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

Title: Biological and Conference Opinion on the Issuance of Scientific Research and Enhancement Permit No. 22678 for monitoring of Pinniped Populations including Guadalupe Fur Seals Inhabiting the U.S. West Coast

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: National Oceanic Atmospheric Administration National Marine Fisheries Service-Office of Protected Resources-Permits and Conservation Division

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1 INTRODUCTION

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

Section 7(b)(3) of the ESA requires that at the conclusion of consultation, NMFS provides an opinion stating whether the Federal agency's action is likely to jeopardize ESA-listed species or destroy or adversely modify designated critical habitat. If NMFS determines that the action is likely to jeopardize listed species or destroy or adversely modify critical habitat, NMFS provides a reasonable and prudent alternative that allows the action to proceed in compliance with section 7(a)(2) of the ESA. If an incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts and terms and conditions to implement the reasonable and prudent measures.

The action agency for this consultation is the NMFS Office of Protected Resources Permits and Conservation Division (hereafter referred to as the Permits Division). The Permits Division proposes to issue a scientific research permit (Permit No. 22678), authorized under section 104 of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 et seq.), the Fur Seal Act of 1966, as amended (16 U.S.C. 1151 et seq.) and section 10(a)(1)(A) of the ESA to NMFS' Marine Mammal Laboratory (MML) (hereafter referred to as the Applicant). The permit would authorize takes of ESA-listed Guadalupe fur seals (*Artocephalus townsendi*) during MML's scientific research on pinniped populations on the U.S. West Coast.

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

Updates to the regulations governing interagency consultation (50 C.F.R §402) were effective on October 28, 2019 [84 FR 44976]. This consultation was pending at that time, and we are applying the updated regulations to the consultation. As the preamble to the final rule adopting the regulations noted, "[t]his final rule does not lower or raise the bar on section 7 consultations, and it does not alter what is required or analyzed during a consultation. Instead, it improves clarity and consistency, streamlines consultations, and codifies existing practice." We have reviewed the information and analyses relied upon to complete this biological opinion in light of the updated regulations and conclude the opinion is fully consistent with the updated regulations.

This document represents the NMFS opinion on the effects of these actions on Guadalupe fur seals. A complete record of this consultation is on file at the NMFS Office of Protected Resources in Silver Spring, Maryland.

1.1 Background

The MML has been conducting pinniped research on the U.S. West Coast for many years to investigate population status, health, demographic parameters, life history, and foraging ecology on pinnipeds pursuant to the MMPA. The Permits Division issued Permit No. 16807 to MML in 2011 for pinniped research on non-ESA-listed California sea lions (*Zalophus californianus*), harbor seals (*Phoca vitulina*), and northern elephant seals (*Mirounga angustrirostris*). Because there were no ESA-listed species authorized for take under Permit No. 16087 at that time, the Permits Division did not request section 7 consultation. However, in 2014, the MML requested a modification to their permit for authorization to conduct research on ESA-listed Guadalupe fur seals. The Permits Division authorized research on Guadalupe fur seals in 2014 as part of Permit Modification No. 16807-02. The ESA section 7 consultation conducted on the issuance of Permit No. 16807-02 resulted in an opinion concluding that the permit was not likely to jeopardize the continued existence or recovery of any ESA-listed species, or the destruction or adverse modification of any designated critical habitat. In 2019, the MML has applied for a new five-year permit to continue to conduct their pinniped research, including research on Guadalupe fur seals, and the Permits Division is proposing to authorize Permit No. 22678 to allow the MML's research to continue.

1.2 Consultation History

This opinion is based on information provided in the Applicant's permit application, the Permits Division's initiation package, the biological assessment, annual and final reports, field investigations, the opinion for Permit No. 16807-02 issued to MML, and other sources of information. Our communications with the Permits Division regarding this consultation is summarized as follows:

- **May 23, 2019**: The MML submitted their permit application to the Permits Division.
- **July 23, 2019**: The Permits Division requested a section 7 biologist assignment from the ESA Interagency Cooperation Division.

- **August 1, 2019**: The Permits Division submitted the initiation package to the ESA Interagency Cooperation Division for review.
- **August 26, 2019**: The ESA Interagency Cooperation Division responded stating that the initiation package was complete.
- **September 13, 2019**: The ESA Interagency Cooperation Division initiated consultation as of August 26, 2019.

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 critical habitat as a whole for the conservation of a listed species (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.

Potential Stressors (Section 5): 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 6): We identify the resources that will either not be affected or are not likely to be adversely affected.

Species and Critical Habitat Likely to be Adversely Affected (Section 7): 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 and Critical Habitat Likely to be Adversely Affected (Section 8): 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 9): We describe the environmental baseline in the action area including: the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action and 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.

Effects of the Action (Section 10): We identify the number, age (or life stage), and sex of ESA-listed individuals that are likely to be exposed to the stressors and the populations or subpopulations to which those individuals belong. We also consider whether the action "may affect" designated critical habitat. This is our exposure analysis. We evaluate the available evidence to determine how individuals of those ESA-listed species are likely to respond given their probable exposure. We also consider how the action may affect designated critical habitat. This is our response analysis. We assess the consequences of these responses of individuals that are likely to be exposed to the populations those individuals represent, and the species those populations comprise. This is our risk analysis. The adverse modification analysis considers the impacts of the proposed action on the essential biological features and conservation value of designated critical habitat.

Cumulative Effects (Section 11): 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 12): In this section we integrate the analyses in the opinion to summarize the consequences to ESA-listed species and designated critical habitat under NMFS' jurisdiction.

Conclusion (Section 13): 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 14) 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* (Section 15) that may be implemented by action agency. 50 C.F.R. §402.14(j). Finally, we identify the circumstances in which reinitiation of consultation is required (Section 16) 50 C.F.R. §402.16.

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

- Information submitted by the Permits Division.
- Government reports (including NMFS biological opinions and stock assessment reports).
- NOAA technical memos.
- 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 Permits Division proposes to issue a scientific research permit (No. 22678) pursuant to section 10(a)(1)(A) of the ESA and the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 et seq.). Permit No. 22678 would be issued to the NMFS MML (Responsible Party: John Bengston). Upon issuance, the permit would authorize close approaches for ground and vessel surveys, incidental disturbance, and direct sampling of threatened Guadalupe fur seal. This research would represent a continuation of the research conducted under MML's current permit (No. 16807-02).

The permit would also authorize the unintentional mortality of two Guadalupe fur seal of any age or sex at any location per year, for a maximum of ten unintentional mortalities over the duration of the permit (including humane euthanasia). The researchers would salvage any dead animals or parts found during the surveys or sampling. This study would provide valuable information on

the current status of Guadalupe fur seals; there has been recent evidence of Guadalupe fur seals expanding their breeding range into U.S. waters.

As part of this proposed action, the Permits Division is also proposing the authorization of additional research activities on non-ESA-listed pinnipeds. Permit No. 22678 would also authorize takes under the MMPA for research on California sea lions, Pacific harbor seals, northern elephant seals, northern fur seals (*Callorhinus ursinus*), and Eastern distinct population segment (DPS) Steller sea lions (*Eumetopia jubatus*). Guadalupe fur seals can co-occur with these species. The permit would authorize takes for incidental disturbance of Guadalupe fur seals during those research activities. The effects of the research activities on the non-ESA-listed pinnipeds are not be considered in this opinion. However, since those research activities could result in incidental disturbance of Guadalupe fur seals, and MML would be authorized take of Guadalupe fur seals under those circumstances, we consider the effects of incidental harassment to Guadalupe fur seals during research activities conducted on non-ESA-listed pinnipeds.

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.

3.1 Proposed Activities

There are a total of six projects that the applicant will conduct under proposed Permit No. 22678. Most of the projects are a continuation of research that occurred under the applicant's previous permit (No. 16807-2). The "sub-projects" described below (e.g., Project 2A and Project 5B) are specifically discussed because the objectives within those projects deal directly with Guadalupe fur seals. There are Guadalupe fur seal takes proposed for those specific sub-projects in Table 1 and Table 2.

- Project 1: Population Assessment
    - Objectives: determine pinniped population trends, including seasonal, annual, or regional differences in those trends; determine any shifts in breeding or migratory range distributions.
- Project 2: Population Health Assessment
    - Objectives: identify and monitor natural and anthropogenic pinniped mortality; determine any relationships between environmental variability and exposure and susceptibility to natural and anthropogenic sources of health issues.

        - Project 2A: Identify and monitor the health threats to California sea lions, Pacific harbor seals, northern elephant seals and Guadalupe fur seals.
- Project 3: Demographic Assessment
    - Objectives: estimate survival of Guadalupe fur seals on San Miguel Island, to serve as a companion study to current research on Guadalupe fur seals in Mexico.
- Project 4: Breeding System of Male California Sea Lions on San Miguel Island
    - Objectives: conduct molecular genetic studies to determine the reproductive contribution of uniquely identifiable California sea lion territorial males; molecular genetic analysis, behavioral observations, and habitat characterizations of other pinniped species to determine the factors that influence their reproductive contribution such as territorial behavior, activity patterns, and habitat characteristics
- Project 5: Foraging Ecology
    - Objectives: examine pinniped spatial and temporal patterns in marine habitat use; diet composition and trophic relationships; and relationships between aspects of foraging ecology and environmental variability.
        - Project 5B: Inter-specific resource partitioning by California sea lions, Guadalupe fur seals. Pacific harbor seals, and northern elephant seals at San Miguel Island, California.
- Project 6: Documentation of Hybridization
    - Objective: document instances of hybridization between California sea lions and Guadalupe fur seals.

Project 1 includes count and survey activities, where Guadalupe fur seals could be disturbed. Projects 2, 3, and 5 will include directed research at Guadalupe fur seals (as well as the other non-ESA-listed pinnipeds), including capture and sampling. Incidental harassment of Guadalupe fur seals could occur during research for project 4 examining breeding in male California sea lions, since the two species co-occur on San Miguel Island. To conduct these projects, the applicant will use numerous survey and research methods, as described in the next section.

In project 6, the project examines hybridization by California sea lions and Guadalupe fur seals at San Miguel Island. Because hybrids are not a distinct pinniped species, the applicant requested "unidentified pinniped" for research in this project.

Research methods include ground, vessel, and aerial surveys, photo identification, capture, handling, and restraint, anesthesia and drug administration, measuring, weighing, marking, tagging, scat collection, biological sampling (e.g., blood, tissue, blubber, milk, fecal, hair, vibrissae, swab), and unintentional mortality. During the vessel, aerial and ground surveys in Project 1, Guadalupe fur seals could be incidentally disturbed, since they can co-occur with California sea lions. The applicant is also requesting authority to import and export Guadalupe fur seal parts (i.e., the tissue samples collected for analysis during Projects 2A, 3, and 5B),

including salvage of any Guadalupe fur seal carcasses they might find during surveys. The proposed annual take numbers and activities are described in Table 1 and Table 2.

Table 1. Proposed annual incidental disturbance and part collection of Guadalupe fur seals of any age or sex during research activities at breeding and haulout sites and offshore waters along the U.S. West Coast.

Species	Authorized Take	Takes Per Animal	Take Action	Procedures	Details
Seal, Guadalupe fur	105	12	Harass	Count/survey	Project 1. Incidental harassment during aerial, ground or vessel abundance surveys or mortality surveys of Guadalupe fur seals
Seal, Guadalupe fur	40	12	Harass	Incidental disturbance	Projects 2-6. Incidental harassment during Guadalupe fur seal, California sea lion or harbor seal research activities
Seal, Guadalupe fur	10	12	Harass	Collect, scat	Project 5. Incidental harassment during Guadalupe fur seal scat collections
Seal, Guadalupe fur	10	12	Harass	Observation, mark resight	Project 3. Incidental harassment during resighting surveys of marked Guadalupe fur seals
Seal, Guadalupe fur	5	1	Sample	Salvage (carcass, tissue, parts)	Project 2. Salvage (carcass, tissue, parts) of dead Guadalupe fur seals
Seal, Guadalupe fur	500	9999	Import/ export/ receive only	Import/export/ receive, parts	Projects 2A, 3, 5B. Import/export/receive, parts collected from Guadalupe fur seals. Unlimited parts from 500 animals annually.

Table 2. Guadalupe fur seal annual takes of either sex during research activities at any breeding or haulout site and offshore waters along the U.S. West Coast.

Life stage	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
Pup	10	1	Capture/ Handle/ Release	Net, Hoop	Instrument, internal (e.g., PIT); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, clip hair; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3. Pups < 12 kg
All	20	2	Capture/ Handle/ Release	Net, Hoop	Administer drug, subcutaneous; Anesthesia, injectable sedative; Instrument, internal (e.g., PIT); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3. Pups 12 kg or greater; Sample, other = urogenital swab non-pups; may be recaptured or resampled at any location.
Pup	20	2	Capture/ Handle/ Release	Net, Hoop	Administer drug, subcutaneous; Instrument, external (e.g., VHF, SLTDR); Instrument, internal (e.g., PIT); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3, 5B. Pups 20 kg or greater will be instrumented; may be recaptured and resampled at any location.

Life stage	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
Non-Pup	20	2	Capture/ Handle/ Release	Net, Hoop	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Instrument, internal (e.g., PIT); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal enema; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3, 5B. Administer drug, IM = oxytocin for milk collection; Sample, Other = urogenital swab; recapture and resample at any location.
Non-Pup	60	1	Harass/ Sampling	Other	Mark, other (e.g., neoprene patch); Sample, blubber biopsy; Sample, other; Sample, skin biopsy	Projects 3, 5B. Mark, other = remote paint with paint balls; Sample, other = remote biopsy sample; marking and sampling may be land or vessel based
All	2	1	Unintentional mortality	Other	Unintentional mortality; salvage	All projects. Two mortalities annually, not to exceed 10 over duration of permit; humane euthanasia if warranted; necropsy.

3.2 Survey Methods

Survey methods proposed for the research activities include the use of aerial, vessel, and ground surveys.

3.2.1 Aerial Surveys

Aerial surveys would occur during the population assessment project (Project 1). Aerial surveys conducted in two ways: with unmanned aerial surveys (UAS) or as manned aerial surveys (i.e., by biologists in an aircraft). Aerial surveys would not be a part of any of the other projects. The surveys will be conducted annually, and would occur over terrestrial haulouts.

The applicants intend to use a APH-22 hexacopter, although other similar models may be used depending on equipment availability. The APH-22 hexacopter weighs 4 pounds (1.8 kilograms), and has a 1.8 foot (55 centimeter) diameter between motor centers for carrying a camera system. The UAS will be launched from a vessel or a suitable ground-based launch site downwind and away from a haulout. The UAS would be flown by a pilot within sight of the ground control station and the pilot in command.

During the UAS surveys, remote camera systems would be used for photo-id of pinnipeds while flying straight-line transects at altitudes of 150 to 250 feet (46 to 76 meters), with a maximum altitude of 400 feet (122 meters). Flying the UAS at these altitudes provide photographs with the necessary resolution to detect pups. Photos will be taken every 2 to 5 seconds during the flight.

Manned aerial surveys would be conducted from a single or twin engine aircraft, at a minimum altitude of 153 meters (502 feet). Flights would be completed in a relatively short amount of time (e.g. 10 minutes) to minimize effects on animals.

3.2.2 Vessel Surveys

Vessel surveys would occur from survey boats between 16 and 40 feet (5 to 12 meters) in length, focusing on pinnipeds visible on the shore, and those visible at sea. For the shore-based surveys, vessels would approach haulout sites very slowly and carefully, so as not to cause animals to flush or be disturbed by the vessels, staying at least 50 meters away (164 feet). Vessel surveys would be conducted multiple times during the breeding season to collect seasonal distribution data. For at-sea vessel surveys, researchers would conduct line transects and distance sampling within specific depth contours and physical oceanographic features (e.g., seamounts). The vessels will approach animals within 100 meters, with survey vessels traveling at slow speeds (5 to 15 knots). At-sea vessel surveys will be conducted throughout the year, with an emphasis on late spring, fall, and winter, when the greatest number of Guadalupe fur seals are expected to be in the water.

3.2.3 Ground Surveys and Photo Identification

Due to their cryptic nature and tendency to reside in caves, ground surveys are the preferred alternative for surveying Guadalupe fur seals. Ground surveys for large colonies or large geographic areas (e.g., the California Channel Islands) may span multiple days with each breeding area counted more than once. Ground surveys would be used to estimate pup production. During ground surveys, mortality could also be estimated by counting dead animals at haulouts, and carcasses collected as necessary. Researchers will also collect Guadalupe fur seal scat for analysis.

There are two methods used for ground surveys to count pups of Guadalupe fur seals during the proposed action: the spook method and the non-spook method. In the spook method, two or more observers move slowly through the area, displacing adults into the water while pups remain behind on the beach. Researchers count the pups, and then move on to the next area. For an example, an average cove of California sea lion pups contains about 2,000 animals, and it takes about two hours for researchers to complete that area. Animals usually return to the area about 30 minutes after the researchers have left. The non-spook method is used in areas that can be counted from overlooks and does not require moving animals into the water. Two or more observers use the naked eye or binoculars to count pups while the pups are resting.

Because the Guadalupe fur seals tagged at San Miguel Island are likely to have fidelity to the colony where they were born, researchers would focus the greatest resighting effort at San Miguel Island. Guadalupe fur seals will be observed using binoculars, spotting scopes and cameras to view marked animals from cliff tops or blinds. In addition, time-lapse cameras will be used at various haulout sites to allow for year-round observations for attendance information. Information on each tagged animal is recorded including date, time, location, tag number, reproductive status, general condition, and behavior.

Remote camera systems may be deployed at haulouts or breeding areas to document behavior seasonally or year round of marked or unmarked animals of all species. These cameras will be deployed before breeding begins if they are in areas where set up will cause disturbance. Otherwise they will be set up as needed in relation to study objectives. Cameras will be serviced monthly or bi-monthly depending on the camera system.

3.3 Capture, Restraint, and Handling

For the population health assessment, demographic assessment, and foraging ecology projects, (projects 2, 3, and 5), Guadalupe fur seal pups and non-pups may be captured, handled, and restrained. Across the three projects, Guadalupe fur seal pups, juveniles, and adult females may be captured, handled, or restrained.

3.3.1 Capture

To capture Guadalupe fur seals, the applicants are proposing to use hoop nets. In this method, individual animals are stalked by researchers crawling or sneaking up on them from behind and then capturing them with a hoop net.

3.3.2 Restraint

To conduct research procedures, Guadalupe fur seals would be restrained manually, by hand, or by net. When a Guadalupe fur seal is manually restrained, the researcher places his/her hands behind the seal's head while straddling the seal and placing his/her knees against the shoulders and foreflippers, to pinch them to the seal's body.

Guadalupe fur seals may also be restrained by cone-shaped nets. The net has a hole at one end for the seal's nose, while the rest of the net fits snuggly around the chest and foreflippers, acting as a restraint. The seal is also restrained by hand to control the animal's lateral movements. When animals are in the cone-shaped net, researchers may also use a sling to restrain the seal. The sling is used for weighing, and is made of a large square of mesh material with straps sewn into the sling so that is can be cinched around the shoulders and foreflippers of the seal. The sling is made of mesh that allows for water and air to pass through for ventilation.

3.3.3 Handling

During the initial capture and subsequent restraint, Guadalupe fur seals will be handled for research procedures (see further discussion in next section). Two of the more basic, less invasive handling procedures—measuring and weighing—are standard morphometrics. Length and girth measurements are recorded for a measure of growth, health, and condition for pups and non-pups. Pup lengths are taken on a measuring board specifically designed for this task. The pup's nose is placed at the front of the board where the measuring tape begins while the animal is prone in the net. Axillary girth is recorded to the nearest centimeter with a measuring tape placed behind the foreflippers. To weigh pups, individuals are placed in hoops nets that are hung from a spring scale mounted on a tripod (or a pole held by two researchers). Non-pups are weighed in slings that clip around the body of the animal and act as a restraint. The sling is clipped to a harness and then the harness is attached to a scale on a tripod for lifting. Once weighed, the seal is gently returned to the ground.

3.4 Anesthesia

Guadalupe fur seals that are to be sampled for projects 2A and 5B (Population Health Assessment and Foraging Ecology) may be sedated or anesthetized and all procedures to take place while the seal is under anesthesia.

The applicants are proposing to use three methods to administer anesthesia: gas with a cone or mask, gas with intubation, or through an injectable sedative. The specific agents, doses, and other pertinent information regarding anesthesia are shown in Table 3, and described in detail in the following sections.

Table 3. Pain-relieving or immobilizing agents that may be used for restraint and stress reduction for Guadalupe fur seals. Route: SC = subcutaneous, IM = intramuscular, IH = inhalation, IV = intravenous.

Procedure	Agent	Reversal	Route	Dose & Reference	Duration	Intervention
Administer drug, subcutaneous	Carprofen	None	SC	4.0 mg/kg (50 mg/ml); Haulena & Schmitt 2018	≤24 hrs	**None available for subcutaneous injection**
Administer drug, subcutaneous	Lidocaine	None	SC	Up to 3 ml of 2% lidocaine (20 mg/ml) injected around biopsy site; Barbieri 2018	≤1 hr	**None available for subcutaneous injection**
Administer drug, subcutaneous	Bupivacaine	None	SC	50:50 mixture of lidocaine (2%)/bupivacaine (0.55), 1-2 ml per site	≤1 hr	**None available for subcutaneous injection**
Administer drug, IM	Atropine	None	IM	0.01– 0.05 mg/kg atropine; may be used alone or in combination with other sedatives; Gulland et al. 1999	≤ 40 min	**bradycardia preventative; emergency recovery from sedatives**
Anesthesia, gas w/ cone, mask or intubation	Isoflurane gas	Stop flow, establish clear airway, ventilate with pure oxygen	IH	Nose cone; Up to 5% isoflurane gas mixed with up to 8 L/min oxygen, intubation after 10 minutes; Heath et al. 1997; Haulena & Schmitt 2018	≤ 1 hr	**Doxapram (up to 5 mg/kg) sublingual and /or epinephrine and/or intubation and oxygen**
Anesthesia, injectable sedative	Midazolam	flumazenil	IM	0.15-0.2 mg/kg; Haulena & Schmitt 2018	≤ 40 min	
Administer drug, IM or IV	Dexamethasone		IM/IV	0.1 to 2.0 mg/kg; Dr. Martin Haulena, pers. com.		**For emergency recovery**

Procedure	**Agent**	**Reversal**	**Route**	**Dose & Reference**	**Duration**	**Intervention**
Administer drug, IM or IV	Furosemide		IM/IV	1 to 2 mg/kg; Dr. Martin Haulena, pers. com.		**For emergency recovery**
Administer drug, IV	Prednisolone		IV	0.1 to 5 mg/kg; Dr. Martin Haulena, pers. com.		**For emergency recovery**
Administer drug, IV	Doxapram		IV	1 to 10 mg/kg; Dr. Martin Haulena, pers. com.		For emergency recovery

3.4.1 Gas Anesthesia: Cone/Mask or Intubation

Whether a Guadalupe fur seal is anesthetized using a cone/mask or through intubation depends on the procedures to be conducted. For simpler procedures (e.g., blood sampling) that can be completed in a relatively short amount of time (ten minutes or less), the seal is anesthetized using isoflurane gas delivered through a mask or cone. For longer procedures or where seals must be completely still (e.g., urine catheter), gas anesthesia is needed. Handling time will be minimized in all cases and usually will not exceed 45 minutes.

Gas anesthesia may be used on all ages and both sex groups of Guadalupe fur seals at breeding or haulout sites. For most activities, physical restraint combined with midazolam injected intramuscularly or lidocaine as a local anesthetic will be sufficient for safe sampling of animals.

Isoflurane gas is administered through an inhalation cone placed over the muzzle. Isoflurane gas is mixed with medical oxygen at a mixture of up to 5 percent isoflurane at a flow rate of up to 8 liters/minute until anesthesia is induced, at which time flow rates of oxygen and isoflurane are reduced at the veterinarian's discretion (Table 3). When anesthesia is needed for a short period (less than 10 minutes), intubation may not be required and the procedures may be completed using only the inhalation cone.

For procedures lasting more than 10 minutes, upon induction, an endotracheal tube is inserted and gas and oxygen are supplied directly at a rate of 1 to 3 percent isoflurane gas with a flow rate of 2 liters/minute (Table 3). The vital signs of the animal will be monitored with observations of breathing, heart rate, and pulse rate and may be monitored using a pulse oxymeter or EKG machine. Once the instrumentation or sample collection is completed, the gas is terminated and the animal inhales air until recovery (indicated by a gag reflex). The endotracheal tube is removed and the animal completes recovery (indicated by aggressive response to tapping on the flippers or rump). If the animal is not intubated, the animal inhales air until it responds to tapping on the flipper or rump. The cone is removed and the animal is moved to a recovery area until it is fully alert and mobile (about 10 minutes after oxygen flow is terminated). All of these methods have been previously employed successfully on pinnipeds (Haulena 2018).

Gas anesthesia will be administered by qualified veterinarians or assistants under the supervision of a veterinarian and may be administered alone or in combination with an injectable sedative or tranquilizer. If used in combination with sedative drugs, the level of gas anesthesia will be much lower than if used alone. The sedatives are typically reversed when the procedures are nearly completed if there is a reversal agent, and the animal is maintained on the inhalant. If necessary for the animal, reversal of the sedative may occur earlier in the course of, or before, gas anesthesia.

Actions to be taken if an animal reacts negatively to the anesthesia include administration of any of the emergency drugs in Table 3, delivery of doxapram hydrochloride (1 to 5 milliliter per kilogram intravenously or sublingual) to stimulate respiration, or intubation with an endotracheal

tube connected to an ambu bag or oxygen source if the animal is not already intubated. Any or all of these actions may be taken at the discretion of the veterinarian.

3.4.2 Injectable Sedative

Guadalupe fur seals may be anesthetized by injectable sedative. This includes injectable tranquilizers, anesthetics, sedatives, and opioids. Sedatives and related drugs are used to relieve stress of capture and handling or can be used to assist with restraint. Chemical anesthesia using stalking and capture is used to handle large adults that are too large or aggressive to handle using physical restraint alone, or when the time required for procedures exceeds that safe for physical restraint, or for which gas anesthesia cannot be administered without first sedating the animal. The drugs that may be used for each species are listed in Table 3 and dosages are those recommended in Haulena (2018). Other drugs may be considered at the discretion of the attending veterinarian or after consultation with experienced veterinarians.

3.5 Biological Sampling

Once the Guadalupe fur seal has been captured, restrained, weighed, measured, and appropriately anesthetized, the applicant proposes to conduct numerous biological sampling techniques on the seals to collect information in support of projects 2, 3, and 5. Non-pups and pups may subjected to these biological sampling techniques; all pups sampled will be 12 kilograms or more.

3.5.1 Skin and Blubber Biopsy Sampling

Skin samples provide genetic samples for molecular studies of the populations. Skin samples can be easily collected from certain tag types that release a piece of skin when applied and no additional procedure is required. In these cases, the applicant will retain the skin for genetic analysis. However, not all tag types result in skin being removed. In these cases, a skin biopsy will be taken from the interdigital webbing of the rear flipper using a sterile 6 millimeter (mm) biopsy punch. The area will be scrubbed with a disinfecting solution (e.g. alcohol, povidone iodine, chlorhexidine) before being sampled and lidocaine or cocktail of 50:50 lidocaine/bupivacaine may be used to anesthetize the area around the biopsy site. Once the skin sample is collected, the wound is left to heal naturally. The applicant has found that samples taken in this manner begin to heal within a few days and are completely healed (hole no longer visible) after two months. The samples are placed in cryovials with 100 percent ethanol and frozen until analyzed.

At haulouts or breeding sites, non-pups will be shot with a biopsy dart using a cross-bow system as described in Hoberecht et al. (2006b) for Steller sea lions. The dart is screwed onto the tip of an arrow. The arrow is attached to the cross-bow with a line so the sample and arrow can be retrieved after the sample is taken. Biopsy darts will be designed to extract a skin and blubber sample about 5 mm in diameter and 10 mm deep but will be modified based on the size of the animal to be darted. Remote biopsies collected from animals at sea will use a different biopsy system to allow retrieval of the dart and sample from the water. Tissue samples (blubber and skin) will be collected using a floating crossbow bolt with a detachable biopsy punch. This

biopsy system is used currently for whales and small cetaceans (Noren and Mocklin 2012) and the bolts will be modified for blubber depth of the target animals. For Guadalupe fur seals biopsy dart dimensions will be based on other *Arctocephalus* species as the applicant expects that these will be similar (~35 mm blubber depth (Arnould et al. 2005)) and does not have blubber depth information for Guadalupe fur seals. For either land-based or water-based remote biopsy procedures, individuals will be targeted when they are a safe distance away from other animals to avoid potential harm to non-target animals if the dart misses the target animal. Biopsy samples will be taken from the rump or posterior to the shoulder to avoid the head and face of the target animal in the case of a misfire. All darts will be sterilized with a disinfecting solution (e.g. povidone iodine, chlorhexidine) before being deployed and will be sterilized before being re-used.

Blubber samples are used for pollutant or fatty acid analysis. A blubber biopsy will be taken using a sterile 6 mm or 8 mm biopsy punch. A small area (3 x 3 centimeter (cm)) is first shaved and then scrubbed with a disinfecting solution (e.g. alcohol, povidone iodine, chlorhexidine) to prevent infection. The cored blubber separates easily away from the untouched muscle and extrudes with removal of the punch. Wounds resulting from the biopsy punch are best left open to allow drainage and to heal naturally [Barbieri in (Gulland et al. 2018)]. Animals may be given an intramuscular injection of tetracycline as a prophylactic antibiotic. If animals are not under anesthesia, lidocaine will be injected around the biopsy site as a local anesthetic. The entire process takes about one minute if lidocaine is not used or about four to five minutes if it is used (i.e., to wait for lidocaine to take effect). Biopsies are stored frozen in aluminum foil or Teflon containers until analysis.

3.5.2 Fur and Vibrissae Sampling

Fur will be collected for stable isotope or hormone analysis. Fur will be collected by cutting or shaving a patch approximately 2 cm x 2 cm on the dorsal side of each individual using scissors or an electric trimmer. For Guadalupe fur seals, only the guard hair will be collected leaving the underfur because they require their fur for thermoregulation.

One or two vibrissae will be pulled at the base for stable isotope, contaminant, or hormonal analysis. Pulling, rather than clipping, a vibrissa is preferable because clipping results in an unknown length remaining behind. Stable isotope ratios show regular, oscillating patterns and changes in ratios can occur in less than 1 cm in Steller sea lions (Hirons et al. 2001). Thus, obtaining the root of the vibrissae, representing the most recent growth, for analysis is crucial. Vibrissae are pulled by gripping with forceps and pulling forcefully and rapidly in one smooth motion. The samples will be placed in a paper envelope and stored dry until analyzed.

3.5.3 Swab Sampling

Fecal (rectal), nasal, ocular, oral, and urogenital swabs may be collected for hormone and health assessment. Up to two sterile cotton tipped swabs will be used to sample each area for virology

and bacteriology. The samples will be placed in tubes with bacterial or viral culture media and stored appropriately.

3.5.4 Fecal Sampling

Two forms of fecal sampling are proposed for Guadalupe fur seals: fecal enema and fecal loop procedure.

Enemas are used to collect contents from the digestive tracts of captured animals and unlike scats, allow the contents to be assigned to a specific individual. Enemas will be conducted by inserting a sterilized, lubricated enema tube into the rectum and gently flushing 1 to 2 liters of warm water into the tube to flush feces from the lower digestive tract. The contents will be collected in plastic bags placed under the rear of the animal and the contents will be sorted in the field or laboratory. After each animal, the enema tube will be sterilized using a sterilizing solution, rinsed with clean water and dried before being used again.

Clean, sterilized lubricated fecal loops will be gently inserted into the rectum to collect fresh fecal samples for analysis of parasites or molecular genetics. The samples will be placed in containers with appropriate preservative media and stored at room temperature, refrigerated or frozen until transported to a laboratory for analysis.

3.5.5 Blood Sampling

Blood may be taken from all ages and both sexes of captured Guadalupe fur seals. Blood samples may be collected during capture operations for health studies (e.g., serum chemistries, hormone analysis) and diet studies (e.g., stable isotope analysis). Analysis and necessary replicates to conduct all assays may require up to 30 milliliters (ml) of blood from adults and 13 ml of blood from pups. However, not more than 1.0 ml blood per kilogram (kg) body mass per capture event will be taken and the amount will not exceed 30 ml for adults and 15 ml for pups. Any excess blood remaining after analyses will be archived. Blood may be taken from the caudal-gluteal vein or plantar interdigital vein of the rear flipper of Guadalupe fur seals [Barbieri in (Gulland et al. 2018)]. Before the blood sample is collected, the surface and injection site will be scrubbed with a disinfecting solution (e.g. alcohol, povidone iodine, chlorhexidine) to prevent infection. Blood is drawn using sterile 18 to 20 gauge needles that range from 1 inch (pups) to 6 inches (for larger adults) directly into sterile blood tubes. Following needle withdrawal, firm pressure is applied to prevent hemorrhage from the venipuncture site. Blood will be stored whole, or as plasma or serum. Standard blood chemistry panels and assays for specific hormones, pathogens or pollutants will be performed.

3.5.6 Milk Sampling

Milk from lactating females will be collected after they receive an IM injection of oxytocin. Milk samples will be used for analysis of energetics, pollutants, pathogens, endocrine-disrupting chemicals, and fatty acid analysis; up to 20 ml milk will be expressed from the mammary glands.

3.6 Tagging and Marking

Guadalupe fur seals would be tagged with external or internal tags, or marked with external markings. Pups and non-pups would undergo these procedures. Only Guadalupe fur seal pups weighing more than 20 kg would be instrumented.

3.6.1.1 External Tags

The attachment of external instruments involves gluing with epoxy or attaching as flipper tags. Both of these attachment types may cause momentary discomfort. Epoxy 'fires' as it bonds and creates a heat reaction that can be quite hot and the heating up of the fur and underlying skin can cause discomfort to the animal. Instruments attached via flipper tag have the same pain and discomfort as a regular flipper tag attachment or skin biopsy (if a hole needs to be punched before the tag is attached). Consequently, this procedure can be administered without anesthesia or analgesics, particularly for pups, but in most cases will be coupled with other procedures that do require chemical restraint. Animals may be instrumented with satellite, Global Positioning System (GPS), time-depth recorder, VHF radio transmitter, digital tag, proximity or acoustic, video data logger, environmental sensor (e.g., dissolved oxygen, chlorophyll *a*) and accelerometer tags to describe their foraging behavior (Table 4).

Table 4. Potential instruments to be applied to Guadalupe fur seals.

Instrument	Size (dimensions cm)	Mass[a] (g)	Attachment Method
Time-depth recorder	6.0 x 1.75 x 1.75	40	External adhesive
SPLASH [b] (large)	10.8-11.9 x 6.5 x 3.5-6.9	145-458	External adhesive
SPLASH (small)	7 x 3 x 3	65-145	External adhesive
SRDL	10.5 x 7 x 4	370	External adhesive
SPOT	7.1 x 3.4 x 2.3	30-145	External adhesive or flipper tag
VHF	3 x 1 x 1	30	External adhesive or flipper tag
Camera-archival	5.5 x 8.5 x 10.5	700	External adhesive
PDD	11.7 x 8.8 x 2.9	327	External adhesive
Acoustic transmitters	1.6 x 8.5	38	External adhesive or flipper tag
DTAGS	5.5 x 8.5 x 10.5	300	External adhesive
GSM	10 x 7 x 4	370	External adhesive
Stomach transmitter (STT)	5.6 x 2.0 Compressed in ethafoam 3.5 x 3.5 x10	36	Internal delivery
Passive Integrated Transponder (PIT)	2.3 x 0.36	0.6	Subcutaneous

[a]Mass in air; mass in water is less.

[b]SPLASH= satellite data recorders, satellite-linked time-depth recorders, GPS relay or archival instruments, Fluoro-transmitter; SRDL = satellite-relayed data logger; SPOT = satellite position only tag; VHF = very high frequency transmitter; PDD = Payload Delivery Device for remote release; GSM = Global System for Mobile communications; DTAGS = digital tags.

The technology in this field is changing quickly and it is impossible to know what the size and weight of instruments will be that will be deployed over the duration of the projects. Currently, weights of individual instruments are generally less than 200 grams (g) (e.g., VHF radio tags 5 to 90 g, satellite tags 80 to 200 g), however, these ranges are subject to change. Instrument weight or combinations of instruments will not exceed 1 percent of the estimated body weight and no more than 3 instrument types will be deployed on an individual animal (Table 5).

Table 5. Summary of Guadalupe fur seal average weight and age class and total instrument weight range based on 1 percent of body mass that may be deployed on an individual.

		Mass range by Age Class			
Species	**Mass**	**Adult males**	**Adult females**	**Juveniles**	**Pups**
Guadalupe fur seal	Body mass (kg)	400-800	40-70	25-75	20-50
	Instrument mass (g)	4000-8000	400-700	250-750	200-500

Instruments may be glued to the pelage with adhesives (e.g., epoxy or superglue) and placed between the shoulders, glued on the head, back or rump. Instruments may also be attached to flipper tags and then the tag is placed into the flipper by creating a hole using a biopsy punch or leather punch and then attaching the tag through the hole. Instruments glued to the pelage will be retained for up to 11 months and will either be recovered by recapture or lost when the animal completes its annual molt. Instruments attached by flipper tag, may remain on the animal for life or until lost.

3.6.1.2 Passive Integrated Transponder Tagging

Passive Integrated Transponder (PIT) tags will be implanted subcutaneously between the shoulders or near the neck, rump or tail as a secondary identification for tagged Guadalupe fur seals. This attachment causes momentary discomfort and pain and will be administered with chemical restraint when other procedures that require chemical restrain are required, otherwise PIT tags may be administered with just physical restraint. A specially designed delivery needle is used to insert the tag under the skin. Before the needle is inserted, the area will be scrubbed with a disinfecting solution (e.g. alcohol, povidone iodine). After each application, the applicator will be sterilized using a disinfecting solution (e.g. alcohol, povidone iodine, chlorhexidine). Currently the tags are 2.3 cm long x 0.36 cm in diameter but the field is changing rapidly and smaller tags with greater detection range may become available and may be used.

PIT tagging may be an effective marking method for this species because Guadalupe fur seals at the Channel Islands haulouts can be approached closely and the animals tend to be in areas where extended wands or automated PIT readers can be installed. In addition, new technology using UAS equipped with PIT readers may greatly advance the use of this technology for skittish pinnipeds.

3.6.1.3 Flipper Tagging

This procedure may be done with just physical restraint or if the Guadalupe fur seal is under chemical restraint for other procedures, tagging will while the animal is sedated or anesthetized. Animals will be tagged with Jumbo plastic roto, temple, or All-flex tags at the trailing edge of the foreflipper anterior to the first digit (the procedure for otariids like Guadalupe fur seals). Roto or temple tag are about 4.5 cm x 2.0 cm and weigh 2.8 g; All-Flex tags are about 5.0 cm x 1.5 cm and weigh 3.0 g. These tag types have been routinely used for other species of pinnipeds. Tags will be applied using pliers supplied by the manufacturer or applied after a hole is punched into the flipper using a biopsy punch or sterilized leather punch. The skin tissue that is displaced by the tagging may be retained as a genetic sample.

3.6.1.4 Remote Paint Marking

Paint balls fired from a CO_2 charged rifle with a silencer and scope are used to temporarily mark Guadalupe fur seals that cannot be captured and marked. Paint balls are 1.5 cm in diameter and leave a mark about 10 cm in diameter. Males will be marked when they are away from females and pups to avoid marking pups or females. Paints or dyes will be non-toxic, waterproof and environmentally safe and will be standard paints used in livestock marking.

3.6.1.5 Neoprene Patch Marking

Any Guadalupe fur seals that are handled may be temporarily marked with neoprene patch glued to their pelage. The patch will be labeled with an identifier and glued using super glue or epoxy. The patch is intended to provide a visible, uniquely identifiable mark to facilitate resighting without recapturing the animal. The patch will fall off during the molt.

3.7 Import and Export of Parts

Research activities under Permit No. 22678 may include the biological sampling of Guadalupe fur seals, and collection of parts and tissue samples. These parts may need to be sent to different laboratories for analysis, or the applicant may need to import or export Guadalupe fur seal parts from researchers in Mexico, and the applicant requires the authority to transfer, import, or export parts of Guadalupe fur seals collected during research. Convention on International Trade in Endangered Species (CITES) import, export, or introduction from the sea permits will be obtained as required. The appropriate Mexican and other foreign CITES export permits will be obtained. All samples will be collected legally and humanely.

3.8 Unintentional Mortality

Unintentional mortality, including humane euthanasia of moribund individuals, has been authorized in the applicant's current permit (No. 16087-02). The proposed action would authorize two mortalities of any life stage or sex per year (10 total for the duration of the permit). These mortalities include post-release and non-target animals when the mortality can be attributed to the research activities.

If a lactating female dies as a result of the permitted activities and her dependent pup can be identified, researchers will contact the appropriate NMFS Regional Stranding Network Coordinator and proceed as directed or euthanize the pup if it is not possible to contact the Stranding Network Coordinator (i.e., no phone or email service) if we believe the pup cannot survive on its own (e.g. a newborn vs a weaning age pup). A full evaluation of any unintentional mortality event (e.g., circumstances surround the event, gross necropsy findings) will be completed at the time of death and will be reported to NMFS. Whenever possible, tissues will also be taken for analysis of disease, contaminants, and histology and when the results are available, a final report on the cause of mortality will be forwarded to NMFS.

If a Guadalupe fur seal of any life stage is seriously injured during research activities and the applicant determines that it is more humane to euthanize it, they will euthanize the seal. Euthanasia methods follow the most recent guidelines for marine mammals in the CRC Handbook of Marine Mammal Medicine [Harms et al. in (Gulland et al. 2018)].

Euthanasia methods will be those that minimize pain, distress and anxiety prior to loss of consciousness and result in rapid unconsciousness followed by cardiac arrest (Leary et al. 2013). Drug and dosage combinations are listed in Table 6.

Table 6. Drug and dose combinations for euthanasia.

Procedure	Agent	Route	Dose and Reference	Intervention
Euthanasia	Butorphanol/ Pentobarbital	IM/IV/ Intra-cardiac	0.2 to 0.4 mg/kg butorphanol; 60-120 mg/kg pentobarbital; Harms et al. 2018	Euthanize moribund individuals
Euthanasia	Midazolam/ Pentobarbital	IM/IV/ Intra-cardiac	0.1 mg/kg (50 mg/ml) Midazolam; 60-100 mg/kg pentobarbital; Harms et al. 2018	Euthanize moribund individuals
Euthanasia	Tiletamine and zolazepam/ Potassium chloride	IM/IV/ peri-cardiac	01.7 mg/kg Telazol; 75-150 mg/kg potassium chloride; Gage 1993; Harms et al. 2018	Euthanize moribund individuals

The primary method of euthanasia for premature and moribund Guadalupe fur seals will be a two-step process as recommended in Harms et al. in Guland et al. (2018). First an intramuscular (IM) injection of a pre-euthanasia anesthetic agent will be administered followed by an intra-cardiac or intravenous (IV) administration of pentobarbital at 60 to 200 mg/kg of body mass. An alternative method may be administered if resource managers are concerned about transfer of the euthanasia agents to other wildlife. A combination of pre-euthanasia anesthetic followed by saturated potassium chloride administered IV or intra-cardiac minimizes relay toxicity and has been approved as a humane euthanasia procedure (Harms et al. 2014). Death will be confirmed based on the cessation of the heartbeat and all samples will be collected after death except for blood, which may be collected prior to administration of the euthanasia protocol.

The applicant will dispose of the euthanized carcasses based on protocols (e.g., bury when pentobarbital is used, ocean disposal when non-toxic agents are used) determined by the resource management entities responsible for the oversight of the collection areas (e.g., National Park Service, U.S. Navy) to avoid any harm to other resources sharing the collection areas with pinnipeds.

3.9 Conservation Measures

The Permits and Conservation Division's proposed action requires mitigation measures to minimize potential adverse effects of the proposed research activities; these measures are included as conditions in the permit. Mitigation measures to minimize effects are also included in the MML's permit applications. They are described in the preceding sections, and are considered throughout the *Exposure and Response Analysis*. The NMFS Permits and Conservation Division will require that the qualifications of individuals conducting the research and enhancement activities under the proposed scientific research permit are commensurate with their roles and responsibilities. In accordance, the only personnel authorized to conduct the research and enhancement activities will be the principal investigators and co-investigators listed in the permit applications, and research assistants. We anticipate that requiring that the research and enhancement activities be conducted by experienced personnel will further minimize impacts to the ESA-listed Guadalupe fur seals that may be exposed to stressors, as these individuals should be able to handle the animals more effectively to reduce impacts and recognize adverse responses and cease or modify their research and enhancement activities accordingly.

Overall, the MML proposes to use techniques that they have employed for many years in carrying out pinniped research. The anticipated effects on individual animals of most of the procedures included in the MML's application have been detailed in the Steller sea lion and northern fur seal Research Programmatic Environmental Impact Statement (NMFS 2007). The methods and effects of the procedures on individual animals for Guadalupe fur seals are similar to northern fur seals.

For more information on mitigation measures related to the MML's proposed activities, see Section 18 in Appendix A for the terms and conditions the Permits and Conservation Division propose to include in Permit No. 22678.

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 the proposed action includes the inland and offshore waters of the U.S. West Coast (California, Oregon, and Washington), on islands and coastlines where breeding rookeries and haulout sites of Guadalupe fur seals and other target pinniped species occur. Research may occur anywhere within the described action area, but particular areas of interest for Guadalupe fur seals include San Miguel, the Channel Islands, California (Figure 1).

Figure 1. Map of the proposed action area, including the U.S. Pacific West Coast, the Channel Islands, and San Miguel, inset.

The ESA-listed species and designated critical habitat that may be present in the action area and possibly affected are shown in Table 7 below.

Table 7. Threatened and endangered species and designated critical habitat that may be affected by the proposed action.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Cetaceans			
Blue Whale (*Balaenoptera musculus)*	E – 35 FR 18319	-- --	07/1998 10/2018 - Draft
Fin Whale (*Balaenoptera physalus)*	E – 35 FR 18319	-- --	75 FR 47538 07/2010
Humpback Whale (*Megaptera novaeangliae*) – Central America DPS	E – 81 FR 62259	84 FR 54354 (Proposed)	11/1991
Humpback Whale (*Megaptera novaeangliae*) – Mexico DPS	T – 81 FR 62259	84 FR 54354 (Proposed)	11/1991
Killer Whale (*Orcinus orca*) – Southern Resident DPS	E – 70 FR 69903 Amendment 80 FR 7380	71 FR 69054 84 FR 99214 (Proposed)	73 FR 4176 01/2008
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
Sperm Whale (*Physeter macrocephalus*)	E – 35 FR 18319	-- --	75 FR 81584 12/2010
Marine Reptiles			
Green Turtle (*Chelonia mydas*) – East Pacific DPS	T – 81 FR 20057	-- --	63 FR 28359 01/1998
Leatherback Turtle (*Dermochelys coriacea*)	E – 35 FR 8491	44 FR 17710 and 77 FR 4170	10/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico 63 FR 28359 05/1998 – U.S. Pacific
Loggerhead Turtle (*Caretta caretta*) – North Pacific Ocean DPS	E – 76 FR 58868	-- --	63 FR 28359
Olive Ridley Turtle (*Lepidochelys olivacea*) Mexico's Pacific Coast Breeding Colonies	E – 43 FR 32800	-- --	63 FR 28359
Fishes			
Bocaccio (*Sebastes paucispinis*) – Puget Sound/Georgia Basin DPS	E – 75 FR 22276 and 82 FR 7711	79 FR 68041	81 FR 54556 (Draft) 10/2017
Chinook Salmon (*Oncorhynchus tshawytscha)* – California Coastal ESU	T – 70 FR 37160	70 FR 52488	81 FR 70666

Species	ESA Status	Critical Habitat	Recovery Plan
Chinook Salmon (*Oncorhynchus tshawytscha)* – Central Valley Spring-Run ESU	T – 70 FR 37160	70 FR 52488	79 FR 42504
Chinook Salmon (*Oncorhynchus tshawytscha)* – Lower Columbia River ESU	T – 70 FR 37160	70 FR 52629	78 FR 41911
Chinook Salmon (*Oncorhynchus tshawytscha)* – Puget Sound ESU	T – 70 FR 37160	70 FR 52629	72 FR 2493
Chinook Salmon (*Oncorhynchus tshawytscha)* – Sacramento River Winter-Run ESU	E – 70 FR 37160	58 FR 33212	79 FR 42504
Chinook Salmon (*Oncorhynchus tshawytscha)* – Snake River Fall-Run ESU	T – 70 FR 37160	58 FR 68543	80 FR 67386 (Draft)
Chinook Salmon (*Oncorhynchus tshawytscha)* – Snake River Spring/Summer Run ESU	T – 70 FR 37160	64 FR 57399	81 FR 74770 (Draft) 11-2017-Final
Chinook Salmon (*Oncorhynchus tshawytscha)* – Upper Columbia River Spring-Run ESU	E – 70 FR 37160	70 FR 52629	72 FR 57303
Chinook Salmon (*Oncorhynchus tshawytscha)* – Upper Willamette River ESU	T – 70 FR 37160	70 FR 52629	76 FR 52317
Chum Salmon (*Oncorhynchus keta*) – Columbia River ESU	T – 70 FR 37160	70 FR 52629	78 FR 41911
Chum Salmon (*Oncorhynchus keta*) – Hood Canal Summer-Run ESU	T – 70 FR 37160	70 FR 52629	72 FR 29121
Coho Salmon (*Oncorhynchus kisutch*) – Central California Coast ESU	E – 70 FR 37160	64 FR 24049	77 FR 54565
Coho Salmon (*Oncorhynchus kisutch*) – Lower Columbia River ESU	T – 70 FR 37160	81 FR 9251	78 FR 41911
Coho Salmon (*Oncorhynchus kisutch*) – Oregon Coast ESU	T – 73 FR 7816	73 FR 7816	81 FR 90780
Coho Salmon (*Oncorhynchus kisutch*) – Southern Oregon and Northern California Coasts ESU	T – 70 FR 37160	64 FR 24049	79 FR 58750
Eulachon (*Thaleichthys pacificus*) – Southern DPS	T – 75 FR 13012	76 FR 65323	9/2017
Giant Manta Ray (*Manta birostris*)	T – 83 FR 2916	-- --	-- --
Green Sturgeon (*Acipenser medirostris*) – Southern DPS	T – 71 FR 17757	74 FR 52300	2010 (Outline) 8/2018- Final
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	T – 83 FR 4153	-- --	9/2018- Outline

Species	ESA Status	Critical Habitat	Recovery Plan
Scalloped Hammerhead Shark (*Sphyrna lewini*) – Eastern Pacific DPS	E – 79 FR 38213	-- --	-- --
Sockeye Salmon (*Oncorhynchus nerka*) – Ozette Lake ESU	T – 70 FR 37160	70 FR 52630	74 FR 25706
Sockeye Salmon (*Oncorhynchus nerka*) – Snake River ESU	E – 70 FR 37160	58 FR 68543	80 FR 32365
Steelhead Trout (*Oncorhynchus mykiss*) – California Central Valley DPS	T – 71 FR 834	70 FR 52487	79 FR 42504
Steelhead Trout (*Oncorhynchus mykiss*) – Central California Coast DPS	T – 71 FR 834	70 FR 52487	81 FR 70666
Steelhead Trout (*Oncorhynchus mykiss*) – Lower Columbia River DPS	T – 71 FR 834	70 FR 52629	78 FR 41911
Steelhead Trout (*Oncorhynchus mykiss*) – Middle Columbia River DPS	T – 71 FR 834	70 FR 52629	74 FR 50165
Steelhead Trout (*Oncorhynchus mykiss*) – Northern California DPS	T – 71 FR 834	70 FR 52487	81 FR 70666
Steelhead Trout (*Oncorhynchus mykiss*) – Puget Sound DPS	T – 72 FR 26722	81 FR 9251	-- --
Steelhead Trout (*Oncorhynchus mykiss*) – Snake River Basin DPS	T – 71 FR 834	70 FR 52629	81 FR 74770 (Draft) 11-2017-Final
Steelhead Trout (*Oncorhynchus mykiss*) – South-Central California Coast DPS	T – 71 FR 834	70 FR 52487	78 FR 77430
Steelhead Trout (*Oncorhynchus mykiss*) – Southern California DPS	E – 71 FR 834	70 FR 52487	77 FR 1669
Steelhead Trout (*Oncorhynchus mykiss*) – Upper Columbia River DPS	T – 71 FR 834	70 FR 52629	72 FR 57303
Steelhead Trout (*Oncorhynchus mykiss*) – Upper Willamette River DPS	T – 71 FR 834	70 FR 52629	76 FR 52317
Yelloweye Rockfish (*Sebastes rubberimus*) – Puget Sound/Georgia Basin DPS	T – 75 FR 22276 and 82 FR 7711	79 FR 68041	81 FR 54556 (Draft) 10/2017
Marine Invertebrates			
Black Abalone (*Haliotis cracherodii*)	E – 74 FR 1937	76 FR 66805	-- --
White Abalone (*Haliotis sorenseni*)	E – 66 FR 29046	66 FR 29046 (Not Prudent)	73 FR 62257

5 POTENTIAL STRESSORS

The proposed action involves multiple activities, each of which can create stressors. Stressors are any physical, chemical, or biological entity that may directly or indirectly induce a response

either in an ESA-listed species or their designated critical habitat. During consultation, we deconstructed the proposed action to identify stressors that are reasonably certain to result from the proposed activities. These can be characterized as pollution (e.g., fuel, oil, trash), ground surveys, vessel surveys, (close approach, visual disturbance, vessel noise, vessel strikes), biological sampling (i.e., drug administration, anesthesia, marking, sample collection) capture, handling, restraint, tagging, and euthanasia. These stressors were evaluated independently to assess the effect each may have on the ESA-listed species. Those stressors which may affect but we conclude are not likely to adversely affect ESA-listed species and designated critical habitat are discussed below and are not carried forward in this consultation. Those stressors determined to likely adversely affect ESA-listed species are evaluated in detail in Section 10.1. Furthermore, the proposed action includes several conservation measures described in Section 10.2 that are designed to minimize effects that may result from these potential stressors. While we consider all of these conservation measures important and expect them to be effective in minimizing the effects of potential stressors, they do not completely eliminate the effects of identified stressors. Nevertheless, we treat them as part of the proposed action and fully consider them when evaluating the effects of the proposed action (Section 10.2).

5.1 Pollution

The operation of the research vessels permitted under the proposed research permit may result in pollution from exhaust, fuel, oil, trash, and other debris. Air and water quality are the basis of a healthy environment for all species. Emissions pollute the air, which could be harmful to air-breathing organisms and lead to ocean pollution (Chance et al. 2015; Duce et al. 1991). Emissions also cause increased greenhouse gases (carbon dioxide, methane, nitrous oxide, and other fluorinated gases) that can deplete the ozone, affect natural earth cycles, and ultimately contribute to climate change (see https://www.epa.gov/ghgemissions/overview-greenhouse-gases for additional information). The release of marine debris such as paper, plastic, wood, glass, and metal associated with vessel operations can also have adverse effects on marine species most commonly through entanglement or ingestion (Gall and Thompson 2015a). The lethal and non-lethal effects to air breathing marine animals such marine mammals, sea turtles, and birds are well documented, and marine debris is known to also adversely affects marine fishes (Gall and Thompson 2015a).

5.2 Aerial Surveys

Aerial surveys conducted under the proposed action can include various types of manned and unmanned platforms. Responses to aerial surveys consist only of behavioral responses, which vary by species and aircraft type. As outlined below in Section 6, behavioral responses to manned aerial surveys are likely more pronounced than to unmanned aerial surveys.

Manned and unmanned aerial surveys (UAS) that will be authorized under the proposed action may cause visual disturbance and/or auditory disturbance (i.e., noise) that may affect ESA-listed cetaceans, pinnipeds, sea turtles, and fishes within the action area.

5.2.1 Ground Surveys

Ground surveys, conducted by researchers on foot, would cause the stressors of visual and auditory disturbance. We expect that only Guadalupe fur seals will be exposed to the stressors associated with ground surveys. Other ESA-listed species present in the action area (e.g., whales, sea turtles, fishes, black and white abalone) would not be affected by ground surveys since these species are in the marine environment and there are no known sea turtle nesting beaches in the action area.

5.2.2 Vessel Surveys

Vessel surveys and close approaches by vessels conducted under the proposed action will expose ESA-listed cetaceans, pinnipeds, sea turtles, fishes, and marine invertebrates within the action area to vessel traffic and visual and/or auditory disturbances. The purpose of vessel surveys and close approaches is to allow researchers to conduct other research activities of the target species, Guadalupe fur seals (i.e., behavioral observations, photography and videography, biopsy sampling), and as such, expect them to be the species primarily at risk to the vessel activity stressors. The proposed action will involve the presence of vessels (and associated gear or equipment) that produce a visual disturbance that may affect ESA-listed cetaceans, pinnipeds, sea turtles, and fishes. Vessel activity will include vessel transit, which brings with it the risks of vessel strike, and visual or auditory disturbance to ESA-listed species in the action area, causing behavioral disruptions, and in the case of vessel strike, injury or mortality.

5.2.3 Directed Research Activities

The proposed action will authorize directed research activities for ESA-listed Guadalupe fur seals. These activities include capture, handling, restraint, sedation, anesthesia, drug administration, biological sampling, external temporary marking, flipper tagging, satellite tagging, and humane euthanasia. The capture, handling, restraint, and other research activities could result in stressors like injury, disruption of normal activities, stress, infection, some of which might lead to a moribund state for the individual. For those individuals, the euthanasia would result in mortality of an individual Guadalupe fur seal. Because of the nature of the directed research activities, we do not expect other ESA-listed species in the action area to be exposed to those stressors, because they are not the species targeted for research.

5.2.4 Import and Export of Parts and Salvage

We have determined the import and export of materials from ESA-listed Guadalupe fur seals will have no effect on their population in the wild and discussion of these research and enhancement activities will not be carried forward in this consultation. The salvage of carcass, parts, or tissues has the potential for live animals to be unintentionally disturbed during collection, and we expect the same responses to Guadalupe fur seals as described above for close approach. Researchers would only be collecting carcasses, parts, and tissues from Guadalupe fur seals (and other non-ESA-listed pinnipeds), so they would be the only species subject to this activity. The researchers would not be authorized to collect carcasses, parts or tissues from any other ESA-listed species.

Therefore, we conclude that effects from this stressor (import/export and salvage of carcass parts, or tissues) are insignificant and may affect but are not likely to adversely affect ESA-listed cetaceans, pinnipeds, sea turtles, fishes, and marine invertebrates, and will not be carried forward in this consultation.

6 SPECIES AND CRITICAL HABITAT NOT LIKELY TO BE ADVERSELY AFFECTED

NMFS uses two criteria to identify the ESA-listed or critical habitat that are not likely to be adversely affected by the proposed action, as well as the effects of activities that are consequences of 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 species ESA-listed in Table 7 and we summarize our results below.

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

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

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

In this section, we evaluate effects to numerous ESA-listed species and proposed or designated critical habitat that may be affected, but are not likely to be adversely affected by the proposed action. For the ESA-listed species, we focus specifically on the stressors associated with the NMFS Permits and Conservation Division's proposed action of issuance of a scientific research permit for research on ESA-listed Guadalupe fur seals and other non-listed pinnipeds and their effects on this species. The effects of other stressors associated with the proposed action, which

are also not likely to adversely affect ESA-listed species, are evaluated in Section 10.1. The species potentially occurring within the action area that may be affected, but are not likely to be adversely affected, are listed in Table 7, along with their regulatory status, proposed or designated critical habitat, and recovery plan. The stressors described above in Section 5 are detailed and evaluated here.

6.1 Pollution

Discharges from research vessels in the form of leakages of fuel or oil are possible, though effects of any spills to ESA-listed species considered in this opinion 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 species directly or pose hazards to their food sources. Given the experience of the researchers and vessel operators in conducting research and enhancement activities and maintaining research vessels in the action areas, it is unlikely that spills, leaks, 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 ESA-listed species directly. To our knowledge, none of these leakages have occurred during the MML's pinniped research activities. Therefore, we conclude that the effects on ESA-listed species that may result from this stressor (discharge) are discountable and thus vessel discharges may affect but are not likely to adversely affect ESA-listed species, and will not be carried forward in this consultation.

Furthermore, because the potential for oil or fuel leakage is extremely unlikely to occur, we find that the risk from this potential stressor is discountable. Therefore, we conclude that pollution by oil or fuel leakage is not likely to adversely affect ESA-listed species, and will not be carried forward in this consultation.

6.2 Aerial Surveys: Manned

Species 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 2009a). The underwater and sound intensity from aircraft is less than produced by waterborne vessels 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. 2008b). The sensitivity to disturbance by aircraft may also differ among species (Wursig et al. 1998a). 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. 2008b). About 14 percent of bowhead whales 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 the NMFS science centers, academic institutions, and other organizations 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. For these reasons, the effects that may result from potential stressors from manned aerial surveys on ESA-listed cetaceans are considered insignificant.

Aerial surveys may disturb the targeted species for this action, Guadalupe fur seal. However, as a condition in the permit, researchers will conduct flights over pinniped haul-outs and rookeries at a minimum elevation of 153 meters. 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. 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 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. 2012b). The NMFS MML has observed no response to aerial surveys by Western DPS of Steller sea lions, and only four and 13 percent of Beringia DPS of bearded seal and Arctic DPS of ringed seals exhibited behavioral responses (NMFS 2016). Therefore, past research and enhancement activities seem to indicate ESA-listed pinnipeds appear to show minimal response to aerial surveys. In summary, we expect ESA-listed pinnipeds to either exhibit no response to aerial surveys or exhibit mild short-term, temporary behavioral reactions but do not expect any long-term behavioral changes. Therefore, the effects that may result from exposure to potential stressors from manned aerial survey on ESA-listed pinnipeds are considered insignificant.

6.3 Aerial Surveys: Unmanned

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 marine

mammals 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 when they are flown at certain altitudes. 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's 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 cetaceans when unmanned aircraft systems were flown at a height of approximately 3.7 meters (12 feet) over the animals (NMFS 2017). 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. Fettermann et al. (2019) documented behavioral changes in bottlenose dolphins during exposure to an unmanned aircraft system, including reorientations of the pod, chin slaps, tail slaps, side floats, and spy hops. However, these behaviors were observed only when the unmanned aircraft system was flown at an altitude of 10 meters (32.8 feet) above the animals. Flying the unmanned aircraft system at altitudes of 25 meters (82 feet) or higher had no significant effect on the animals' behavior.

Unmanned aerial surveys (UAS) have been conducted over pinniped haulouts, and a variety of responses have been documented among different species to surveys conducted at different heights. Guadalupe fur seals are the only ESA-listed pinniped in the action, and although we do not have species-specific information on their responses to UAS, we do have that information for other species, and we rely on it in our analysis. Spotted (*Phoca largha*) and ribbon (*Histriophoca fasciata*) seals displayed no behavioral responses to UAS conducted at 122 meters (Moreland et al. 2015). Harbor seals at a haulout during breeding showed a variety of reactions. There was little to no reaction from seals to UAS flown at 30 meters at a frequently disturbed site, but at another more isolated haulout, some adults and pups moved into the water in reaction to UAS conducted at heights greater than 50 meters (Pomeroy et al. 2015). For gray seals (*Halichoerus grypus*) at molt, individuals exhibited reactions to UAS at altitudes less than 30 meters; these reactions included head up alerts and changes in position (Pomeroy et al. 2015). For Steller sea lions (*Eumetopias jubatus*) experiencing UAS conducted at 45 meters, there were either negligible responses or no responses (Christie et al. 2016). As a condition of the proposed action, UAS must be flown at an altitude of 150 to 250 feet (45.7 to 76.2 meters). Since the UAS will be flown at altitudes where we do not expect a reaction based on other pinniped species, we do not expect Guadalupe fur seals to be affected by the UAS.

Adult sea turtles exhibited no response to a quadcopter UAS operating at heights of 30 to 50 meters (Bevan et al. 2015). For fish species in the action area, we believe that the altitude of the UAS during surveys (greater than 45 meters) will be high enough that the species will not exhibit any response (e.g., startle, avoidance). Marine invertebrates (i.e., black and white abalone) in the action area inhabit rocky intertidal and subtidal reefs under the water, so we do not expect UAS to elicit a response.

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 can occur. Although we do not anticipate any effects to the fitness of individuals from these behavioral responses. Given the nature of these responses, we do not expect they will significantly disrupt the normal behavioral patterns of ESA-listed species including cetaceans, pinnipeds, marine reptiles, fishes, and marine invertebrates. Therefore, we conclude that this stressor (unmanned aerial surveys) is insignificant and is not likely to adversely affect ESA-listed cetaceans, pinnipeds, marine reptiles, fishes, and marine invertebrates, and will not be carried forward in this consultation.

6.4 Ground Surveys

Guadalupe fur seals have been known to stampede when they are disturbed (Aurioles-Gamboa et al. 2010). To minimize this risk, the researcher will maintain safe distances from the fur seals during observation, conducting surveys from blinds, cliff tops, and using remote cameras to remain out of sight of the animals. In addition, the researchers will wear camouflaged clothing and move slowly, approaching the animals from downwind to avoid detection.

To minimize the effects of close approach during ground surveys, the permit requires researchers to exercise caution when approaching animals and to retreat if behaviors indicate the approach may be interfering with reproduction, feeding, or other vital functions. Researchers would also apply “good practice” measures to minimize potential risks associated with the research activities.

Based on the available information, we anticipate that in most cases, there will be no response of animals to ground surveys, but in some cases, mild short-term behavioral responses could occur. Although we do not anticipate these responses will affect the fitness of individuals. Given the nature of these responses, we do not expect for them to significantly disrupt the normal behavioral patterns of ESA-listed Guadalupe fur seals. Therefore, we conclude that this stressor is insignificant, and not likely to adversely affect ESA-listed Guadalupe fur seals, and will not be carried forward in this consultation.

6.5 Vessel Surveys

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 cetaceans occur when vessels are traveling at speeds greater than approximately 18.5 km 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 (Conn and Silber 2013; Jensen and Silber 2004; Laist et al. 2001; Vanderlaan and Taggart 2007).

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 vessel strikes during research and enhancement activities are possible, we are aware of only two instances of a research vessel striking a large cetacean in thousands of hours at sea (Wiley et al. 2016). One of these vessel strikes 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). The vessel was traveling at 10.6 km 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 km per hour (10 knots) restrictions that were active at the time within the area for larger vessels (greater than 19.8 meters [65 feet]). Six marine mammal observers were on the lookout when the mate spotted a large cetacean. The North Atlantic right whale exhibited minor bleeding from seven to eight lacerations on the tip of its left tail fluke, which follow up photographs show eventually healed with the tip of the fluke falling off. 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 vessel strike and the animal appearing to be healthy (Wiley et al. 2016).

There was another instance of a NOAA Office of Coast Survey contractor vessel striking and killing a blue whale off the coast of California occurred in October 2009. This event involved the R/V *Pacific Star* (161 feet [49 meters], 295 tons [267.6 metric tons]) traveling at 5.5 knots. There was no observer present on the ship. Later, the State of California analyzed the event and concluded that since the whale suddenly surfaced beneath the hull, the collision was unavoidable. It was determined that the propeller severed the whale's vertebrate (Peters 2009).

The R/V *Auk* and R/V *Pacific Star* vessel strike incidents are 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 the R/V *Auk* incident, there were six dedicated marine mammal observers, but no indication of the animal's presence prior to the initial sighting within 9 meters (29.5 feet) of the vessel by the mate. Both vessel strike incidents occurred with much larger vessels than will be used in the proposed action (16 and 40 feet [4.9 and 12.2 meters]). We consider this event extremely rare given that only two instances of research vessel strikes for cetaceans have ever been reported over the years of research and enhancement activities similar to the proposed action under ESA/MMPA permits (Wiley et al. 2016).

The likelihood of vessel strikes of sea turtles is expected to be extremely unlikely given that researchers 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 surface for air, or which are basking, or feeding at the surface.

On October 5, 2018, we received a report of an incident involving a vessel strike of an olive ridley turtle in Hawaii during cetacean research activities under a scientific research permit (Permit No. 20605). To our knowledge, this was the first report and only incident in the history of the cetacean research permitting program of a researcher striking a sea turtle with a research vessel during cetacean research and enhancement activities.

We do not expect the vessel to run aground, or otherwise damage black or white abalone habitats, and we expect that ESA-listed fishes will be able to move away rapidly from the vessel, avoiding strike. Thus, we do not expect ESA-listed fishes or marine invertebrates to be exposed to the stressor of vessel strike

We generally expect the movement of ESA-listed species including marine mammals to be away from or parallel to the research vessels, as well as the generally slow movement of the research vessels during most of its travels. Also, the researchers have not documented any vessel strikes on ESA-listed marine mammals during research and enhancement activities. Given the rarity of vessel strikes of large cetaceans during research and enhancement activities from historical data, the extensive experience of researchers at the NMFS science centers, academic institutions, and other organizations have in spotting cetaceans at sea and the fact that the researchers have not struck a large cetacean during past research and enhancement activities, and the slow speeds (generally 18 km per hour [10 knots]) at which they will operate when near animals, we believe the likelihood of a vessel strike on cetaceans 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 that may result from vessel strike are discountable.

Numerous studies of interactions between surface vessels and marine mammals have demonstrated that free-ranging marine mammals engage in avoidance behavior when surface vessels move toward them. It is not clear whether these responses are caused by the physical presence of a surface vessel, the underwater noise generated by the vessel, or an interaction between the two (Amaral and Carlson 2005; Au and Green 2000; Bain et al. 2006; Bauer 1986; Bejder et al. 1999; Bejder and Lusseau. 2008; Bejder et al. 2009; Bryant et al. 1984; Corkeron 1995; Erbe 2002; Félix 2001; Goodwin and Cotton 2004; Lemon et al. 2006; Lusseau 2003; Lusseau 2006; Magalhaes et al. 2002; Nowacek et al. 2001; Richter et al. 2003; Scheidat et al. 2004; Simmonds 2005; Watkins 1986; Williams et al. 2002; Wursig et al. 1998b). However, several authors suggest that the noise generated during motion is probably an important factor (Blane and Jaakson 1994b; Evans et al. 1992; Evans et al. 1994). These studies suggest that the behavioral responses of marine mammals to surface vessels are similar to their behavioral responses to predators.

The only ESA-listed species that will be deliberately approached by a vessel would be Guadalupe fur seals during vessel surveys and remote sampling. Other ESA-listed whales or sea turtles might be present during those activities, but researchers will avoid these species and the permit conditions require it. Photography and videography will occur during vessel surveys as mentioned in the proposed action and may affect ESA-listed species within the action area. Potential stressors associated with photography and videography include close approaches during vessel, ground, and aerial surveys (described above). Researchers typically observe Guadalupe fur seals during vessel surveys at distances of 50 to 100 meters (164 to 328.1 feet) from small research vessels. The operation of a remote camera system (placed during ground surveys) would not impact Guadalupe fur seals, or any other ESA-listed species present. Photography would be used during the aerial surveys, but the impacts would come from the UAS or aircraft used during the survey, not the photography itself, and the effects of aerial surveys are discussed above. Simply taking an animal's photograph or video is not expected to present any unique stressors that will cause additional responses.

Researchers at the NMFS science centers, academic institutions, and other organizations have years of experience approaching pinnipeds in a way that is designed to minimize disturbance and associated responses. Researchers will be constantly watching for marine mammals, and thus, if non-target ESA-listed cetaceans, pinnipeds, or sea turtles 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 cetacean, pinniped, or sea turtle species from a distance. No long-term effects on behavior or fitness from disturbances caused by close approaches by research vessels have been documented by researchers at the NMFS science centers, academic institutions, and other organizations and more generally in the literature. Based on accounts from past research and enhancement activities, responses documented in the literature, and the proposed research method for closely approaching pinnipeds 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 to have fitness consequences for individual Guadalupe fur seals.

The impact of vessel surveys on ESA-listed pinnipeds, marine reptiles, fishes, marine invertebrates, is insignificant and/or discountable based on information presented above. Any disturbance to ESA-listed pinnipeds, marine reptiles, fishes, sea turtles, or marine invertebrates that may result from this stressor (close approaches for research and enhancement activities, biopsy sampling, and tagging) are insignificant.

6.5.1.1 Visual and Auditory Disturbance from Vessels

Research vessels associated with the proposed action may cause visual disturbances to ESA-listed species that spend time near the surface, such as marine mammals, sea turtles, and fishes, which may generally disrupt their behavior. Studies have shown that vessel operation can result

in changes in the behavior of marine mammals, sea turtles, and fishes (Hazel et al. 2007; Holt et al. 2009; Luksenburg and Parsons 2009b; Noren et al. 2009; Patenaude et al. 2002; Richter et al. 2003; Smultea et al. 2008a). In many cases, particularly when responses are observed at great distances, it is thought that animals are likely responding to sound more than the visual presence of vessels (Blane and Jaakson 1994a; Evans et al. 1992; Evans et al. 1994). Nonetheless, it is generally not possible to distinguish responses to the visual presence of vessels from those to the sounds associated with those vessels. Moreover, at close distances animals may not even differentiate between visual and acoustic disturbances created by vessels and simply respond to the combined disturbance.

Assessing whether sounds produced by vessels may adversely affect ESA-listed species involves understanding the characteristics of the active acoustic sources, the species that may be present in the vicinity of the sound, and the effects that sound may have on the physiology and behavior of those species. Although it is known that sound is important for marine mammal communication, navigation, and foraging (NRC 2003b; NRC 2005), there are many unknowns in assessing impacts of sound, such as the potential interaction of different effects and the significance of responses by marine mammals to sound exposures (Nowacek et al. 2007; Southall et al. 2007). Other ESA-listed species such as such as sea turtles are often considered less sensitive to anthropogenic sound, but given that much less is known about how they use sound, the impacts of anthropogenic sound are difficult to assess (Nelms et al. 2016; Popper et al. 2014). Nonetheless, depending on the circumstances exposure to anthropogenic sounds may result in auditory injury, changes in hearing ability, masking of important sounds, behavioral responses, as well as other physical and physiological responses.

Research vessels may cause auditory disturbance to ESA-listed species and more generally can disrupt their behavior. In addition to the active acoustic sound sources mentioned above, we expect that any research vessel permitted under the proposed action will add to the local noise environment in the action area due to the research vessel's propulsion and other noise characteristics of the research vessel's machinery.

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 2009a; 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 from vessel noise exposure are insignificant.

Very little research exists on sea turtle responses to vessel noise disturbance. Currently, there is nothing in the available literature specifically aimed at studying and quantifying sea turtle response to vessel noise. However, a study examining vessel strike risk to green sea turtles suggests that sea turtles may habituate to vessel sound and may be more likely to respond to the sight of a vessel rather than the sound of a vessel, although both may play a role in prompting reactions (Hazel et al. 2007). Regardless of the specific stressor associated with vessels to which turtles are responding, they only appear to show responses (i.e., avoidance behavior) at approximately 10 meters (32.8 feet) or closer (Hazel et al. 2007). Therefore, the noise from research vessels is not likely to affect sea turtles from further distances, and disturbance may only occur if a sea turtle hears a vessel nearby or sees it as it approaches. These responses appear limited to non-injurious, minor changes in behavior based on the limited information available on sea turtle response to vessel noise.

All fishes can detect vessel noise due to its low-frequency content and their hearing capabilities. Therefore, ESA-listed fishes could be exposed to a range of vessel noises, depending on the source and context of the exposure. Because of the characteristics of vessel noise, the continuous, low-frequency sound produced from research vessels are unlikely to result in direct injury, hearing impairment, or other trauma to fishes. Plus, in the near field, fish are able to detect water motion as well as visually locate an oncoming vessel. In these cases, most fishes located in close proximity that detect the research vessels either visually, via sound and motion in the water will be capable of avoiding the research vessel or move away from the area affected by vessel sound. Thus, fish are more likely to react to vessel noise at close range than to vessel noise emanating from a greater distance away. These reactions may include physiological stress responses, or avoidance behaviors, which could result in fitness consequences.

The contribution of vessel noise by any research vessel is likely small in the overall regional sound field. Any research vessels passage past a cetacean, pinniped, sea turtle, fish, or marine invertebrate will be brief and not likely to be significant in impacting 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 vessels, either as a result of engine noise, the physical presence of the vessel, or both (Lusseau 2006; Mitson and Knudsen 2003). Also, as stated sea turtles are most likely to habituate and are shown to be less effected by vessel noise at distances greater than 10 m (32.8 feet) (Hazel et al. 2007). In addition, during operations the research vessels will be traveling at slow speeds, reducing the amount of noise produced by the propulsions system and the probability of a vessel strike for marine mammals (Kite-Powell et al. 2007; Vanderlaan and Taggart 2007). The distance between the

research vessel and observed marine mammals, per avoidance protocols, will also minimize the potential for acoustic disturbance from engine noise.

Because the potential acoustic interference from engine noise will be undetectable or so minor that it cannot be meaningfully evaluated, we find that the risk from this potential stressor is insignificant. Therefore, we conclude that acoustic interference from sound sources and/or engine noise may affect, but are not likely to adversely affect ESA-listed cetaceans, pinnipeds, sea turtles and fishes and will not be carried forward in this consultation.

6.5.1.2 Behavioral Disturbances

Observation of Guadalupe fur seals will occur during vessel surveys in the proposed action and may affect ESA-listed cetaceans within the action area. Behavioral observations are used to increase the understanding of Guadalupe fur seal ecology and behavior, as well as provide insight on the effects of anthropogenic disturbance on cetaceans. Behavioral observations will occur concurrently with other research and enhancement activities including aerial surveys, vessel surveys, 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. This extended duration may increase the likelihood an individual will respond to the research vessel's close proximity. However, as detailed in Section 3.2.2 most of the time the research vessel will be at distances no closer than approximately 50 meters (164 feet) for shore-based surveys from a vessel, and 100 meters (300 feet) for at-sea vessel surveys. During these surveys, the objective is to count and observe the Guadalupe fur seals (and other pinnipeds, so in order to get accurate counts, the researchers would minimize disturbing the pinnipeds to the maximum extent possible. Thus, given the far distances from which most observation will occur, and the motivation of the researchers to minimize disturbing pinnipeds during observations, we expect no effects on fitness as the result of observations.

As stated in the biological assessment and conditioned by the permit, the researchers would purposefully not approach or pursue any non-target ESA-listed species during vessel surveys. If another ESA-listed species was sighted (e.g., whale, sea turtle, etc.), researchers would stop research activities and would move to another area or wait until the non-target species have left the area. The effects that may result from potential stressors from behavioral observation are considered insignificant. Therefore, we conclude that this stressor (behavioral observation) may affect, but are not likely to adversely affect ESA-listed cetaceans, pinnipeds, sea turtles, fishes, or marine invertebrates, and will not be carried forward in this consultation.

6.6 Endangered Species Act –Listed Cetaceans

Researchers will not purposefully approach or pursue ESA-listed cetaceans if encountered and will stop research and enhancement activities and move to another area or wait until they have left the area if any of these ESA-listed cetacean species are observed.

In summary, the ESA-listed blue whales, fin whales, Central America and Mexico humpback whales, Southern Resident killer whales, North Pacific right whales, sei whales, and sperm whales in Table 7 are not likely to be adversely affected by the proposed action. No directed takes of these species are considered under the proposed action. As described above, a suite of stressors created by the proposed action were determined to not likely to adversely affect ESA-listed species because the effects would be insignificant or discountable. We conclude that the proposed action is not likely to adversely affect ESA-listed cetaceans. As a result, these species will not be considered further in this consultation.

6.7 Endangered Species Act–Listed Sea Turtles

The proposed action spatially and temporally overlaps with ESA-listed sea turtles species and/or DPSs (see Table 7), including Central North Pacific DPS of green turtle, hawksbill turtle, Kemp's ridley turtle, leatherback turtle, North Pacific Ocean DPS of loggerhead turtle, and Mexico's Pacific Coast breeding colonies as well as all other areas of olive ridley turtle. As part of the proposed research permit for activities directed at Guadalupe fur seals, ESA-listed marine sea turtles may occasionally be present with targeted species. Research activities that would take place in the water or air have the potential to disturb marine reptiles, and include aerial (manned and unmanned) surveys, and vessel surveys. There are no known nesting beaches within the action area for any sea turtle species, so none of the terrestrial activities proposed under the permit would affect sea turtles. Researchers will not purposely approach or pursue these ESA-listed sea turtles if encountered and will stop research and enhancement activities and move to another area or wait until they have left the area if any of these ESA-listed sea turtles are observed. During vessel and aerial surveys, researchers will constantly be on the lookout for Guadalupe fur seals (and other pinnipeds) and thus be able to spot sea turtles at a distance (approximately 100 to 200 meters, Epperly 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, the researchers will exercise caution and remain a safe distance from the animal(s), as described in the permit applications and conditioned by the permit (see Section 18, Appendix A). Precautionary steps may include stopping research activities, moving to another area, or waiting until the sea turtle has left the area. In the event a marine reptile 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.

Sea turtles will not be subject to any of the proposed research activities that are likely to affect Guadalupe fur seals. We conclude that the proposed action is not likely to adversely affect ESA-listed sea turtles. As a result, these species or DPSs will not be considered further in this consultation.

6.8 Endangered Species Act–Listed Fishes

The proposed action spatially and temporally overlaps with numerous ESA-listed fish species, DPSs, and ESUs of elasmobranchs and bony fishes (see Table 7).

Under the proposed research permit, non-target ESA-listed fishes may occasionally be present with targeted Guadalupe fur seal. Research activities that have the potential to disturb fishes include aerial (manned and unmanned) surveys, and vessel surveys. However, the vast majority of fishes do not show strong responses to low frequency sound. Researchers will not purposefully approach or pursue these ESA-listed fishes if encountered and will stop research and enhancement activities and move to another area if any of these ESA-listed fishes are observed.

As discussed for previous species, ESA-listed fishes will not be subject to any of the activities that are likely to adversely affect other ESA-listed species. We conclude that the proposed action is not likely to adversely affect ESA-listed fishes. As a result, these species, DPSs, and ESUs will not be considered further in this consultation.

6.9 Endangered Species Act–Marine Invertebrates

Under the proposed action, ESA-listed marine invertebrates like white and black abalone may occasionally be present in areas inhabited by Guadalupe fur seals. Research activities that have the potential to disturb marine invertebrates include vessel surveys. However, the possibility of these interactions is considered remote because the proposed research activities are directed at Guadalupe fur seals at the water surface, and thus the proposed action will not adversely affect the benthic habitat or area of the water column where these species generally occur.

ESA-listed black abalone and white abalone will not be subject to any of the activities that are likely to affect ESA-listed species. We conclude that the proposed action is not likely to adversely affect white or black abalone. As a result, these species will not be considered further in this consultation.

6.10 Proposed or Designated Critical Habitat

The proposed action will take place within the exclusive economic zone of U.S. waters along the U.S. West Coast, and in the waters of Washington, Oregon, and California. The action area includes proposed or designated critical habitat for multiple ESA-listed species.

6.10.1 Humpback Whale—Central America and Mexico Distinct Population Segment Proposed Critical Habitat

On October 9, 2019, NMFS proposed critical habitat for three distinct population segments of humpback whale on the U.S. West Coast: Central America, Mexico, and Western North Pacific DPSs. The proposed critical habitat for the Western North Pacific DPS is exclusively in the waters of Alaska, outside of the action area for the proposed action. As such, it will not be discussed here.

The essential feature for both the Mexico and Central America DPS critical habitat is prey species, primarily euphausiids and small pelagic schooling fishes of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth.

For the Central America DPS, the proposed critical habitat includes marine waters in Washington, Oregon, and California (Figure 2). In Washington, the proposed critical habitat boundaries are the nearshore boundary is defined by the 50-meter isobath, and the offshore boundary is defined by the 1,200-meter isobath relative to mean lower low water. Critical habitat also includes waters within the U.S. portion of the Strait of Juan de Fuca to an eastern boundary line at Angeles Point at 123°33′ W. In Oregon, the proposed critical habitat boundaries are the nearshore boundary is defined by the 50-meter isobath. The offshore boundary is defined by the 1,200-meter isobath relative to mean lower low water; except, in areas off Oregon south of 42°10′, the offshore boundary is defined by the 2,000-meter isobath. For proposed critical habitat in California, the nearshore boundary is defined by the 50-meter isobath relative to mean low lower water except, from 38°40′ N to 36°00′ N, the nearshore boundary is defined by the 15-meter isobath relative to mean lower low water; and from 36°00′ N to 34°30′ N, the nearshore boundary is defined by the 30-meter isobath relative to mean low lower water. North of 40°20′ N, the offshore boundary of the critical habitat is defined by a line corresponding to the 2,000-meter isobath, and from 40°20′ N to 38°40′ N, the offshore boundary is defined by the 3,000-meter isobath. From 38°40′ N southward, the remaining areas have an offshore boundary defined by a line corresponding to the 3,700-meter isobath.

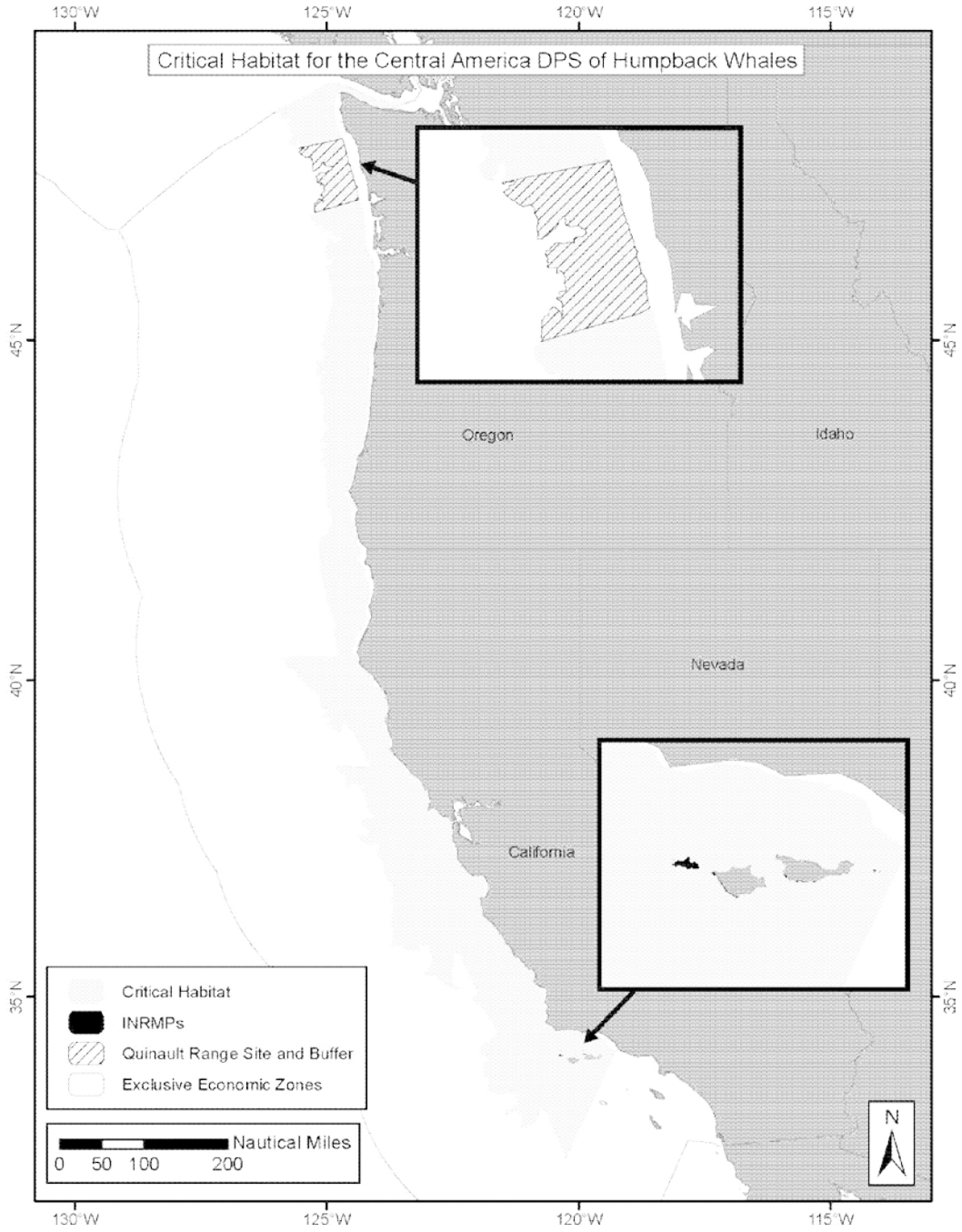

Figure 2. Proposed critical habitat for the Central America distinct population segment of humpback whales.

For the Mexico DPS, the proposed critical habitat includes marine waters in Washington, Oregon, California, and Alaska (Figure 3).

In Washington, the nearshore boundary is defined by the 50-meter isobath, and the offshore boundary is defined by the 1,200-meter isobath relative to mean lower low water. Critical habitat also includes waters within the U.S. portion of the Strait of Juan de Fuca to an eastern boundary line at Angeles Point at 123°33′ W.

In Oregon, the nearshore boundary is defined by the 50-meter isobath. The offshore boundary is defined by the 1,200-meter isobath relative to mean lower low water; except, in areas off Oregon south of 42°10′, the offshore boundary is defined by the 2,000-meter isobath.

In California, the nearshore boundary is defined by the 50-meter isobath relative to mean lower low water except, from 38°40′ N to 36°00′ N, the nearshore boundary is defined by the 15-meter isobath relative to mean lower low water; and from 36°00′ N to 34°30′ N, the nearshore boundary is defined by the 30-meter isobath relative to mean lower low water. North of 40°20′ N, the offshore boundary of the critical habitat is defined by a line corresponding to the 2,000-meter isobath, and from 40°20′ N to 38°40′ N, the offshore boundary is defined by the 3,000-meter isobath. From 38°40′ N southward, the remaining areas have an offshore boundary defined by a line corresponding to the 3,700-meter isobath.

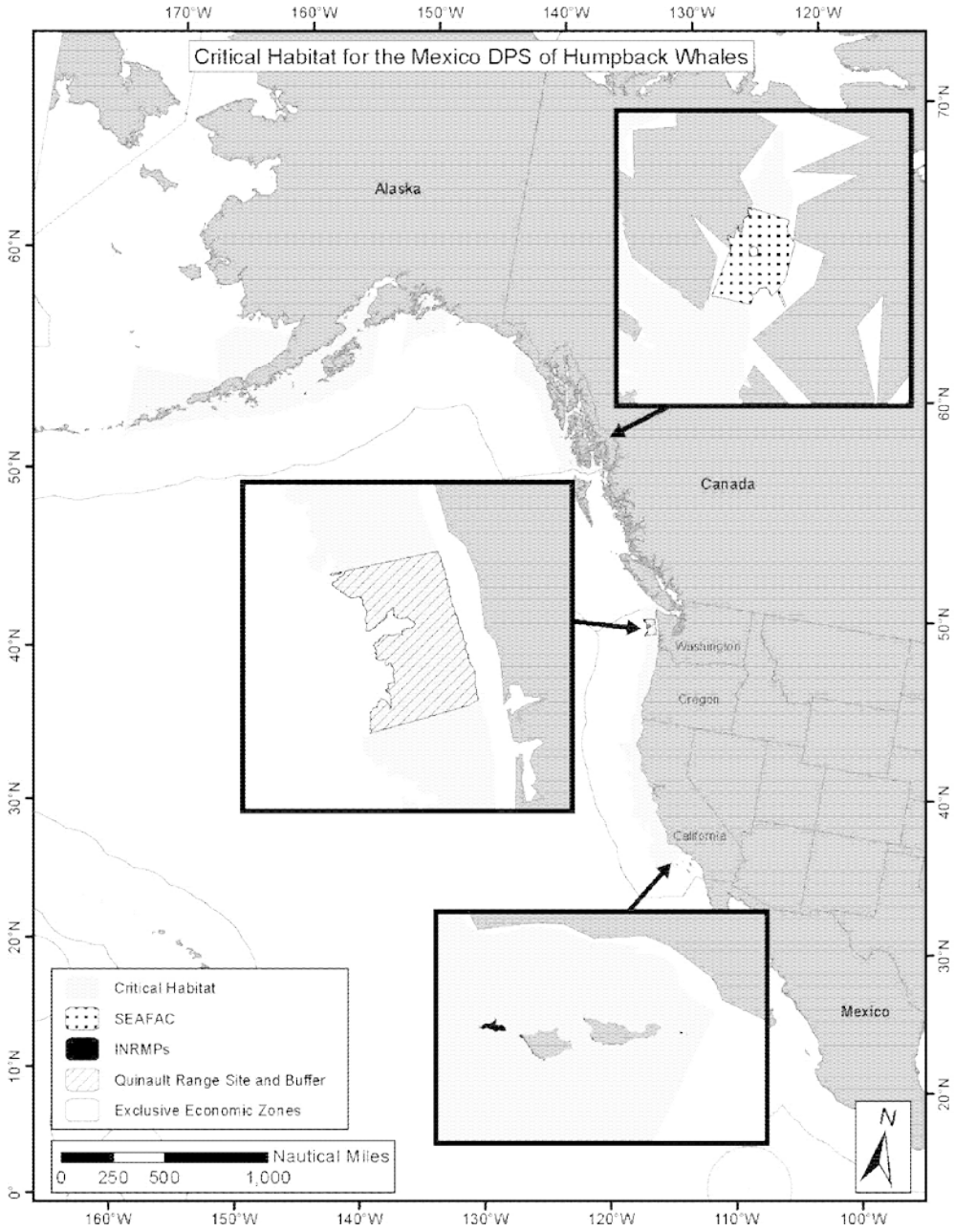

Figure 3. Proposed critical habitat for Mexico distinct population segment of humpback whales.

The proposed action would be targeted research for Guadalupe fur seals, and would not involve any in-water activities that might affect prey availability for humpback whales. The vessels would only be transiting through the proposed critical habitat, or conducting surveys in it. As outlined in Section 6.1, any fuel discharge or pollution coming from the research vessel is expected to be minor, and thus not expected to rise to a level that would significantly impact prey species. Therefore, we conclude that the effects of the action on the proposed Central America

and Mexico DPS humpback whale critical habitat are insignificant, and not likely to be adversely affected. It will not be considered further in this opinion.

6.10.2 Killer Whale – Southern Resident Distinct Population Segment Proposed 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 4), which comprise approximately 6,630 km^2 (1,933 square nautical miles) of marine habitat (Figure 4).

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.

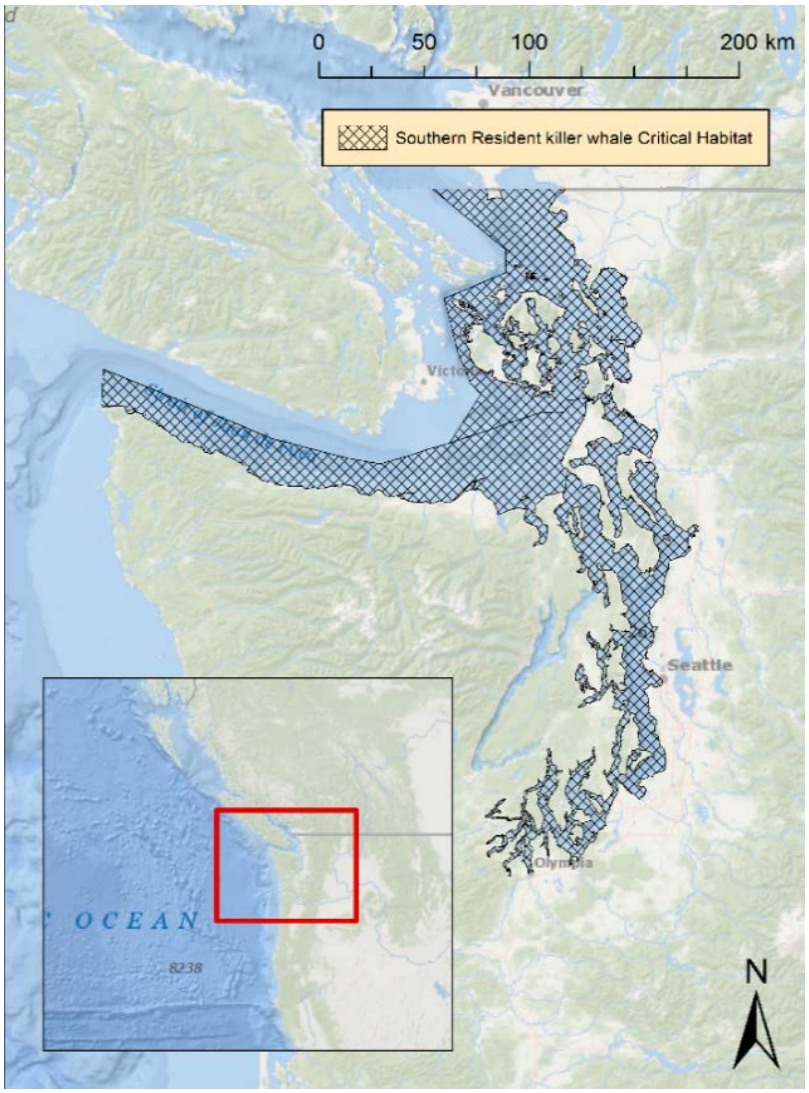

Figure 4. Map identifying designated critical habitat for the endangered Southern Resident distinct population segment of killer whale.

On September 19, 2019, NMFS proposed to revise the critical habitat designation for Southern Resident killer whales by expanding it to include six new areas along the U.S. West Coast, while keeping the current designated critical habitat area in Washington (Figure 5). The proposed new areas along the U.S. West Coast include roughly 15,626 square miles of marine waters between the 6.1-meter depth contour and the 200-meter depth contour from the U.S. international border with Canada south to Point Sur, California.

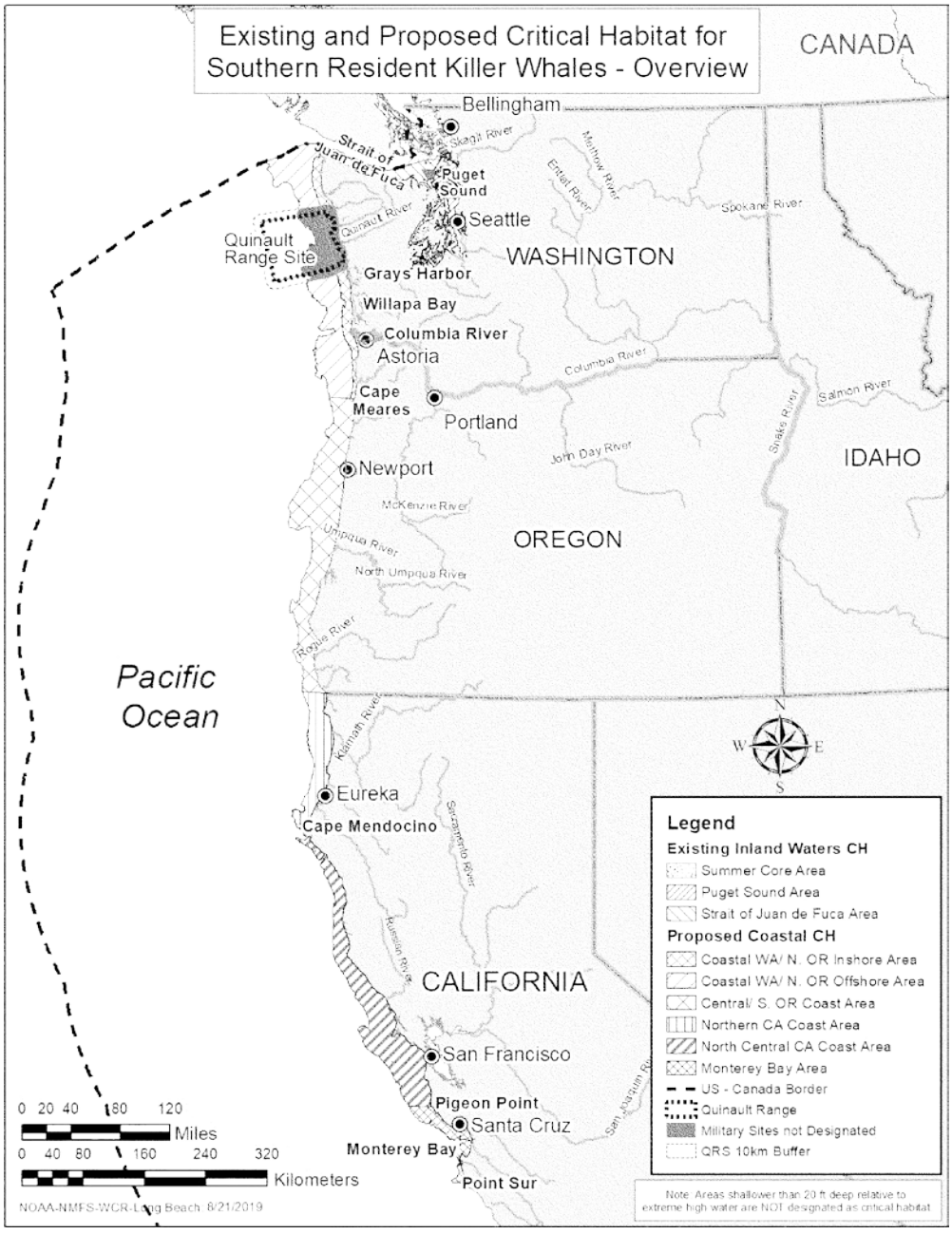

Figure 5. Existing and proposed critical habitat for Southern Resident killer whales.

The essential features for the conservation of Southern Resident killer whales are the following:

(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) Passage conditions to allow for migration, resting, and foraging.

The proposed permit would authorize activities in the currently designated and proposed critical habitat areas of the Southern Resident killer whale DPS, but the research is not expected to adversely affect any of the physical, chemical, or biotic features that form the critical habitat. The proposed activities are targeted at Guadalupe fur seals, and will not remove any fish from the environment. Thus, it would not adversely affect the population ecology or population dynamics of Southern Resident killer whale prey species and, therefore, are not expected to affect prey quality, quantity, or availability. The vessels would only transit through proposed or designated critical habitat for brief periods of time, and as discussed in Section 6.1, we do believe that any vessel fuel discharge or pollution that might occur would be very minor. Any effects on water quality or passage conditions are expected to be insignificant. As a result, the proposed activities are not likely to adversely affect the conservation value of the designated or proposed critical habitat for Sothern Resident killer whale, or result in its destruction or adverse modification. Southern Resident killer whale designated and proposed critical habitat is not addressed further in this opinion.

6.10.3 Steller Sea Lion – Western Distinct Population Segment Critical Habitat

In 1997, NMFS designated critical habitat for the Steller sea lion. The Steller sea lion eastern DPS was delisted on November 4, 2013 (78 FR 66139); therefore this DPS will not be considered in this Opinion. However, this change in listing status does not affect the designated critical habitat for Steller sea lions (58 FR 45269), because "removing the eastern DPS from the List of Endangered and Threatened Wildlife does not remove or modify that designation" (78 FR 66162). Steller sea lion designated critical habitat remains in place until a separate rulemaking amends the designation.

The critical habitat includes specific rookeries, haulouts, and associated areas, as well as three foraging areas that are considered to be essential for the health, continued survival, and recovery of the species. The three areas of Steller sea lion critical habitat are located in Alaska, Oregon and California; only the critical habitat areas in Oregon and California fall within the action area. Within the action area, CH is located on islands off the coast of Oregon (Long Brown and Seal Rocks, and Pyramid Rock), and California (Sugarloaf Island, Cape Mendocino, and Southeast Farallon Island).

In California and Oregon, major Steller sea lion rookeries and associated air and aquatic zones are designated as critical habitat. Critical habitat includes an air zone extending 3,000 feet (0.9 km) above rookery areas historically occupied by sea lions. Critical habitat also includes an aquatic zone extending 3,000 feet (0.9 km) seaward. 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).

The proposed research activities would be directed at Guadalupe fur seals and would not affect commercial fishing activities or prey concentrations. Research activities taking place on land would not alter the terrestrial habitat the rookeries rely upon, and the associated boating activities would not alter the nearshore waters surrounding rookeries and haulouts. Aerial surveys will not come into contact with the waters of the critical habitat. The aerial surveys will not enter the air zone of the Steller sea lion critical habitat. As per the permit conditions, the manned aerial surveys will be flown at altitudes of 500 feet or greater, outside the zone designated as critical habitat for Steller sea lions. Therefore, the proposed action is expected to have no effect on designated critical habitat for Steller sea lions and will not be discussed further in this opinion.

6.10.4 Pacific Salmonid Critical Habitat

There are six species of Pacific salmon and steelhead comprising several ESUs and DPSs (n=28) that have designated critical habitat within the action area, in Washington, Oregon, and California (Table 7; Figure 6).

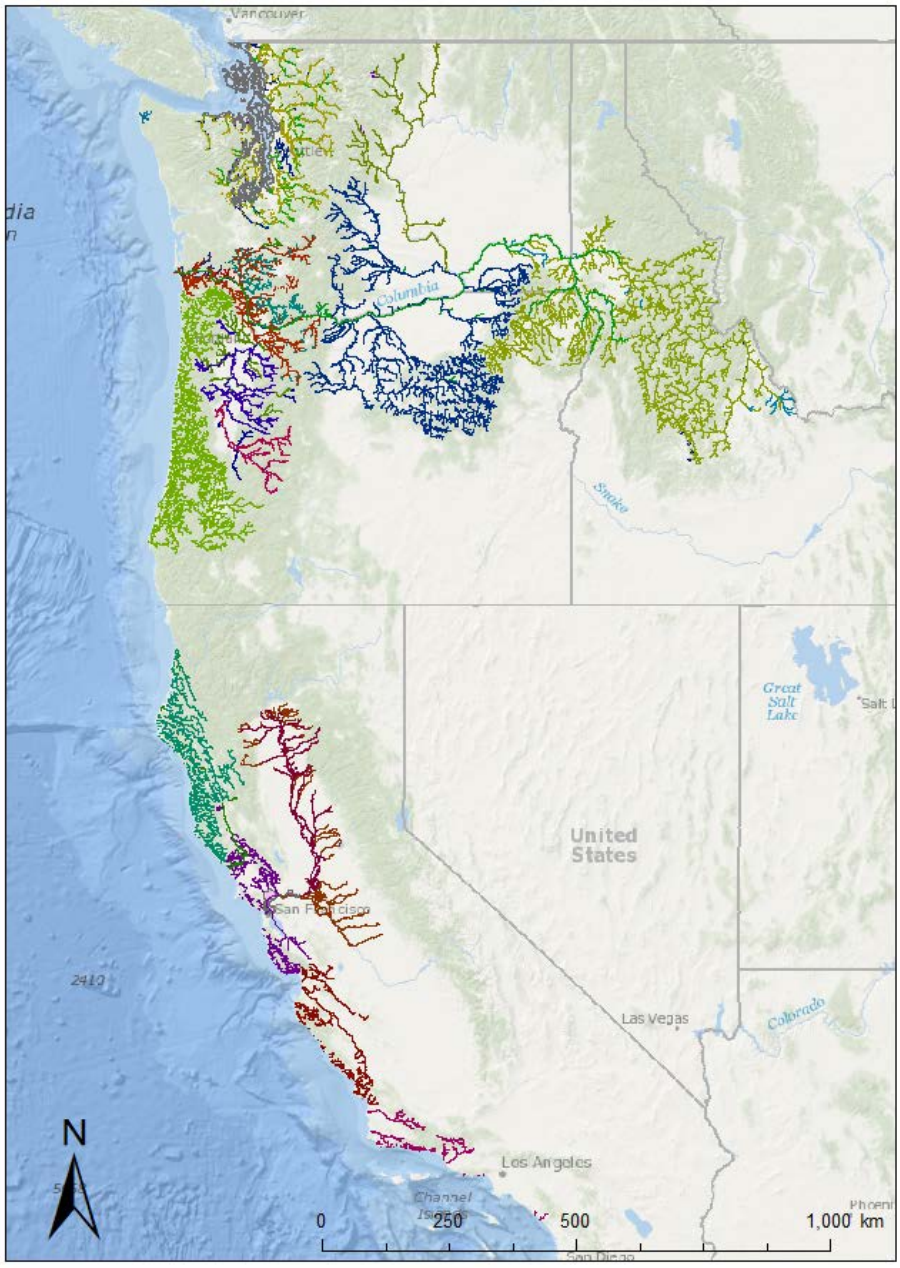

Figure 6. Map identifying designated critical habitat for all of the threatened and endangered distinct population segments and evolutionarily significant units of Pacific salmon and steelhead.

The designated critical habitat for all Pacific salmon species includes locations and physical and biological features necessary to support one or more life stages. These areas are important for the species' overall conservation by protecting quality growth, reproduction, and feeding. The physical and biological features essential to Pacific salmon critical habitat include:

- Freshwater spawning sites with water quantity and quality conditions and substrate that support spawning, incubation, and larval development;

- Freshwater rearing sites with (1) water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility, (2) water quality and forage that support juvenile development, and (3) natural cover such as shade, submerged and overhanging large wood, logjams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;

- Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks that support juvenile and adult mobility and survival;

- Estuarine areas free of obstruction and excessive predation with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation;

- Nearshore marine areas free of obstruction and excessive predation with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and

- Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

The proposed activity involves boating, vessel surveys, aerial surveys, observation and incidental disturbance, capture and sampling of Guadalupe fur seals. For the most part, the activities will take place in the marine environment, or on haulout beaches, but the researchers may transit through the designated critical habitat of the Pacific salmon described above. The researchers may transit through the estuarine, offshore, and nearshore marine areas, but will not be conducting any activity that causes obstruction of fish passage, since the vessel will be at the water's surface. Researchers will not alter any natural cover, vegetation, or channel features. The vessel transit is not expected to cause any consequential or substantive changes to water quality or quantity; as described in Section 6.1, any vessel fuel leakage, discharge, or other pollution would be insignificant.

Due to the very brief and limited contact the proposed action would have in the designated critical habitats, the proposed research would not alter any physical habitat, impair water quality, or in any other way adversely affect designated critical habitat for any listed Pacific salmon identified above and will not be considered further in this opinion.

6.10.5 Leatherback Sea Turtle Critical Habitat

In 2012, NMFS revised designated critical habitat for the leatherback turtle by designating additional areas within the Pacific Ocean. This designation includes approximately 43,798 km^2 (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 km^2 (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 km^2 (41,914 square miles) of marine habitat and include waters from the ocean surface down to a maximum depth of 80 meters (262 feet) (Figure 7).

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).

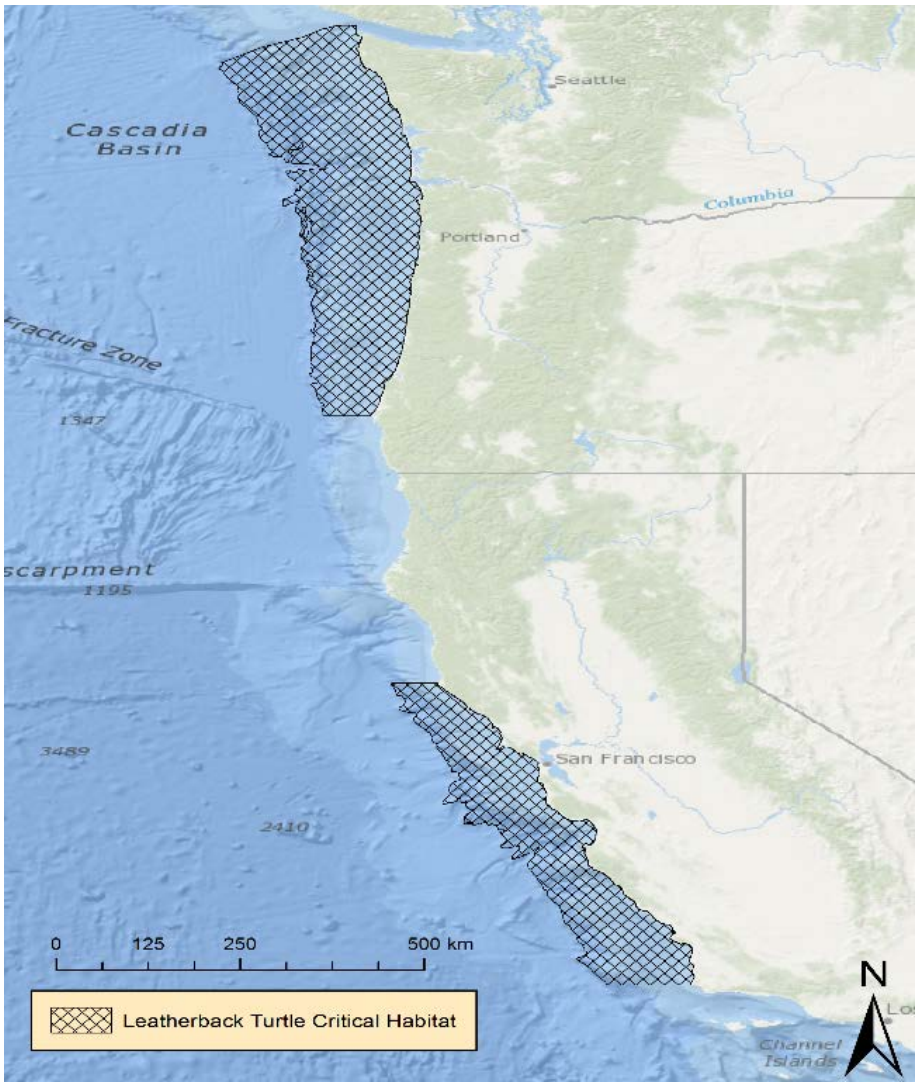

Figure 7. Map identifying designated critical habitat for the endangered leatherback turtle along the United States Pacific Coast.

The proposed permit would authorize activities in critical habitat areas for leatherback sea turtles, but the research is focused on Guadalupe fur seals and is not expected to adversely affect any aspect of prey availability that forms the physical and biological feature for the critical habitat. As such, the proposed action is expected to have no effect on designated critical habitat for leatherback sea turtle and will not be discussed further in this opinion.

6.10.6 Green Sturgeon—Southern Distinct Population Segment Critical Habitat

In 2009, NMFS designated critical habitat for the Southern DPS of green sturgeon. Specific areas include coastal U.S. marine waters within 109.7 meter (359.9 feet) depth from Monterey Bay, California (including Monterey Bay), north to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its U.S. boundary; the Sacramento River, lower Feather River, and lower Yuba River in California; the Sacramento-San Joaquin Delta and Suisun, San Pablo, and

San Francisco bays in California; the lower Columbia River estuary; and certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor). NMFS designated approximately 515 km (320 miles) of freshwater river habitat, 2,323 km^2 (11,421 square miles) of marine habitat, 784 km (487 miles) of habitat within the Yolo and Sutter bypasses (Sacramento River, California) as critical habitat for Southern DPS of green sturgeon (Figure 8).

The physical and biological features essential for Southern DPS of green sturgeon include freshwater riverine systems, estuarine habitats, and nearshore coastal marine areas that provide sufficient food resources, substrate type suitable for egg deposition, and development, water flow, water quality, migratory corridors, depth (greater than or equal to 5 meters [16.4 feet]), and sediment quality.

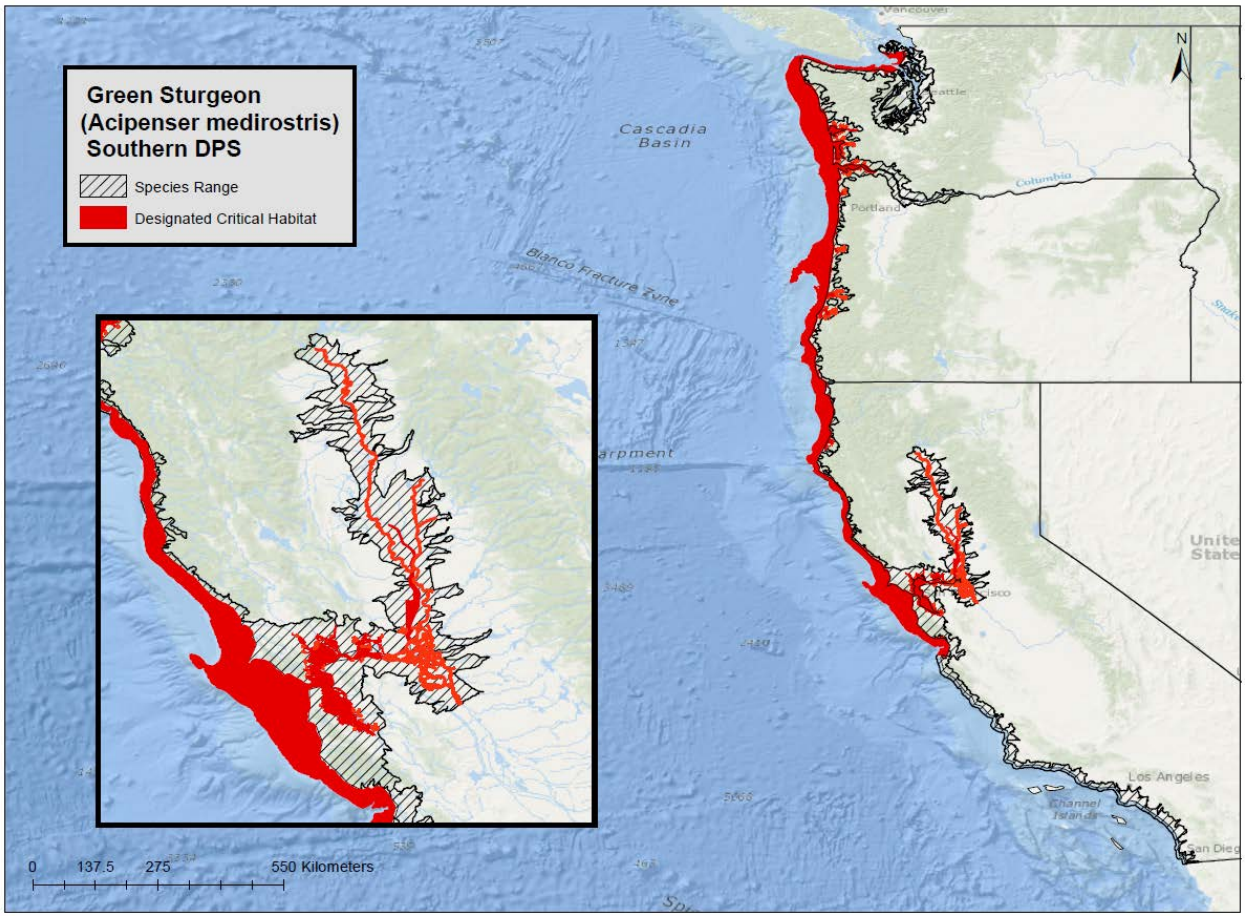

Figure 8. Map of geographic range (within the contiguous U.S.) and designated critical habitat for the threatened Southern distinct population segment of green sturgeon.

The proposed activity involves boating, vessel and aerial surveys, observation and incidental disturbance, capture and sampling directed at Guadalupe fur seals, which would not alter any of the physical and biological features for Southern DPS green sturgeon. The researchers would be

transiting through and conducting vessel surveys in areas of designated critical habitat, and these activities would not involve any in-water actions that might alter substrate, water flow or depth. Any possible impacts from pollution on water quality are expected to be minor (Section 6.1) and insignificant, and the vessel activity will take place at the water surface, where it will not impede green sturgeon migratory abilities. There will be no aspect of the research that removes fish or other prey from the environment, so food resources for green sturgeon will not be affected. The proposed action would not adversely affect designated critical habitat for Southern DPS green sturgeon, and is not considered further in this opinion.

6.10.7 Rockfish – Bocaccio and Yelloweye Rockfish – Puget Sound/Georgia Basin Distinct Population Segment Critical Habitat

In 2014, NMFS designated critical habitat for the Puget Sound/Georgia Basin DPS of bocaccio, canary rockfish, and yelloweye rockfish (79 FR 68041). The critical habitat designation was updated in 2017 when canary rockfish were delisted (82 FR 7711). The specific areas designated for bocaccio include approximately 3,068.5 km^2 (1,184.75 square miles) of marine habitat in Puget Sound, Washington. Designated habitat was divided into two units – nearshore, to support juveniles, and deeper, rocky habitat for adults (Figure 9).

Physical and biological features essential for adult bocaccio and yelloweye rockfish (greater than 30 meters [98.4 feet] deep) include sufficient prey resources, water quality, and rocks or highly rugose habitat. For juvenile bocaccio and yelloweye rockfish, physical and biological features essential for their conservation include sufficient prey resources and water quality.

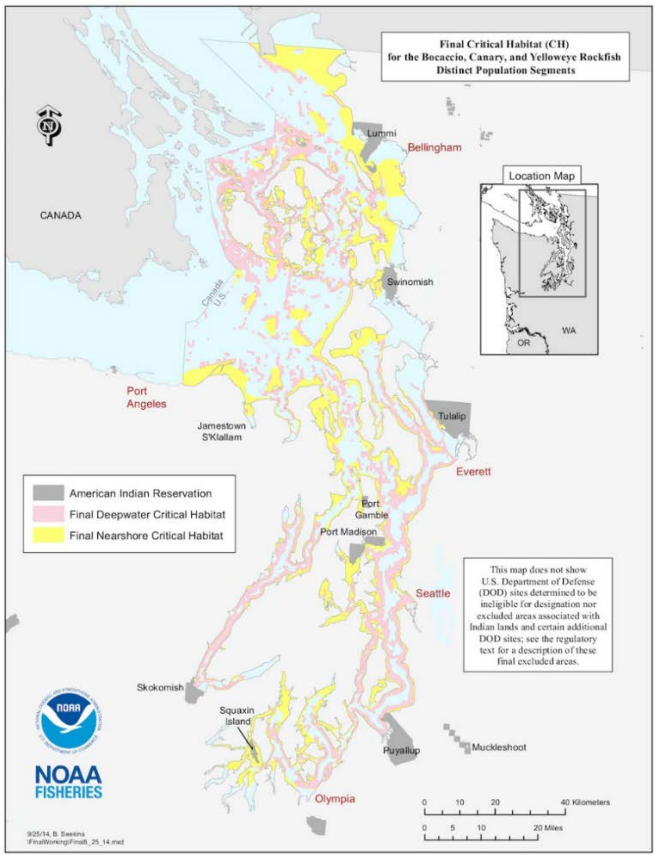

Figure 9. Map of designated critical habitat for the threatened and endangered Puget Sound/Georgia Basin distinct population segments of bocaccio and yelloweye rockfish.

The proposed research activities would be directed at Guadalupe fur seals. The proposed research activities have no in-water activities such as any bottom sediment sampling or fish sampling that would alter or impair benthic habitat, water quality, or prey resources of the critical habitat for the Puget Sound/Georgia Basin DPS rockfishes. Any pollution that might occur would be insignificant (Section 6.1). Thus, the proposed action would not adversely affect critical habitat for the Puget Sound/Georgia Basin DPS for bocaccio or yelloweye rockfish, and is not considered further in this opinion.

6.10.8 Eulachon – Southern Distinct Population Segment Critical Habitat

In 2011, NMFS designated critical habitat (76 FR 65324). Sixteen areas were designated in the states of Washington, Oregon, and California (Figure 10). These areas include: the Mad River, California; Redwood Creek, California, Klamath River, California; Umpqua River/Winchester Bay, Oregon; Tenmile Creek, Oregon; Sandy River, Oregon; Lower Columba River, Oregon and Washington; Grays River, Washington; Skamokawa Creek, Washington; Elochoman River, Washington; Cowlitz River, Washington; Toutle River, Washington; Kalama River, Washington; Lewis River, Washington; Quinault River, Washington; and the Elwha River, Washington. The

designated areas are a combination of freshwater creeks and rivers and their associated estuaries, comprising approximately 539 km (335 miles) of habitat.

The physical or biological features essential to the conservation of the DPS include:

- Freshwater spawning and incubation sites with water flow, quality and temperature conditions and substrate supporting spawning and incubation, and with migratory access for adults and juveniles.
- Freshwater and estuarine migration corridors associated with spawning and incubation sites that are free of obstruction and with water flow, quality and temperature conditions supporting larval and adult mobility, and with abundant prey items supporting larval feeding after the yok sac is depleted.
- Nearshore and offshore marine foraging habitat with water quality and available prey, supporting juveniles and adult survival.

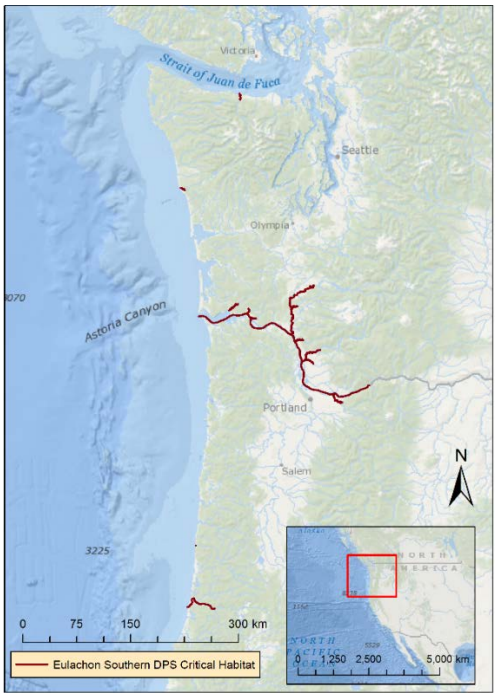

Figure 10. Map of designated critical habitat for the threatened Southern distinct population segment of eulachon.

The proposed activity involves boating, vessel and aerial surveys, observation and incidental disturbance, capture and sampling directed at Guadalupe fur seals, which would not alter any of these essential features. The proposed research activities have no in-water activities such as any bottom sediment sampling or fish sampling that would alter or impair benthic habitat, water quality, or prey resources of the critical habitat for the Southern DPS eulachon. Any pollution that might occur would be insignificant (Section 6.1). The proposed action would not adversely affect designated critical habitat for Southern DPS eulachon, and is not considered further in this opinion.

6.10.9 Black Abalone Critical Habitat

In 2011, the NMFS designated critical habitat for black abalone. This includes rocky areas from mean high water to 6 meters (19.7 feet) water depth in the Farallon, Channel, and Año Nuevo islands, as well as the California coastline from Del Mar Ecological Reserve south to Government Point (excluding some stretches, such as in Monterey Bay and between Cayucos and Montaña de Oros State Park) in northern and central California and between the Palos Verdes and Torrance border south to Los Angeles Harbor (Figure 11).

These areas include primary biological features required by black abalone, such as rocky substrates to cling to, nourishment resources (bacterial and diatom films, crustose coralline algae, and a source of detrital macroalgae), juvenile settlement habitat (rocky intertidal habitat containing crustose coralline algae and crevices or cryptic biogenic structures [e.g., urchins, mussels, chiton holes, conspecifics, anemones]), suitable water quality (temperature, salinity, pH, and other chemical characteristics necessary for normal settlement, growth, behavior, and viability of black abalone), and suitable nearshore circulation patterns (where sperm, eggs, and larvae are retained in the nearshore environment).

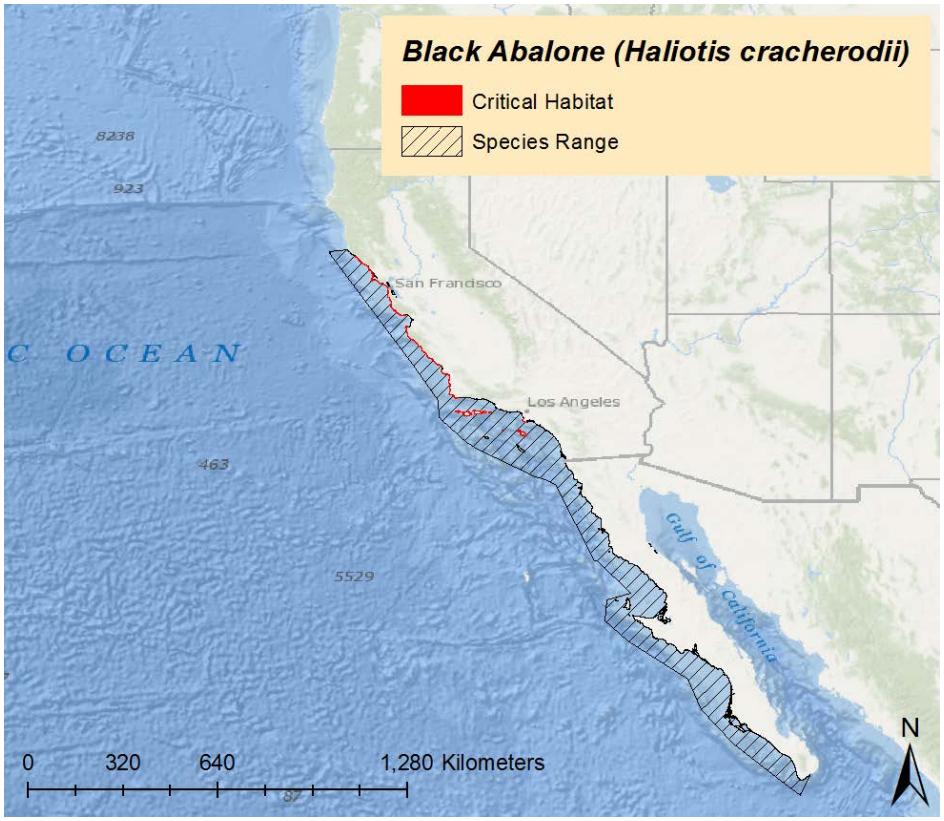

Figure 11. The range and designated critical habitat of the endangered black abalone along the Pacific Coast of North America.

The proposed action involves boating, vessel and aerial surveys, observation and incidental disturbance, capture and sampling directed at Guadalupe fur seals. The vessel activity would be

temporary and minor within the designated critical habitat, and would not be expected to alter water quality. Any possible pollution that might occur due to the vessels would be insignificant (Section 6.1). The proposed research activities would not include any bottom-sampling or other activities that would affect rocky substrate. These proposed research activities would not alter or impair any physical and biological features for designated black abalone critical habitat; thus it would not be adversely affected, and is not considered further in this opinion.

6.10.10 Summary of Effects to Designated Critical Habitat

As described above, designated critical habitat for several ESA-listed species considered in this opinion occurs within the action area and may be affected by the proposed action. Critical habitat for each species is characterized by physical and biological features that are deemed essential to the conservation of the ESA-listed species for which the habitat was designated. In determining if designated critical habitat is likely to be destroyed or adversely modified, we assess whether the proposed action would appreciably diminish the value of designated critical habitat as a whole 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). If the proposed action would not appreciably diminish the conservation value of designated critical habitat, we conclude that the proposed action is not likely to adversely modify or destroy the designated critical habitat.

While the proposed research and enhancement activities may directly overlap with the physical and biological features including water quantity, and quality and prey availability, very few if any, effects are possible. We consider the effects of vessel discharge to be minor, and the possibility of an accidental fuel leak to be remote. Generally, for all designated or proposed critical habitat, interactions that may result from the proposed research and enhancement activities will be limited to aerial and vessel surveys, because all other research and enhancement activities will be directed at individual Guadalupe fur seals and other pinnipeds. Given the nature of the proposed aerial and vessel surveys, none of the physical and biological features essential to the conservation of the ESA-listed species found in these critical habitats will be significantly altered.

In conclusion, we find that the effects of the proposed research and enhancement activities on the physical and biological features of the proposed or designated critical habitat listed in this section are either insignificant or discountable. As such, these proposed research and enhancement activities are not likely to adversely affect nor destroy or adversely modify proposed or designated critical habitat under NMFS jurisdiction and will not be carried forward in this consultation.

7 SPECIES AND CRITICAL HABITAT LIKELY TO BE ADVERSELY AFFECTED

This section identifies the ESA-listed species that occur within the action area that are likely to be adversely affected by the issuance of scientific research Permit No. 22678 to the NMFS

Marine Mammal Laboratory for research on Guadalupe fur seals and other non-listed pinnipeds (Table 8). All of the species potentially occurring within the action area are ESA-listed in Table 8, along with their regulatory status.

Table 8. Threatened species that are likely to be adversely affected by the Permits Division's proposed action of issuing a scientific research permit to the Marine Mammal Laboratory for pinniped research.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Pinnipeds			
Guadalupe Fur Seal (*Arctocephalus townsendi*)	T – 50 FR 51252	-- --	-- --

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

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

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

8.1 Guadalupe Fur Seal

Guadalupe fur seals were once found throughout Baja California, Mexico and along the California coast. Currently, the species breeds mainly on Guadalupe Island, Mexico, off the coast of Baja California. A smaller breeding colony, discovered in 1997, appears to have been established at Isla Benito del Este in the San Benito Archipelago, Baja California, Mexico (Belcher and T.E. Lee 2002).

Guadalupe fur seals are medium sized, sexually dimorphic otariids (Belcher and T.E. Lee 2002; Reeves et al. 2002). Distinguishing characteristics of the Guadalupe fur seal include the digits on their hind flippers (all of similar length), large, long foreflippers, and unique vocalizations

(Reeves et al. 2002). Guadalupe fur seals are dark brown to black, with the adult males having tan or yellow hairs at the back of their mane. Guadalupe fur seals were listed as threatened under the ESA on December 16, 1985 (50 FR 51252).

8.1.1 Life History

Guadalupe fur seals prefer rocky habitats and can be found in natural recesses and caves (Fleischer 1978), using sheltered beaches and rocky platforms for breeding (Arias-del-Razo et al. 2016). Breeding occurs in June through August. Adult males return to the colonies in early June. Female Guadalupe fur seals arrive on beaches in June, with births occurring between mid-June to July (Pierson 1978); the pupping season is generally over by late July (Fleischer 1978). Breeding adult males are polygamous, and may mate with up to 12 females during a single breeding season. Females stay with pups for seven to eight days after parturition, and then alternate between foraging trips at sea and lactation on shore; nursing lasts about eight months (Figureroa-Carranza 1994). Guadalupe fur seals feed mainly on squid species (Esperon-Rodriguez and Gallo-Reynoso 2013); the Gulf of Ulloa on the Pacific side of the Baja California peninsula is an important feeding area (Aurioles-Gamboa and Szteren 2019). Based on a stable isotope analysis of male Guadalupe fur seal carcasses, there appears to be some niche segregation between coastal and oceanic males, possibly based on individual age and size (Aurioles-Gamboa and Szteren 2019). Foraging trips can last between four to twenty-four days (average of fourteen days). Tracking data show that adult females spend seventy-five percent of their time sea, and twenty-five percent at rest (Gallo-Reynoso et al. 1995).

8.1.2 Population Dynamics

It is difficult to obtain an accurate abundance estimate of Guadalupe fur seals due in part to their tendency to stay in caves and remain at sea for extended lengths of time, making them unavailable for counting. At the time of listing in 1985, the population was estimated at 1,600 individuals, compared to approximately 30,000 before hunting occurred in the 18th and 19th centuries. A population was “rediscovered” in 1928 with the capture of two males on Guadalupe Island; from 1949 on, researchers reported sighting Guadalupe fur seals at Isla Cedros (near the San Benito Archipelago), and Guadalupe Island (Bartholomew Jr. 1950; Peterson et al. 1968). In 1994, the population at Guadalupe Island was estimated at 7,408 individuals (Gallo-Reynoso 1994). There have been other, more recent population abundance estimates for Guadalupe Island, with a considerable amount of variation between them: 20,000 in 2010 (García-Capitanachi et al. 2017), and between 34,000 and 44,000 in 2013 (García-Aguilar et al. 2018). Guadalupe fur seals are also found on San Benito Island, likely immigrants from Guadalupe Island, as there are relatively few pups born on San Benito Island (Aurioles-Gamboa et al. 2010). There were an estimated 2,504 seals on San Benito Island in 2010 (García-Capitanachi et al. 2017). Based on information presented by (García-Aguilar et al. 2018), and using a population size:pup count ratio of 3.5, the minimum population estimate is 31,019 (Carretta 2019).

All Guadalupe fur seals represent a single population, with two known breeding colonies in Mexico, and a purported breeding colony in the United States. Gallo-Reynoso (1994) calculated

that the population of Guadalupe fur seals in Mexico from thirty years of population and counts and concluded the population was increasing; with an average annual growth rate of 13.3 percent on Guadalupe Island. The 2000 NMFS stock assessment report for Guadalupe fur seals also indicated the breeding colonies in Mexico were increasing; and more recent evidence indicates that this trend is continuing (Aurioles-Gamboa et al. 2010; Esperon-Rodriguez and Gallo-Reynoso 2012). From 1984 to 2013 at Guadalupe Island, the Guadalupe fur seal population increased at an average annual growth rate of 5.9 percent (range 4.1 to 7.7 percent) (García-Aguilar et al. 2018). Other estimates of the Guadalupe fur seal population of the San Benito Archipelago (from 1997-2007) indicate that it is increasing as well at an annual rate of 21.6 percent (Esperon-Rodriguez and Gallo-Reynoso 2012), and that this population is at a phase of exponential increase (Aurioles-Gamboa et al. 2010). However, these estimates are considered too high, and likely result from immigration at Guadalupe Island (Carretta 2017; Carretta 2019). Based on direct counts of animals from 1955 and 1993, the estimated annual population growth rate is 13.7 percent(Carretta 2019).

The Guadalupe fur seal clearly experienced a precipitous decline due to commercial exploitation, and may have undergone a population bottleneck. Bernardi et al. (1998) compared the genetic divergence in the nuclear fingerprint of samples taken from 29 Guadalupe fur seals, and found an average similarity of 0.59 of the DNA profiles. This average is typical of outbreeding populations. When comparing the amount of unique character fragments found in Guadalupe fur seals to that of other pinnipeds that have experienced bottlenecks (e.g., Hawaiian monk seals), that amount is much higher (0.14 vs. 0.05) in Guadalupe fur seals than Hawaiian monk seals. By using mitochondrial DNA sequence analysis in comparing the genetic diversity of Guadalupe fur seals to northern elephant seals (which did experience a severe bottleneck), Guadalupe fur seals had more haplotypes and a higher number of variable sites. The authors hypothesized that the numbers of Guadalupe fur seals left after harvest may have been underestimated, and the population may not have actually experienced a bottleneck, or the bottleneck may have been of short duration and not severe enough to suppress genetic diversity. Although the relatively high levels of genetic variability are encouraging, it is important to note that commercial harvest still influenced the population. Later studies comparing mitochondrial DNA found in the bones of pre-exploitation Guadalupe fur seals against the extant population showed a loss of genotypes, with twenty-five genotypes in pre-harvest fur seals, and seven present today (Weber et al. 2004).

Guadalupe fur seals are known to travel great distances, with sightings occurring thousands of kilometers away from the main breeding colonies (Aurioles-Gamboa et al. 1999). Guadalupe fur seals are infrequently observed in U.S. waters. They can be found on California's Channel Islands, with as many fifteen individuals being sighted since 1997 on San Miguel Island, including three females and reared pups.

8.1.3 Status

Commercial sealers in the 19th century decimated the Guadalupe fur seal population, taking as many 8,300 fur seals from San Benito Island (Townsend 1924). Numbers on the total number of

fur seals harvested are difficult to ascertain because of the difficulty the hunters had in distinguishing species while hunting (Seagars 1984). These harvests were devastating for the Guadalupe fur seal population, so much so that in 1892, only seven individuals were observed on Guadalupe Island, the location of one of the larger known breeding colonies (Bartholomew Jr. 1950); two years later, a commercial sealer took all 15 remaining individuals that could be found (Townsend 1899).

The species was presumed extinct, until 1926, when a small herd was found on Guadalupe Island by commercial fishermen, who later returned and killed all the seals they could find. In 1928, the Mexican government declared Guadalupe Island as a pinniped sanctuary. In 1954, during a survey of the island, Hubbs (1956) discovered at least 14 individuals. The government of Mexico banned the hunting of Guadalupe fur seals in 1967. Although population surveys occurred on an irregular basis in subsequent years, evidence shows that the Guadalupe fur seal population has been increasing ever since (see Section 8.1.2).

How the Guadalupe fur seal population was able to persist despite intensive and repeated episodes of hunting is not precisely known, although several factors likely played a role. Hubbs (1956) postulated that since Guadalupe fur seals bred in caves, it made them difficult to find, and they were able to evade hunters. Furthermore, since the adult females spend up to 75 percent of their time at sea for two weeks or more at a time, enough females were away during hunting to survive these episodes.

Although a number of human activities may have contributed to the current status of this species, historic commercial hunting was likely the most devastating. Even with population surveys occurring on an irregular basis in subsequent years, these surveys provide evidence that the Guadalupe fur seal has been increasing after suffering such a significant decline. Although commercial hunting occurred in the past, and has since ceased, the effects of these types of exploitations persist today. Other human activities, such as entanglements from commercial fishing gear, are ongoing and continue to affect these species. While some incidental breeding takes place on the San Benito Islands and the Channel Islands, the Guadalupe Island breeding colony supports the population (García-Aguilar et al. 2018). The current abundance of the Guadalupe fur seal represents about one-fifth of the estimated historical population size, and although the population has continued to increase, the species has not expanded its breeding range, potentially affecting its recovery (García-Aguilar et al. 2018). Because that over the last fifty years the population has been increasing since being severely depleted, we believe that the Guadalupe fur seal population is resilient to future perturbations.

8.1.4 Critical Habitat

No critical habitat has been designated for Guadalupe fur seals.

8.1.5 Recovery Goals

NMFS has not prepared a Recovery Plan for Guadalupe fur seals.

9 ENVIRONMENTAL BASELINE

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 C.F.R. §402.02).

A number of human activities have contributed to the status of the population of ESA-listed Guadalupe fur seals in the action area. Some human activities are ongoing and appear to continue to affect Guadalupe fur seal populations in the action area considered in this consultation. Some of these activities, most notably, commercial hunting, occurred extensively in the past, and the effects of past reductions in numbers persist today. The following discussion summarizes the impacts, some of which include climate change, unusual mortality events, pollution, fisheries interactions, anthropogenic sound, and scientific research activities.

9.1 Climate Change

There is a large and growing body of literature on past, present, and future impacts of global climate change, exacerbated and accelerated by human activities. 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://climate.gov).

In order to evaluate the implications of different climate outcomes and associated impacts throughout the 21st 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 RCP4.5, 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 (an agreement within the United Nations Framework Convention on Climate Change, dealing with greenhouse-gas-emissions mitigation, adaptation, and finance, signed in 2016) 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 degrees 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 (Allen et al. 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).

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 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).

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 cetaceans, sea turtles, and fish – regardless of the ocean basin. 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). We expect the same changes to occur with Guadalupe fur seals within the action area. 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 (Evans and Bjørge 2013; IPCC 2014; Kintisch 2006; Learmonth et al. 2006; MacLeod et al. 2005; McMahon and Hays 2006; Robinson et al. 2005). Though predicting the precise consequences of climate change on highly mobile marine species is difficult (Simmonds and Isaac 2007), research has indicated that the foraging habits of Guadalupe fur seals change during warming events in El Niño years, probably linked to a decline in primary productivity is coastal areas, associated with increased sea surface temperatures, causing them to forage further offshore. Observed individuals exhibited diminished body condition, especially pups (Elorriaga-Verplancken et al. 2016). The circumstances in this example are related to El Niño Southern Oscillation event, and not climate change precisely, but it does provide insight into how Guadalupe fur seals may be affected as oceans warm under various climate change scenarios.

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 (Clapham et al. 1999; Payne et al. 1986; Payne et al. 1990), regardless of ocean basin and therefore we expect similar changed to occur in the action area. 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 Guadalupe fur seals, whose diet is primarily squid. For Guadalupe fur seals which 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.

9.2 Natural Mortality

Guadalupe fur seals appear to have no terrestrial predators. White sharks are well-known natural predators of pinnipeds, and are commonly found near Guadalupe Island, but there are few accounts of white sharks preying on Guadalupe fur seals (Domeier and Nasby-Lucas 2007). However, recent isotopic studies show that pinnipeds from Guadalupe Island (possibly including Guadalupe fur seals) are a significant prey species for white sharks in the area (Jaime-Rivera et

al. 2014). Cookiecutter sharks have also been known to prey upon Guadalupe fur seals (Gallo-Reynoso and Figueroa-Carranza 1992).

Little is known about common diseases or parasites that inflict Guadalupe fur seals in the wild, although stranded individuals offer some insight (see discussion below). A recent study of Guadalupe fur seal pups at Guadalupe Island tested for bacterial genera *Brucella* and *Leptospira*. The study found no *Brucella* spp., but *Leptospira* was found. *Leptospira* infection can cause acute renal failure in pinnipeds (Ziehl-Quirós et al. 2017).

9.3 Strandings and Unusual Mortality Events

Guadalupe fur seal strandings are infrequently reported along the West coast of the U.S., and the species accounts for a relatively low proportion of the overall stranded pinnipeds. From 1986 to 1998, the Marine Mammal Center reported 13 live-strandings of Guadalupe fur seals along the central California coast, out of 6,196 total pinniped species. Two of the Guadalupe fur seals showed evidence of human interaction (i.e., discarded fishing gear, monofilament line) (Goldstein et al. 1999). Guadalupe fur seals have also stranded in Washington and Oregon, with an unusual mortality event being declared for the species in 2007 (Calambokidis 2008) (Engelhard 2012). The cause of the unusual mortality event (which had a total of 19 strandings in Oregon and Washington) was undetermined.

Although marine debris is a source of concern and can be a causal factor in stranding, other stranded fur seals have diseases, or are malnourished. Guadalupe fur seals found stranded in northern California were found to be suffering from hemorrhagic gastroenteritis (Gerber et al. 1993). Guadalupe fur seal strandings are also reported at the southern end of their range, inside the Gulf of California (i.e., on the eastern side of the Baja California peninsula), thousands of kilometers from Guadalupe Island (Aurioles-Gamboa et al. 1999). Many stranded individuals were emaciated and malnourished, and some died during rehabilitation (Aurioles-Gamboa et al. 1999; Hanni et al. 1997).

An unusual mortality event (UME) was declared for Guadalupe fur seals beginning in January 2015, and continuing to the present (2015 to 2019)[1]. The UME was declared due to the increased stranding of Guadalupe fur seals in California, and was expanded to include Oregon and Washington due to the elevated number of strandings there. Strandings in California were eight times the historical average in 2015, and have remained above average to the present (Figure 12). Strandings in Oregon and Washington have also been well above typical numbers since 2015 (Figure 13).

[1] https://www.fisheries.noaa.gov/national/marine-life-distress/2015-2019-guadalupe-fur-seal-unusual-mortality-event-california

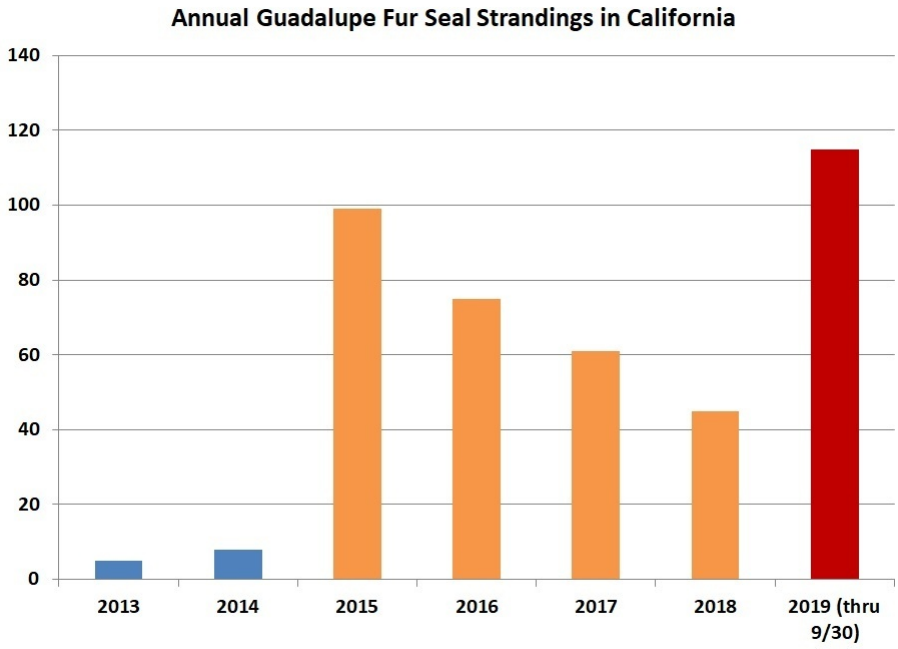

Figure 12. Guadalupe fur seal annual strandings in California, 2013 to 2019.

Figure 13. Guadalupe fur seal annual strandings in Oregon and Washington, 2013 to 2019.

Guadalupe fur seal strandings generally peak in April through June each year. Stranded individuals were mostly weaned pups and juveniles, aged one to two years old. Most stranded individuals showed signs of malnutrition and had secondary bacterial and parasitic infections.

As the UME is currently on-going, we expect Guadalupe fur seals to continue to be impacted.

9.4 Fisheries Interactions

Fisheries interactions are a universal threat to pinnipeds (Kovacs et al. 2012), and can pose problems in several ways: prey reduction, injuries and mortality through shootings, incidental bycatch, and entanglement in fishing gear. Reduced quantity or quality of prey appears to be a major threat to several pinniped species, as evidenced by population declines, reduced body size/condition, low birth rates, and high juvenile mortality rates (Trites and Donnelly 2003). Other species of pinnipeds (e.g., California sea lions and Steller sea lions) are shot in response to actual or perceived competition with fishermen (Atkinson et al. 2008). One Guadalupe fur seal was found dead in Oregon in 2012, with injuries consistent with blunt force trauma. Additionally, a Guadalupe fur seal was found dead in Mexico with bullet holes in 2012 (Carretta et al. 2015).

There have been reports of Guadalupe fur seals stranding with evidence of entanglement in fishing gear or other marine debris (Hanni et al. 1997). Previous bycatch data do not report any Guadalupe fur seal bycatch in fisheries in the U.S., including observed fisheries such as the driftnet and gillnet fisheries in California, and the groundfish trawl fishery in California, Washington and Oregon (NMFS 2000; NMFS 2013). Incidence of Guadalupe fur seal bycatch in

Mexican fisheries is unknown. However, there are reports of Guadalupe fur seal bycatch, or interacting with fishing gear. In early 2016, there was one confirmed interaction of a Guadalupe fur seal hooked in the mouth in the Hawaii shallow set longline fishery (Carretta 2017). From the period of 2009 to 2013, there were 20 Guadalupe fur seals reported as injured or killed as a result of human-related injury; 13 dead, three seriously injured, and four non-seriously injured (Carretta et al. 2015). Several of these individuals were entangled in pieces of gillnet, trawl nets, or gear from an unidentified net fishery.

Impacts to Guadalupe fur seals from commercial fishing operations and entanglement are difficult to quantify or assess. However, if the current trends of expansion into U.S. waters and increasing population size continue, it is probable that Guadalupe fur seals will come into contact with commercial fishing more frequently in the future both within the action area and throughout their range.

9.5 Pollution

Within the action area, pollution poses a threat to Guadalupe fur seals. Pollution can come in the form of marine debris, oil spills, and contaminants.

9.5.1 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 2015b). Entanglement in marine debris can lead to injury, infection, and reduced mobility, increased susceptibility to predation, decreased feeding ability, fitness consequences, and mortality for Guadalupe fur seals in the action area. Entanglement can also result in drowning for air breathing marine species including Guadalupe fur seals. 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, including Guadalupe fur seals, and can lead to serious internal injury or mortality (Carretta et al. 2015; Derraik 2002). Law et al. (2010) presented a time series of plastic content at the surface of the western North Atlantic Ocean and Caribbean Sea from 1986 through 2008. More than 60 percent of 6,136 surface plankton net tows collected small, buoyant plastic pieces. 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 Guadalupe fur seals

in the eastern North Pacific Ocean, but we assume similar effects from marine debris documented within other ocean basins and other marine mammals could also occur to Guadalupe fur seals from marine debris encountered within the action area.

Regardless of ocean basin, pinnipeds are impacted by marine debris, which includes: plastics, glass, metal, polystyrene foam, rubber, and derelict fishing gear (Baulch and Perry 2014; Li et al. 2016). More than 80 percent of all marine debris consists of plastics (reviewed in (Poeta et al. 2017). While we do not have a great deal of information on the impacts of plastic marine debris to Guadalupe fur seals specifically, we can make assessments about impacts to pinnipeds in general.

Observations of Guadalupe fur seals entangled in fishing gear are scarce, although individuals have stranded showing evidence of interaction with discarded fishing gear or marine debris (Goldstein et al. 1999). For Guadalupe fur seals, marine debris is listed as the leading cause of observed human-caused injury and mortality, with ten records of such instances from 2009 to 2013. The records indicated the debris was from a variety of sources, including balloon string, gillnet fragments, nylon netting, twine, plastic line, and plastic pieces found in the stomach (Carretta et al. 2015). For other pinnipeds within the action area like California sea lions and northern elephant seals, entanglement in discarded fishing gear, plastic garbage and synthetic materials is an on-going problem (Hanni and Pyle 2000; Harcourt 1994).

Being entangled in gear can also cause energetic effects to the animal. For example, northern fur seals (*Callorhinus ursinus*) experienced up to a four-fold increase in caloric demand due to the extra energy required to compensate for the drag created by net fragments weighing 200 grams (Feldkamp et al. 1989).

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). Plastic waste in the ocean can leach chemical additives into the water or these additives, such as brominated flame retardants, stabilizers, phthalate esters, biphenyl A, and nonylphenols (Panti et al. 2019). Additionally, plastic waste chemically attracts hydrocarbon pollutants such as polychlorinated biphenyl and dichlorodiphenyltrichloroethane. Individuals can mistakenly consume these wastes containing elevated levels of toxins instead of their prey. Once consumed, plastics can act as nutritional diluents in the gut, making the animal feel satiated before it has acquired the necessary amount of nutrients required for general fitness (reviewed in (Machovsky-Capuska et al. 2019)). Plastics may therefore influence the nutritional niches of animals in higher trophic levels, such as Guadalupe fur seals and other pinnipeds (Machovsky-Capuska et al. 2019).

9.5.2 Oil spills

Exposure to petroleum hydrocarbons released into the environment via oil spills and other discharge sources represents a potentially serious risk for Guadalupe fur seals. Chronic oil pollution kills large numbers of seabirds (e.g., Wiese and Roberston 2004); however, its impact

on the Guadalupe fur seal population is poorly documented. In addition, the long-term effects of repeated ingestion of sub-lethal quantities of petroleum hydrocarbons on marine mammals are not well understood, either. As a result, the magnitude of the risks posed by oil discharges in the proposed action area is difficult to precisely quantify or estimate.

One of the more high-profile oil spills in the action area was the 1969 Santa Barbara oil spill, which remains the largest oil spill in California to date (and the third largest in the U.S.), where an estimated 3,250,000 barrels were spilled along the coast of southern California (Baldwin 1970). During this spill, San Miguel and San Nicolas Islands were particularly impacted, along with the area of Santa Barbara Channel. Although the impacts to pinnipeds in the area were difficult to assess directly, over one hundred dead California sea lions and northern elephant seals were found on San Miguel Island less than two months after the spill (Brownell Jr and Le Boeuf 1969). Furthermore, while it was not possible to quantify or assess the effects of the spill to Guadalupe fur seal prey species like squid, it is likely that they and other pinnipeds in the area ingested oil-contaminated prey.

Large, catastrophic oil spills undoubtedly grab ahold of the public's attention, but oil spills occur on a smaller scale with unfortunate regularity. In a nationwide study examining vessel oil spills from 2002-2006 found that over 1.8 million gallons of oil were spilled from vessels in 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 type of boats.

Although oil spills can have devastating impacts on marine life and habitat, it is important to note that the susceptibility of a particular species to oil exposure varies from that of another (Rainer Engelhardt 1983). Likely pathways of exposure of fur seals to hydrocarbons include inhalation of vapors at the water's surface and ingestion during feeding. Marine mammals are generally able to metabolize and excrete limited amounts of hydrocarbons, but acute or chronic exposure poses greater toxicological risks. Acute exposure of marine mammals to petroleum products can cause changes in behavior and reduced activity, inflammation of the mucous membranes, lung congestion, pneumonia, liver disorders, and neurological damage (Geraci 1990). In addition, oil spills have the potential to adversely impact prey populations, and therefore may affect Guadalupe fur seals indirectly by reducing food availability.

Because of the prevalence of oil spills in U.S. waters, it is likely that Guadalupe fur seals will continue to be exposed to this problem in the action area for the foreseeable future.

9.5.3 Contaminants

Persistent organic pollutants (POPs) is a collective term for environmental contaminants like dioxins, furans, PCBs, PBDEs, dichlorodiphenyltrichloroethane (DDT), hexachlorocyclohexanes (HCHs), and hexachlorobenzenes (HCBs). These chemicals are used (or have previously been used) in pesticides, industrial manufacturing, and pharmaceutical production, to name a few applications. A common characteristic of POPs is their high lipid solubility, aiding in their

absorption in the fatty tissues of living organisms. In addition, POPs are semi-volatile, and can travel great distances in the atmosphere (Ritter et al. 2007). POPs tend to persist over long periods in the environment, and can bioaccumulate in fatty tissues, and be transmitted from mother to offspring (Haraguchi et al. 2009). Even though a POP can be banned, its characteristics allow it to persist in the environment, remaining in soil, the atmosphere, and the fatty tissues of organisms. (Ritter et al. 2007).

Because they were in the pesticides and industrial products used so extensively after World War Two, organochlorines (e.g., PCBs, DDT) are a principal contaminant threat (Ross et al. 2000). Organobromines like PBDEs are also a threat; unlike many organochlorines, which have been banned or restricted, organobromines are currently used in fire retardants (Ritter et al. 2007). With up to 1,000 new chemicals entering the global marine environment annually, it is difficult to monitor levels and sources of all contaminants (Grant and Ross 2002). Marine ecosystems receive pollutants from a variety of local, regional and international sources (Garrett 2004; Grant and Ross 2002). Hotspots for contaminants in the action area are centered near these urban areas where industrial and domestic activities are concentrated; however, because of the properties of POPs, contamination can extend widely, and into nursery areas for many species.

Numerous factors can affect concentrations of POPs in marine mammals, such as age, sex and birth order, diet, and habitat use (Mongillo et al. 2012). In marine mammals, POP 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). POPs can be transferred from mothers to juveniles at a time when their bodies are undergoing rapid development, putting juveniles at risk for immune and endocrine system dysfunction later in life (Krahn et al. 2009).

Pollutants and contaminants cause adverse health effects in pinnipeds. Acute toxicity events may result in mass mortalities; repeated exposure to lower levels of contaminants may also result in immune suppression and/or endocrine disruption (Atkinson et al. 2008). In addition to hydrocarbons and other persistent chemicals, pinnipeds may become exposed to infectious diseases (e.g., Chlamydia and leptospirosis) through polluted waterways (Aguirre et al. 2007).

The world's largest DDT manufacturer was located in southern California, and from 1948 to 1970 discharged up to 20 tons of DDT waste into the Los Angeles outfall. Organochlorine pesticides and PCBs have been found in the blubber of California sea lions, gray whales, humpback whales, northern elephant seals, and harbor seals in the southern California area (Kannan et al. 2004). California sea lions co-occur with Guadalupe fur seals on Guadalupe Island.

Because POPs are both ubiquitous and persistent in the environment, Guadalupe fur seals (and other forms of marine life) will continue to be exposed to POPs for all of their lives. The effects of POPs to Guadalupe fur seals are unknown and not directly studied, but it is possible that the effects could be sub-lethal and long-term in nature, and include impacting reproduction, immune function, and endocrine activity. These are effects that would become more apparent as time

goes on. At present, however, the effects of POPs in Guadalupe fur seals are not currently well known.

9.5.4 Pollution Summary

While exposure to marine debris, oil spills, and other contaminants is likely to continue and occur for Guadalupe fur seals in the action area through the duration of the permit, the level of risk and degree of impact is unknown, but could exacerbate the risk posed to the species from other threats within the action area.

9.6 Anthropogenic Sound

All marine mammals present in the action area, including Guadalupe fur seals, are regularly exposed to several sources of natural and anthropogenic sounds. Anthropogenic noises that could affect ambient noise arise from activities that occur in and near the sea, any combination of which can contribute to the total noise at any one place and time. These noises include those coming from activities like transportation, dredging, construction, oil, gas, and mineral exploration in marine areas, as well as seismic surveys, sonars, explosions, and ocean research activities (Richardson et al. 1995).

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 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 2003b). 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 2003b). Most of the sound energy is at frequencies below 500 Hertz, which is within the hearing range of otariids like Guadalupe fur seals (NMFS 2018). The National Science Foundation periodically funds seismic surveys in the action area to conduct geological research over the Cascadia Subduction Zone, off the coast of Oregon and Washington. These surveys typically last a few weeks to a month or more. Military activities, mainly the U.S. Navy, are also a source of anthropogenic sound like sonar and explosion; see section 9.8 for further discussion.

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 (NRC 2003) to marine mammals, including Guadalupe fur seals in the action area. The U.S. Army Corps of Engineers authorizes or carries out dredging projects throughout the action area, recently a maintenance dredging project in San Diego Bay, or removing sediment to stabilize a shoreline in San Luis Obispo's Laguna Lake. The U.S. Navy has also undertaken a dredging maintenance project to maintain the depth required at its piers in San Diego in the summer of 2019. Other construction projects in the action area authorized by the U.S. Army Corps of Engineers, like pier or wharf replacement, boat launch replacement,

bank stabilization or repair projects, use dredging or pile driving, and occur fairly routinely, with around a dozen such projects from 2018 to 2019.

Transportation, including commercial and recreational vessel traffic, airplanes and helicopters, all contribute to sound in the ocean (NRC 2003a). The military uses sound to test the construction of new vessels, as well as for naval operations. In some areas where oil and gas production takes place, noise originates from the drilling and production platforms, tankers, vessel and aircraft support, seismic surveys, and the explosive removal of platforms (NRC 2003a).

Much of the increase in sound in the ocean environment is due to increased shipping, as vessels become more numerous and of larger tonnage (Hildebrand 2009b; McKenna et al. 2012; NRC 2003b). 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.

The issue of noise in the marine environment and its potential effects to marine life has come under scrutiny in recent years and is likely to continue to receive attention. Although such activities that create underwater noise are now receiving close scrutiny, the potential remains for these disruptions to occur, or even the potential for auditory trauma, stranding, and death in marine mammals and other marine species. The International Maritime Organization recently adopted guidelines providing recommendations on minimizing ship noise through proper vessel maintenance and guidance on designing quieter ships (IMO 2013).

The effects of noise on Guadalupe fur seals specifically are not known, although generally noise in the marine environment is thought to cause at least disturbance to pinnipeds within the vicinity (Fair and Becker 2000). In other pinniped species, many researchers have described behavioral responses of Steller sea lions to sounds produced by boats and vessels, as well as other sound sources such as helicopters and fixed-wing aircraft (Kucey and Trites 2006; Wilson et al. 2012a). Most observations have been limited to short-term behavioral responses, which included avoidance behavior and temporary cessation of feeding, resting, or social interactions. Masking may also occur, in which an animal may not be able to detect, interpret, and/or respond to biologically relevant sounds. 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). Although the impacts of noise on marine mammals is receiving attention and regulating bodies are working to mitigate those effects, sources of marine noise are likely to persist or increase into the future.

9.7 Scientific Research

Scientific research permits, issued by the Permits Division, authorize the study of listed resources in the action area. The primary objective of these studies is generally to monitor populations or gather data for behavioral and ecological studies. Activities authorized include: surveys, marking, tagging, biopsy sampling, and attachment of scientific instruments. These "take" activities may result in harassment, stress, and, in limited cases, injury or morality.

Due to their limited geographic distribution, Guadalupe fur seals are one of the less studied pinniped species. Most of the authorized takes for Guadalupe fur seals are for harassment that might occur during other research activities. The applicant's current permit (and then the proposed action), is the only action in U.S. waters which includes specific research directed at Guadalupe fur seals. Guadalupe fur seal takes that would occur under Permit No. 18786 would be in the course of stranding response (that is, not the subject of a specific research project).

There are currently ten scientific research and enhancement permits for Guadalupe fur seals in the action area, one of them being for non-releasable captive animals, one for the import and export of parts for disease study, one for stranding response, and the others for incidental disturbance during other research projects (Table 9). In each of the permits listed below, all life stages are authorized for take.

Table 9. Current NMFS scientific research and enhancement permits authorizing take of Guadalupe fur seals.

Permit No.	Permit Holder	Permit Description	Activities	Annual Takes	Expiration Date
16087-02	MML	Pinniped Research	Capture, Sampling, Harass, Euthanasia	500	December 31, 2019
18769	Sea World, LLC	Public display of non-releasable animals	Captive Maintenance	6	August 31, 2021
18786	NMFS Office of Protected Resources	Marine Mammal Health and Stranding Response	Capture, Sampling, Import/Export/Receive, Euthanasia	60	June 30, 2020
19116	Southall Environmental Associates, Inc.	Marine Mammal behavioral response to sound	Incidental Take (during vessel surveys)	5	June 30, 2021
19706	School of Natural Sciences, Mathematics,	Disease study in stranded pinnipeds	Import/Export/Receive	25	July 31, 2021

Permit No.	Permit Holder	Permit Description	Activities	Annual Takes	Expiration Date
	and Engineering				
20605	Cascadia Research Collective	Cetacean Research	Harass (during vessel and aerial surveys)	100	August 1, 2022
21348	NMFS Northwest Fisheries Science Center	Cetacean Research	Harass (during vessel and aerial surveys)	200	June 15, 2023
21482	HDR, Inc.	Marine Mammal Monitoring Program	Harass, Count/Survey (during vessel and aerial surveys)	1482	July 31, 2024
21585	Oregon State University Marine Mammal Institute	Cetacean Research	Harass (during vessel surveys)	100	December 31, 2023
21678	Cascadia Research Collective	Marine Mammal Research	Harass (during vessel surveys)	200	November 30, 2023

Currently, there are two permits where euthanasia mortalities are authorized; under the applicant's current permit (16807-02), and under the Marine Mammal Health and Stranding Program's permit (18786).

Additional "take" under the ESA and MMPA is likely to be authorized in the future as additional permits are issued. It is noteworthy that although the numbers tabulated above 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 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 Pacific Ocean (i.e., the U.S. West Coast and the action area). Although Guadalupe fur seals are generally wide-ranging, we do not expect many of the

authorized "takes" to involve individuals that will also be "taken" under the proposed action and scientific research activities.

9.8 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 Hawaii-Southern California Training and Testing and Northwest Training and Testing range complexes overlaps with the action area for Permit No. 22678. 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 harm and 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. Sound produced during U.S. Navy activities is expected to result in instances of hearing impairment (e.g. temporary threshold shifts) to Guadalupe fur seals. 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 Pacific Oceans. Conservation measures include employing visual observers and implementing mitigation zones during activities using active sonar and explosives.

9.9 Synthesis of Baseline Impacts

Taken together, the components of the environmental baseline for the action area include sources of natural mortality as well as influences from natural oceanographic and climatic features in the action area. The effects of climatic variability on this species in the action area and the availability of its prey remain largely undetermined; however, it is likely that any changes in weather and oceanographic conditions resulting in effects on squid populations would have consequences for Guadalupe fur seals.

The environmental baseline also includes human activities resulting in disturbance, injury, or mortality of individuals. These activities include commercial hunting of Guadalupe fur seals, which affected the species in the past but no longer occurs at present. However, effects from these activities may still persist today. Current anthropogenic activities and effects on individuals

in the action area are thought to include habitat degradation (e.g., contaminants, oil spills, underwater sound, disease), interactions with fishing gear and marine debris, and scientific research on Guadalupe fur seals. Conservation and management efforts are ongoing, and take prohibitions have undoubtedly had a positive effect on the status of threatened Guadalupe fur seals within the action area.

Guadalupe fur seals may be adversely affected by the proposed activities authorized by the issuance of Permit No. 22678. This species is, or has been, exposed to the existing conditions of the environmental baseline. The activities discussed in the above section likely have some level of effect on Guadalupe fur seals in the proposed action area; however, the combined consequences of those effects on the status, trend, or demographic processes that drive the status and trends of this population remain largely unknown.

10 EFFECTS OF THE ACTION

Section 7 regulations define "effects of the action" as all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action. This effects analyses section is organized following the stressor, exposure, response, risk assessment framework.

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

In this section, we describe the potential stressors associated with the proposed action that are likely to adversely affect ESA-listed Guadalupe fur seals, the probability of individual Guadalupe fur seals being exposed to these stressors based on the best scientific and commercial evidence based on the available evidence. As described in Section 10.3.2, 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 risk posed to the viability of the population those individuals comprise and to the ESA-listed Guadalupe fur seal 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 could 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

Guadalupe fur seals that could appreciably reduce their likelihood of surviving and recovering in the wild.

10.1 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 scientific researcher permits will authorize several methods for research activities that may expose ESA-listed Guadalupe fur seals within the action area to a variety of stressors. Each research activity presents a unique set of stressors, as further detailed below. Given the directed nature of the proposed research, as discussed in section 6, research and enhancement activities are not expected to present any stressors to other ESA-listed species (e.g., cetaceans, sea turtles, fishes and marine invertebrates) found in the action area. The potential stressors we expect to result from the proposed action for Guadalupe fur seals are capture, handling restraint, administering anesthesia, sedatives/drugs, tagging/marking, hair/vibrissae sampling, blood sampling, milk sampling, fecal sampling, skin and blubber biopsy sampling. Effects to Guadalupe fur seals from these stressors can result in stress, injury, infection, and behavioral responses.

10.2 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. Those measures are described within the *Description of the Proposed Action* (Section 3) and are considered throughout the *Exposure and Response Analysis*. The proposed minimization measures as described in Section 3 will be implemented in order to reduce the potential adverse effects from these research activities. See Appendix A for the minimization measures the Permits and Conservation Division proposes to include in Permit No. 22678.

10.3 Exposure and Response Analysis

The *Exposure Analysis* identifies, as possible, the number, age (or life stage), and sex of the ESA-listed individuals that are likely to be exposed to the stressors and the population(s) of the sub-population(s) those individuals belong. The *Response Analysis* evaluates the available evidence to determine how individuals of those Guadalupe fur seals are likely to respond given their probable exposure.

10.3.1 Exposure Analysis

In this section, we quantify the likely exposure of Guadalupe fur seals to the activities and associated stressors that may result from the proposed action (Section 3), and when possible quantify the number of exposures to an individual animal. The stressors we expect individuals of Guadalupe fur seals to be exposed to are listed above (Section 10.1). Table 1 and Table 2 specify the applicants' and the Permits and Conservation Division's proposed exposure to these stressors on Guadalupe fur seals.

The MML has explained the MMPA annual take number estimates in their permit applications for Permit No. 22678. Based on this explanation, our own evaluation of these numbers in comparison to the MML's 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 numbers for Guadalupe fur seals that are reasonably certain to occur as the number of animals specified in Table 1 and Table 2 likely to be affected by the specific research activities. These annual numbers and resulting effects are discussed below:

- 165 individuals of any age or sex during vessel, aerial, and ground surveys, non-invasive terrestrial research activities (i.e., behavioral observation and photographic identification) [105 (Project 1), 40 (Projects 2-6), 10 (Project 5), 10 (Project 3)]
- 505 takes of opportunistic collection of scat and carcasses during ground surveys [Salvage (n=5) and Import/Export Parts (n=500) (Projects 2, 2A, 3, and 5B)]
- 10 individual pups of any sex from:
    - Capture (i.e. hoop net),
    - Restraint (net or hand),
    - Handling (measuring and weighing), and
    - Sampling (i.e. marking, blood and fecal sampling, swab sampling, hair/vibrissae collection, and release).
    - Two takes per animal would be authorized so that a marked individual may be recaptured and resampled at another location [Projects 2A, 3, and 5B)].
- 20 individuals of any life stage or sex (pups weighing more than 12 kilograms) from
    - Capture (i.e. hoop net),
    - Restraint by hand or net,
    - Handling (measuring and weighing), and
    - Sampling (i.e. anesthesia via injectable sedative, administer subcutaneous drug, internal marking (PIT tag), external marking (dye or paint, flipper tag), blubber biopsy, skin biopsy, blood and fecal sampling, swab sampling, hair/vibrissae collection, and release).
    - Two takes per animal would be authorized so that an individual may be recaptured and resampled at another location. [Projects 2A and 3]
- 20 individual pups of any sex (pups weighing more than 20 kilograms will be instrumented) from:
    - Capture (i.e. hoop net),
    - Restraint by hand or net, and handling (measuring and weighing), and
    - Sampling (i.e. anesthesia via injectable sedative, administer subcutaneous drug, external marking (dye or paint, flipper tag, and VHF tag), internal marking (PIT tag), blubber biopsy, skin biopsy, blood and fecal sampling, swab sampling, hair/vibrissae collection, and release).

    - Two takes per animal would be authorized so that an individual may be recaptured and resampled at another location. [Projects 2A, 3, and 5B].
- 20 individual non-pups of any sex from:
    - Capture (i.e. hoop net),
    - Restraint by hand or net,
    - Handling (measuring and weighing), and
    - Sampling (i.e. anesthesia (via gas intubation or cone/mask, or injectable sedative), administer subcutaneous drug, and intermuscular drug for milk collection, external marking (dye or paint, flipper tag, and VHF tag), internal marking (PIT tag), blubber biopsy, skin biopsy, blood and fecal sampling, milk sampling from females, swab sampling, hair/vibrissae collection, and release).
    - Two takes per animal would be authorized so that an individual may be recaptured and resampled at another location. [Projects 2A, 3, and 5B].
- 60 individual non-pups of any sex from:
    - Harassing and remote skin and biopsy sampling and remote marking with paint balls, from vessels or from land.
    - Only one take per animal would be authorized; the animals would be externally marked so that they could be resighted. [Projects 3 and 5B].
- Two unintentional mortalities per year, of any sex or age class, including humane euthanasia, across all projects.

In total, 130 Guadalupe fur seals would be harmed by being captured and sampled annually as described above. Annually, 165 individuals would be harassed during aerial, ground, and vessel surveys, and 60 individuals would be remotely sampled. Up to 505 carcasses and parts would be salvaged, imported, or exported. The permit would authorize two mortalities per year, not to exceed ten mortalities over the life of the permit.

Given the Permits and Conservation Division's issuance and counting of takes as well as the researchers' ability to identify each individual animal in the field in real time, the *Annual Number of Authorized Takes* presented in Table 1 and Table 2 represent 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 Individual* (Table 1 and Table 2) in a given year for research activities under Permit No. 22678.

10.3.2 Response Analysis

In all we expect few mortalities or long-term adverse effects as a result of the proposed activities for ESA-listed Guadalupe fur seals. The NMFS' Permits and Conservation Division claims that occasionally, capture of pinnipeds and associated activities can result in serious injury and mortality of a small number of individuals. This provided the basis for their justification in authorizing a small amount of take for mortality/human euthanasia. These events are most commonly the results of anesthesia and sedation complications. We recognize that this is a possible outcome, and consider the effects of mortality in our analysis. However, we expect that

mostly short-term behavioral responses from disturbance would be from capture, handling, restraint, sampling and tagging. In addition, they state that energetic costs (from tag attachments) that may result from research activities would not likely lead to disruption of essential behaviors such as feeding, mating, or nursing, to a degree that the individual's likelihood of successful reproduction or survival would be substantially reduced. The sections below present an in-depth review of each research activity the MML proposes to conduct and their corresponding effects on Guadalupe fur seals.

This permit would be the only current NMFS permit authorizing direct sampling of Guadalupe fur seals in U.S. waters. Several publications on Guadalupe fur seal research from the Mexican research community (e.g., (Aurioles-Gamboa et al. 2010; Esperon-Rodriguez and Gallo-Reynoso 2013; Gallo-Reynoso and Esperon-Rodriguez 2013; Garcia-Aguilar et al. 2013)), relied on census counts and scat collection, not capture or other forms of direct handling. As a result, there is little information available as to how Guadalupe fur seals will specifically respond to the proposed research activities. However, since Guadalupe fur seals are otariids, like the more commonly-studied Steller sea lions and California sea lions, we expect that Guadalupe fur seals would exhibit similar responses to the proposed action. The research techniques are common in pinniped research, and will be employed by experienced personnel.

10.3.2.1 Capture

Capture can result in a variety of reactions in Guadalupe fur seals. Overall, capture of Guadalupe fur seals is expected to elicit an escape-avoidance response, during which the individuals could be injured, and also could experience a stress response, capture myopathy, or heat exhaustion.

Guadalupe fur seals may potentially be injured during capture, or while trying to escape capture. Efforts to avoid or escape capture can lead to contusions, lacerations, hematomas, nerve injuries, concussions, and fractures, as well as hyperthermia and myopathy from increased muscle activity; these injuries can also occur during a successful capture, as the animal may struggle to get away. Since there has been very little research conducted on Guadalupe fur seals in the wild in the U.S., we do not have records of any of such events occurring. However, by relying on the effects during other pinniped research projects, such as those conducted by the applicant, we can reasonably make assumptions about the effects of capture on Guadalupe fur seals.

The applicant has conducted numerous pinniped research projects over many years, and thus has much experience in successfully and safely capturing and restraining pinnipeds. They have no cases of injuries sustained by pups or adults during capture or handling. In their experience, pups may struggle initially after capture, they typically calm down very quickly after being hand-restrained. The MML's handling techniques are designed to encourage pups to be calm while restraining them. The most likely injuries to pups are heat exhaustion. Heat stress is routinely avoided by keeping animals wetted (with seawater) while held when ambient conditions are such that heat stress is probable. Upon the rare occasion that animals show symptoms of heat exhaustion or severe stress they are doused with water and immediately removed from the

capture nets, and then released as soon as they respond normally to stimulus (e.g., pulling on whiskers, pinching ears).

Capture can lead to stress, which in turn can cause myopathic injury (muscle damage stemming from stress hormone release) or even death. A major factor in myopathic injury and death is the time involved with handling. In general, the shorter the interaction between humans and fur seals, the better, as mammalian stress hormone levels increases with handling time. Evidence from several species indicates that the hypothalamic-pituitary-adrenal (HPA) axis responds rapidly to a stressor, with increases within five minutes (Moe and Bakken 1997). Depending upon the species and the perceived threat level, the stress response may level out (where it may remain for periods of days or weeks) or continue to rise throughout the experience. This response can be additive with repeated exposure, eventually leading to severe injury or death (Cowan and Curry 1998; Cowan and Curry 2002; Cowan and Curry 2008; Herraez et al. 2007).

Aldesterone is a hormone released by the HPA axis, and it is released in substantial amounts in elephant seals during induced stress, indicating that it is an important stress responsive hormone. Thyroid hormones, like thyroxine (T4) and triiodothyroxine (T3), emitted by the hypothalamic-pituitary-thyroid (HPT) axis, regulate metabolism. Stress can alter the regulation of the HPT axis, reducing thyroid function. Chronic stress, caused by nutritional deficiencies or disease, reduces thyroid function and energy expenditure (DeRango et al. 2019).

Hormone concentrations can vary greatly by sex, life stage, season, reproductive cycle, and nutritional stress. At various stages in a pinniped's life, it will undergo periods of food deprivation because it is nursing, molting, or breeding, causing changes in adrenal and thyroidal activity. For example, in one study, aldosterone concentration increased in adult Guadalupe fur seals in time as a result of capture, but did not increase in pups over time. Both cortisol and corticosterone concentrations increased in both captured pups and adults over time (DeRango et al. 2019).

De Rango et al. (2019) assessed total integrated stress response in Guadalupe fur seals during capture. In this study, the release of cortisol and corticosterone in response to capture was strongly associated in Guadalupe fur seal adults and pups. Release of corticosteroids varied greatly by individual, with declines from peak values by 60 minutes in some individuals, and aldosterone declines in some adults from peak values by 40 minutes (DeRango et al. 2019).

Decline in body condition can also result from repeated capture or chronic stress caused by handling and restraint (Cattet et al. 2008). However, Engelhard et al. (2002) found no difference in the cortisol response between southern elephant seal pups being captured and restrained for the first time and those having been captured and restrained multiple times. This suggests that there is no meaningful effect from previous capture and restraint exposures on how stressful future captures and restraints will be for a pinniped.

10.3.2.2 Chemical Restraint: Sedation/Anesthesia

We do not have much information specific to Guadalupe fur seal's reaction to sedation and anesthesia. To supplement the analysis, we rely on the responses of other pinnipeds, under the assumption that Guadalupe fur seals would react similarly. Effects from anesthesia can include asphyxiation, aspiration of gastric contents, and apnea. These effects are largely due to the fact that pinnipeds have a strong dive response that can be triggered by anesthesia which can lead to breath-holding, apnea, and bradycardia (Haulena 2014; Haulena and Heath 2001). Chemical restraint and immobilization of pinnipeds can be problematic because of their cardio-respiratory adaptations for breath-hold diving. In addition to impacts from strong dive responses, effects from anesthesia can also cause hypothermia. While performing field anesthesia of juvenile Steller sea lions, Lian et al. (2018) observed severe hypothermia with temperatures less than 35 degrees Celsius (95 degrees Fahrenheit) measured in 22 percent of all animals that underwent anesthesia procedures. There was a strong association with the month in which the procedures took place and the occurrence of hypothermia. The majority of hypothermia events occurred in February and March. Hypothermia also had a significant but weak association with length of anesthesia (slope = -0.02, r2 = 0.02, F1, 439 = 8.4, $P < 0.01$) and sex (F2, 462 = 8.6, $P < 0.01$), but no association with year, region, body weight, and time spent resting from capture to start of anesthesia. However, applicants will closely monitor all anesthetized Guadalupe fur seals during research activities to monitor for signs of apnea, respiratory depression, bradycardia, tachycardia, hypothermia, and hyperthermia, and will treat as necessary (See Section 3.4 and Table 3).

Another concern with chemical restraint is passing of chemical effects to fetuses or to suckling pups. The applicants routinely use benzodiazepines as tranquilizers or sedatives for juvenile and adult California sea lions and harbor seals. In human infants that nursed on mothers shortly after the mothers received high doses of diazepam, the plasma concentration in the infant was typically less than 10 percent of the mother's concentration, which is well below the level that could produce anesthetic symptoms or other complications (Hale 1999; Lee and Rubin 1993). Gas anesthesia, primarily using isoflurane, is also routinely used for anesthetizing lactating California sea lions and Guadalupe fur seals (DeRango et al. 2019). Based on the pharmokinetics of isoflurane, the amount of isoflurane that would be expected to be excreted in milk would be negligible (Lee and Rubin 1993).

In general, the applicants have not documented any health or behavior issues of chemically restrained pups, pups of anesthetized adults, juveniles, or adults themselves during observations after handling of marked California sea lions, harbor seals or northern elephant seals. The MML has not yet used these methods on Guadalupe fur seals but studies in Mexico indicate that gas anesthesia with isoflurane is an effective and safe method and there will be veterinarians experienced with administering gas anesthesia to Guadalupe fur seals participating in any study that involves anesthesia of this species.

In instances when the Guadalupe fur seal is captured (i.e., not during remote sampling), local anesthetics like lidocaine and bupivacaine would be delivered subcutaneously to relieve pain

associated with biopsies taken with biopsy punches for animals that are not under general anesthesia. Up to 3 ml of 2 percent (20 mg/ml) lidocaine or 1 to 2 ml of a 50:50 solution of lidocaine/bupivacaine will be injected subcutaneously around the biopsy site as a local anesthetic before the biopsy is taken. Carprofen is a local analgesic drug which would be delivered subcutaneously as a non-steroidal inflammatory drug that reduces post-operative pain.

Atropine would be used to keep airways dry when anesthetizing or tranquilizing Guadalupe fur seals.

Isoflurane gas would be administered via intubation or with a cone or mask to anesthetize Guadalupe fur seals. In addition, researchers may inject the sedative midazolam. If complications arise, and an individual needs to be brought out of sedation, intervention methods for isoflurane gas and midazolam include doxapram, epinephrine, or intubation with oxygen.

Dexamethasone, furosemide, prednisolone, and doxapram would be used for emergency recovery, and delivered either intravenous or intramuscular means.

Local Anesthetics

Lidocaine may be used in a 50:50 mixture with bupivacaine. Bupivacaine provides relief for a long period of time after the procedures (about three to eight hours). At the low dosages of lidocaine and bupivacaine proposed for use, we do not anticipate any negative effects. Carprofen is used routinely in marine mammal facilities, and there are no negative effects associated with its use.

Atropine

The pharmacologic effects of atropine are dose related. At low doses salivation, bronchial secretions, and sweating may be inhibited. At moderate systemic doses, atropine dilates and inhibits accommodation of the pupil, and increases heart rate. High doses will decrease gastrointestinal and urinary tract motility. Very high doses will inhibit gastric secretion. Adverse effects are basically extensions of the drug's pharmacologic effects and are generally dose related. At the low dosages proposed for use, we do not anticipate any negative effects.

Gas Anesthesia: Isoflurane

In general, captive animals have been observed to fully recover from anesthesia with isoflurane after eight hours (Gage 1993). Isoflurane gas appears to have the best recovery characteristics, and be safe and reliable, in otariids (Haulena and Heath 2001). It has been used in Guadalupe fur seals by other researchers (DeRango et al. 2019) with no reported negative short or long-term effects. The MML has handled more than 1,000 California sea lion non-pups and 2,500 pups using gas anesthesia. They have reported four California sea lion mortalities over the past ten years that occurred during or after gas anesthesia for a variety of reasons.

Anesthesia: Injectable Sedative

Midazolam or diazepam are used to tranquilize Guadalupe fur seals. The full effects of midazolam and diazepam are realized within five minutes, the drug is metabolized in the liver and the half-life is two hours. Adverse effects of diazepam may include congenital abnormalities if administered in the first trimester of pregnancy; however this effect has not been demonstrated for midazolam. Midazolam is generally a safe drug even at high dosages. The effects of these drugs can be reversed with flumazenil. The use of midazolam or diazepam to tranquilize harbor seals and California sea lions is a standard protocol in handling these species (Haulena and Schmitt 2018). These drugs are commonly used as pre-treatments before gas anesthesia to allow more efficient handling during coning or masking. As such, we do not anticipate any cumulative or synergistic effects on Guadalupe fur seals from the implementation of these procedures.

Recovery and Intervention Drugs

We do not expect the recovery and intervention drugs to cause negative effects to Guadalupe fur seals. These drugs will be used in emergencies, in the event that an individual is reacting badly to the research procedures. Since these drugs would reverse the negative effects, they would ameliorate the harm. The ability to use recovery drugs in the event of an emergency would facilitate positive outcomes for Guadalupe fur seals.

Summary

After considering all the information for these research activities described above, the use of sedation, anesthesia, and other drugs may cause potential adverse effects to Guadalupe fur seals. Nevertheless, as shown through the data, the risk from these effects to cause serious harm or mortality is extremely low. However, due to the data presented above on past research activities, there is a possibility that rare occurrences of injury or mortality may occur, although the risk for this is smaller than that of non-chemical capture. Due to the rare occurrences of injury and mortality as a result of sedation/anesthesia activities, coupled with the conservation measures presented in Section 3.4, we anticipate most adverse responses from sedation/anesthesia on Guadalupe fur seals to be temporary and minor.

10.3.2.3 Handling of Restrained/Sedated/Anesthetized Guadalupe Fur Seals

As part of handling procedure, length and girth measurements would be taken, and the animal would be weighed. Taking these measurements would involve additional handling that is expected to contribute a few minutes of handling to the process. The most significant response by fur seals will likely be the added stress of the procedure. However, this additional stress is not expected to significantly hamper any individual's ability to survive or reproduce and carries no long-term effects that are likely to result fitness consequences. These findings are consistent with previous investigations on Steller sea lions, where Petrauskas et al. (2008) found that capture and restraint elicit greater responses than the invasive or non-invasive procedures to which they are exposed.

10.3.2.4 Biological Sampling of Restrained/Sedated/Anesthetized Guadalupe Fur Seals

Guadalupe fur seals would undergo several biological sampling techniques while restrained, sedated, or anesthetized. The effects on the animal of many of these biological sampling procedures are considered minor compared to the effects of capture and restraint. The responses of Guadalupe fur seals to these methods are described below.

Hair Sampling

A hair sample will be collected by using scissors or an electric trimmer; if a hair sample is collected from a molting pup, the researcher may simply use a comb to obtain the hair. Care would be taken to only take the sample from the top layer of guard hair, leaving the underfur intact. For Guadalupe fur seals, which require their fur for thermoregulation, only a small patch of guard hair will be removed. All these marks will disappear before or during the annual molt. Thus hair sampling is considered a minor, non-invasive technique, and would only require a short amount of additional handling of an individual. Any stress that may result from this procedure is expected to be minor and transitory.

Vibrissae Sampling

Vibrissae sampling, is the pulling of a whisker, and may cause more than momentary pain due to the highly sensitive nature of the location and function of this sensory organ. The area of the snout where the vibrissae follicles are located is highly vascularized with numerous nerve endings to enable a sea lion to use its vibrissae to search for food even at very cold temperatures (Gee 1998). Even though effects from pulling whiskers are great than that of clipping, adverse effects on the animal of pulling a whisker are probably minor compared to the effects of capture and restraint.

Swab Biological Sampling

The swab sampling does require a brief direct contact with a Guadalupe fur seal by using cotton-tipped sampling swab to the sampled area (nasal cavity, mouth, rectum, etc.), but the contact is only expected to last for seconds.

The sampling swab is sterile and will not contain any hazardous materials. This procedure will not result in skin breakage, and therefore we do not expect any potential for serious injury or long-term effects.

Skin Sampling

The skin sample would be obtained during the flipper tagging, because the tagging releases a piece of skin of sufficient size for genetic analysis. The response to flipper tagging is discussed below.

Blubber Biopsy Sampling

Remote blubber biopsy sampling has not been performed on Guadalupe fur seals, but is expected to elicit a similar escape-avoidance response as in most Steller sea lion juveniles and adult

females but less often in subadult and adult males (Hoberecht et al. 2006a). The small wound site may drip blood for about ten minutes (Hoberecht et al. 2006a). The physiological response from darting is similar to a reaction created by other small wounds obtained by natural causes. Hazards of remote biopsy sampling include inadvertently striking vulnerable areas such as the head (Gemmell and Majluf 1997) or abdomen, darts that penetrate too deeply and cause excessive bleeding or tissue damage, stuck darts or broken tips remaining attached to the animals, causing irritation and possibly abscess and infection, and inadvertent repeated sampling of the same individual, thereby compounding the effects on that animal (NMFS 2007b). Depending on the depth of penetration and force of impact biopsy darts can damage internal organs if they strike the abdominal area, resulting in a fatal wound that may not be detected by researchers at the time of sampling.

NMFS (2007b) states that biopsy punches for skin and blubber samples produce a small wound that has the potential for infection, especially when considering the unsanitary conditions of the environment. An otherwise healthy animal should be able to heal and recover from a properly performed procedure, but animals with compromised immune systems may develop major complications from infection. In addition, this procedure may cause more than momentary pain. Muscle biopsy produces a small-diameter deep wound that can bleed excessively and tends to heal at the surface prior to deep tissue healing, thereby increasing the chances of abscess formation, particularly if the biopsy needle or dart was not properly sterilized. Biopsy wounds, as with any wounds including those acquired during intra-species aggressive interactions, may become contaminated despite use of sterile equipment. Therefore, leaving the wound open to drain should an abscess form, rather than suturing closed, is preferable (NMFS 2007a).

Responses of Steller sea lions biopsied with the larger darts used by Hoberecht et al. (2006a) varied by age/sex class: 95 percent of juveniles, 65 percent of adult females, and 30 percent of adult males left the haulout after they were darted, often returning within five minutes. Previous work noted dart retrieval (by pulling in the retrieval line) caused unintentional alerts and movements; however this can be minimized by retrieving darts slowly, avoiding brightly colored darts and line (Hoberecht et al. 2006a) and ensuring disturbed individuals have safe egress routes available.

Like remote sampling, blubber biopsy samples collected "in-person" result in the removal of tissue that can produce wounds that, as with any wound, have the potential for infection, particularly given the unsanitary environment of the rookeries. These wounds are left open to drain and are undetectable within days after the sample is taken (Hobrecht et al. 2006) and do not usually have lasting effects on the health of the individual animal. An otherwise healthy animal should be able to heal and recover from a properly performed procedure, but animals with compromised immune systems may develop complications.

Given the data presented above, we anticipate adverse responses from biopsies performed on Guadalupe fur seals to be minor. A biopsy may cause a small wound site but this is expected to heal. Although there is a small chance that the wound may lead to infection, we believe this is

unlikely to occur. In addition, we anticipate any unintentional disturbance of non-targeted individuals during biopsy darting to be low and not result in significant behavioral responses.

Blood Collection

The insertion of needles into the veins of Guadalupe fur seals for blood collection will cause discomfort and may result in a hematoma at the insertion site, but these effects are short in duration. Blood collection necessitates the extended restraint of animals, which may increase the risk of stress-related effects and behavioral changes when the animals are released. All procedures that require insertion of needles (i.e., blood collection) carry the risk of infection and abscesses that may affect an animal's general health. To reduce this risk, seals may be scrubbed with betadine or ethyl to prevent infection. Use of these substances may cause a temporary burning sensation and itching could occur (NMFS 2007a). In addition, blood collection can cause pain, stress, damage to the vein, abscesses, and clotting, particularly when multiple attempts are made on the same animal, but if animals are anesthetized, there would be no immediate pain associated with the insertion of the needles.

Fecal Sampling

Fecal loops to collect fecal samples carry the risk of perforating the rectum, which may lead to peritonitis. Any time a foreign object is inserted into the rectum there is the possibility of perforation, which can lead to peritonitis that may result in death. In addition, there is the slight potential to introduce or spread infection if fecal loops are not used properly. When performed by a qualified, experienced person using commonly accepted standards of good practice, these risks are likely minor. The risks associated with capture and restraint are also associated with this procedure.

Milk Collection

Milk collection from adult females will be accomplished by first administering an intramuscular injection of oxytocin. Once the drug takes effect, milk will be extracted from the teats by hand. We do not anticipate any short- or long-term effects for the female as a result of this procedure. The loss of up to 20 ml of milk will reduce the amount available for the pup but it is not likely that the removal of this amount of milk will cause a significant impact on the pup's survival. The effects of collecting milk from lactating females are minor compared to the effects of capture and restraint

10.3.2.5 External Instrument Attachment and Marking

Guadalupe fur seals would have external flipper tags attached, as well as external instruments (i.e., VHF radio tags or satellite tags). Paint marking and the attachment of a neoprene patch to Guadalupe fur seals would be two temporary, external ways researchers would mark individuals during seal count surveys. There is scant information available on the effects of tagging and marking on Guadalupe fur seals specifically. There have been rehabilitated Guadalupe fur seals marked and instrumented after their release (see Section 8.1). In those cases, the seals exhibited

expected behavior with no apparent adverse effects. To supplement our analysis in this section, we rely on the responses of other pinnipeds, under the assumption that Guadalupe fur seals would react similarly.

External instrument attachment and marking can result in potential impacts to Guadalupe fur seals. In a review of both tagging and marking effects on marine mammals as a whole, Walker et al. (2011) claims that marking and tagging can cause pain and changes in swimming/haulout behavior, maternal attendance and the duration of foraging trips. However, Walker et al. (2011) state that these impacts typically have not been found to affect survival of the individuals. New technology for these tags has shown that they can provide data over multiple years reducing the number of times an individual has to be recaptured to obtain longitudinal behavior data. Instruments that are not recovered will remain in the environment. From examination of the scientific literature, the attachment of instruments to pinnipeds may result in modifications of behavior; however there is no other way to obtain information about the animals when they are at sea (Walker and Boveng 1995). Animals that have carried instruments for various amounts of time have been recaptured to retrieve the instruments or resighted in years after they were instrumented indicating that the effects of carrying an instrument do not usually result in reduced survival.

Studies of marked/tagged pinnipeds have tended to focus on effects such as maternal foraging and attendance behavior (Walker and Boveng 1995) and survival and migration (Baker and Johanos 2002). For example, Antarctic fur seals (*Arctocephalus gazella*) fitted with both time-depth recorders and radio-transmitters had increased foraging-trip and nursing-visit durations compared with animals carrying only radio-transmitters (Walker and Boveng 1995). Another study using devices attached with epoxy glue examined the effects of research handling, including blood sampling, flipper tagging and the placement of time-depth recorders, data loggers and video recorders, on the migratory behavior, survival and body condition of Hawaiian monk seals, and found no difference between control and handled animals (Baker and Johanos 2002). There was, however, no direct assessment of how the attachment of devices affected the behavior or foraging success of the animals.

NMFS (2007b) summarizes impacts from these activities by stating the following possible complications involved with internal and external instrument attachment of Steller sea lions:

- External attachment of instruments to the fur or skin with epoxy can cause irritation and lead to increases in grooming behavior with reductions in foraging behavior and other normal behavior. The hydrodynamic drag created by the instrument can hinder swimming performance and result in increased energetic costs of swimming, potentially affecting foraging efficiency.
- Flipper tagging causes momentary discomfort and pain during the attachment of tags and probably for a short time after application. Flipper tags create puncture wounds that produce more than momentary pain, include chances of infection, and may also pull out over time, creating a rip in the flipper.

- Use of dyes, bleach, paint, or other chemicals to temporarily mark the pelage of Steller sea lions or Northern fur seals can potentially cause irritation, and some of the chemicals can be toxic if ingested, and, if they get into an animal's eye can result in blindness. Additional physiological or behavioral effects of temporary pelage marking are unknown, but potentially could alter thermoregulation or grooming behavior.

Flipper tags can cause destruction of tissue at the site of tag attachment (Irvine et al. 1982) and have been known to cause subsequent tissue damage when torn out (Henderson and Johanos 1988). Paterson et al. (2010) used infrared thermography to monitor the healing process after the attachment of flipper tags in grey seals and found small increases in surface temperature during the healing process, with some animals presenting with exudate, swelling and partially open wounds; 24 days after tagging, these signs were no longer present.

There is a possibility that the flipper tag site could become infected, but based on reports from the applicant's current and past research permits for California sea lions, harbor seals or northern elephant seals, no such infections occurred. Tags may also be lost, pulled out or may pop out as the animal grows and may create a permanent hole or tear in the flipper but the applicants have not observed infection associated with lost tags on any of these species. The applicants will use the smallest tags possible and are small relative to the size of the flippers. Although tags may cause some drag on young animals when the animal is swimming, the short and long-term effects of flipper tags are thought to be minor.

Other examples of effects from flipper tags can include changes in haulout behavior, however impacts on migration patterns has not been observed within pinnipeds. For example, tagged Hawaiian monk seals hauled out further from the marking site than did untagged animals (Henderson and Johanos 1988). While another study showed that migration rates of Hawaiian monk seals were not influenced by flipper tagging (Baker and Johanos 2002). Similarly, there was no segregation or rejection between unmarked northern fur seals and animals marked with fluorescent pelage paste (Griben et al. 1984).

Trites (1991) re-evaluated data collected from 1957 to 1966 to determine whether flipper tagging and marking affected growth rates in northern fur seal pups. A previous assessment of the data by Abegglen et al. (1957) concluded that marking reduced growth rates, but Trites (1991) found that tagged and untagged pups grew at the same rate and suggested that differences in weight may have been due to inadvertently selecting smaller pups that were more easily captured. Due to the data presented above, we expect the effects of external instrument attachment and marking to result in low level harassment or harm that will is expected to temporary, limited to when the device is being attached or mark is applied. However, there may be some ongoing, but minor discomfort from the attachment of flipper tags.

No study has found that visual tags affect survival (Baker and Johanos 2002; Hastings et al. 2009; Henderson and Johanos 1988). Neoprene patches would attach to the Guadalupe fur seal's fur temporarily, and would fall off when the seal molted. We anticipate the effects of neoprene patches to be minor. In order to paint mark Guadalupe fur seals, the researchers will use paint

ball guns. This system is the same as that used in human paintball sport and will not harm the animals on impact but will cause momentary pain. The applicant has used this method to mark California sea lions and they do not react or slightly flinch when the paint ball hits but they immediately return to whatever behavior they were engaged in before being marked. An individual Guadalupe fur seal may experience pain from the impact of a paint ball during paint marking, but we expect that the pain sensation and associated stress to be transitory. The paint mark would fade and be gone completely by the time the animal molted. Paint was not reported to cause histological abnormalities in a single study comparing tissue biopsies of painted and unpainted regions from northern fur seals marked with fluorescent paste (Griben et al. 1984).

10.3.2.6 Lethal Take

During research activities, it is possible that moribund fur seals could die or be euthanized at the discretion of the on-site veterinarian. In all cases of euthanasia and mortality, death will occur to the focal individual. Euthanasia will occur based upon a variety of factors:

- Likelihood of survival if not euthanized,
- Clinical signs of disease and the concern that a particular animal and/or animals represent a serious contagious threat to a larger group of animals (e.g. respiratory signs consistent with a morbillivirus infection or systemic ocular disease)
- number of animals involved

The euthanasia of a moribund or severely ill Guadalupe fur seal is not expected to carry a reduced survival or reproductive cost to other individuals in the population. Moribund or severely ill seals would not be expected to live long otherwise, and would not likely survive on their own for a significant period, let alone successfully compete for mating opportunities or successfully produce offspring. By euthanizing, removing, and necropsying these individuals, findings may add to the understanding of disease and illness in Guadalupe fur seals and potentially provide insights that would aid in the conservation and recovery of the other seals in the population.

10.3.2.7 Long-term Effects from Research Activities

The adverse effects of all activities for each research project including capture, restraint, biological sample collection (e.g., tissue, blood, fecal, milk), tagging, marking, instrumentation, and anesthesia on individual animals will have a short-term effect on the animals by disrupting their daily activities or by temporarily displacing them from the haulout or breeding site, but no long-term effects (e.g., reduced survival or reproduction) are anticipated on individuals for any of the species in this application. Other pinnipeds undergoing these procedures (e.g., California sea lions, harbor seals, and northern elephant seals) return to their normal behavior and distribution on the rookery usually within an hour after a disturbance or handling. Based on other researchers' experience (DeRango et al. 2019), Guadalupe fur seals handled in Mexico also return to normal behavior shortly after handling.

Only Guadalupe fur seals in good body condition would be exposed to proposed stressors for the directed sampling activities—those individuals whose body reserves could be able to withstand the metabolic stresses involved with the proposed actions. We expect that, if healthy individuals are exposed and subsequently become moribund and die, the stressors associated with the proposed study will not have contributed significant to the individual's decline, rather there may have been some preexisting conditions affecting the individuals health or some other factor influenced the fitness of the individual and the individual would have died regardless of the research actions considered here.

The permit conditions, the experience of the researchers on other pinniped species, and best practices for close approaches and sampling would help minimize any risk of disturbance or injury occurring during the proposed studies. Assuming an animal is no longer disturbed after it returns to pre-approach behavior, we do not expect long-term consequences for the individuals affected. The permit also requires coordination of the proposed activities with other permit holders conducting similar activities on the same species in the same locations or times of year to avoid unnecessary disturbance.

Permit conditions also address the potential for repeat disturbance of these species. Available information suggests the cumulative effect of close approaches could be greater than the effect of each individual approach (e.g., Weinrich et al. 1992; Beale and Monaghan 2004). To minimize repeated disturbances to individual fur seals, the proposed permit limits directed takes to no more than two per individual each year.

10.4 Risk Analysis

In this section, we assess the consequences of the responses of individuals that have been exposed to the stressors we have identified as adversely affecting Guadalupe fur seals, the populations those individuals represent, and the species those populations comprise. Whereas the *Response Analysis* (Section 10.3.2) 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 10.3.1) and the expected responses to those stressors (as described in Section 10.3.2).

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 fitness, we will assess the consequences of those fitness reductions on the population(s) those individuals belong to.

As noted in the *Response Analysis* (Section 10.3.2), most of the research activities and associated mitigation measures to minimize exposure and associated responses as proposed (other than a negligible amount of lethal take), are not expected to reduce the long-term fitness of any individual Guadalupe fur seals.

Under Permit No. 22678, 355 live Guadalupe fur seals may be exposed to research activities each year. The number of lethal takes proposed to occur under Permit No. 22678 is at a level expected to a threshold of concern. Several population surveys in recent years indicate that the Guadalupe fur seal population is increasing, with a current annual rate of increase at 13.7 percent (Carretta 2019). A low number of expected mortalities related to research activities (two per year) is not a significant threat to population recovery. The maximum number of individuals that may be removed annually from the Guadalupe fur seal population while still allowing it to reach its optimum sustainable population is 1,062 individuals (Carretta 2019). In addition to lethal take, most effects to Guadalupe fur seals during the proposed research activities are expected to be short term and any injuries from tagging or biopsies are expected to heal within weeks. This, combined with the low potential for the proposed research activities to have long-term effects on the Guadalupe fur seal population (see Section 10.3.2.7), illustrates that the proposed research activities present a low threat level to Guadalupe fur seals. As such, the issuance of Permit No. 22678 are not expected to present any long-term risk to the Guadalupe fur seals.

In addition to lethal take, considering the totality of the research activities, individual Guadalupe fur seals may experience stress, minor injury from tagging or the taking of a biopsy, or exhibit altered behaviors. The majority of effects to Guadalupe fur seals are expected to be short term, low level, and minor behavioral effects from exposure to aerial surveys, vessel surveys, ground surveys, non-invasive research activities, and unintentional disturbance which consist of 165 individuals being impacted. Up to 60 individuals would be remotely sampled (e.g., remote biopsy/skin sampling, and paint marking. Invasive procedures which will directly take Guadalupe fur seals by capture, tagging, biopsy, handling and sampling will only include 130 individual Guadalupe fur seals a year which only makes up 1.1 percent of the population. Any injuries from tagging or biopsies are expected to heal within weeks. External instruments and tags are not expected to cause a hindrance to swimming or haulout behavior because of the small size and mass of the tags compared to the size of Guadalupe fur seals. Behavioral and physiological responses that may be exhibited by Guadalupe fur seals upon tagging are expected to return to normal soon after tag attachment. Other than a small amount of proposed lethal take, none of the research activities are expected to result in any intermediate or long-term fitness consequences for individual Guadalupe fur seals. As such, we do not anticipate the proposed research activities will impede the recovery of Guadalupe fur seals.

11 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 9) of this opinion. Anthropogenic effects include climate change, oceanic temperature regimes, vessel strikes, fisheries interactions, 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 other ESA-listed marine animals such as cetaceans from the same anthropogenic effects affecting Guadalupe fur seals may aid in abating the downward trajectory of some and lead to recovery of these and other populations.

12 INTEGRATION AND SYNTHESIS

The *Integration and Synthesis* section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the *Effects of the Action* (Section 10) to the *Environmental Baseline* (Section 9) and the *Cumulative Effects* (Section 11) 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 8). For this consultation, only the risks to ESA-listed Guadalupe fur seals are analyzed in this section since there is no designated critical habitat for Guadalupe fur seals.

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 No. 22678. 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.

No reduction in the distribution of Guadalupe fur seals from the North Pacific Ocean is expected as a result of the proposed research activities covered under Permit No. 22678.

The Guadalupe fur seal is threatened as a result of past commercial hunting. In the North Pacific Ocean, tens of thousands of Guadalupe fur seals were killed in the 18th and 19th centuries until they were believed to be extinct in the early 20th century. Commercial hunting no longer occurs, but Guadalupe fur seals are affected by anthropogenic noise, entanglement in fishing gear, pollution, and reduced prey abundance and habitat degradation due to climate change. There is one single, range-wide population of Guadalupe fur seals, with a minimum population estimate of 31,019 individuals, and a growth rate of 13.7 percent (Carretta 2019). 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 proposed action would have both sublethal and lethal effects on Guadalupe fur seals. Based on our exposure and response analysis above (Section 10.3), we determine that sublethal effects on Guadalupe fur seals resulting from research activities authorized under the proposed action will be minimal, short-term, and are not likely to result in any reduced fitness or loss of fecundity to individual seals.

Based on our exposure and response analysis above (Section 10.3), we believe that the proposed action may result in the death of no more than two Guadalupe fur seals annually. Mortality of Guadalupe fur seals will be limited in the proposed action by an annual maximum limit. If Guadalupe fur seals are not killed by being captured, handled, sampled, or anesthetized, (i.e., sublethal take), we expect that individual Guadalupe fur seals would normally experience no more than short-term stresses as a result of handling and release. Based on our risk analysis (Section 10.4), we expect that the very small numbers of lethal interactions attributed to the Guadalupe fur seal research will not result in any measurable effect on the Guadalupe fur seal population trend. Similarly, we do not anticipate any long-term or adverse effects on either individual seals or the population resulting from the research activities. Several mitigation measures are in place as part of the proposed action that should further minimize the risk of adverse effects on Guadalupe fur seals. In summary, we determine that the proposed action will not appreciably reduce the likelihood of both the survival and recovery of the Guadalupe fur seal.

13 CONCLUSION

After reviewing the current status of the ESA-listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of Guadalupe fur seals. No critical habitat has been designated or proposed for this species; therefore, none will be affected.

14 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 No. 22678 involve directed take for the purposes of scientific research. Therefore, NMFS does not expect the proposed action will incidentally take other threatened or endangered species. However, we request that the Permits and Conservation Division report to us whether the MMPA-authorized take specified in Table 1 and Table 2 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 MML and other similar research activities permitted by the Permits and Conservation Division.

15 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 marine mammals:

Documentation of Responses in Annual Reports

Researchers should thoroughly document the time spent in all attempted capture and release activities and the responses of target animals to these activities in order to assess stress responses on the part of these animals and develop measures to further minimize the stress responses of captured animals as a result of capture and release activities. In addition, researchers should thoroughly document the behavioral reactions to all sampling and tagging activities in order to determine whether additional measures to further minimize stress are needed. Researchers should submit this information to the Permits and Conservation Division as part of their required annual reporting. The Permits Division should post this information on their Authorizations and Permits for Protected Species online database (https://apps.nmfs.noaa.gov/) including all attachments detailing the results.

Documentation of Responses in Future Permit Applications

The Permits and Conservation Division should require that all researchers conducting tagging of pinnipeds provide detailed information on the responses they have observed from their past research. Researchers should provide a high-level of detail in their application and supporting materials to inform recommendations related to minimizing impacts of tagging on ESA-listed pinnipeds. These reports should be provided to the ESA Interagency and Cooperation Division during future Section 7 consultations involving pinniped research.

Results of Tagging

The Permits and Conservation Division should gather data from researchers conducting tagging of Guadalupe fur seals 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. Such information would be very valuable for Guadalupe fur seals in particular, as there is scant tagging information for this species. This should be provided as part of the annual reporting.

Data Sharing

The Permits and Conservation Division should 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 trusted 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. This information would further inform the tracking of impacts of multiple research activities on ESA-listed pinnipeds.

Aggregate Take Tracking

The Permits and Conservation Division should 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.

Action Agency

We recommend the MML consult with the ESA Interagency Cooperation Division on the funding and/or carrying out 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 destroy or adversely modify their designated critical habitat.

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

16 REINITIATION NOTICE

This concludes formal consultation for the Permits and Conservation Division's issuance of Permit No. 22678 to MML to authorize scientific research on Guadalupe fur seals. As 50 C.F.R. §402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

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

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18 APPENDIX A—PERMIT NO. 22678

The text below was taken directly from the proposed permit provided to us in the consultation package from the Permits and Conservation Division. The final permit may have minor changes that will not affect this opinion.

Permit No. 22678

Effective Date: January 1, 2020

Expiration Date: December 31, 2024
Reports Due: March 31, annually

PERMIT TO TAKE PROTECTED SPECIES[2] FOR SCIENTIFIC PURPOSES

I. Authorization

This permit is issued to the National Marine Fisheries Service (NMFS) Marine Mammal Laboratory, Seattle, WA (hereinafter "Permit Holder"), [Responsible Party: John Bengtson, Director], 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 (FSA; 16 U.S.C. 1151 *et seq*.

II. Abstract

The objectives of the permitted activity, as described in the application, are to investigate population status, health, demographic parameters, life history, foraging ecology, and physiology of pinnipeds on the West Coast of the United States.

III. Terms and Conditions

[2] "Protected species" include species listed as threatened or endangered under the ESA, and marine mammals.

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 December 31, 2024. This permit may be extended by the Director, 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 Division for written permission to resume:

   a. If three elephant seals or California sea lions are darted and suffer unanticipated adverse effects, including entering the water and either drowning or disappearing so that their fate cannot be determined.

   b. If serious injury or mortality[3] of protected species reaches that specified in Tables 1-6 of Appendix 1.

   b. If authorized take[4] is exceeded in any of the following ways:

[3] This permit allows for unintentional serious injury and mortality caused by the presence or actions of researchers up to the limit in Tables 1-6 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 during capture and handling, or while attempting to avoid researchers or escape capture. Note that for marine mammals, a serious injury is defined by regulation as any injury that will likely result in mortality.

[4] 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. A take or taking under the FSA means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill. The FSA authorizes the taking, transportation, importation, exportation, or possession of northern fur seals or their parts for educational, scientific, or exhibition

i. More animals are taken than allowed in Tables 1-6 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[5] acquired[6] 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); 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 1-6 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. 22678. This statement must accompany the images and recordings in all subsequent uses or sales.

purposes.
[5] 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.
[6] 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:

    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 Take

a. For pinnipeds observed on land during ground, vessel, and aerial surveys, count 1 take per animal per day for those animals that react to the permitted activities in these ways:

    i. movements of twice the animal's body length or more,
    ii. changes of direction greater than 90 degrees, or
    iii. retreats (flushes) to the water.

b. For pinnipeds observed in water during ground, vessel, and aerial surveys, and audio broadcasts (i.e., playbacks), count 1 take per animal per day for those that exhibit a noticeable adverse behavioral response from your activities.

c. Count every animal netted or captured even if immediately released. Count and report any non-target species that are netted.

d. Do not count takes of pinnipeds as you are transiting between research locations and not actively conducting research.

Manned Aerial Surveys

e. Manned aerial surveys must be flown at a minimum altitude of 500 feet.

Unmanned Aircraft Systems (UAS)

f. Researchers are authorized to use a fixed wing or vertical take-off and landing UAS.

g. UAS must be flown at an altitude of 150 feet or higher.

Capture and Handling

h. Researchers must carry out activities efficiently and use biologists experienced in capture and sampling techniques to complete the activities as quickly and safely as possible to reduce disturbance and minimize handling time.

i. Efforts to approach and capture a particular pinniped or lactating female and pup must be immediately terminated if there is any evidence that the activities may be life-threatening to the animals.

j. Researchers must take reasonable steps to identify pups of lactating females before attempting to immobilize a lactating female.

k. Researchers must minimize the time lactating females are removed or otherwise separated from their dependent offspring as a result of research activities.

l. Researchers must capture and handle pinnipeds in groups small enough so that all animals can be adequately monitored to prevent drowning, overheating, suffocation, or injury.

m. Researchers must use sterile disposable instruments (e.g., needles, biopsy punches) to the maximum extent practicable.

n. Researchers must thoroughly clean and disinfect all non-disposable equipment between animals and, as needed, immediately prior to each use.

o. Researchers must consult an experienced marine mammal veterinarian for proper dosages and protocols for use of anesthesia and sedatives, including administration via remote darting.

p. Researchers must immediately cease research-related procedures if a pinniped is showing signs (e.g., overexertion, constant muscle tensions, abnormal respiration or heart rate) that may lead to serious injury, capture myopathy, other disease conditions, or death; and monitor and treat the animal as determined appropriate by the Principal Investigator (PI), Co-Investigator (CI), or attending veterinarian.

q. Researchers must ensure that pinnipeds that have been captured and anesthetized or administered immobilizing drugs have an opportunity to recover after release without undue risk of drowning or injury from other animals.

Remote Sedation

r. Researchers must halt the use of remote sedation and in-water capture/sedation techniques and consult with NMFS if three or more pinnipeds are sedated and disappear so that their fate cannot be determined or suffer unanticipated adverse effects, including entering the water and drowning.

Mortalities

s. To the maximum extent practical without causing further disturbance, researchers must monitor study sites following any disturbance (e.g., surveys or sampling activities) to determine if any animals have been seriously injured or killed, or if any pups have been abandoned. Any observed serious injury to or death of a marine mammal or observed abandonment of a dependent pup is to be reported as indicated below and in Condition E.2.

t. If a lactating female dies as a result of the permitted activities and her dependent pup can be identified, or if a dependent pup is abandoned, the PI, CI or veterinarian present will evaluate the pup's age, health, and ability to survive on its own. If the pup is determined not likely to survive, Researchers must immediately contact the NMFS West Coast Regional Stranding Network Coordinator [(562) 980-3230 for California, (206) 526-4747 for Washington and Oregon, https://www.fisheries.noaa.gov/contact-directory/marine-mammal-stranding-network-coordinators] and proceed as directed. If the pup is not likely to survive and the Coordinator determines the pup is not a candidate for rehabilitation, or rehabilitation is not logistically feasible, the PI/CI will determine the proper course of action (e.g., euthanasia) in accordance with the approved Institutional Animal Care and Use Committee (IACUC) protocols and the pup must be counted as a research-related mortality.

u. In the event an animal dies, is euthanized, or if a dependent pup is abandoned as a result of research activities, the Permit Holder must,

within two weeks, submit an incident report as described in Condition E.2. For research-related mortalities, a necropsy should be performed, except where not feasible such as in remote areas with limited personnel. Gross necropsy findings should be included as part of an incident report. Final necropsy findings (e.g., histology and other analyses) must be submitted when complete.

Salvage

v. The Permit Holder must coordinate with the NMFS West Coast Region Stranding Coordinator (phone (206) 526-4747 for Washington/Oregon; phone (562) 980-3230 for California) prior to collecting samples or carcasses of any dead stranded ESA-listed marine mammals. The Stranding Coordinator may require the Permit Holder to collect specific data and samples and provide these to the NMFS West Coast Regional Office.

w. The Permit Holder must submit a Level A data sheet (http://www.nmfs.noaa.gov/pr/pdfs/health/levela.pdf), or a report with enough information to prepare a Level A data sheet, to the NMFS West Coast Regional Stranding Coordinator within 30 days of the end of any research trip where dead stranded animals are sampled.

Non-target Species

x. 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 animals to avoid take, including harassment.

Sea Otters

y. Obey all speed zones and drive slowly in all areas with sea otters. Boat strikes are a cause of death for sea otters.

z. If sea otters are observed prior to an encounter, care should be taken to slowly maneuver away from the direction of the animals. If a sea otter is encountered while on the water, a minimum distance of 66 feet should be maintained at all times.

aa. If sea otters approach, place boat engines in neutral and allow the animals to pass.

bb. If a sea otter is injured or killed while conducting the activities authorized under this permit:

i. Such activity must be suspended, unless it would result in the death of the animal(s) being rescued.
ii. Immediately contact the USFWS for instruction (see contact information below).
iii. For any activities which result in the injury or death of a sea otter, a written report must be submitted to USFWS Division of Management Authority (DMA) and the appropriate regional or field office (see contact information below) within 30 days detailing the circumstances that led to the injury or mortality and suggesting measures to prevent or minimize the chances of future injuries or mortalities. A necropsy (if applicable) should be performed by a qualified veterinarian and details of the cause of death included in the written report.
iv. The USFWS may subsequently recommend continuation of the suspended activities with any necessary modifications/conditions.

cc. USFWS contact information:

i. For All Species: USFWS Division of Management Authority, Branch of Permits, MS: IA, 5275 Leesburg Pike, Falls Church, VA 22041-3803 (phone 1-800-358-2104; fax 703-358-2281).
ii. For Southern Sea Otters in California or Oregon: USFWS Ventura Fish and Wildlife Office, 2493 Portola Road, Suite B, Ventura, CA 93003-7726 (phone 805-644-1766; fax 805-644-3958).

iii. For Northern Sea Otters in Washington: USFWS Western Washington Fish and Wildlife Office, 510 Desmond Dr. Suite 102, Lacey, WA 98503 (phone 360-753-9440; 360-753-9405).

6. The Permit Holder must comply with the following conditions, and the regulations at 50 CFR 216.37, for biological samples[7] acquired[8] 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 per Conditions at B.6.d.

[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. 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. For temporary transfers:

i. The Permit Holder may designate Authorized Recipients (ARs) for analysis and curation of samples related to the permit objectives. The Permit Holder must maintain a record of the transfer including the following:

1. Name and affiliation of the AR;

2. Address of the AR;

3. Types of samples sent (species, tissue type);

4. Type of analysis; and

5. Whether samples will be consumed in analysis, returned to the Permit Holder, curated, or destroyed.

ii. The Permit Holder must provide a written copy of the AR designation and the permit per Condition D.3 when transferring samples to the AR.

iii. Samples remain in the legal custody of the Permit Holder while in the possession of ARs. The Permit Holder remains responsible for the samples, including any reporting requirements.

d. For permanent transfers:

i. If the Permit Holder wishes to permanently transfer marine mammal samples (i.e., relinquish custody), recipients must have separate

authorization pursuant to 50 CFR 216.37 (e.g., permit, regional authorization letter) prior to transfer.

e. Samples cannot be bought or sold.

f. After meeting the permitted objectives, the Permit Holder may continue to possess and use biological samples acquired under this permit, including after permit expiration, without additional written authorization. The samples must be maintained as specified in the permit

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. PI – Robert DeLong, Ph.D.

b. CIs – See Appendix 2 for list of names and corresponding activities.

c. Research Assistants – personnel identified by the Permit Holder or PI 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 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 CI named in Condition C.1 is present to act in place of the PI.

c. 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 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 by facsimile or email on the day of designation.

   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.

7. 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.

8. Submit requests to add CIs or change the PI by one of the following:

   a. The APPS 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 or imported 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 APPS 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 APPS.

2. Incident Reporting

a. If the total number of mortalities is reached, or authorized takes have been exceeded as specified in Conditions A.2 and B.5, 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. Any time a serious injury or mortality of a protected species occurs, a written report must be submitted within two weeks.

c. 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 to 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. Include data on pinnipeds that have been remotely sedated or are sedated during in-water captures, specifically reporting on (1) their behavioral response and any activities that put them at heightened risk of injury or death and (2) whether remotely sedated pinnipeds entered the water and their fate could not be determined.

4. A joint annual/final report including a discussion of whether the objectives were achieved must be submitted by March 31, 2025, 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.

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.

2. 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, veterinarian, boat driver, safety diver, animal restrainer, Research Assistant "in training").

    b. Notification must be sent to the Assistant Regional Administrator for Protected Resources:

        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;

3. 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[9] 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

[9] 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.

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.

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, and the FSA;

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

_____ _____

John Bengtson, Ph.D. Date Effective

Director, National Marine Mammal Laboratory

National Marine Fisheries Service

Responsible Party

Appendix 1: Tables Specifying the Kinds of Protected Species, Locations, and Manner of Taking

Table 1. Incidental disturbance of California sea lions, Pacific harbor seals, northern elephant seals and Guadalupe fur seals during research activities at breeding and haulout sites and offshore waters along the U.S. West Coast.

Line	Species	Stock/ Listing Unit	Production/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
1	Sea lion, California	US Stock	Wild	All	Male and Female	175,000	12	Harass	Other	Count/survey	Project 1. Incidental harassment during aerial, ground or vessel abundance or mortality surveys of California sea lions.
2	Seal, harbor	Range-wide	Wild	All	Male and Female	50,000	30	Harass	Other	Count/survey	Project 1. Incidental harassment during aerial, ground or vessel abundance surveys or mortality surveys of harbor seals
3	Seal, northern elephant	California Breeding Stock	Wild	All	Male and Female	23,6000	10	Harass	Other	Count/survey	Project 1. Incidental harassment during aerial, ground abundance surveys or mortality surveys of northern elephant seals
4	Seal, Guadalupe fur	Range-wide	Wild	All	Male and Female	105	12	Harass	Other	Count/survey	Project 1. Incidental harassment during aerial, ground or vessel abundance surveys or mortality surveys of Guadalupe fur seals
5	Sea lion, California	US Stock	Wild	All	Male and Female	52,700	2	Harass	Other	Incidental disturbance	Projects 2-6. Incidental harassment during California sea lion, harbor seal, Guadalupe fur seal or northern elephant seal research activities

Table 1. Incidental disturbance of California sea lions, Pacific harbor seals, northern elephant seals and Guadalupe fur seals during research activities at breeding and haulout sites and offshore waters along the U.S. West Coast.

Line	Species	Stock/ Listing Unit	Production/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
6	Sea lion, California	US Stock	Wild	All	Male and Female	105,500	20	Harass	Other	Collect, scat	Project 5. Incidental harassment during California sea lion scat collections
7	Sea lion, California	US Stock	Wild	All	Male and Female	9000	4	Harass	Other	Observation, mark resight	Project 3. Incidental harassment during resight surveys of California sea lions
8	Seal, harbor	Range-wide	Wild	All	Male and Female	6800	20	Harass	Other	Incidental disturbance	Projects 2-6. Incidental disturbance during harbor seal, California sea lion, Guadalupe fur seal or northern elephant seal research activities
9	Seal, harbor	Range-wide	Wild	All	Male and Female	13,000	24	Harass	Other	Collect, scat	Project 5. Incidental harassment during harbor seal scat collections
10	Seal, harbor	Range-wide	Wild	All	Male and Female	600	30	Harass	Other	Observation, mark resight	Project 3. Incidental harassment during resighting surveys for marked harbor seals
11	Seal, northern elephant	California Breeding Stock	Wild	All	Male and Female	9600	2	Harass	Other	Incidental disturbance	Projects 2-6. Incidental harassment during northern elephant seal, California sea lion, harbor seal or Guadalupe fur seal research activities

Table 1. Incidental disturbance of California sea lions, Pacific harbor seals, northern elephant seals and Guadalupe fur seals during research activities at breeding and haulout sites and offshore waters along the U.S. West Coast.

Line	Species	Stock/ Listing Unit	Production/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
12	Seal, Guadalupe fur	Range-wide	Wild	All	Male and Female	40	12	Harass	Other	Incidental disturbance	Projects 2-6. Incidental harassment during Guadalupe fur seal, California sea lion or harbor seal research activities
13	Seal, Guadalupe fur	Range-wide	Wild	All	Male and Female	10	12	Harass	Other	Collect, scat	Project 5. Incidental harassment during Guadalupe fur seal scat collections
14	Seal, Guadalupe fur	Range-wide	Wild	All	Male and Female	10	12	Harass	Other	Observation, mark resight	Project 3. Incidental harassment during resighting surveys of marked Guadalupe fur seals
15	Sea lion, California	US Stock	Wild	All	Male and Female	500	1	Sample	Other	Salvage (carcass, tissue, parts)	Project 2B. Salvage (carcass, tissue, parts) of dead California sea lions
16	Seal, harbor	Range-wide	Wild	All	Male and Female	500	1	Sample	Other	Salvage (carcass, tissue, parts)	Project 2B. Salvage (carcass, tissue, parts) of dead harbor seals
17	Seal, northern elephant	California Breeding Stock	Wild	All	Male and Female	500	1	Sample	Other	Salvage (carcass, tissue, parts)	Project 2B. Salvage (carcass, tissue, parts) from dead elephant seals
18	Seal, Guadalupe fur	Range-wide	Wild	All	Male and Female	5	1	Sample	Other	Salvage (carcass, tissue, parts)	Project 2B. Salvage (carcass, tissue, parts) of dead Guadalupe fur seals

Table 1. Incidental disturbance of California sea lions, Pacific harbor seals, northern elephant seals and Guadalupe fur seals during research activities at breeding and haulout sites and offshore waters along the U.S. West Coast.

Line	Species	Stock/ Listing Unit	Production/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
19	Sea lion, California	US Stock	Wild	All	Male and Female	500	9999	Import/ export/ receive only	Other	Import/export/ receive, parts	Projects 2-6. Import/export/receive, parts collected from California sea lions. Unlimited parts from 500 animals annually.
20	Seal, harbor	Range-wide	Wild	All	Male and Female	500	9999	Import/ export/receive only	Other	Import/export/ receive, parts	Projects 2, 3, 5. Import/export/receive, parts collected from harbor seals. Unlimited parts from 500 animals annually.
21	Seal, northern elephant	California Breeding Stock	Wild	All	Male and Female	500	9999	Import/ export/ receive only	Other	Import/export/ receive, parts	Projects 2, 5. Import/export/receive, parts collected from northern elephant seals. Unlimited parts from 500 animals annually.
22	Seal, Guadalupe fur	Range-wide	Wild	All	Male and Female	500	9999	Import/ export/ receive only	Other	Import/export/ receive, parts	Projects 2, 3, 5. Import/export/receive, parts collected from Guadalupe fur seals. Unlimited parts from 500 animals annually.

Table 1. Incidental disturbance of California sea lions, Pacific harbor seals, northern elephant seals and Guadalupe fur seals during research activities at breeding and haulout sites and offshore waters along the U.S. West Coast.

Line	Species	Stock/ Listing Unit	Production/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
23	Sea lion, Steller	East of 144° Long (Eastern US)	Wild	All	Male and Female	500	2	Harass	Other	Incidental disturbance	All projects. Incidental disturbance during California sea lion research activities
24	Seal, Northern fur	San Miguel Islands Stock	Wild	All	Male and Female	4600	8	Harass	Other	Incidental disturbance	All projects. Incidental disturbance during California sea lion, harbor seal or northern elephant seal research activities

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
1	Sea lion, California	US Stock	Pup	Male and Female	40	1	Intentional Directed Mortality	Net, Hoop	Administer drug, IM ; Anesthesia, injectable sedative; Intentional (directed) mortality; Measure (standard morphometrics); Restrain, hand; Sample, other; Weigh	Project 2B. Other=Euthanize and necropsy premature pups; Sample, other=full histology tissue collection; archive samples at MML; transfer samples to cooperating entities for analysis.
2	Sea lion, California	US Stock	Pup	Male and Female	40	1	Intentional Directed Mortality	Net, Hoop	Administer drug, IM ; Anesthesia, injectable sedative; Intentional (directed) mortality; Measure (standard morphometrics); Restrain, cage; Restrain, hand; Restrain, net; Sample, other	Project 2B. Other=Euthanize and necropsy moribund full-term pups; Sample, other=full histology tissue collection; archive samples at MML; transfer samples to cooperating entities for analysis.

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
3	Sea lion, California	US Stock	Pup	Male and Female	410	4	Capture/ Handle/ Release	Net, Hoop	Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Restrain, other; Weigh	Project 2A. Pup growth assessment. Restrain, other = pen; Recapture and repeat procedures except skin biopsy and flipper tag at any location
4	Sea lion, California	US Stock	Pup	Male and Female	90	4	Capture/ Handle/ Release	Net, Hoop	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Restrain, other; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, stomach lavage; Sample, vibrissae (pull); Weigh	Project 2A. Restrain, other = pen; Sample, stomach lavage = milk for contaminants analysis. Recapture and resample at any location

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
5	Sea lion, California	US Stock	Juvenile	Male and Female	100	2	Capture/ Handle/ Release	Trap, floating	Anesthesia, injectable sedative; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, cage; Sample, blood; Weigh	Project 2A. Retain tissue from tagging for genetics; Mark, other = neoprene patch; recapture and resample at any location.
6	Sea lion, California	US Stock	Juvenile	Male and Female	120	2	Capture/ Handle/ Release	Net, Hoop	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, urine catheter; Sample, vibrissae (pull); Ultrasound; Weigh	Project 2A, 5C. Sample, other = urogenital swab; Sample, other = urine cystocentesis; recapture and resample at any location

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
7	Sea lion, California	US Stock	Adult	Female	15	2	Capture/ Handle/ Release	Trap, floating	Anesthesia, injectable sedative; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, cage; Sample, blood; Weigh	Project 2A. Retain tissue from tagging for genetics; Mark, other = neoprene patch; recapture and resample at any location.
8	Sea lion, California	US Stock	Adult	Female	30	2	Capture/ Handle/ Release	Net, Hoop	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Mark, dye or paint; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, urine catheter; Sample, vibrissae (pull); Ultrasound; Weigh	Project 2A. Sample, other = urogenital swab; Sample, other = urine cystocentesis; recapture and resample at any location.

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
9	Sea lion, California	US Stock	Adult	Male	180	2	Capture/ Handle/ Release	Trap, floating	Anesthesia, injectable sedative; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, cage; Sample, blood; Weigh	Project 2A. Retain tissue from tagging for genetics; Mark, other = neoprene patch; recapture and resample at any location.
10	Sea lion, California	US Stock	Adult	Male	140	2	Capture/ Handle/ Release	Trap, floating	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, cage; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, urine catheter; Sample, vibrissae (pull); Ultrasound; Weigh	Project 2A, 5C. Sample, other = urogenital swab; Sample, other = urine cystocentesis; recapture and resample at any location

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
11	Sea lion, California	US Stock	Pup	Male and Female	450	4	Capture/ Handle/ Release	Other	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Restrain, hand; Restrain, net; Restrain, other; Sample, skin biopsy; Weigh	Project 3. Pups 12 kg or greater; Collect, Other = round up; Restrain, other=pen; recapture and resample at any location...
12	Sea lion, California	US Stock	Pup	Male and Female	50	4	Capture/ Handle/ Release	Other	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Restrain, hand; Restrain, net; Restrain, other; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3. Pups 12 kg or greater; Collect, Other = round up; Restrain, other=pen; recapture and resample at any location.

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
13	Sea lion, California	US Stock	Pup	Male and Female	400	1	Capture/ Handle/ Release	Net, Hoop	Administer drug, subcutaneous; Mark, clip fur; Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, skin biopsy; Weigh	Project 4. San Miguel Island; retain tissue from tagging for skin biopsy; Administer drug, subcutaneous if biopsy punch is used for tissue sample
14	Sea lion, California	US Stock	All	Male	150	4	Harass/ Sampling	Other	Mark, other (e.g., neoprene patch); Sample, blubber biopsy; Sample, other; Sample, skin biopsy	Project 4. Mark, other=remote paint mark with paint balls, may be repeated to maintain mark through season; Sample, other=remote biopsy sample with crossbow

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
15	Sea lion, California	US Stock	Pup	Male and Female	60	4	Capture/ Handle/ Release	Net, Hoop	Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, cage; Restrain, hand; Restrain, net; Restrain, other; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal enema; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, stomach lavage; Sample, urine catheter; Sample, vibrissae (pull); Ultrasound; Weigh	Projects 2A, 5A, 5B. Pups 20 kg or greater; Restrain, other = pen; Sample, other = urine cystocentisis; Sample, stomach lavage = milk for pollutant analysis. Recapture and resample at any location.

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
16	Sea lion, California	US Stock	Juvenile	Male and Female	40	4	Capture/ Handle/ Release	Net, Hoop	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, cage; Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal enema; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, urine catheter; Sample, vibrissae (pull); Ultrasound; Weigh	Projects 2A, 5A, 5B. Sample, other = urogenital swab; Sample, other = urine cystocentesis; Recapture and resample at any location.

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
17	Sea lion, California	US Stock	Juvenile	Male and Female	20	4	Capture/ Handle/ Release	Trap, floating	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, cage; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal enema; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, urine catheter; Sample, vibrissae (pull); Ultrasound; Weigh	Projects 2A, 5C. Mark, other=neoprene patch; Sample, other = urogenital swab; Sample, other = urine cystocentisis; recapture and resample at any location.

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
18	Sea lion, California	US Stock	Adult	Female	30	4	Capture/ Handle/ Release	Net, Hoop	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, cage; Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal enema; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, urine catheter; Sample, vibrissae (pull); Ultrasound; Weigh	Projects 2A, 5A, 5B. Sample, other = urogenital swab; Sample, other = urine cystocentesis; Recapture and resample at any location.

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
19	Sea lion, California	US Stock	Adult	Male	10	2	Capture/ Handle/ Release	Dart, injectable immobilizing agent	Administer drug, IM ; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal enema; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, urine catheter; Sample, vibrissae (pull); Ultrasound; Weigh	Projects 2A, 5A, 5B. Mark, other=neoprene patch; Sample, other = urogenital swab; Sample, other = urine cystocentesis; recapture and resample at any location.
20	Sea lion, California	US Stock	Adult	Male	60	4	Harass/ Sampling	Other	Mark, other (e.g., neoprene patch); Sample, blubber biopsy; Sample, other; Sample, skin biopsy	Projects 6. Mark, other=remote mark with paint balls; Sample, other = remote biopsy sample.
21	Sea lion, California	US Stock	Pup	Male and Female	16	1	Unintentional mortality	Other	Unintentional mortality	All projects.

Table 2. California sea lion research takes. California Channel Islands; Ano Nuevo Island; Farallon Islands; offshore haulouts in California, Oregon and Washington; Columbia River, Inland Washington haulouts; from coasts to 50 nm offshore.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
22	Sea lion, California	US Stock	Non-Pup	Male and Female	10	1	Unintentional mortality	Other	Unintentional mortality; salvage	All projects. All projects. Ten mortalities annually, not to exceed 50 over duration of permit; humane euthanasia if warranted; necropsy.

Table 3. Pacific harbor seal takes during research activities in offshore waters and at breeding and haulouts along the California, Oregon and Washington coasts.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
1	Seal, harbor	Range-wide	Pup	Male and Female	80	2	Capture/ Handle/ Release	Other	Mark, dye or paint; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, clip hair; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3. <20 kg; Observe/Collect Method, Other = hoop net or seine net depending on capture site; Mark, other = patch; Tissue from tagging retained for genetics; May be recaptured and resampled at any location.

Table 3. Pacific harbor seal takes during research activities in offshore waters and at breeding and haulouts along the California, Oregon and Washington coasts.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
2	Seal, harbor	Range-wide	Pup	Male and Female	110	2	Capture/ Handle/ Release	Other	Administer drug, subcutaneous; Mark, dye or paint; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3. <20 kg; Observe/Collect Method, Other = hoop net or seine net depending on capture site; Mark, other = patch; Tissue from tagging retained for genetics; May be recaptured and resampled at any location.

Table 3. Pacific harbor seal takes during research activities in offshore waters and at breeding and haulouts along the California, Oregon and Washington coasts.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
3	Seal, harbor	Range-wide	All	Male and Female	340	2	Capture/ Handle/ Release	Other	Mark, dye or paint; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, clip hair; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3. Animals 20 kg or greater; Observe/Collect Method, Other = hoop net or seine net depending on capture site; Mark, other = patch; Tissue from tagging retained for genetics; May be recaptured and resampled at any location.

Table 3. Pacific harbor seal takes during research activities in offshore waters and at breeding and haulouts along the California, Oregon and Washington coasts.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
4	Seal, harbor	Range-wide	All	Male and Female	110	2	Capture/ Handle/ Release	Other	Administer drug, subcutaneous; Anesthesia, injectable sedative; Mark, dye or paint; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3. Animals 20 kg or greater; Observe/Collect Method, Other = hoop net or seine net depending on capture site; Mark, other = patch; Sample, other = urogenital swab; Tagging tissue retained; May be recaptured and resampled at any location

Table 3. Pacific harbor seal takes during research activities in offshore waters and at breeding and haulouts along the California, Oregon and Washington coasts.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
5	Seal, harbor	Range-wide	All	Male and Female	250	2	Capture/ Handle/ Release	Other	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, clip hair; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Project 2A, 3. Animals 20 kg or greater; Observe/Collect Method, Other = hoop net or seine net depending on capture site; Sample, urogenital swab; Tag tissue retained; May be recaptured and resampled at any location
6	Seal, harbor	Range-wide	All	Male and Female	150	2	Capture/ Handle/ Release	Other	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3. Animals 20 kg or greater; Observe/Collect Method, Other = hoop net or seine net depending on capture site; Sample, urogenital swab; May be recaptured and resampled at any location

Table 3. Pacific harbor seal takes during research activities in offshore waters and at breeding and haulouts along the California, Oregon and Washington coasts.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
7	Seal, harbor	Range-wide	All	Male and Female	40	2	Capture/ Handle/ Release	Net, Hoop	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Project 5B. Animals 20 kg or greater; San Miguel Island; Mark, other = patch; Sample, other = urogenital swab non-pups; Tag tissue retained; May be recaptured and resampled at any location
8	Seal, harbor	Range-wide	All	Male and Female	295	2	Capture/ Handle/ Release	Other	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Mark, other (e.g., neoprene patch); Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 5C. Animals 20 kg or greater; Observe/Collect Method, Other = hoop net or seine net depending on capture site; Sample, other = urogenital swab non-pups; May be recaptured and resampled at any location

Table 3. Pacific harbor seal takes during research activities in offshore waters and at breeding and haulouts along the California, Oregon and Washington coasts.

Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
9	Seal, harbor	Range-wide	Non-Pup	Male and Female	30	2	Capture/ Handle/ Release	Other	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Instrument, internal (e.g., PIT); Mark, dye or paint; Mark, flipper tag; Mark, hot brand; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 5C. > 60 kg; Observe/Collect Method, Other = hoop net or seine net depending on capture site; Instrument, internal = stomach telemetry transmitter; May be recaptured and resampled at any location
10	Seal, harbor	Range-wide	Unknown	Male and Female	6	1	Unintentional mortality	Other	Unintentional mortality	All projects
11	Seal, harbor	Range-wide	Non-Pup	Male and Female	6	1	Unintentional mortality	Other	Unintentional mortality; salvage	All projects. All projects. Six mortalities annually, not to exceed 30 over duration of permit; humane euthanasia if warranted; necropsy.

Table 4. Northern elephant seal takes for research activities at breeding and haulout sites along the U.S. West Coast.										
Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
1	Seal, northern elephant	California Breeding Stock	Pup	Male and Female	20	2	Capture/ Handle/ Release	Other	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, injectable sedative; Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, other; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, stomach lavage; Sample, vibrissae (pull); Weigh	Project 2A. Observe/Collect, Other = head bag; Restrain, other=head bag; Sample, stomach lavage for milk sample; Subcutaneous drugs will be used when no injectable sedative is used and a blubber biopsy is taken; recapture and resample at any location.

Table 4. Northern elephant seal takes for research activities at breeding and haulout sites along the U.S. West Coast.										
Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
2	Seal, northern elephant	California Breeding Stock	Juvenile	Male and Female	20	2	Capture/ Handle/ Release	Other	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, injectable sedative; Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, other; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Project 2A. Observe/Collect, Other = head bag; Restrain, other=head bag; Sample, other = urogenital swab; Subcutaneous drugs will be used when no injectable sedative is used and a blubber biopsy is taken; recapture and resample at any location.

Table 4. Northern elephant seal takes for research activities at breeding and haulout sites along the U.S. West Coast.										
Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
3	Seal, northern elephant	California Breeding Stock	Adult	Female	20	2	Capture/ Handle/ Release	Other	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, injectable sedative; Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, other; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Project 2A. Observe/Collect, Other = head bag; Restrain, other=head bag; Sample, other = urogenital swab; recapture and resample at any location.

Table 4. Northern elephant seal takes for research activities at breeding and haulout sites along the U.S. West Coast.										
Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
4	Seal, northern elephant	California Breeding Stock	Adult	Male	20	2	Capture/ Handle/ Release	Dart, injectable immobilizing agent	Administer drug, IM ; Anesthesia, injectable sedative; Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Project 2A. Sample, other = urogenital swab; May be recaptured and resampled at any location.

Table 4. Northern elephant seal takes for research activities at breeding and haulout sites along the U.S. West Coast.										
Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
5	Seal, northern elephant	California Breeding Stock	Pup	Male and Female	10	2	Capture/ Handle/ Release	Other	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, other; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, stomach lavage; Sample, vibrissae (pull); Weigh	Projects 2A, 5B. Observe/Collect, Other = head bag; Restrain, other=head bag; Subcutaneous drugs will be used when no injectable sedative is used and a blubber biopsy is taken; recapture and resample at any location.

Table 4. Northern elephant seal takes for research activities at breeding and haulout sites along the U.S. West Coast.										
Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
6	Seal, northern elephant	California Breeding Stock	Juvenile	Male and Female	10	2	Capture/ Handle/ Release	Other	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, other; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, stomach lavage; Sample, vibrissae (pull); Weigh	Projects 2A, 5B. Observe/Collect, Other = head bag; Restrain, Other = head bag; Sample, other = urogenital; recapture and resample at any location.

Table 4. Northern elephant seal takes for research activities at breeding and haulout sites along the U.S. West Coast.										
Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
7	Seal, northern elephant	California Breeding Stock	Adult	Female	10	2	Capture/ Handle/ Release	Other	Administer drug, IM ; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, other; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, stomach lavage; Sample, vibrissae (pull); Weigh	Project 2A, 5B. Observe/Collect, Other = head bag; Restrain, Other = head bag; Sample, other = urogenital; recapture and resample at any location.

Table 4. Northern elephant seal takes for research activities at breeding and haulout sites along the U.S. West Coast.										
Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
8	Seal, northern elephant	California Breeding Stock	Adult	Male	10	2	Capture/ Handle/ Release	Dart, injectable immobilizing agent	Administer drug, IM ; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal enema; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, stomach lavage; Sample, vibrissae (pull); Weigh	Projects 2A, 5B. Sample, other = urogenital swab; May recapture and resample at any location.
9	Seal, northern elephant	California Breeding Stock	Pup	Male and Female	2	1	Unintentional mortality	Other	Unintentional mortality	All projects.

Table 4. Northern elephant seal takes for research activities at breeding and haulout sites along the U.S. West Coast.										
Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
10	Seal, northern elephant	California Breeding Stock	Non-Pup	Male and Female	2	1	Unintentional mortality	Other	Unintentional mortality; salvage	All projects. All projects. Two mortalities annually, not to exceed 10 over duration of permit; humane euthanasia if warranted; necropsy.

Table 5. Guadalupe fur seal takes during research activities at any breeding or haulout site and offshore waters along the U.S. West Coast.										
Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
1	Seal, Guadalupe fur	Range-wide	pup	Male and Female	10	1	Capture/Handle/ Release	Net, Hoop	Instrument, internal (e.g., PIT); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, clip hair; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3. Pups < 12 kg

Table 5. Guadalupe fur seal takes during research activities at any breeding or haulout site and offshore waters along the U.S. West Coast.										
Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
2	Seal, Guadalupe fur	Range-wide	All	Male and Female	20	2	Capture/ Handle/ Release	Net, Hoop	Administer drug, subcutaneous; Anesthesia, injectable sedative; Instrument, internal (e.g., PIT); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3. Pups 12 kg or greater; Sample, other = urogenital swab non-pups; may be recaptured or resampled at any location.
3	Seal, Guadalupe fur	Range-wide	Pup	Male and Female	20	2	Capture/ Handle/ Release	Net, Hoop	Administer drug, subcutaneous; Instrument, external (e.g., VHF, SLTDR); Instrument, internal (e.g., PIT); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal loop; Sample, fecal swab; Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3, 5B. Pups 20 kg or greater will be instrumented; may be recaptured and resampled at any location.

Table 5. Guadalupe fur seal takes during research activities at any breeding or haulout site and offshore waters along the U.S. West Coast.										
Line	Species	Stock/ Listing Unit	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
4	Seal, Guadalupe fur	Range-wide	Non-Pup	Male and Female	20	2	Capture/ Handle/ Release	Net, Hoop	Administer drug, IM ; Administer drug, subcutaneous; Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Instrument, internal (e.g., PIT); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, blubber biopsy; Sample, clip hair; Sample, fecal enema; Sample, fecal swab; Sample, milk (lactating females); Sample, nasal swab; Sample, ocular swab; Sample, oral swab; Sample, other; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Projects 2A, 3, 5B. Administer drug, IM = oxytocin for milk collection; Sample, Other = urogenital swab; recapture and resample at any location.
5	Seal, Guadalupe fur	Range-wide	Non-Pup	Male and Female	60	1	Harass/ Sampling	Other	Mark, other (e.g., neoprene patch); Sample, blubber biopsy; Sample, other; Sample, skin biopsy	Projects 3, 5B. Mark, other = remote paint with paint balls; Sample, other = remote biopsy sample; marking and sampling may be land or vessel based
6	Seal, Guadalupe fur	Range-wide	All	Male and Female	2	1	Unintentional mortality	Other	Unintentional mortality; salvage	All projects. Two mortalities annually, not to exceed 10 over duration of permit; humane euthanasia if warranted; necropsy.

Table 6. Otariid hybrid takes during research activities at any breeding or haulout site or in offshore waters along the U.S. West Coast.											
Line	Species	Stock/ Listing Unit	Production/ Origin	Life stage	Sex	Authorized Take	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
1	Pinniped, unidentified	NA	Wild	pup	Male and Female	10	2	Capture/ Handle/ Release	Net, Hoop	Instrument, external (e.g., VHF, SLTDR); Instrument, internal (e.g., PIT); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, clip hair; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Project 6. Only pups 20 kg or greater will be instrumented with external instruments; may be recaptured and resampled at any location.
2	Pinniped, unidentified	NA	Wild	Non-Pup	Male and Female	10	2	Capture/ Handle/ Release	Net, Hoop	Anesthesia, gas w/cone or mask; Anesthesia, gas w/intubation; Anesthesia, injectable sedative; Instrument, external (e.g., VHF, SLTDR); Instrument, internal (e.g., PIT); Mark, dye or paint; Mark, flipper tag; Measure (standard morphometrics); Restrain, hand; Restrain, net; Sample, blood; Sample, clip hair; Sample, skin biopsy; Sample, vibrissae (pull); Weigh	Project 6. May be recaptured and resampled at any location.
3	Pinniped, unidentified	NA	Wild	All	Male and Female	1	1	Unintentional mortality	Other	Unintentional mortality	

Appendix 2: NMFS-Approved Personnel and Authorized Recipients for Permit No. 22678.

The following individuals are approved to act as Principal Investigator (PI) and Co-Investigators (CIs) pursuant to the terms and conditions under Section C (Qualifications, Responsibilities, and Designation of Personnel) of this permit. Investigators listed by authority for conducting (X) or supervising (S) procedures conducted on California sea lions, Pacific harbor seals, northern elephant seals, or Guadalupe fur seals.

	PI	CIs						
Activities	**R. DeLong**	**J. Harris**	**S. Jeffries**	**D. Lambourn**	**S. Melin**	**A. Orr**	**S. Steingass**	**B. Wright**
Intentional Mortality (directed, euthanasia)	X		X	X	S			
Count/Survey, aerial (manned)	X	X	X	X		S		X
Count/Survey, aerial (UAS)	S	X				X		
Count/Survey, ground	X	X	X	X	X	X		X
Count/Survey, vessel	X	X	X	X	X	X		X
Capture, head bag	X		S	X	S	S		
Capture, hoop net	X	X	X	X	X	X	S	X
Capture, seine net	S	X	X	X	S	X	S	X
Capture floating trap	X	X	X	X	S	X	X	X
Capture, dart with injectable immobilizing drug	X	S	X	S	S	S		
Collect, scat, spew, molted hair	X	X	X	X	X	X		X
Salvage/necropsy	X	X	X	X	X	X	X	
Import/export/receive parts	X	X	X	X	X	X	X	
Administer drug, IM	X	X	X	X	X	X		
Administer drug, IV	X		X	X				
Administer drug, subcutaneous	X	X	X	X	X	X		
Anesthesia, injectable sedative	X	X	X	X	X			
Anesthesia, gas cone or mask	X	S	X	X	S	S		
Anesthesia, gas intubation	S	S	X	X	S	S		
Restrain, board	X	X	X	X	X	X	S	X
Restrain, sqeeze cage or crate	X	X	X	X	X	X	X	X
Restrain, hand	X	X	X	X	X	X	S	X
Restrain, head bag	X	X	X	X	X	X		
Restrain, net	X	X	X	X	X	X	S	X

Activities	PI	CIs						
	R. DeLong	J. Harris	S. Jeffries	D. Lambourn	S. Melin	A. Orr	S. Steingass	B. Wright
Restrain, pen	X	X	X	X	X	X		
Mark, clip fur	X	X	X	X	X	X	X	X
Mark, bleach, dye or paint	X	X	X	X	X	X	S	X
Mark, flipper tag	X	X	X	X	X	X	S	X
Mark, hot brand	X	X	X	X	X	X		X
Mark, neoprene patch	X	X	X	X	X	X		X
Mark, remote paint		X	X	S	X	X		
Measure	X	X	X	X	X	X	X	X
Weigh	X	X	X	X	X	X	X	X
Observation, mark resight or behavior	X	X	X	X	X	X	X	X
Instrument, external	X	X	X	X	X	X	S	X
Instrument, internal (PIT)	S	S	S	X	S			
Instrument, internal (SST)				X				
Blood	X	X	X	X	X	X		
Biopsy, blubber	X	X	X	X	X	X		
Biopsy, skin	X	X	X	X	X	X		
Biopsy, remote biopsy skin or blubber	S	X	X	S	X		S	
Clip hair, Stable isotope analysis	X	X	X	X	X	X	X	
Fecal enema	X	X	X	X	X	X		
Fecal loop	X	X	X	X	X	X		
Milk	X	X	X	X	X	X		
Stomach lavage	X	X	X	X	X	X		
Swab, fecal	X	X	X	X	X	X	S	
Swab, nasal	X	X	X	X	X	X	S	
Swab, ocular	X	X	X	X	X	X		
Swab, oral	X	X	X	X	X	X		
Swab, urogenital	X	X	X	X	X	X		
Ultrasound	S	S	S	X	S	S		
Urine, catheter	X	S	S	X		S		
Urine, cystocentesis				X				
Vibrissae (pull)	X	X	X	X	X	X	X	
Photo-Identification	X	X	X	X	X	X		X
Photograph/video	S	X	X	X	X	X		X

Activities	PI	CIs						
	R. DeLong	**J. Harris**	**S. Jeffries**	**D. Lambourn**	**S. Melin**	**A. Orr**	**S. Steingass**	**B. Wright**
Boat operator	X	X	X	X	X	X		
UAS visual observer		X			S	X		
UAS pilot		X				X		