no lower than 500 feet for detailed images and photo-identification.

Unmanned Aerial Surveys

h. Researchers may use a vertical take-off and landing UAS.

i. Researchers must operate UAS at an altitude of 100 feet or higher. The UAS may descend to no lower than 6 feet for breath sampling.

Underwater Filming or Photography

j. Underwater filming may occur via pole cameras or divers.

k. No more than 2 divers may be in the water at one time during research. Contact the NMFS Permits Division for approval of additional diver(s).

l. Research Assistants may be divers and conduct underwater activities only if they are trained photographers, videographers, or safety divers.

m. Terminate an underwater approach if a cetacean exhibits adverse or evasive changes in behavior.

General Conditions for Remote Procedures (Biopsy sampling, Breath Collection, and Tagging)

n. Researchers may attempt (deploy or discharge/fire) each procedure (biopsy, breath sample, or tag) on an animal 3 times a day.

o. Discontinue an attempt to biopsy sample, breath sample, or tag if an animal exhibits repetitive, strong, adverse reactions to the activity or vessel.

p. Researchers may biopsy sample and tag an individual on the same day where authorized in Appendix 1.

Data Collection and Sharing

q. To the maximum extent possible, Researchers must collect photos or high-resolution video simultaneously when biopsy sampling, and tagging to identify the individual and the sampling or tagging location on each individual.

Protocol Modifications

r. The Permit Holder or Principal Investigator (PI) must notify the Permits Division before implementing any change to protocols to determine if additional authorization is required. This may include, but is not limited to:

   i. Modifications to sterilization or Institutional Animal Care and Use Committee (IACUC) requirements;

ii. Increases in a biopsy tip's size or depth of penetration; or

iii. Increases in a tag's mass, footprint, or number of anchors.

Biopsy Sampling

Biopsy Sterilization and Disinfection

s. Biopsy tips must be sterile[31] before every use. Sterilization must follow your IACUC approved protocol.

i. As a last resort during the same field trip, Researchers can reuse contaminated[32] biopsy tips that are cleaned and high-level disinfected[33] (versus sterile). High level disinfection[34] may include 10% bleach or similar high-level disinfection solution[35] (e.g., 6% hydrogen peroxide or 2% glutaraldehyde) for at least 20 minutes.

Biopsy Target Animals and Age-classes

t. Researchers may biopsy sample adults and juveniles greater than approximately 1 year old and females accompanied by these juveniles. However, Researchers must not biopsy sample any calf less than approximately 1 year old or a female accompanied by a calf less than 1 year old.

u. Before attempting to biopsy sample an individual, Researchers must take reasonable measures (e.g., compare photo-identifications) to avoid unintentional repeated takes of any individual.

Biopsy Sampling Location and Frequency

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[31] Sterilization = destroys or eliminates all forms of microbial life and is carried out by physical or chemical methods (CDC 2008). These methods must follow the IACUC-approved protocol for sterilization (e.g., gas).
[32] Contaminated = e.g., missed attempt, contacts seawater, physical contact, etc.

[33] Disinfection = eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects usually by liquid chemicals (CDC 2008).
[34] High level disinfection can destroy all microbes, with the exception of some bacterial spores.
[35] FDA 2015. FDA-Cleared Sterilants and High Level Disinfectants with General Claims for Processing Reusable Medical and Dental Devices - March 2015. Available online here: https://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/ReprocessingofReusableMedicalDevices/ucm437347.htm

v. Do not attempt to biopsy sample a cetacean anywhere forward (cranial) of the pectoral fin.

w. Animals may be biopsy sampled up to 2 times over the course of a year where authorized in Appendix 1. During each event, two biopsy samples may be collected, for a total of four biopsy samples per year.

Tagging

Tagging Sterilization

x. Invasive tag anchors (darts, pins, bolts, etc.), and fully-implantable tags must be sterile[36] before every use. Sterilization must follow your IACUC approved protocol.

  i. Researchers must cease tagging efforts if all sterile tag anchors or fully-implantable tags are contaminated[37].

y. Handling or manipulation of the sterile tag anchors or deep-implant tags before deployment should be performed with sterile surgical gloves or other sterilized equipment.

Tagging Target Animals and Age-classes

z. Fully-implantable tags are not authorized for Gulf of Mexico Bryde's whales, North Atlantic right whales, or sei whales.

aa. Where authorized in Appendix 1, Researchers may tag adults and juveniles greater than approximately 1 year old and females accompanied by these juveniles. However, Researchers must not tag a calf less than approximately 1 year old or a female accompanied by a calf less than 1 year old.

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[36] Sterilization = destroys or eliminates all forms of microbial life and is carried out by physical or chemical methods (CDC 2008). These methods must follow the IACUC-approved protocol for sterilization (e.g., gas).

[37] Contaminated = e.g., missed attempt, contacts seawater, physical contact, etc.

bb. Before attempting to tag an individual, Researchers must take reasonable measures (e.g., compare photo-identifications) to avoid unintentional repeated takes of any individual.

cc. Avoid invasive tagging of animals in obviously poor health or exhibiting species-specific body condition parameters indicating compromised health such as, but not limited to:

i. Noticeable reductions in body mass in the post-cranial region (i.e., exhibiting a nuchal fat pad depression);

ii. Prominent vertebral column;

iii. Visible ribs;

iv. Excessive skin lesions, parasites or cyamids;

v. Behaving abnormally;

vi. Obviously pregnant; or

vii. Immunocompromised populations or otherwise compromised individuals.

<u>Tagging Location and Frequency</u>

dd. Avoid tagging a cetacean anywhere forward (cranial) of the pectoral fin or below (ventral) the lateral vertebral processes.

ee. Researchers may deploy up to 2 tags at one time on the same animal with the exception that only one unit is invasive (dart/barb or fully-implantable).

ff. Researchers must not intentionally re-tag an individual animal within the same permit year.

Post-tag Monitoring

gg. Researchers must make reasonable efforts to opportunistically monitor animals instrumented with invasive tags (dart/barb and fully-implantable) through tracking and resightings (photographic/video or genetic) to assess:

i. The location on the body and condition of the tag (including breakage);

ii. Tag wound reaction and healing (e.g., severity of swelling, depressions, and coloration);

iii. Animal health and behavior;

iv. Fecundity (presence of calf); and

v. Survival.

hh. Results of post-tag monitoring must be provided in annual reports as indicated in Conditions at E.3.

For Gulf of Mexico Bryde's Whales

ii. The Permit Holder must receive written authorization from the Permits Division prior to conducting research activities that will result in take of Gulf of Mexico Bryde's whales (see Condition A.2.d).

jj. Researchers must attempt to collect photos or high-resolution video simultaneously when biopsy sampling or tagging to identify the individual and the sampling location on each individual. Also see Condition F.4 for data sharing requirements to include photos and video in the SEFSC photo-ID database.

kk. Before attempting to biopsy sample or tag an individual Gulf of Mexico Bryde's whale, Researchers must take reasonable measures (e.g., compare photographs, when possible) to avoid unintentional repeated sampling/tagging of any individual, unless specifically authorized.

ll. For biopsy sampling, each individual Gulf of Mexico Bryde's whale may be biopsy sampled during two biopsy events per year. During each event, two biopsy samples may be collected, for a total of four biopsy samples per year.

mm. For tagging, each individual Gulf of Mexico Bryde's whale may receive no more than two tags (one dart/barb tag and one suction-cup tag) per year.

  i. Both tags may be attached at the same time or during separate events.

  ii. Known individuals that have been dart tagged must not be intentionally dart tagged a second time within the same calendar year.

nn. Researchers may biopsy sample and tag an individual on the same day.

For North Atlantic right whales

oo. Researchers must report information on tagged whales to the Permits Division and the Marine Mammal Health and Stranding Response Program (MMHSRP) following Permit Condition E.7.

Non-target Species

pp. This permit does not authorize takes of any protected species not identified in Appendix 1, including those species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS). Should Researchers encounter other protected species during the activities authorized under this permit, exercise caution and remain a safe distance from the animal(s) to avoid take, including harassment.

6. The Permit Holder must comply with the following conditions and the regulations at 50 CFR 216.37, for biological samples acquired or possessed under authority of this permit.

h. The Permit Holder is ultimately responsible for compliance with this permit and applicable regulations related to the samples unless the samples are permanently transferred according to NMFS regulations governing the taking and importing of marine mammals (50 CFR 216.37) and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR 222.308).

i. Samples must be maintained according to accepted curatorial standards and must be labeled with a unique identifier (e.g., alphanumeric code) that is connected to on-site records with information identifying the following:

i. Species and, where known, age and sex;

ii. Date of collection, acquisition, or import;

iii. Type of sample (e.g., blood, skin, bone);

iv. Origin (i.e., where collected or imported from); and
v. Legal authorization for original sample collection or import.

j. Biological samples belong to the Permit Holder and may be temporarily transferred to Authorized Recipients identified in Appendix 2 without additional written authorization, for analysis or curation related to the objectives of this permit. The Permit Holder remains responsible for the samples, including any reporting requirements.

k. The Permit Holder may grant written approval to additional Authorized Recipients for analysis and curation of samples related to the permit objectives. The Permit Holder must maintain a record of the transfer including the following:

v. Name and affiliation of the recipient;

vi. Address of the recipient;

vii. Types of samples sent (species, tissue type); and

viii. Type of analysis or whether samples will be curated.

l. Sample recipients must have authorization pursuant to 50 CFR 216.37 prior to permanent transfer of samples and transfers for purposes not related to the objectives of this permit.

m. Samples cannot be bought or sold, including parts transferred pursuant to 50 CFR 216.37.

n. After meeting the permitted objectives, the Permit Holder may continue to possess and use samples acquired under this permit, without additional written authorization, provided the samples are maintained as specified in the permit and findings are discussed in the annual reports (See Condition E.3).

C. Qualifications, Responsibilities, and Designation of Personnel

1. At the discretion of the Permit Holder, the following Researchers may participate in the conduct of the permitted activities in accordance with their qualifications and the limitations specified herein:

a. Principal Investigator – Keith Mullin, Ph.D.

b. Co-Investigators – See Appendix 2 for list of names and corresponding activities.

c. Research Assistants – Personnel identified by the Permit Holder or Principal Investigator and qualified to act pursuant to Conditions C.2, C.3, and C.4 of this permit.

2. Individuals conducting permitted activities must possess qualifications commensurate with their roles and responsibilities. The roles and responsibilities of personnel operating under this permit are as follows:

   a. The Permit Holder is ultimately responsible for activities of individuals operating under the authority of this permit. Where the Permit Holder is an institution/facility, the Responsible Party is the person at the institution/facility who is responsible for the supervision of the Principal Investigator.

   b. The Principal Investigator (PI) is the individual primarily responsible for the taking, import, export and related activities conducted under the permit. This includes coordination of field activities of all personnel working under the permit. The PI must be on site during activities conducted under this permit unless a Co-Investigator named in Condition C.1 is present to act in place of the PI.

   c. Co-Investigators (CIs) are individuals who are qualified to conduct activities authorized by the permit, for the objectives described in the application, without the on-site supervision of the PI. CIs assume the role and responsibility of the PI in the PI's absence.

   d. Research Assistants (RAs) are individuals who work under the direct and on-site supervision of the PI or a CI. RAs cannot conduct permitted activities in the absence of the PI or a CI.

3. Personnel involved in permitted activities must be reasonable in number and essential to conduct of the permitted activities. Essential personnel are limited to:

   a. Individuals who perform a function directly supportive of and necessary to the permitted activity (including operation of vessels or aircraft essential to conduct of the activity),

b. Individuals included as backup for those personnel essential to the conduct of the permitted activity, and

c. Individuals included for training purposes.

4. Persons who require state or Federal licenses or authorizations (e.g., pilots – including UAS operators) to conduct activities under the permit must be duly licensed/authorized and follow all applicable requirements when undertaking such activities.

5. Permitted activities may be conducted aboard vessels or aircraft, or in cooperation with individuals or organizations, engaged in commercial activities, provided the commercial activities are not conducted simultaneously with the permitted activities.

9. The Permit Holder cannot require or receive direct or indirect compensation from a person approved to act as PI, CI, or RA under this permit in return for requesting such approval from the Permits Division.

7. The Permit Holder or PI may designate additional CIs without prior approval from the Chief, Permits Division provided:

a. A copy of the letter designating the individual and specifying their duties under the permit is forwarded to the Permits Division on the day of designation by facsimile, email, or the online system at https://apps.nmfs.noaa.gov.

b. The copy of the letter is accompanied by a summary of the individual's qualifications to conduct and supervise the permitted activities.

c. The Permit Holder acknowledges that the designation is subject to review and revocation by the Chief, Permits Division.

8. Where the Permit Holder is an institution/facility, the Responsible Party may request a change of PI by submitting a request to the Chief, Permits Division that includes a description of the individual's qualifications to conduct and oversee the activities authorized under this permit.

9. Submit requests to add CIs or change the PI by one of the following:

   d. The online system at https://apps.nmfs.noaa.gov;

   e. An email attachment to the permit analyst for this permit; or

   f. A hard copy mailed or faxed to the Chief, Permits Division, Office of Protected Resources, NMFS, 1315 East-West Highway, Room 13705, Silver Spring, MD 20910; phone (301)427-8401; fax (301)713-0376.

D. Possession of Permit

1. This permit cannot be transferred or assigned to any other person.

2. The Permit Holder and persons operating under the authority of this permit must possess a copy of this permit when:

   a. Engaged in a permitted activity.

   b. A protected species is in transit incidental to a permitted activity.

   c. A protected species taken under the permit is in the possession of such persons.

3. A duplicate copy of this permit must accompany or be attached to the container, package, enclosure, or other means of containment in which a protected species or protected species part is placed for purposes of storage, transit, supervision or care.

E. Reporting

4. The Permit Holder must submit incident and annual reports containing the information and in the format specified by the Permits Division.

   a. Reports must be submitted to the Permits Division by one of the following:

      iv. The online system at https://apps.nmfs.noaa.gov;

      v. An email attachment to the permit analyst for this permit; or

vi. A hard copy mailed or faxed to the Chief, Permits Division.

d. You must contact your permit analyst for a reporting form if you do not submit reports through the online system.

5. Incident Reporting

c. If a serious injury or mortality occurs, or authorized takes have been exceeded as specified in Condition A.2, the Permit Holder must:

iv. Contact the Permits Division by phone (301-427-8401) as soon as possible, but no later than 2 business days of the incident;

v. Submit a written report within 2 weeks of the incident as specified below; and

vi. Receive approval from the Permits Division before resuming work. The Permits Division may grant authorization to resume permitted activities based on review of the incident report and in consideration of the Terms and Conditions of this permit.

d. The incident report must include 1) a complete description of the events, and 2) identification of steps that will be taken to reduce the potential for additional serious injury and research-related mortality or exceeding authorized take.

6. Annual reports describing activities conducted during the previous permit year (from January 1st to December 31st) must:

a. Be submitted by March 31st each year for which the permit is valid, and

b. Include a tabular accounting of takes and a narrative description of activities and their effects.

c. Include data on disturbance rates of marine mammals specific to UAS operations. Details should include, but not be limited to: species, altitude and angle of approach, context of exposure (e.g., behavioral states), and observed behavioral responses to the UAS.

d. Include results of post-tag monitoring as described in B.5.hh.

4. A joint annual/final report including a discussion of whether the objectives were achieved must be submitted by July 31, 2024, or, if the research concludes prior to permit expiration, within 90 days of completion of the research.

5. Research results must be published or otherwise made available to the scientific community in a reasonable period of time. Copies of technical reports, conference abstracts, papers, or publications resulting from permitted research must be submitted to the Permits Division upon request.

6. For the purposes of monitoring and annual reauthorization of Gulf of Mexico Bryde's whale research, the Permit Holder must submit a separate annual report to the Permits Division on research conducted on this species for January – December, by December 31st of each year. Details should include, but are not limited to:

   a. Date, location, number, and type of takes;

   b. Identification of individuals when possible;

   c. Status and disposition of biopsy samples including field number and dates samples were entered in the genetics database;

   d. Success rate of biopsy and tagging attempts;

   e. Post-tag monitoring (See Condition B.5.hh) and retention time of any tags;

   f. Progress made toward meeting your objectives, including a narrative summary, citing any reports, publications, and presentations that resulted;

   g. Future field plans (including proposed dates, number and type of takes, and objectives) and funding levels for the next 3 years; and

h. Descriptions of opportunistically observed human interactions or other observations (e.g., health, behavior, etc.) that may be of management interest or concern.

7. To assist in monitoring the NARW population and current 2017 unusual mortality event (https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2019-north-atlantic-right-whale-unusual-mortality-event), any time Researchers dart tag a NARW, they must report the tagging to the Permits Division and the MMHSRP (nmfs.mmhsrp.headquarters@noaa.gov) within 24 hours. The notification must include:

   a. Date tagging occurred;

   b. Location tagging took place (latitude and longitude);

   c. Identification of the individual NARW (if known at the time, or provide within 1 week of individual identification);

   d. Location of the tag on the body; and

   e. Photograph(s) of the tag placement.

F. Notification and Coordination

1. 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.

5. The Permit Holder must ensure written notification of planned field work for each project is provided to the NMFS Regional Offices listed below at least two weeks prior to initiation of each field trip/season.

   c. Notification must include the following:

      i. Locations of the intended field study and/or survey routes;

      ii. Estimated dates of activities; and

iii. Number and roles of participants (for example: PI, CI, boat driver, Research Assistant "in training").

d. Notification must be sent to the following Assistant Regional Administrators for Protected Resources as applicable to the location of your activity:

For activities in NC, SC, GA, FL, AL, MS, LA, TX, PR, and USVI:

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; and

For activities in NJ, DE, MD, and VA: Greater Atlantic Region, NMFS, 55 Great Republic Drive, Gloucester, MA 01930; phone (978)281-9328; fax (978)281-9394

Email (*preferred*): NMFS.GAR.permit.notification@noaa.gov

6. Researchers must coordinate their activities with other permitted researchers to avoid unnecessary disturbance of animals or duplication of efforts. Contact the applicable Regional Offices listed above for information about coordinating with other Permit Holders.

7. In addition, for Gulf of Mexico Bryde's whale research:

a. For all research permits authorizing takes of Gulf of Mexico Bryde's whales combined, no more than the entire population (currently estimated at 33 whales) may be intentionally taken twice per calendar year by each biopsy sampling and tagging if granted approval.

i. Individuals may only be intentionally biopsy sampled a maximum of twice per year.

ii. No more than 2 tags (1 suction-cup and 1 dart/barb tag) may be attached at one time to an animal in the same calendar year.

b. Researchers must therefore comply with recommendations provided by the SERO to coordinate research, including additional measures deemed necessary to minimize unnecessary duplication, harassment, or other adverse impacts from multiple permit holders.

c. Researchers (including the Responsible Party, PI, and/or CIs) proposing to conduct research on Gulf of Mexico Bryde's whales must also participate in that year's Bryde's whale annual research coordination meeting convened by the SERO and the Permits Division.

d. The Gulf of Mexico Bryde's whale research coordination meetings will include, but are not limited to, discussions regarding the following aspects of the research:

   i. Geographic location and seasonality of sampling sites;

   ii. Type of takes (e.g., UAS surveys, biopsy sampling, tagging);

   iii. Numbers of takes, by type;

   iv. Takes of known individuals through photo-identification or genetics;

   v. Laboratory analyses; and

   vi. Final disposition and repository of samples.

   vii. Annual authorization for research activities may be subsequently provided following the annual research coordination meeting (see Condition A.2.d).

e. The Permit Holder must coordinate their activities with other permitted researchers before and during Gulf of Mexico Bryde's whale field research to avoid unnecessary disturbance of these animals and duplication of efforts. Collaboration and coordination are <u>mandatory</u> to ensure that only one group of researchers is targeting the same animals in the course of a day for procedures that may result in take.

f. Collected photographs or video of Gulf of Mexico Bryde's whales must be used by the SEFSC for development of a photo-identification catalog as a shared resource among managers and Permit Holders.

g. A skin sub-sample from each biopsy collected from Gulf of Mexico Bryde's whales must be included in the SEFSC's database of genetic identification of individuals in the population.

G. Observers and Inspections

1. NMFS may review activities conducted under this permit. At the request of NMFS, the Permit Holder must cooperate with any such review by:

a. Allowing an employee of NOAA or other person designated by the Director, NMFS Office of Protected Resources to observe and document permitted activities; and

b. Providing all documents or other information relating to the permitted activities.

H. Modification, Suspension, and Revocation

1. Permits are subject to suspension, revocation, modification, and denial in accordance with the provisions of subpart D [Permit Sanctions and Denials] of 15 CFR Part 904.

2. The Director, NMFS Office of Protected Resources may modify, suspend, or revoke this permit in whole or in part:

a. In order to make the permit consistent with a change made after the date of permit issuance with respect to applicable regulations prescribed under Section 103 of the MMPA and Section 4 of the ESA;

b. In a case in which a violation of the terms and conditions of the permit is found;

c. In response to a written request[38] from the Permit Holder;

d. If NMFS determines that the application or other information pertaining to the permitted activities (including, but not limited to, reports pursuant to Section E of this permit and information provided to NOAA personnel pursuant to Section G of this permit) includes false information; and

e. If NMFS determines that the authorized activities will operate to the disadvantage of threatened or endangered species or are otherwise no longer consistent with the purposes and policy in Section 2 of the ESA.

3. Issuance of this permit does not guarantee or imply that NMFS will issue or approve subsequent permits or amendments for the same or similar activities requested by the Permit Holder, including those of a continuing nature.

I. Penalties and Permit Sanctions

1. A person who violates a provision of this permit, the MMPA, ESA, or the regulations at 50 CFR 216 and 50 CFR 222-226 is subject to civil and criminal penalties, permit sanctions, and forfeiture as authorized under the MMPA, ESA, and 15 CFR Part 904.

2. The NMFS Office of Protected Resources shall be the sole arbiter of whether a given activity is within the scope and bounds of the authorization granted in this permit.

c. The Permit Holder must contact the Permits Division for verification before conducting the activity if they are unsure whether an activity is within the scope of the permit.

d. Failure to verify, where the NMFS Office of Protected Resources subsequently determines that an activity was outside the scope of the permit, may be used as evidence of a violation of the permit, the MMPA, the ESA, and applicable regulations in any enforcement actions.

J. Acceptance of Permit

[38] The Permit Holder may request changes to the permit related to: the objectives or purposes of the permitted activities; the species or number of animals taken; and the location, time, or manner of taking or importing protected species. Such requests must be submitted in writing to the Permits Division in the format specified in the application instructions.

1. In signing this permit, the Permit Holder:

    a. Agrees to abide by all terms and conditions set forth in the permit, all restrictions and relevant regulations under 50 CFR Parts 216, and 222-226, and all restrictions and requirements under the MMPA, and the ESA;

    b. Acknowledges that the authority to conduct certain activities specified in the permit is conditional and subject to authorization by the Office Director; and

    c. Acknowledges that this permit does not relieve the Permit Holder of the responsibility to obtain any other permits, or comply with any other Federal, State, local, or international laws or regulations.

______________________________	__________________
Donna S. Wieting	Date Issued
Director, Office of Protected Resources	
National Marine Fisheries Service	

______________________________	__________________
Theophilus Brainerd, Ph.D.	Date Effective
Director, NMFS SEFSC	
Responsible Party	

Appendix 1: Tables Specifying the Kinds of Protected Species, Locations, and Manner of Taking.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
1	Cetacean, unidentified	All	500	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
2	Dolphin, Atlantic spotted; Range-wide	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
3		Adult/ Juvenile	450	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

[39] Takes = the **maximum** number of animals, not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
4		All	15,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
5	Dolphin, bottlenose; Range-wide	Adult/ Juvenile	1,500	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
6		All	25,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys. Large-scale surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
7	Dolphin, bottlenose; Range-wide	All	20,000	30	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys. Localized, small boat, photo-ID effort in Gulf of Mexico, Atlantic Ocean, and Caribbean bays, sounds, estuaries and coastal waters.
8		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
9	Dolphin, clymene; Range-wide	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
10		Adult/ Juvenile	75	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
11		All	5,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
12	Dolphin, common, short-beaked; Range-wide	Adult/ Juvenile	150	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
13		All	20,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
14		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
15	Dolphin, Fraser's; Range-wide	Adult/ Juvenile	75	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
16		All	3,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
17		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
18	Dolphin, pantropical spotted; Range-wide	Adult/ Juvenile	450	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
19		All	30,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
20		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
21	Dolphin, Risso's; Range-wide	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
22		Adult/ Juvenile	300	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
23		All	6,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
24	Dolphin, rough-toothed; Range-wide	Adult/ Juvenile	75	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
25		All	4,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
26		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
27	Dolphin, spinner; Range-wide	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag)
28		Adult/ Juvenile	250	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
29		All	10,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
30	Dolphin, striped; Range-wide	Adult/ Juvenile	150	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
31		All	15,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
32		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
33	Dolphin, unidentified	All	5,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
34	Porpoise, harbor; Range-wide	Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
35		All	2,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
36		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
37	Whale, Blainville's beaked; Range-wide	Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
38		All	2,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
39		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
40	Whale, blue; Range-wide (NMFS Endangered)	Adult/ Juvenile	10	2	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. 2 biopsy samples may be collected per event for a total of 2 biopsy samples per individual per year.
41		All	20	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
42		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb or implantable tag and 1 suction-cup tag).

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Anima l	Observe / Collect Method	Procedures	Details
43	Whale, Bryde's; Range-wide, Excludes Gulf of Mexico subspecies	Adult/ Juvenil e	60	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 20 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
44		Adult/ Juvenil e	75	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
45		All	300	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
46	Whale, Cuvier's beaked; Range-wide	Adult/ Juvenil e	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
47		Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
48		All	2,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
49	Whale, dwarf sperm;	Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.

Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
50	Range-wide	All	1,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
51		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
52	Whale, false killer; Range-wide	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
53		Adult/ Juvenile	150	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
54		All	2,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
55	Whale, fin; Range-wide (NMFS Endangered)	Adult/ Juvenile	15	2	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. 2 biopsy samples may be collected per event for a total of 2 biopsy samples per individual per year.
56		All	500	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
57		Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 10 successfully tagged animals with up to 2 tags maximum (1 dart/barb or implantable tag and 1 suction-cup tag).
58	Whale, Gervais' beaked; Range-wide	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
59		Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
60		All	2,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
61	Whale, humpback; Range-wide Includes: West Indies DPS, and Cape Verde/ Northwest Africa DPS (NMFS Endangered)	Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 10 successfully tagged animals with up to 2 tags maximum (1 dart/barb or implantable tag and 1 suction-cup tag).
62		Adult/ Juvenile	75	2	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. 2 biopsy samples may be collected per event for a total of 2 biopsy samples per individual per year
63		All	1,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
64	Whale, killer;	Adult/ Juvenile	75	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
65	Range-wide	All	1,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
66		Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 10 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
67	Whale, melon-headed; Range-wide	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
68		Adult/ Juvenile	150	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
69		All	5,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
70	Whale, minke; Range-wide	Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
71		All	200	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
72		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
73	Whale, pygmy killer; Range-wide	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
74		Adult/ Juvenile	75	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
75		All	1,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
76	Whale, pygmy sperm; Range-wide	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
77		Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
78		All	1,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
79	Whale, right, North Atlantic; Range-wide (NMFS Endangered)	Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Dart/barb and suction-cup tagging. 10 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
80		All	50	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
81	Whale, sei; Range-wide (NMFS Endangered)	Adult/ Juvenile	15	2	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. 2 biopsy samples may be collected per event for a total of 2 biopsy samples per individual per year.
82		All	10	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
83		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb and 1 suction-cup tag).

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
84	Whale, sperm; Range-wide (NMFS Endangered)	Adult/ Juvenile	60	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 20 successfully tagged animals with up to 2 tags maximum (1 dart/barb or implantable tag and 1 suction-cup tag).
85		Adult/ Juvenile	150	2	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. 2 biopsy samples may be collected per event for a total of 2 biopsy samples per individual per year.
86		All	4,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
87	Whale, True's beaked; Range-wide	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
88		Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
89		All	2,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
90	Whale, unidentified baleen	All	500	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
91		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
92	Whale, unidentified beaked	Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.
93		All	2,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
94	Whale, unidentified Kogia	Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
95	(dwarf/ pygmy sperm)	All	1,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
96	Whale, unidentified Mesoplodon	Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 5 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
97		Adult/ Juvenile	30	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
98		All	1,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
99	Whale, unidentified pilot	Adult/ Juvenile	60	1	Survey, aerial/ vessel	Collect, sloughed skin; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Underwater photo/videography	Tagging. 20 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag).
100		Adult/ Juvenile	300	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 1. Annual take Information for Atlantic Ocean, Gulf of Mexico, Caribbean Sea, U.S. territorial seas, and international waters. Some animals may be taken multiple times per year for Level B activities. DPS = Distinct Population Segment.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [39]	Takes Per Animal	Observe / Collect Method	Procedures	Details
101		All	10,000	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
102	Whale, unidentified toothed	All	500	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Aerial and vessel surveys.
103		Adult/ Juvenile	15	1	Survey, aerial/ vessel	Collect, sloughed skin; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling.

Table 2. Annual take information for the Gulf of Mexico (GOMx) Bryde's whale. Annual take numbers and activities are contingent upon annual authorization per Condition A.2.c., and must have a separate authorization accompanying this permit each year. See additional Permit Conditions starting at F.4 for research coordination requirements for this subspecies.							
Line	Species; Stock/ Listing Unit	Life stage	No. Takes [40]	Takes Per Animal	Observe/ Collect Method	Procedures	Details
1	Whale, Bryde's; Northern Gulf of Mexico Stock (NMFS Endangered)	Adult/ Juvenile	Up to 40	2	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Biopsy sampling. 20 individual animals may be biopsy sampled twice per year. Two samples per event for a total of four biopsy samples per individual per year. Maximum of 3 attempts to biopsy sample per day.
2		All	Up to 300	5	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal; Underwater photo/videography	Vessel and aerial surveys.
3		Adult/ Juvenile	Up to 40	1	Survey, aerial/ vessel	Acoustic, passive recording; Collect, sloughed skin; Count/survey; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Observation, monitoring; Observations, behavioral; Photo-id; Photogrammetry; Photograph/Video; Remote vehicle, aerial (VTOL); Sample, skin and blubber biopsy; Underwater photo/videography	Suction-cup and dart tagging. 20 successfully tagged animals with up to 2 tags maximum (1 dart/barb tag and 1 suction-cup tag) attached at one time. Maximum of 3 attempts to tag per day.

[40] Takes = the **maximum** number of animals, not necessarily individuals, that may be targeted for research annually for the suite of procedures in each row of the table.

Table 3. Annual import, export, and receipt of cetacean parts.							
Line	Species	Life stage	Sex	No. Animals per Year	No. Samples per Animal	Procedures	Details
1	Cetacean, unidentified	All	Male and Female	400	100	Import/ export/ receive, parts	Includes samples collected under other authorizations and samples collected under this permit in international waters.

Appendix 2: NMFS-Approved Personnel and Authorized Recipients for Permit No. 21938.

The following individuals are approved to act as Co-Investigators pursuant to the terms and conditions under Section C (Qualifications, Responsibilities, and Designation of Personnel) of this permit.

Name	Level B Harassment Activities[41]	Biopsy	Tagging	Laboratory/ Affiliation
Aichinger Dias, Laura	Y	N	N	Miami
Andrews, Russel	N	N	Y [a,b]	Marine Ecology and Telemetry Research
Balmer, Brian	Y	Y	N	National Marine Mammal Foundation
Barry, Kevin	Y	Y	N	Pascagoula
Byrd, Barbie	Y	N	N	Beaufort
Contillo, Joseph	Y	N	N	Miami
Engleby, Laura	Y	N	N	NMFS Southeast Regional Office
Gazda, Stefanie	Y	N	N	Univ. Massachusetts Dartmouth
Gorgone, Antoinette	Y	Y	N	Beaufort
Hohn, Aleta	Y	N	N	Beaufort
Litz, Jenny	Y	N	N	Miami
Martinez, Anthony	Y	Y	Y [a,b,c]	Miami
Mullin, Keith	Y	Y	N	Pascagoula
Ninke, Tom	Y	Y	N	Beaufort
Powell, Jessica	Y	N	N	NMFS Southeast Regional Office
Quigley, Brian	Y	N	N	National Marine Mammal Foundation
Rittmaster, Keith	Y	N	N	North Carolina Maritime Museum
Rodriguez-Ferrer, Grisel	Y	N	N	Department of Natural Resources, Puerto Rico
Ronje, Errol	Y	N	N	Pascagoula
Sinclair, Carrie	Y	Y	N	Pascagoula
Speakman, Todd	Y	Y	N	National Marine Mammal Foundation
Whitehead, Heidi	Y	N	N	Texas Marine Mammal Stranding Network

[41] Level B Harassment activities have the potential to disturb, but not injure, a marine mammal or stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

[a] Authorized for suction-cup tagging.

[b] Authorized for dart tagging.

[c] Authorized for implantable tagging.

Name	Level B Harassment Activities[41]	Biopsy	Tagging	Laboratory/ Affiliation
Wicker, Jesse	Y	Y	N	Miami
Young, Robert	Y	Y	N	Coastal Carolina University
Zolman, Eric	Y	Y	N	National Marine Mammal Foundation

Biological samples authorized for collection or acquisition in Tables 1-3 of Appendix 1 may be transferred to the following Authorized Recipients for the specified disposition, consistent with Condition B.6 of the permit:

Authorized Recipient	Sample Type	Disposition
National Institute of Standards (NIST), Charleston, SC	Skin and blubber	Analysis
National Marine Mammal Tissue Bank, Charleston, SC	Skin and blubber	Curation
SEFSC NMFS Molecular Genetics Lab, Lafayette, LA	Skin samples	Analysis/Curation
IsoForensics Inc., Salt Lake City, UT	Skin and blubber	Analysis
Florida International University, Miami, FL	Skin and blubber	Analysis
Stable Isotope Laboratory, Cornell University, Ithaca, NY	Skin	Analysis
University of California, Davis, Davis, CA	Skin	Analysis
University of Virginia, Charlottesville, VA	Skin	Analysis

Appendix 3. NOAA Office of National Marine Sanctuaries (ONMS) Sanctuary and Monument Permit Contact Information.

Site	Mailing Address	Contact Numbers	Permit Contact(s)
ONMS Headquarters Office Silver Spring, Maryland	NOAA Office of National Marine Sanctuaries 1305 East-West Highway (N/NMS2) SSMC4 Silver Spring, MD 20910	wk 240-533-0605 fax 301-713-0404 wk 240-533-0679 fax 301-713-0404	Vicki Wedell Vicki.Wedell@noaa.gov
Florida Keys National Marine Sanctuary	Florida Keys National Marine Sanctuary 33 East Quay Road Key West, FL 33040	wk 305-809-4714 fax 305-293-5011	Joanne Delaney Joanne.Delaney@noaa.gov
Flower Garden Banks National Marine Sanctuary	Flower Garden Banks National Marine Sanctuary 4700 Avenue U, Building 216 Galveston, TX 77551	wk 409-621-5151 x 111 fax 409-621-1316	Emma Hickerson (Research permits) Emma.Hickerson@noaa.gov
Gray's Reef National Marine Sanctuary	Gray's Reef National Marine Sanctuary 10 Ocean Science Circle Savannah, GA 31411	wk 912-598-2382 fax 912-598-2367	Kimberly Roberson Kimberly.Roberson@noaa.gov
Monitor National Marine Sanctuary	*Monitor* National Marine Sanctuary c/o The Mariners' Museum 100 Museum Drive Newport News, VA 23606	wk 757-591-7333	Tane Casserley Tane.Casserley@noaa.gov
Stellwagen Bank National Marine Sanctuary	Stellwagen Bank National Marine Sanctuary 175 Edward Foster Road Scituate, MA 02066	wk 203-882-6515 fax 203-882-6572 wk 781-545-8026 x 207 fax 781-545-8036	Alice Stratton Alice.Stratton@noaa.gov Ben Cowie-Haskell (Alternate contact) Ben.Haskell@noaa.gov