National Marine Fisheries Service
Endangered Species Act Section 7 Biological Opinion

Action Agencies: Permits and Conservation Division of the Office of Protected Resources, National Marine Fisheries Service

Activity Considered: Issuance of Permit No. 19091 for research on pinnipeds, cetaceans and sea turtles, pursuant to Section 10(a)(1)(A) of the Endangered Species Act of 1973

Consultation Conducted By: Endangered Species Act Interagency Cooperation Division, Office of Protected Resources, National Marine Fisheries Service

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Acronyms and Abbreviations

CE-Categorical Exclusion
CFR-Code of Federal Regulations
CITES-Convention on International Trade in Endangered Species of Wild Fauna and Flora
dB-decibel
DDT-Dichlorodiphenyltrichloroethane
DO-Dissolved oxygen
DPS-Distinct population segment
ESA-Endangered Species Act
ESU-Evolutionarily significant unit
FR-Federal Register
ft-feet
gal-gallon
g-gram
kg-kilogram

kHz-kilohertz
km-kilometer
m-meter
mL-milliliter
MMPA-Marine Mammal Protection Act
mW-milliwatt
nm-nautical miles
NMFS-National Marine Fisheries Service
NOAA-National Oceanic and Atmospheric Administration
PCB-Polychlorinated biphenyl
PCE-primary constituent element
PIT-passive integrated transponder
ppt-parts per thousand
SCL-straight carapace length
UAS-Unmanned aerial systems
USFWS-United States Fish and Wildlife Service
VHF-very high frequency

1 INTRODUCTION

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. When a Federal agency's action "may affect" a protected species, that agency is required to consult formally with NOAA's National Marine Fisheries Service (NMFS) or the US Fish and Wildlife Service (USFWS), depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR §402.14(a)). Federal agencies are exempt from this general requirement if they have concluded that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and NMFS or the USFWS concurs with that conclusion (50 CFR §402.14(b)).

Section 7 (b)(3) of the ESA requires that at the conclusion of consultation, NMFS and/or USFWS provide an opinion stating how the Federal agencies' actions will affect ESA-listed species and their critical habitat under their jurisdiction. If an incidental take is expected, section 7 (b)(4) requires the consulting agency to provide an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts.

For the actions described in this document, the action agency is the NMFS Permits and Conservation Division.

The biological opinion (opinion) and incidental take statement were prepared by NMFS Endangered Species Act Interagency Cooperation Division in accordance with section 7(b) of the ESA and implementing regulations at 50 CFR §402. This document represents NMFS' opinion on the effects of these actions on endangered and threatened species and critical habitat that has been designated for those species. A complete record of this consultation is on file at NMFS Office of Protected Resources in Silver Spring, Maryland.

1.1 Background

The NMFS Permits and Conservation Division has initiated formal consultation with the NMFS Endangered Species Act Interagency Cooperation Division (both of the NMFS Office of Protected Resources) on the Permits and Conservation Division's proposal to issue a scientific research permit to NMFS Southwest Fisheries Science Center.

The NMFS Southwest Fisheries Science Center is proposing to conduct research activities through aerial and vessel surveys on marine mammals and sea turtles in all oceans of the world, with a focus on populations in the eastern Pacific.

The proposed research would be a continuation of research previously conducted by the NMFS Southwest Fisheries Science Center under Permit No. 14097 (issued in 2010), which also involved aerial and vessel surveys on pinnipeds, cetaceans and sea turtles.

1.2 Consultation History

This opinion is based on information provided in the draft categorical exclusion memorandum, the permit application, past reports and other sources of information.

If issued, Permit No. 19091 would replace the current Permit No. 14097, which was originally issued on July 1, 2010. On December 16, 2014, the ESA Interagency Cooperation Division issued a biological opinion on the issuance of a modification (Permit No. 14097-05) to authorize takes of humpback whales in the Southern Ocean.

On October 31, 2014, the Permits and Conservation Division provided a draft version of the permit application for Permit No. 19091 for comment and review. A revised application was re-submitted to the Permits and Conservation Division in February 2015 and the ESA Interagency Cooperation Division provided comments that were forwarded to the applicant. On July 29, 2015, the Permits and Conservation Division published notice in the Federal Register on their proposal to issue Permit No. 19091.

On December 8, 2015, the Permits and Conservation Division requested a consultation under the ESA in a memorandum on its proposal to issue a scientific research Permit No. 19091. Consultation was initiated on December 9, 2015, after the Permits and Conservation Division provided some additional materials for the consultation package.

2 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 Federal action considered in this opinion is the Permits and Conservation Division's proposal to issue a scientific research permit to the NMFS Southwest Fisheries Science Center and authorize take of ESA-listed pinnipeds, cetaceans and sea turtles pursuant to ESA section 10(a)(1)(A).

2.1 Proposed Activities

The proposed action would authorize take for a broad suite of research activities on several ESA-listed species during aerial and vessel surveys conducted by the NMFS Southwest Fisheries Science Center. The surveys could take place in any ocean in the world, but would primarily be focused in the Pacific Ocean.

In its application, the Southwest Fisheries Science Center organized its request into three projects, with each single project focusing on pinnipeds, cetaceans or sea turtles. Each project is described below.

2.1.1 Project 1 Pinniped Studies

In Project 1, pinniped studies will focus on monitoring the populations of Northern elephant seals, California sea lions, Eastern distinct population segment (DPS) Steller sea lions and harbor seals by using ground and vessel censuses and aerial surveys to determine abundance, distribution patterns, breeding densities and other demographic attributes. These research objectives would help gather information necessary for stock assessment reports under the MMPA.

The takes authorized for research activities under Project 1 would be for MMPA-listed pinnipeds only. There would be no authorized take of ESA-listed pinnipeds for this action (e.g., Western DPS Steller sea lions, Arctic DPS ringed seals, Hawaiian monk seals). Furthermore, the research activities focusing on pinnipeds will take place in California, Oregon and Washington, outside of the range of ESA-listed pinnipeds such as Hawaiian monk seals and Western DPS Steller sea lions.

2.1.2 Project 2 Cetacean Studies

In Project 2, cetacean studies will focus on determining the abundance, distribution patterns, dive behavior, demographic parameters, recruitment trends, risk analysis and stock structure of several species of cetaceans. These research objectives support the requirements specified by the MMPA and ESA, including stock assessment surveys, potential biological removal calculation and recovery plan goals. The project will encompass aerial and vessel surveys, close approach for sample collection and tag attachment and acoustic research.

2.1.2.1 Visual and Aerial Surveys

Surveys to collect census and population data will be conducted from vessels and aircraft. The at-sea vessel surveys will take place on large research vessels (~209 ft in length) and from smaller (14 ft) inflatable boats with a 40 horsepower outboard motor. Surveys taking place on the larger research vessels will travel along predetermined track lines at a speed of about 10 knots. Marine mammal observers will be aboard the research vessels and stationed on a flying bridge deck using 25 power binoculars.

In cases where a data collection opportunity arises, the research vessel may turn off the transect line and approach a marine mammal group to confirm species identification. The vessel would approach within 500 m of the group at a speed no more than 10 knots; the approach would generally occur from behind or from the side of the animals. By traveling slowly and keeping an adequate distance, the research vessel operator would take care to not cause the cetacean group to break up or to otherwise disrupt the animals.

Small boat approaches of cetacean groups would be conducted in a similar conservative manner, minimizing boat noise by keeping a consistent speed and direction and approaching the animals from behind.

Other research activities may also occur during these vessel surveys, such as biological sample collection and photo identification. See below for further details on these activities.

Aerial surveys will occur year-round along the U.S. west coast, up to 150 nm offshore. The number of aerial survey days can vary (based on factors like weather and season), but the applicant states that there are usually between 7 and 20 survey days per year. There are usually two 4 hour flights per day. The aircraft used in the aerial surveys will be a twin-engine, fixed-wing aircraft (e.g., a Twin Otter or Partenavia).

The aerial line transect surveys are generally flown at an altitude of 700 ft above sea level; the aircraft will circle between 500 and 1000 ft above sea level to confirm species and estimate group size. Aerial photogrammetry may also occur during these aerial surveys.

2.1.2.2 Unmanned Aerial Systems: Photogrammetry and Breath Sample Collection

The action will involve the use of aerial survey platforms known as an unmanned aerial system (UAS) to achieve research objectives. The UAS (i.e., quadcopter or hexacopter) that is proposed for use for this research is about 0.5 m square and weighs 2.6 lbs; when loaded with a battery and camera, the UAS weighs 4.5 lbs. The UAS is described as “almost silent”, with sounds levels less than 5 dB at 30 m.

The UAS is remotely operated and will be launched from land, small boat or large research vessel. The unit contains a camera which will be used to photograph cetaceans at an altitude of 100-200 ft above sea level. Typical flight time is between 12 and 15 minutes and the maximum aircraft endurance is about 35 minutes. During operation, the UAS would make 2-3 passes over an individual animal to get multiple photogrammetric-quality images. The amount of time the UAS would be over an individual would be 1-2 minutes.

The flight team is composed of two individuals, a pilot in charge and a ground station operator. The UAS is controlled by the pilot and the ground operator provides the pilot with live video, telemetry data on the UAS (altitude, position, battery, orientation) and status of each control switch on the radio control unit. The UAS returns to its launch site (or the location of the ground station) when it 1) receives the signal to come home or 2) when there is a loss of link with the radio control unit. In order to be in compliance with FAA regulations, the individuals operating the UAS would be properly certified and the applicant would obtain the necessary authorizations to operate the UAS.

In addition to photogrammetric imaging, the UAS would also be used to collect breath samples. A small boat would be used to locate cetaceans and the operator would track the individual so as to be prepared when the whale surfaces to blow. The UAS would follow the whale for about 15 minutes. To collect breath samples, the UAS would be flown through the whale’s exhalant cloud (altitude of 6-8 ft) to collect DNA samples. In some cases, the researchers would attempt to collect three consecutive blow samples from the same animal.

The genetic samples would be used to provide information on the health and reproductive status of an individual. This technique would be used on larger whales (e.g., blue whales), but not on smaller cetaceans (e.g., killer whales). The applicant wants to gain experience using UAS to collect breath samples on large whales first; the permit would only authorize take of ESA-listed large whales for this activity.

2.1.2.3 Tissue Collection

Biological tissue samples for skin and blubber biopsy samples will be collected during the large vessels surveys and small boat coastal surveys. These samples will be submitted for genetic analysis which will be used to identify population structure. Biopsies are collected using a variety of implements, including a crossbow, adjustable pressure modified air-gun, black powder gun, and pole. During a single approach, a maximum of three sample attempts per individual will be permitted. If signs of harassment are observed, biopsy activities will be discontinued on that individual or group. The whales to be sampled will approach the vessel on their own, be approached by the large research vessel, or be approached by a small boat. The projectile biopsy sample will be collected from animals which are between 5 and 30 m from the bow of the vessel. No more than five biopsy sample attempts would be made in a single encounter.

For large cetaceans (e.g., humpback whales), the researchers typically use a tethered biopsy dart using a spooled line with the spool attached to the crossbow and the other end of the line attached to the dart. The line is light enough to be easily snapped by a large whale should it become entangled, but the researchers have never seen an entanglement using this method. The stainless steel tip of the dart is 4cm in length with an internal diameter of 6 mm and is fitted with a 2.5 cm stop to ensure recoil and prevent deeper penetration; only 1.5 cm of the tip is available to penetrate the animal. Samples are typically < 1 g. Between sampling events, the biopsy tips are thoroughly cleaned and sterilized with bleach. In order to prevent injury to the head and face of the whale, the researchers would not be permitted to sample the whale anywhere forward of the pectoral fins.

The permit would limit biopsy sampling of calves to those older than two months; neither younger calves nor their mothers would be sampled. The age of a calf would be determined by the judgment of the researchers who have up to 20 years' experience in the field. If there is any ambiguity about a calf's age, researchers will avoid biopsying that calf. The same size biopsy dart would be used for calves and adult whales.

To conduct hormone analysis on humpback, blue, gray and fin whales in the Pacific Ocean, the applicant is requesting authorization to collect two samples, taken 1.5-36 hours apart, from the same individual. Taking two samples in a short time frame will allow the researchers to compare baseline hormone levels (initial sample) to later second sample to evaluate changes in hormone level. During sampling, photo-identification will be used to track individuals sampled. No individual whale will be sampled more than three times in a year.

For humpback whales in the Southern Ocean, the applicant is requesting authorization to collect multiple biopsy samples to assess tissue turnover rates for isotope analysis and stress-induced hormone changes. Up to 25 humpback whales would be biopsy sampled no more than five times each. The inter-sampling period of individual would be as little as 5 minutes or as long as 12 months. In a single day, a maximum of three animals would be sampled up to three times each on different parts of the body. Samples could be taken from the back, belly, tail stock and fluke to assess whether isotope signatures are consistent throughout the body. This portion of the action would continue the research authorized in the modification to the Southwest Fisheries Science Center's current permit, 14097-05.

2.1.2.4 Instrumentation and Tagging

Telemetry instruments will be used to gather information on cetacean physiology, health, movements and behavior. These instruments would include satellite tags, time-depth recorders, Crittercams and acoustic tags. The researchers would use three types of attachment platforms to affix the tags to cetaceans: 1) implantable, 2) dart/barb and 3) suction cup. The size of the tag used would be appropriate for the species and size of the individual.

The attachment platform for the implantable tag secures the device to the targeted whale by using a penetrating stainless steel cylinder or "flat box" (Heide-Jorgensen et al. 2012; Mate et al. 2007a). For baleen whales, the standard size for a cylinder package is >19.0 cm long and 1.9 cm in diameter, and the package weighs 170-210 g; these dimensions include the cutting blade. Tags will be deployed using a modified version of an air-powered applicator system, crossbow, pneumatic projector or black-powder gun. Implantable tags typically remain attached for several months.

Dart/barb tags are attached to the dorsal fin of the targeted whale (or the posterior upper lateral dorsal surface) by one or two penetrating darts (Andrews et al. 2008b). Typically, the penetration depth is 6.5 cm for large whales to avoid penetration of the blubber-muscle interface. Wildlife Computer 240C transmitter tags housed in the Low-Impact Percutaneous Environmental Tag (LIMPET) dart/barb configuration will be used and deployed via crossbow, pneumatic projector, or black powder gun. Another alternate design tag that would be used, similar to the LIMPET design, would be based on the KiwiSat 202 fin-mount design (7.5 x 2.0 x 2.5 cm; 37 g).

Suction cup attachment tags are attached to target animals via a 4.5 m long pole by researchers approaching the animal in a small boat. The tag is affixed to the animal by four suction cups, 2.5 cm in diameter. The tag package weighs about 300 g in air. Suction cup tags typically remain attached for > 24 hours.

All instrumentation and tagging will be conducted by an experienced team of researchers—the boat driver, a photographer, and the researcher administering the tag. The whale would be photographed to identify it and to obtain images of the attachment site during and post-deployment. The researchers will also record any behavioral responses. Whenever possible, researchers will also collect a blubber and/or tissue sample from individuals tagged with telemetry instruments. No more than two telemetry tags will be attached to any one animal at a time.

Animals would be approached using the methods described for large vessel surveys, small vessel approaches and photo-identification. Approaches would be slow and steady, from behind and beside the animal, and would be timed to coincide with the individual surfacing. Since the telemetry tags could be relocated, researchers would attempt to relocate tagged animals to document wound healing and overall condition whenever possible.

2.1.2.5 Fecal Sample and Sloughed Skin Collection

Cetacean feces and sloughed skin will be collected from a small boat using a net, similar to an aquarium or pool-skimming net. These collections would occur opportunistically and the samples used for genetic analysis.

2.1.2.6 Photo-identification and Laser Photography

Photography will be used during various other research activities on research vessels, small boats and on land and primarily for photo-identification of cetaceans. Photo-identification would most often occur during dedicated small boat coastal surveys, using small boats, rigid-hull inflatables, or cabin cruisers, usually with a 150 horsepower outboard four-stroke engine. Photography during large research vessel surveys would be limited to an opportunistic basis. Large whales would be approached within 15-20 m; smaller animals (i.e., delphinids) would be approached to within 5-10 m. If there is any evidence that the activity is interfering with pair bonding, nursing, feeding, or any other essential function, the researchers will stop the activity immediately. Photos would be used to contribute to on-going species photo-identification catalogs.

Laser photogrammetry would be another photographic technique used during cetacean research. In addition to photo-identifying individual whales, laser photogrammetry can measure morphometrics of individuals. Two parallel laser pointers are mounted on a digital camera at known separation. The lasers are projected onto the cetacean’s dorsal fin (or surface) to provide a scale of known size, which allows for measurements of body length to be scaled to true size.

The applicant will use low-powered lasers, that is, lasers safe for researchers and animals because they are no more powerful than standard laser pointers. The lasers used in the action will be class IIIA lasers (<5 mW), which comply with the Food and Drug Administration safety regulations. There is minimal safety risk from brief (<10 seconds) exposure to the lasers. The cetacean will likely only be exposed to the laser for fractions of a second while moving through the water. The eyes are at very low risk of being exposed to the lasers. The researchers will be projecting the lasers at the dorsal surface of the animal while the eyes are typically submerged beneath the water’s surface.

2.1.2.7 Acoustic Studies

Acoustic studies will be conducted as part of the proposed action. These studies will use hydrophone arrays or autonomous recording packages to detect cetacean vocalizations and compare them to real-time visual and acoustic detections. The recordings will be studied further for vocalization patterns and geographical differences.

Hydrophone arrays will be towed about 300 m behind large research vessels during daylight, for about 12 hours. The arrays will be deployed before visual surveys begin and retrieved in the evening after visual observation effort ends. The hydrophone array has 2-6 hydrophones with a frequency range of 1-140 kHz.

Several types of recording devices may be used to record cetacean vocalizations. These autonomous recording devices are deployed from large research vessels or small boats and the devices are moored or allowed to drift from the vessel and then retrieved later. Types of sonobuoys that will be used during research activities include static acoustic monitoring devices and drifting autonomous spur buoy recorders. Static acoustic monitoring devices are moored and used to detect echolocation clicks of delphinids (toothed whales). Drifting autonomous spur buoy recorders have a large white spar buoy attached to a cable that has hydrophones, drogue (parachute for drag) and weight at a 100 m depth. The spar buoy is attached to a secondary buoy by a 10 m float line. Drifting buoys are equipped with satellite geo-locators and will be relocated using very high frequency (VHF) radio tracking equipment and observers with binoculars. Drifting autonomous spur buoys are retrieved 1-3 months after deployment to download the data.

2.1.3 Project 3 Sea Turtle Studies

In Project 3, sea turtles studies will focus on determining the abundance, distribution, movement patterns, stock structure and diet of sea turtles. The research will use genetic information, flipper tagging and satellite telemetry to examine nesting beach origins and stock structure of sea turtles in the Pacific Ocean, including the North Pacific Ocean and the Eastern Tropical Pacific Ocean. The Southwest Fisheries Science Center will conduct this research to respond to specific recovery plan goals such as to determine genetic relationships among sea turtle populations and determine the distribution, abundance and status of sea turtles in the marine environment.

2.1.3.1 Visual and Aerial Surveys

Visual and aerial surveys of sea turtles will be conducted in the same manner as described for cetaceans (Section 2.1.2.1).

2.1.3.2 Capture and Holding

For most species of sea turtles, individuals will be captured by hand or dip net. The dip net is an aluminum hooped net approximately 1.5 m in diameter with a 4 inch knot to knot mesh size. The pole is made of telescoping fiberglass or aluminum that can extend to 5 m in length. A support vessel will deploy from the research vessel and approach floating or surfacing sea turtles from behind. The researchers will gently place the net in the water just ahead of the turtle so that it swims into the net or so that they can scoop the turtle up from underneath.

Sea turtles may also be captured by hand. Researchers will approach sea turtles that are floating or surfacing from behind in a small boat. When they are close enough, an experienced researcher will enter the water and grasp the sea turtle by the carapace so that the turtle is directed towards the water's surface. The researcher in the water will hand the turtle up to personnel in the boat. This technique is most commonly used on juveniles weighing less than 100 lbs.

No drugs will be used during the proposed research activities. Turtles will be held in the small boat, placed on top of a tire, on foam pads, or if available, a wooden or plastic box. Turtles will be kept under shade and periodically doused with water in a manner to keep them calm (prevented from flailing around and possibly banging themselves). Turtles will be held for flipper tagging and collection of other biological samples. Turtles will typically be held for a maximum of two hours. Turtles will be kept in enclosures that prevent them from injuring themselves or other turtles and are kept in the shade, covered with towels and kept wet to prevent overheating.

Researchers would use a breakaway hoop net to capture leatherbacks at the surface (James et al. 2005b) (Dodge et al. 2014). The breakaway hoop net would be custom made so that the hoop fits easily over a leatherback with front flippers loosely held at its side. One of the researchers would be positioned on the bow, ready to guide the hoop net (fitted to a long guiding pole) over the leatherback. The hoop net would be fitted with breakaway stays to a cast net which would be pursed over the turtle. The net is constructed of four-inch diameter knotless mesh. This design contains the large front flippers and permits greater control of the captured animal by reducing movement of the front flippers through the mesh. The 'knotless' mesh reduces potential for abrasion. Upon capture of a leatherback, the net will be adjusted by hand to provide 'slack' and ensure the turtle is able to extend its neck to breathe several times alongside the boat prior to bringing aboard the vessel. Depending upon the vessel, the animal may be brought on board the main research vessel, if it is equipped with the proper equipment. In most instances, however, the captured turtle will be quickly brought alongside to the stern of the capture boat and guided up a short ramp onto either a raised auxillary platform or to the ship's wet deck. Following capture with a breakaway hoop net, as described previously, the turtle will be raised to the ship's wet deck, or auxiliary platform 1-2 meters above the waterline, with the aid of a cargo net.

2.1.3.3 Measuring and Weighing

Captured sea turtles will be measured and weighed. Researchers will use a soft measuring tape for measuring the turtle's carapace, plastron and tail widths and lengths. To measure the straight carapace length, width and body depth, researchers will use forestry calipers. Sea turtles will be restrained in a harness to protect the animal during weighing. The harness will restrain the turtle's flippers so they are not damaged during weighing and prevent the turtle from flailing. The turtle in a harness will be suspended from a tripod and digital scale capable of weighing up to 600 kg. Turtles will be restrained for a maximum of 15 minutes.

2.1.3.4 Flipper and Passive Integrated Transponder (PIT) Tagging

For identification and in support of mark-recapture studies, all captured sea turtles will be tagged with metal Iconel tags on the trailing edge of their right or left front flipper near the carapace.

Researchers will use the technique described in the IUCN Marine Turtle Specialist Group Manual on Research Techniques (Eckert et al. 1999). During the procedure, turtles are placed in a collapsible containment box or on top of a tire covered in padding.

2.1.3.5 Blood and Tissue Sample Collection

All captured sea turtles will have tissue samples collected from them for the purposes of stable isotope analysis. After cleansing the sample area with alcohol, a small disk of skin would be collected from the epidermis layer of the neck tissue (approximately 1 mm deep) using a sterile 6 mm biopsy tool or forceps and a razor. Tissue samples will be preserved (frozen or in a salt solution) and analyzed at the Southwest Fisheries Science Center.

Researchers may not be able to bring large leatherback sea turtles on board for sampling because of their size. In those cases, the researchers will use a biopsy pole to collect tissue samples. A biopsy pole is a 1 cm long steel corer attached to a 2-4 m long anodized steel pole.

Blood collection would be conducted on each turtle captured. After cleansing the site with betadine or alcohol to disinfect it, approximately 10cc of blood would be collected from each turtle by inserting a sterile needle, attached to a vacuum syringe, into the dorsal cervical sinus on the lateral dorsal region of the neck, using the technique described in Bentley and Dunbar-Cooper (1980) and Owens and Ruiz (1980). Once sampling is complete the area would be cleansed again with betadine or alcohol to avoid infection at the sample site. The samples would be kept on ice for no more than two hours until they can be centrifuged. The separated serum would then be pipetted off and frozen. Hormone assays would follow the standard procedure described by Plotkin et al. (1997). Remaining red blood cells would be used for genetic analysis.

2.1.3.6 Scute Sample Collection

To determine contaminant levels in the tissue, researchers will collect scute samples from captured sea turtles. Scute samples will be taken from one or more of the eight posterior marginal scutes of the carapace. Before collection, sample sites will be cleaned with a plastic scrubbing pad, clean room wipes, high-purity water and 2-propanol. The keratin will be scraped from the radial edge of the scute, where the dorsal and ventral surfaces form a thin edge and the keratin can be discerned from the underlying tissue. Researchers will use a disposable stainless steel biopsy tool to collect a sample parallel to the edge of the scute (0.2-0.6 g) (Reich et al. 2007). The scute sampling will yield splinters of keratin approximately 1 mm thick representing the entire depth of scute deposition (Day et al. 2005). The sampling will not go through to living tissue or draw blood. The total amount of scute sample will not exceed 2.0 g per animal per sampling event. Scute samples will be stored in acid-washed containers and kept in a freezer until analysis.

The researchers are opting to use the scute sampling method described here because it will work best for Eastern Pacific green turtles. Other techniques, such as that described by the NIST Pacific Sampling Protocol (Keller et al. 2014), use a knife blade to collect the scute sample.

Knife blades are not advised to collect scute samples from Eastern Pacific green turtles due to their covering on the carapace.

2.1.3.7 Lavage and Fecal Sample Collection

Some turtles will undergo esophageal lavage immediately upon capture to collect stomach samples for analysis. A soft plastic tube (3/4-inch outside diameter) is inserted down the esophagus to the pre-stomach area where recently ingested food is located prior to entering the stomach. Clean seawater is flushed through the tube so that food particles are flushed from the pre-stomach area. The contents are caught in a basin and the samples fixed in preservative for later analysis (Forbes and Limpus 1993; Seminoff et al. 2002). The entire process will take between 5 and 10 minutes. Lavage procedures will only be conducted by researchers who are properly trained and possess long-term experience.

Fecal samples and regurgitated food may be collected opportunistically. Samples will be analyzed for prey items and toxicological and parasitological analyses.

2.1.3.8 Urine Sample Collection

Urine will be collected opportunistically from male turtles to assess reproductive status. The researchers will not attempt to express urine from turtles. Samples will be kept refrigerated until analysis.

2.1.3.9 Instrumentation and Tagging

Transmitters will be attached to the carapace with thin coats of fiberglass resin as described in Balazs et al. (1996) or 2-part quick-set epoxy. The attachment area on the carapace will be lightly sanded to remove algae. A non-toxic compound such as plumbers putty or elastomer will be used to "cushion" the transmitter and hold it in place during the attachment procedure. For fiberglass resin, a thin coat of laminating resin will be applied to the carapace and transmitter and 6-8 strips of fiberglass cloth will be pasted over the transmitter to attach it. This technique has been widely used and is an accepted safe and effective method for transmitter attachment (Balazs et al. 1996). For epoxy resin, a smooth mound of epoxy resin around a tag will be created to hold the tag in place. It can take anywhere between 15 minutes to 2 hours for the resin to completely cure. Curation is dependent upon the type of resin used and the outside ambient temperatures. Once the resin is cured, the turtles are then released back into the study area at the point of capture. A subset of satellite transmitter-equipped turtles may also be fitted with an ultrasonic transmitter (see attachment procedure above) to track short range movements. The number of animals outfitted with a transmitter or combination of transmitters is dependent upon the study question(s) and the amount of funding that is available to allocate to the purchase of transmitters or number of transmitters supplied via our research partners. Transmitters may stay on for approximately one year.

For juvenile turtles measuring less than 50 cm straight carapace length, researchers will use Microwave Telemetry's PTT-100 9.5 g solar-paneled satellite tags. The dimensions of the tag are 38 mm length × 17 mm width × 12 mm height and weighs 11-13 g in air.

2.1.3.10 Ultrasound and Heart Rate Monitoring

Ultrasonography will be used to non-invasively measure the depth of the subcutaneous fat layer to quantify nutritional condition of captured turtles. A portable veterinary ultrasound machine (Sonosite Vet 180 Plus, C60 5-2 MHz transducer) will be used to obtain images of the subcutaneous fat and underlying musculature at five anatomical sites: right shoulder, central neck, left shoulder, right hip, and left hip. Ultrasound gel will be applied to the skin, and the probe will be held against the skin for several seconds until an image is obtained. The resulting image will be frozen on the screen, measurements of the subcutaneous fat will be recorded, and the image will be saved and later downloaded to a laptop computer. In addition, ultrasonography will be used to visually determine the presence of gonads.

Heart rate will be monitored using a Doppler blood flow detector (Pocket-Dop3; Nicolet Vascular, Madison, WI). This is a minimally invasive procedure where ultrasound gel is applied to the skin a handheld instrument (transducer) is passed lightly over the skin above the femoral artery. The transducer sends and receives sound waves that are amplified through a microphone. The sound waves bounce off solid objects, including blood cells. The movement of blood cells causes a change in pitch of the reflected sound waves (called the Doppler effect). If there is no blood flow, the pitch does not change. In other words, this is just a simple ultrasound. The site used to detect blood flow using the Doppler is dorsal to the hip, anterior to the tail base, under the margin of the carapace, with the probe directed dorsomedially toward the kidney.

2.1.3.11 Oxytetracycline Injection

Juvenile turtles may be injected intramuscularly in the dorsal shoulder musculature with the antibiotic tetracycline. The purpose of the injection is to mark the bones of the sea turtle at the time of the injection so they can be used in the calibration of bone growth if the turtle strands dead. Young animals (<65 cm straight carapace length [SCL]) will be the subject of marking because the researchers are interested in understanding the resorption of rings at the center of the humeri. This information is also necessary for the validation of skeletochronological studies (Bjorndal et al. 1998). The quantity of tetracycline, injected into the shoulder muscle, will depend on the weight of the animal. Animals will be weighed in order to calculate the proper dosage (Dosage = Weight [kg] x 25 [mg/kg] / concentration [mg/ml], (SEFSC 2008). Oxytetracycline will be administered via multiple intramuscular injections (1.5-inch, 18 gauge needle) in the dorsal shoulder musculature, not to exceed 10 ml per site (SEFSC 2008). The skin will be scrubbed with betadine in order to disinfect the site prior to injection. Prior to injection, the product’s expiration date and concentration will be verified. Injections will be done with an 18 gauge needle and a 3-cc, 5-cc, or 10-cc syringe depending upon the total dosage. Animals with an SCL > 70 cm will have the dosage split into two or more equal volumes to administer in each shoulder as is recommended by the Southeast Fisheries Science Center. All procedures to prevent contamination would be followed. Following injection, the site will be wiped again with betadine to minimize the chance of infection. No adverse effects were noted in 20 captive juvenile loggerhead sea turtles that received intravenous and intramuscular injections of the same antibiotic at a higher dose of 25 mg/kg (Harms et al. 2004).

2.1.3.12 Cloacal and Buccal Swabbing

Periodically, cloacal and buccal swabs will be taken to determine if they represent a viable way to collect DNA samples in the field, and to determine reproductive status of female turtles through cloacal cytology (changes during estrus cycle). DNA quantity and quality will be compared with other tissue collection techniques described above. These techniques are not intended to replace blood or skin sampling as the primary source of genetic material. A stainless steel pry bar will be used to carefully open the turtle's mouth followed by a canine mouth gag to hold the mouth open (Forbes and Limpus 1993). The soft tissue portion of the buccal area will be swabbed with a Whatman® Omni Swab for approximately six seconds. Cloacal samples will be collected by insertion of another Whatman® Omni Swab approximately 5 mm into the cloaca for about six seconds. Both swabbing methods involved gentle scraping of the epithelium with the swab. Immediately after collection, each swab will be placed inside a 15ml conical tube and placed on ice for field storage until transfer to a -20°C laboratory freezer. No liquid preservative will be used in the tube to prevent absorption of liquid into the sample swab, thereby not diluting the cells (Lanci et al. 2012). For reproductive status assessment, the cloaca swab will be moistened with saline and the same procedure followed above. The cells obtained on the swab will then be rolled onto slides to examine cytology.

2.1.3.13 Temporary Marking

Areas of softness on the plastron in males will be temporarily marked using a Sharpie® type pen. The information will be used for reproductive comparisons with the hormone and ultrasound analyses. The animal will be turned for a short period of time with the carapace side down in order to mark the plastrons. Photographs of the outlined area will be taken and compared based on the testosterone levels to determine if the animal is close to reproductive status. The animal will be placed on either padding or a tire to prevent any potential injuries to the animal. All animals will be photographed to catalogue carapace, body, head, and plastron coloring, and any distinguishing marks, old wounds, and/or lesions.

2.1.4 Research Practices and Permit Conditions

Researchers are expected to apply the following practices, which are considered "good practice," and taken by qualified, experienced personnel to minimize the potential risks associated with the proposed activities. Only personnel with extensive experience with the proposed research activities may be involved in the research activities.

The proposed Permit No. 19091 lists conditions that researchers must comply with as part of the authorized activities. The tables in Appendix A outline the number of protected species, by species and stock, authorized to be taken and the locations, manner and time period in which they may be taken. Developed by the Permits Division, these conditions include the following:

<u>Cetaceans</u>

<u>Counting and Reporting Takes for Cetaceans</u>

a. No individual animal may be taken more than 3 times in one day with the exception of Condition B.5.o [Cetacean Biopsy Sampling and Tagging condition allowing for multiple tissue samples in certain specified cases].

b. Any "approach"[1] of a cetacean constitutes a take and must be counted and reported regardless of whether an animal reacts.

c. During an approach, Researchers may attempt the procedures in a take table row once.

d. <u>For Level A procedures</u>:

Within an approach, each additional attempt to tag or sample constitutes a new take and must be counted and reported against that row of takes. Attempts include:

- Misses
- Successful hits
- Hits with no sample or tag attachment

e. During aerial surveys flown at an altitude lower than 1,000 ft, any cetacean observed should be counted and reported as a take.

<u>Cetacean General Conditions</u>

f. To minimize disturbance of the subject animals the Researchers must exercise caution when approaching animals and must retreat from animals if behaviors indicate the approach may be interfering with reproduction, feeding, or other vital functions.

g. Where females with calves are authorized to be taken, Researchers:

i. Must immediately terminate efforts if there is any evidence that the

[1] An "approach" is defined as a continuous sequence of maneuvers involving a vessel or equipment, including drifting, directed toward a cetacean or group of cetaceans closer than 100 yards for baleen and sperm whales and 50 yards for all other cetaceans.

activity may be interfering with pair-bonding or other vital functions;

ii. Must not position the research vessel between the mother and calf;

iii. Must approach mothers and calves gradually to minimize or avoid any startle response;

iv. Must discontinue an approach if a calf is actively nursing; and

v. Must, if possible, sample the calf first to minimize the mother’s reaction when sampling mother/calf pairs.

h. <u>For research in the inland waters of Washington state and/or research on humpbacks in Hawaii:</u>

Vessels engaged in research activities must fly a clearly visible triangular pennant at all times. The pennant must be yellow with minimum dimensions of 18"H x 26"L and with the permit number displayed in 6" high black numerals.

<u>Cetacean Aerial Surveys</u>

i. Aerial flights must not be conducted over pinnipeds on land.

j. Manned aerial surveys must be flown at an altitude of 700 feet or higher. Descents for identification and group size estimates must be no lower than 500 feet.

k. Unmanned Aircraft Systems (UAS): You are authorized to use both fixed wing and vertical take-off and landing UAS.

l. UAS must be flown at an altitude of 100 - 200 feet for photogrammetry and photo-id surveys. Passes for breath sampling must be no lower than 6 feet.

<u>Cetacean Biopsy Sampling and Tagging</u>

m. All biopsy tips must be disinfected prior to each use.

n. Researchers may biopsy sample cetaceans authorized in Appendix 1 of the permit except

i. Large whales: Calves less than 2 months old and the accompanying females.

ii. Smaller cetaceans: Calves less than 1 year old and the accompanying females.

o. Where repeated biopsy sampling is authorized in Tables 4 and 6, target large whales may be taken up to 5 times per day to allow for the collection of up to 3 biopsy samples per day.

p. Researchers may tag cetaceans authorized in Appendix 1 of the permit except

i. Large whales: Calves less than 6 months old and the accompanying females.

ii. Smaller cetaceans: Calves less than 1 year old and the accompanying females.

q. Before attempting to biopsy or tag an individual, Researchers must take reasonable measures (e.g., compare photo-identifications) to avoid unintentional repeated sampling of any individual.

r. A tag or biopsy attempt must be discontinued if an animal exhibits repetitive, strong, adverse reactions to the activity or the vessel.

s. Researchers must not attempt to biopsy or tag a cetacean anywhere forward of the pectoral fin.

<u>Sea Turtles</u>

<u>Capture by Hoop Net</u>

s. Researchers must follow the procedures for handling and monitoring leatherbacks included as in the Attachment.

t. The Permit Holder must ensure that only a researcher experienced with the hoop net capture technique conducts the capture using this technique.

u. Researchers must be aware of the increased stress that accompanies captures and do his best to minimize stress levels by minimizing in-water chase activities to the extent possible and removing the animal from the net as quickly as possible while ensuring it is done safely.

v. The number of attempts to capture a leatherback sea turtle with the hoop net is limited to 5 per 24-hour period. If Researchers are unsuccessful after the first 3 attempts, they must wait a minimum of 4 hours before making the final 2 attempts for the day.

<u>*General Turtle Handling, Resuscitation and Release*</u>

w. Researchers must

i. Handle turtles according to procedures specified in 50 CFR 223.206(d)(1)(i). Use care when handling live animals to minimize possible injury.

ii. Use appropriate resuscitation techniques on any comatose turtle prior to returning it to the water.

iii. When possible, transfer injured, compromised, or comatose animals to rehabilitation facilities and allow them an appropriate period of recovery before return to the wild.

iv. Have an experienced veterinarian, veterinary technician, or rehabilitation facility (i.e., medical personnel) on call for emergencies.

x. If an animal becomes highly stressed, injured, or comatose during capture or handling or is found to be compromised upon capture, Researchers must forego or cease activities that will further significantly stress the animal (erring on the side of caution) and contact the on call medical personnel as soon as possible. Compromised turtles include animals that are obviously weak, lethargic, positively buoyant, emaciated, or that have severe injuries or other abnormalities resulting in debilitation. One of the following options must be implemented (in order of preference):

i. Based on the instructions of the veterinarian, if necessary, immediately transfer the animal to the veterinarian or to a rehabilitation facility to receive veterinary care.

iii. If medical personnel cannot be reached at sea, Researchers should err on the side of caution and bring the animal to shore for medical evaluation and rehabilitation as soon as possible.

iv. If the animal cannot be taken to a rehabilitation center due to logistical or safety constraints, allow it to recuperate as conditions dictate and return the animal to the sea.

y. In addition to Condition A.2 of the permit, the Permit Holder is responsible for following the status of any sea turtle transported to rehab as a result of permitted activities and reporting the final disposition (death, permanent injury, recovery and return to wild, etc.) of the animal to the Chief, Permits Division.

z. While holding sea turtles, Researchers must

  i. Protect sea turtles from temperature extremes (ideal air temperature range is between 70°F and 80°F).

  ii. Provide adequate air flow.

  iii. Keep sea turtles moist when the temperature is ≥ 75°F.

  v. Keep the area surrounding the turtle free of materials that could be accidentally ingested.

aa. During release, turtles must be lowered as close to the water's surface as possible to prevent injury.

bb. Researchers must carefully monitor newly released turtles' apparent ability to swim and dive in a normal manner. If a turtle is not behaving normally within one hour of release, the turtle must be recaptured and taken to a rehabilitation facility.

cc. Extra care must be exercised when handling, sampling and releasing leatherbacks. Field and laboratory observations indicate that leatherbacks have more friable skin and softer bones than hardshell turtles which tend to be hardier and less susceptible to trauma. Researchers must

  i. only board leatherbacks if they can be safely brought on board the vessel.

  ii. handle and support leatherbacks from underneath, with one person on either side of the turtle.

  iii. not turn leatherbacks on their backs.

Turtle Handling, Measuring, Weighing and Flipper Tagging

dd. Refer to Appendix B for more information on the requirements for handling and sampling sea turtles.

ee. Researchers must

  i. Clean and disinfect all equipment (tagging equipment, tape measures, etc.) and surfaces that comes in contact with sea turtles between the processing of each turtle.

ii. Maintain a designated set of instruments and other items should be used on turtles with fibropapillomatosis (FP). Items that come into contact with sea turtles with FP should not be used on turtles without tumors. All measures possible should be exercised to minimize exposure and cross-contamination between affected turtles and those without apparent disease, including use of disposable gloves and thorough disinfection of equipment and surfaces. Appropriate disinfectants include 10% bleach and other viricidal solutions with proven efficacy against herpes viruses.

iii. Examine turtles for existing flipper and PIT tags before attaching or inserting new ones. If existing tags are found, the tag identification numbers must be recorded. Researchers must have PIT tag readers capable of reading 125, 128, 134.2 and 400 kHz tags.

iv. When flipper tagging, clean and disinfect

A. flipper tags (to remove oil residue) before use;

B. tag applicators, including the tag injector handle, between sea turtles; and

C. the application site before the tag pierces the animal's skin.

ff. PIT Tagging

i. Use new, sterile tag applicators (needles) each time.

ii. The application site must be cleaned and then scrubbed with two replicates of a medical disinfectant solution (*e.g.*, Betadine, Chlorhexidine) followed by 70% isopropyl alcohol before the applicator pierces the animal's skin. If it has been exposed to fluids from another animal, the injector handle must be disinfected between animals.

iii. Turtles < 30 cm SCL

A. Researchers must have specialized experience to tag turtles < 30 cm SCL.

B. PIT tags must be inserted into the thickest part of the triceps superficialis muscle*. The tag must occupy no more than an estimated 20% of the muscle's total volume and length. To determine eligibility, pinch the muscle forward and assess the tag size relative to the muscle size. Alternative sites may be used provided: 1) there is sufficient mass to accommodate the tag (< 20%) and 2) there is minimal risk of injury to vital structures or other anatomical features.

C. Local anesthetic (e.g., lidocaine) must be used.

*The preferable site for Kemp's ridleys is the left triceps superficialis muscle to maximize the chances of tag detection, as the nesting project in Rancho Nuevo scans the left front flipper.

gg. Marking the Carapace

i. Researchers must use non-toxic paints or markers that do not generate heat or contain xylene or toluene.

ii. Markings should be easily legible using the least amount of paint or media necessary to re-identify the animal.

Turtle Sampling

hh. Blood Sampling

i. Blood samples must be directly taken by or supervised by experienced personnel.

ii. New disposable needles must be used on each animal.

iii. Collection sites must be thoroughly cleaned prior to sampling using Chlorhexidine-alcohol solution or betadine followed by 70% alcohol. Two (2) applications of alcohol may be used if disinfectant solutions may affect intended analyses.

iv. Samples must not be taken if an animal cannot be adequately immobilized for blood sampling or conditions on the boat preclude the safety and health of the turtle.

v. Attempts (needle insertions) to extract blood from the neck must be limited to a total of four, two on either side. Best practices must be followed, including retraction of the needle to the level of the subcutis prior to redirection to avoid lacerating vessels and causing other unnecessary soft tissue injury.

vi. Blood Volume Limits

A. *Sample volume.* The volume of blood withdrawn must be the minimal volume necessary to complete permitted activities. A single sample must not exceed 3 ml per 1 kg of animal.

B. *Sampling period.* Cumulative blood volume taken from a single turtle must not exceed the maximum safe limit described above within a 45-day period. If more than 50% of the maximum safe limit is taken, in a single event or cumulatively from repeat sampling events, from a single turtle within a 45-day period that turtle must not be re-sampled for 3 months from the last blood sampling event.

C. *Research coordination.* Researchers must, to the maximum extent practicable, attempt to determine if any of the turtles they blood sample may have been sampled within the past 3 months or will be sampled within the next 3 months by other researchers. The Permit Holder must make efforts to contact other researchers working in the area that could capture the same turtles to ensure that none of the above limits are exceeded.

ii. Biopsy Sampling

i. A new biopsy punch, scalpel blade or razor must be used on each turtle.

ii. For small samples (*e.g.*, biopsy punches): Samples must be collected from the neck or trailing edge of a flipper if possible and practical. At a minimum, the tissue surface must be thoroughly disinfected before sampling. The procedure area and Researchers' hands must be clean.

iii. Leatherback biopsies by pole must be collected in the location most safely and easily accessed by Researchers from anywhere on the limbs or neck, avoiding the head.

iv. If it can be easily determined (through markings, tag number, etc.) that a sea turtle has been recaptured and has been already sampled under this permit, no additional biopsy samples may be collected from the animal during the same permit year.

jj. Gastric Lavage

i. The washing must not exceed three minutes.

ii. Once the samples have been collected, water must be turned off and water and food allowed to drain until all flow has stopped. The posterior of the turtles must be elevated slightly to assist in drainage.

iii. Researchers must thoroughly clean equipment prior to disinfection (viruses can remain protected in organic matter).

iv. A separate set of equipment must be used for infected and non-infected animals.

Turtle Instrument Attachments

kk. Up to 2 transmitters may be attached to an animal at one time with no more than one satellite transmitter at one time.

ll. Total combined weight of all transmitter attachments and media must not exceed 5% of the animal's body mass.

i. Each attachment must be made so that there is minimal risk of entanglement. The transmitter attachment must contain a weak link (where appropriate) or have no gap between the transmitter and the turtle that could result in entanglement. The lanyard length (if used) must be less than half of the turtle's carapace length. It must include a corrosive, breakaway link that will release the unit after its battery life.

ii. Transmitters must not be placed at the peak height of the carapace whenever possible.

iii. Researchers must make attachments as hydrodynamic as possible.

iv. Adequate ventilation around the head of the turtle must be provided during the attachment of transmitters if attachment materials produce fumes. Turtles must not be held in water during application to prevent skin or eye contact with harmful chemicals.

v. Crittercam: Attachments must be made so that turtles are able to move freely without impairment.

Non-target Species

mm. Report any opportunistic monk seal sightings to the NMFS Pacific Islands Fisheries Science Center, Hawaiian Monk Seal Research Program, NOAA IRC, 1845 WASP Blvd, Building 176, Honolulu, HI 96818

In the main Hawaiian Islands: Tracy Mercer; Tracy.Mercer@noaa.gov; phone (808)725-5718; fax (808)725-5567

In the Northwestern Hawaiian Islands: Thea Johanos; Thea.Johanos-Kam@noaa.gov; phone (808)725-5709; fax (808)725-5567

nn. Endangered Steller Sea Lions

To avoid taking listed Steller sea lions, Researchers must:

i. Not approach within 92 meters (100 yards) of a listed Steller sea lion in the water or hauled out on land.

ii. Remain at an altitude of 3,000 feet while flying over any major Steller sea lion haulouts and rookeries listed in 50 CFR 223.202.

iii. Maintain an altitude of at least 1000 feet (304.8 meters) when flying over all other known Steller sea lion terrestrial habitat (rookeries and haulouts) and associated aquatic zones during periods when Steller sea lions are likely to be present.

iv. Maintain a vessel distance of at least 3 nautical miles (5.5 kilometers) of a Steller sea lion rookery site listed in 50 CFR 223.202.

v. Not discharge a firearm at or within 100 yards (91.4 meters) of a Steller sea lion.

vi. Not approach on land not privately owned within one-half statutory miles (0.8 kilometers) or within sight of a listed Steller sea lion rookery site listed in 50 CFR 223.202.

vii. Not approach on land not privately owned within one and one-half statutory miles (2.4 kilometers) or within sight of the eastern shore of Marmot Island.

6. Transfer of Sea Turtle Biological Samples

a. Samples may be sent to the Authorized Recipients listed in Appendix 2 of the permit provided that

i. The analysis or curation is related to the research objectives of this permit.

ii. A copy of this permit accompanies the samples during transport and remains on site during analysis or curation.

b. Samples remain in the legal custody of the Permit Holder while in the possession of Authorized Recipients.

c. The transfer of biological samples to anyone other than the Authorized Recipients in Appendix 2 of the permit requires written approval from the Chief, Permits Division.

d. Samples cannot be bought or sold.

7. Marine Mammal Biological Samples

The Permit Holder must comply with the following conditions and the regulations at 50 CFR 216.37, for marine mammal biological samples acquired or possessed under authority of this permit.

a. The Permit Holder is ultimately responsible for compliance with this permit and applicable regulations related to the samples unless the samples are permanently transferred according to NMFS regulations governing the taking and importing of marine mammals (50 CFR 216.37) and the regulations governing the taking, importing and exporting of endangered and threatened species (50 CFR 222.308).

b. Samples must be maintained according to accepted curatorial standards and must be labeled with a unique identifier (e.g., alphanumeric code) that is connected to on-site records with information identifying the

i. species and, where known, age and sex;

ii. date of collection, acquisition, or import;

iii. type of sample (e.g., blood, skin, bone);

iv. origin (i.e., where collected or imported from); and

v. legal authorization for original sample collection or import.

c. Biological samples belong to the Permit Holder and may be temporarily transferred to Authorized Recipients identified in Appendix 2 of the permit without additional written authorization, for analysis or curation related to the objectives of this permit. The Permit Holder remains responsible for the samples, including any reporting requirements.

d. The Permit Holder may request approval of additional Authorized Recipients for analysis and curation of samples related to the permit objectives by submitting a written request to the Permits Division specifying the

i. name and affiliation of the recipient;

ii. address of the recipient;

iii. types of samples to be sent (species, tissue type); and

iv. type of analysis or whether samples will be curated.

e. Sample recipients must have authorization pursuant to 50 CFR 216.37 prior to permanent transfer of samples and transfers for purposes not related to the objectives of this permit.

f. Samples cannot be bought or sold, including parts transferred pursuant to 50 CFR 216.37.

g. After meeting the permitted objectives, the Permit Holder may continue to possess and use samples acquired under this permit, without additional written authorization, provided the samples are maintained as specified in the permit and findings are discussed in the annual reports (See Condition E. 3).

Other relevant permit conditions include:

- Ensuring qualified individuals are authorized to conduct research activities;
- Limiting the number of researchers present to essential personnel;
- Requiring individuals to be properly licensed as necessary;
- Prohibiting commercial activities to take place during research activities;
- Requiring that new personnel be reviewed by the Permits Division prior to being added to the permit;
- Requiring that a copy of the permit be retained on the boat, plane or vessel during research for reference;
- Providing requirements and instructions for submitting annual, final and incident reports;
- Instructions for notifying NMFS Regional Office of the research activities;
- Instructions to coordinate research activities with other researchers in the area;
- Notification that activities conducted under the permit may be reviewed and observed by NMFS; and
- Notification that the permit can be modified, suspended or revoked at the discretion of the Director, NMFS Office of Protected Resources.

2.2 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 CFR 402.02).

Activities would be conducted year-round, primarily in the Pacific Ocean, but also in the Atlantic, Southern and Indian Oceans. Not all species would be affected in all action areas.

Research on non-ESA-listed pinnipeds would take place on the Channel Islands off of Southern California, as well as in National Marine Sanctuaries such as Channel Islands, Cordell Bank, Greater Farallones, Monterey Bay and Olympic Coast. Cetacean studies would take place throughout the Atlantic, Pacific and Southern Oceans; the blue whale is the only ESA-listed species for which the proposed permit would authorize research in the Indian Ocean. Recurring cetacean sturdies would take place in the eastern tropical Pacific and the North Pacific Ocean, with a focus on the waters off of California, Oregon, Washington and Hawaii. Sea turtle research would take place throughout the eastern tropical Pacific and North Pacific Oceans.

2.3 Interrelated and Interdependent Actions

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

The Permits and Conservation Division's proposal to issue a scientific research permit to the Southwest Fisheries Science Center is interdependent on the proposed research activities, as it would not have an independent use if not for the actual activity proposed. The proposed scientific research conducted by the Southwest Fisheries Science Center would not carry forward without the authorization to exempt take from the Permits and Conservation Division.

3 Overview of NMFS' Assessment Framework

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

"To jeopardize the continued existence of an ESA-listed species" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of an ESA-listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR §402.02). The jeopardy analysis considers both survival and recovery of the species.

Section 7 assessment involves the following steps:

1) We identify the proposed action and those aspects (or stressors) of the proposed action that are likely to have direct or indirect effects on the physical, chemical and biotic environment within the action area, including the spatial and temporal extent of those stressors.

2) We identify the ESA-listed species and designated critical habitat that are likely to co-occur with those stressors in space and time.

3) We describe the environmental baseline in the action area including: past and present impacts of Federal, state, or private actions and other human activities in the action area; anticipated

impacts of proposed Federal projects that have already undergone formal or early section 7 consultation; and impacts of state or private actions that are contemporaneous with the consultation in process.

4) We identify the number, age (or life stage) and gender of ESA-listed individuals that are likely to be exposed to the stressors and the populations or subpopulations to which those individuals belong. This is our exposure analysis.

5) We evaluate the available evidence to determine how those ESA-listed species are likely to respond given their probable exposure. This is our response analyses.

6) We assess the consequences of these responses to the individuals that have been exposed, the populations those individuals represent and the species those populations comprise. This is our risk analysis.

7) The adverse modification analysis considers the impacts of the proposed action on the critical habitat features and conservation value of designated critical habitat.

8) We describe any cumulative effects of the proposed action in the action area.

   Cumulative effects, as defined in our implementing regulations (50 CFR §402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation.

9) We integrate and synthesize the above factors by considering the effects of the action to the environmental baseline and the cumulative effects to determine whether the action could reasonably be expected to:

   a) Reduce appreciably the likelihood of both survival and recovery of the ESA-listed species in the wild by reducing its numbers, reproduction, or distribution; or

   b) Reduce the conservation value of designated or proposed critical habitat. These assessments are made in full consideration of the status of the species and critical habitat.

10) We state our conclusions regarding jeopardy and the destruction or adverse modification of 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, we must identify a reasonable and prudent alternative (RPA) to the action. The RPA must not be likely to jeopardize the continued existence of ESA-listed species nor adversely modify their designated critical habitat and it must meet other regulatory requirements.

To comply with our obligation to use the best scientific and commercial data available, we conducted electronic searches of the general scientific literature using search engines like Google Scholar, as well as an internal electronic library containing scientific articles and reports. We supplement these searches with electronic searches of doctoral and master's theses. We also relied on the information provided to us by the Permits and Conservation Division in the initiation package. We conducted these searches to identify information relevant to the potential stressors and responses of targeted species and any other species that may be affected by the proposed action to draw conclusions about the likely risks to the continued existence of the species and the conservation value of their critical habitat.

4 Status of ESA-listed Species

This section identifies the ESA-listed species that potentially occur within the action area that may be affected by the Permits and Conservation Division's issuance of Permit No. 19091 to the NMFS Southwest Fisheries Science Center (Table 1). This section also summarizes the biology and ecology of those species and what is known about their life histories in the action area. The species potentially occurring within the action area are listed in Table 1, along with their regulatory statuses.

Table 1. Threatened and endangered species that may be affected by the NMFS Permits and Conservation Division's proposed action of issuance of Permit No. 19091 to the NMFS Southwest Fisheries Science Center.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals – Cetaceans			
Blue Whale (*Balaenoptera musculus)*	E – 35 FR 18319	-- --	07/1998
Fin Whale (*Balaenoptera physalus)*	E – 35 FR 18319	-- --	75 FR 47538
Humpback Whale (*Megaptera novaeangliae*)	E – 35 FR 18319 and 80 FR 22304 (Proposed)	-- --	55 FR 29646
North Atlantic Right Whale (*Eubalaena glacialis*)	E – 73 FR 12024	59 FR 28805 and 81 FR 4837	70 FR 32293
Southern Right Whale (*Eubalaena australis*)	E – 35 FR 8491	-- --	-- --
North Pacific Right Whale (*Eubalaena japonica*)	E – 73 FR 12024	59 FR 28805	70 FR 32293
Sei Whale (*Balaenoptera borealis*)	E – 35 FR 18319	-- --	76 FR 43985
Bowhead Whale (*Balaena mysticetes*)	E – 35 FR 18319	-- --	-- --
Sperm Whale (*Physeter macrocephalus*)	E – 35 FR 18319	-- --	75 FR 81584

Species	ESA Status	Critical Habitat	Recovery Plan
Gray Whale (*Eschrichtius robustus*) Western North Pacific	E – 35 FR 18319	-- --	-- --
Killer Whale, (*Orcinus orca*) Southern Resident DPS	E -- 70 FR 69903	71 FR 69054	73 FR 4176
False Killer Whale, (*Pseudorca crassidens*) Main Hawaiian Islands Insular DPS	E -- 77 FR 70915	-- --	-- --
Beluga Whale, (*Delphinapterus leucas*) Cook Inlet DPS	E -- 73 FR 62919	76 FR 20179	80 FR 27925
Marine Mammals – Pinnipeds			
Ringed Seal, (*Phoca hispida hispida*) – Arctic DPS	T – 77 FR 76706	79 FR73010 (Proposed)	-- --
Steller Sea Lion, (*Eumetopias jubatus*) Western DPS	T – 55 FR 49204	58 FR 45269	3/2008
Guadalupe Fur Seal (*Arctocephalus townsendi*)	T – 50 FR 51252	-- --	-- --
Hawaiian Monk Seal (*Neomonachus schauinslandi*)	E – 41 FR 51611	80 FR 50925 and 53 FR 18988	72 FR 46966
Spotted Seal, (*Phoca largha*) Southern DPS	T -- 75 FR 65239	-- --	-- --
Bearded Seal, (*Erignathus barbatus*) Okhotsk DPS	T -- 77 FR 76739	-- --	-- --
Sea Turtles			
Green Turtle, (*Chelonia mydas*) – North Atlantic DPS	T – 81 FR 20057	63 FR 46693	63 FR 28359
Green Turtle, (*Chelonia mydas*) – South Atlantic DPS	T – 81 FR 20057	-- --	-- --
Green Turtle, (*Chelonia mydas*) – East Pacific DPS	T – 81 FR 20057	-- --	-- --
Green Turtle, (*Chelonia mydas*) – Central North Pacific DPS	T – 81 FR 20057	-- --	-- --
Green Turtle, (*Chelonia mydas*) – Central West Pacific DPS	E – 81 FR 20057	-- --	-- --
Green Turtle, (*Chelonia mydas*) – East Indian West Pacific DPS	T – 81 FR 20057	-- --	-- --
Green Turtle, (*Chelonia mydas*) – Southwest Pacific DPS	T – 81 FR 20057	-- --	-- --

Species	ESA Status	Critical Habitat	Recovery Plan
Green Turtle, (*Chelonia mydas*) – Central South Pacific DPS	E – 81 FR 20057	-- --	-- --
Green Turtle, (*Chelonia mydas*) – North Indian DPS	T – 81 FR 20057	-- --	-- --
Green Turtle, (*Chelonia mydas*) – Southwest Indian DPS	T – 81 FR 20057	-- --	-- --
Hawksbill Turtle (*Eretmochelys imbricata)*	E – 35 FR 8491	63 FR 46693	57 FR 38818
Kemp's Ridley Turtle (*Lepidochelys kempii*)	E – 35 FR 18319	-- --	75 FR 12496
Leatherback Turtle (*Dermochelys coriacea*)	E – 61 FR 17	44 FR 17710 and 77 FR 4170	63 FR 28359
Loggerhead Turtle, (*Caretta caretta*) – Northwest Atlantic Ocean DPS	T – 76 FR 58868	79 FR 39855	74 FR 2995
Loggerhead Turtle, (*Caretta caretta*) – South Atlantic Ocean DPS	T – 76 FR 58868	-- --	-- --
Loggerhead Turtle, (*Caretta caretta*) – Southeast Indo-Pacific Ocean DPS	T – 76 FR 58868	-- --	63 FR 28359
Loggerhead Turtle, (*Caretta caretta*) – Northeast Atlantic Ocean DPS	E – 76 FR 58868	-- --	-- --
Loggerhead Turtle, (*Caretta caretta*) – North Pacific Ocean DPS	E – 76 FR 58868	-- --	63 FR 28359
Loggerhead Turtle, (*Caretta caretta*) – South Pacific Ocean DPS	E – 76 FR 58868	-- --	63 FR 28359
Loggerhead Turtle, (*Caretta caretta*) – North Indian Ocean DPS	E – 76 FR 58868	-- --	-- --
Loggerhead Turtle, (*Caretta caretta*) – Southwest Indian Ocean DPS	T – 76 FR 58868	-- --	-- --
Olive Ridley Turtle (*Lepidochelys olivacea*)	T – 43 FR 32800	-- --	-- --
Fishes			
Shortnose sturgeon (*Acipenser brevirostrum*)	E – 32 FR4001	-- --	63 FR 69613
Gulf sturgeon (*Acipenser oxyrinchus desotoi*)	T – 56 FR 49653	68 FR 13370	Recovery Plan
Green sturgeon, (*Acipenser medirostris*) Southern DPS	T -- 71 FR 17757	74 FR 52300	-- --

Species	ESA Status	Critical Habitat	Recovery Plan
Atlantic sturgeon, (*Acipenser oxyrinchus oxyrinchus*) Gulf of Maine DPS	T -- 77 FR 5880	-- --	-- --
Atlantic sturgeon, (*Acipenser oxyrinchus oxyrinchus*) New York Bight DPS	E -- 77 FR 5880	-- --	-- --
Atlantic sturgeon, (*Acipenser oxyrinchus oxyrinchus*) Chesapeake DPS	E -- 77 FR 5880	-- --	-- --
Atlantic sturgeon, (*Acipenser oxyrinchus oxyrinchus*) Carolina DPS	E -- 77 FR 5880	-- --	-- --
Atlantic sturgeon, (*Acipenser oxyrinchus oxyrinchus*) South Atlantic DPS	E -- 77 FR 5880	-- --	-- --
Smalltooth Sawfish (*Pristis pectinata*)	E – 68 FR 15674	74 FR 45353	74 FR 3566
Largetooth Sawfish (*Pristis pristis*)	E – 76 FR 40822	-- --	-- --
Scalloped Hammerhead Shark, (*Sphyrna lewini*) Eastern Atlantic DPS	E -- 79 FR 38213	-- --	-- --
Scalloped Hammerhead Shark, (*Sphyrna lewini*) Eastern Pacific DPS	E -- 79 FR 38213	-- --	-- --
Scalloped Hammerhead Shark, (*Sphyrna lewini*) Central and Southwest Atlantic DPS	T -- 79 FR 38213	-- --	-- --
Scalloped Hammerhead Shark, (*Sphyrna lewini*) Indo-West Pacific DPS	T -- 79 FR 38213	-- --	-- --
Nassau grouper (*Epinephelus striatus*)	Proposed T -- 79 FR 51929	-- --	-- --
Steelhead Trout, (*Oncorhynchus mykiss*) Southern California DPS	E -- 71 FR 834	70 FR 52488	77 FR 1669
Steelhead Trout, (*Oncorhynchus mykiss*) South-Central California Coast DPS	T -- 71 FR 834	70 FR 52488	78 FR 77430
Steelhead Trout, (*Oncorhynchus mykiss*) Central California Coast DPS	T -- 71 FR 834	70 FR 52488	80 FR 60125
Steelhead Trout, (*Oncorhynchus mykiss*) California Central Valley DPS	T -- 71 FR 834	70 FR 52488	79 FR 42504
Steelhead Trout, (*Oncorhynchus mykiss*) Northern California DPS	T -- 71 FR 834	70 FR 52488	80 FR 60125
Steelhead Trout, (*Oncorhynchus mykiss*) Lower Columbia River DPS	T -- 71 FR 834	70 FR 52630	78 FR 41911
Steelhead Trout, (*Oncorhynchus mykiss*) Upper Willamette River DPS	T -- 71 FR 834	70 FR 52630	76 FR 52317
Steelhead Trout, (*Oncorhynchus mykiss*) Middle Columbia River DPS	T -- 71 FR 834	70 FR 52630	74 FR 50165
Steelhead Trout, (*Oncorhynchus mykiss*) Upper Columbia River DPS	T -- 71 FR 834	70 FR 52630	72 FR 57303
Steelhead Trout, (*Oncorhynchus mykiss*) Snake River Basin DPS	T -- 71 FR 834	70 FR 52630	Draft Recovery Plan (2011)

Species	ESA Status	Critical Habitat	Recovery Plan
Steelhead Trout, (*Oncorhynchus mykiss*) Puget Sound DPS	T -- 72 FR 26722	81 FR 9251	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)* Central Valley Spring-Run ESU	T -- 70 FR 37160	70 FR 52488	79 FR 42504
Chinook Salmon, (*Oncorhynchus tshawytscha)* California Coastal ESU	T -- 70 FR 37160	70 FR 52488	80 FR 60125
Chinook Salmon, (*Oncorhynchus tshawytscha)* Upper Willamette River ESU	T -- 70 FR 37160	70 FR 52630	76 FR 52317
Chinook Salmon, (*Oncorhynchus tshawytscha)* Lower Columbia River ESU	T -- 70 FR 37160	70 FR 52630	78 FR 41911
Chinook Salmon, (*Oncorhynchus tshawytscha)* Upper Columbia River Spring-Run ESU	E -- 70 FR 37160	70 FR 52630	72 FR 57303
Chinook Salmon, (*Oncorhynchus tshawytscha)* Puget Sound ESU	E -- 70 FR 37160	70 FR 52630	72 FR 2493
Chinook Salmon, (*Oncorhynchus tshawytscha)* Snake River Fall-Run ESU	T -- 70 FR 37160	58 FR 68543	Draft Recovery Plan (9/2015)
Chinook Salmon, (*Oncorhynchus tshawytscha)* Snake River Spring/Summer Run ESU	E -- 70 FR 37160	64 FR 57399	Draft Recovery Plan (2011)
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*) Southern Oregon/Northern California Coast ESU	T -- 70 FR 37160	64 FR 24049	79 FR 58750
Coho Salmon, (*Oncorhynchus kisutch*) Oregon Coast ESU	T -- 73 FR 7816	73 FR 7816	80 FR 61379
Chum Salmon, (*Oncorhynchus keta*) Columbia River ESU	T -- 70 FR 37160	70 FR 52630	78 FR 41911
Chum Salmon, Hood Canal Summer-Run (*Oncorhynchus keta*) ESU	T -- 70 FR 37160	70 FR 52630	Recovery Plan (6/2005)
Sockeye Salmon, (*Oncorhynchus nerka*) Snake River ESU	E -- 70 FR 37160	58 FR 68543	80 FR 32365
Sockeye Salmon, (*Oncorhynchus nerka*) Lake Ozette ESU	T -- 70 FR 37160	70 FR 52630	74 FR 25706
Bocaccio, Puget Sound/Georgia Basin DPS (*Sebastes paucispinis*)	T -- 75 FR 22276	79 FR 68041	-- --
Canary Rockfish, Puget Sound/Georgia Basin DPS (*Sebastes pinniger*)	T -- 75 FR 22276	79 FR 68041	-- --
Yelloweye Rockfish, Puget Sound/Georgia Basin DPS (*Sebastes rubberimus*)	T -- 75 FR 22276	79 FR 68041	-- --

Species	ESA Status	Critical Habitat	Recovery Plan
Smoothback Angelshark (*Squatina oculata*)	E -- 80 FR 40969 (Proposed)	-- --	-- --
Sawback Angelshark (*Squatina aculeata*)	E -- 80 FR 40969 (Proposed)	-- --	-- --
Common Angelshark (*Squatina squatina*)	E -- 80 FR 40969 (Proposed)	-- --	-- --
Daggernose Shark (*Isogomphodon oxyrhynchus*)	E -- 80 FR 76067 (Proposed)	-- --	-- --
Brazilian Guitarfish (*Rhinobatos horkelii*)	E -- 80 FR 76067 (Proposed)	-- --	-- --
Striped Smoothhound Shark (*Mustelus fasciatus*)	E -- 80 FR 76067 (Proposed)	-- --	-- --
Narrownose Smoothhound Shark (*Mustelus schmitti*)	E -- 80 FR 76067 (Proposed)	-- --	-- --
Spiny Angel Shark (*Squatina guggenheim*)	E -- 80 FR 76067 (Proposed)	-- --	-- --
Argentine Angel Shark (*Squatina argentina*)	E -- 80 FR 76067 (Proposed)	-- --	-- --
Graytail Skate (*Bathyraja griseocauda*)	E -- 80 FR 76067 (Proposed)	-- --	-- --
Banggai Cardinalfish (*Pterapogon kauderni*)	T -- 81 FR 3023	-- --	-- --
African coelacanth, (*Latimeria chalumnae*) – Tanzanian DPS	T -- 81 FR 17398	-- --	-- --
Marine Invertebrates			
Elkhorn Coral (*Acropora palmata*)	T – 71 FR 26852	73 FR 72210	80 FR 12146
Staghorn Coral (*Acropora cervicornis*)	T – 71 FR 26852	73 FR 72210	80 FR 12146
Johnsons Seagrass (*Halophila johnsonii*)	T -- 63 FR 49035	65 FR 17786	67 FR 62230
White Abalone (*Haliotis sorenseni*)	E -- 66 FR 29046	N/A -- 66 FR 29046	73 FR 62257
Black Abalone (*Haliotis cracherodii*)	E -- 74 FR 1937	76 FR 66805	-- --
Mycetophyllia ferox coral	T – 79 FR 54122	-- --	-- --
Pillar Coral *(Dendrogyra cylindrus)*	T – 79 FR 54122	-- --	-- --
Orbicella annularis coral	T – 79 FR 54122	-- --	-- --
Mountainous Star Coral *(Orbicella faveolata)*	T – 79 FR 54122	-- --	-- --

Species	ESA Status	Critical Habitat	Recovery Plan
Boulder Star Coral (*Orbicella franksi)*	T – 79 FR 54122	-- --	-- --
Lobed Star Coral (Acropora globiceps)	T – 79 FR 54122	-- --	-- --
Acropora jacquelineae coral	T – 79 FR 54122	-- --	-- --
Acropora lokani coral	T – 79 FR 54122	-- --	-- --
Acropora pharaonis coral	T – 79 FR 54122	-- --	-- --
Acropora retusa coral	T – 79 FR 54122	-- --	-- --
Acropora rudis coral	T – 79 FR 54122	-- --	-- --
Acropora speciose coral	T – 79 FR 54122	-- --	-- --
Acropora tenella coral	T – 79 FR 54122	-- --	-- --
Anacropora spinosa coral	T – 79 FR 54122	-- --	-- --
Euphyllia paradivisa coral	T – 79 FR 54122	-- --	-- --
Isopora crateriformis coral	T – 79 FR 54122	-- --	-- --
Montipora australiensis coral	T – 79 FR 54122	-- --	-- --
Pavona diffluens coral	T – 79 FR 54122	-- --	-- --
Porites napopora coral	T – 79 FR 54122	-- --	-- --
Seriatopora aculeate coral	T – 79 FR 54122	-- --	-- --

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

The second criterion is the probability of a response given exposure. ESA-listed species or designated critical habitat that is exposed to a potential stressor but is likely to be unaffected by the exposure is also not likely to be adversely affected by the proposed action. We applied these criteria to the species ESA-listed in Table 1 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.

4.1.1 Species Not Considered Further in This Opinion

The Western DPS of Steller sea lions, Guadalupe fur seal, Hawaiian monk seal, Cook Inlet beluga whales, Main Hawaiian Islands Insular false killer whales, bowhead whales and Western North Pacific gray whale may occur in the action area, but are not expected to be exposed to the proposed activities. The permit will not authorize takes for these species. If a protected whale or pinniped is observed in the action area, the vessel would operate at a reduced speed and avoid the animal, following marine mammal viewing guidelines. The pinniped surveys will be conducted in California, Oregon and Washington, outside the range of non-targeted ESA-listed pinnipeds (like Eastern DPS Steller sea lions, Guadalupe fur seals, and Hawaiian monk seals) that may co-occur with the targeted species. Given permit conditions, the manner in which activities would be conducted and the fact that research would target other species, the Western DPS of Steller sea lions, Cook Inlet beluga whales, bowhead whales, Guadalupe fur seal, Main Hawaiian Islands Insular false killer whales, Hawaiian monk seal and Western North Pacific gray whale are not likely to be adversely affected by the proposed action. We therefore conclude that the effects of the proposed action to these species are discountable and will not consider them further in this opinion.

We do not expect any of the ESA-listed DPSs of bearded, spotted or ringed seals to be affected by the proposed action. These species are circumpolar, and found in the Arctic. The proposed action will not occur in the Arctic, and therefore we conclude that there will be no effect to these species and will not consider them further in this opinion.

The proposed action may take place in the Atlantic, Pacific, Indian and Southern Oceans. For ESA-listed corals, Johnson’s seagrass, black and white abalone, as well as Atlantic, shortnose, gulf and green sturgeon (Southern DPS), Puget Sound/Georgia Basin rockfishes, Southern DPS eulachon, smalltooth and largetooth sawfish, any scalloped hammerhead shark DPSs, any of the angel sharks, daggernose shark, striped smoothound shark, narrownose smoothhound shark, Brazilian guitarfish, graytail skate, Banggai cardinalfish, African coelacanth, Nassau grouper, and Pacific salmon ESUs that may be present in the action area, the proposed activities would target other species and would be conducted in a manner that is not expected to adversely affect these species. The proposed action will not involve any capture methods or sampling techniques that would capture or impact ESA-listed fishes or invertebrates. Since the proposed action would involve research techniques that are not expected to interact with ESA-listed invertebrates or fishes, we do not expect them to be adversely affected by the proposed action. We therefore conclude that the effects of the proposed action to these species are discountable and will not be considered further in this opinion.

4.1.2 Critical Habitat Not Considered Further in This Opinion

Critical habitats designated for ESA-listed Pacific salmon, Southern DPS eulachon, Southern DPS of green sturgeon, Puget Sound/Georgia Basin DPS rockfishes, leatherback sea turtles, Southern Resident killer whale, Cook Inlet beluga whale, black abalone, Hawaiian monk seal, North Atlantic right whale, North Pacific right whale, ringed seal critical habitat (proposed), elkhorn and staghorn coral, Johnson's seagrass, and smalltooth sawfish occur within the action area. The designated critical habitat for these species will not be considered further in this opinion for the reasons discussed in below.

4.1.2.1 ESA-listed Pacific Salmon Critical Habitat

Designated critical habitat for several evolutionarily significant units (ESUs) of steelhead and chinook, sockeye and chum salmon includes nearshore marine waters contiguous with the shoreline from the line of extreme high water out to a depth no greater than 30 m (98 ft) relative to mean lower low water (70 FR 52630; September 2, 2005). The primary constituent elements (PCEs) for these critical habitat designations include 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; natural cover; and offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation. Any potential effects to this critical habitat would be insignificant because the proposed activities would not cause obstruction or significantly affect predation, would not cause any significant changes to water quality in designated critical habitat, would not affect forage or the ability for critical habitat areas to support growth and maturation of listed salmon and would not affect the natural cover in these areas. Therefore, the proposed activities are not expected to adversely affect the conservation value of designated critical habitat for these species.

4.1.2.2 Southern DPS Pacific Eulachon Critical Habitat

Critical habitat has been designated for the southern DPS of Pacific eulachon (76 FR 65323), and falls within the proposed action area. The designated areas are a combination of freshwater creeks and rivers and their associated estuaries, comprising approximately 539 km (335 mi) 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 yolk sac is depleted.
- Nearshore and offshore marine foraging habitat with water quality and available prey, supporting juveniles and adult survival.

The proposed activity involves boating, observation and incidental disturbance, capture and sampling of ESA-listed cetaceans and sea turtles, which would not alter any of these essential features. The proposed action would not destroy or adversely modify designated critical habitat for Southern DPS eulachon, and is not considered further in this Opinion.

4.1.2.3 Southern DPS Green Sturgeon Critical Habitat

Designated habitat for the Southern DPS green sturgeon generally includes coastal U.S. marine waters within 60 fathoms depth, from Monterey Bay, California, north to Cape Flattery, Washington, as well as certain rivers, bays and estuaries (74 FR 52300; October 9, 2009). PCEs are designated for each of the three different systems that green sturgeon at specific life stages. The action area intersects the coastal marine critical habitat, for which the PCEs area migratory corridor, water quality and food resources. Any potential effects to this critical habitat would be insignificant because the proposed activities would not disrupt the migratory behavior of the fish, would not cause any significant changes to water quality in designated critical habitat and would not affect food availability. Therefore, the proposed activities are not expected to adversely affect the conservation value of designated critical habitat for this species.

4.1.2.4 Puget Sound/Georgia Basin DPS Bocaccio, Canary Rockfish and Yelloweye Rockfish

Critical habitat for the Puget Sound/Georgia Basin DPS for bocaccio, canary rockfish, yelloweye rockfish was finalized in 2014 (79 FR 68041), and it overlaps with the proposed research area. The specific areas designated for canary rockfish and bocaccio include approximately 1,184.75 mi^2 (3,068.5 km^2) of marine habitat in Puget Sound, Washington. The specific areas designated for yelloweye rockfish include approximately 574.75 mi^2 (1,488.6 km^2) of marine habitat in Puget Sound, Washington. Features essential for adult canary rockfish and boccacio and adult and juvenile yelloweye rockfish (>30 m deep) include sufficient prey resources, water quality, and rocks or highly rugose habitat. For juvenile canary rockfish and boccacio features essential for their conservation include sufficient prey resources and water quality.

The proposed research activities would not alter or impair benthic habitat, water quality, or prey resources of the designated critical habitat for the Puget Sound/Georgia Basin DPS rockfishes. Thus, the proposed action would not result in the destruction or adverse modification of designated critical habitat for the Puget Sound/Georgia Basin DPS for bocaccio, canary rockfish, or yelloweye rockfish, and is not considered further in this Opinion.

4.1.2.5 Leatherback Sea Turtle Critical Habitat

Leatherback sea turtle critical habitat is designated within the proposed action area along the California coast from Point Arena to Point Arguello and from Cape Flattery, Washington to Cape Blanco, Oregon. On March 23, 1979, leatherback critical habitat was identified adjacent to Sandy Point, St. Croix, U.S.V.I. from the 183 m isobath to mean high tide level between 17° 42'12" N and 65°50'00" W (44 FR 17710). This habitat is essential for nesting, which has been increasingly threatened since 1979 when tourism increased significantly, bringing nesting habitat and people into close and frequent proximity. However, studies do not currently support significant critical habitat deterioration. In addition to other oceans worldwide, the proposed action would take place in the Pacific Ocean along the coast of California, Oregon, and Washington, and in the Atlantic Ocean, meaning that it could overlap with leatherback critical habitat.

Only one PCE was identified for leatherback critical habitat: the occurrence of prey species, primarily scyphomedusae 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 leatherbacks.

The proposed permit would authorize activities in critical habitat areas for leatherback sea turtles, but the research is not expected to adversely affect any aspect of prey availability that forms the PCE 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.

4.1.2.6 Southern Resident Killer Whale Critical Habitat

Critical habitat has been designated for the Southern Resident killer whale in Haro Strait, U.S. waters around the San Juan Islands, the Strait of Juan de Fuca, and throughout Puget Sound (71 FR 69054) and falls within the proposed action area. The physical, chemical, and biotic features that form killer whale critical habitat include water quality to support growth and development; prey species of sufficient quantity, quality, and availability to support individual growth, reproduction and development, as well as overall population growth; and passage conditions to allow for migration, resting, and foraging. On February 24, 2015, NMFS responded to a petition to revise Southern Resident killer whale critical habitat to include marine waters off the U.S. West Coast that are important foraging and wintering areas, and protective in-water sound levels. NMFS intends to proceed with the revisions, and is currently compiling the best available information in preparation of a proposed rule.

The proposed permit would authorize activities in 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 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. 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 critical habitat for Southern Resident killer whale, or result in its destruction or adverse modification. Southern Resident killer whale critical habitat is not addressed further in this Opinion.

4.1.2.7 Cook Inlet Beluga Whale Critical Habitat

On April 11, 2011, NMFS designated critical habitat for the Cook Inlet beluga whale that includes two areas. Area 1 encompasses the upper Inlet, a 1,909 km^2 area bounded by the Municipality of Anchorage, the Matanuska-Susitna Borough and the Kenai Peninsula Borough. This area hosts a high concentration of belugas from spring through fall. It provides shallow tidal flats and river mouths or estuarine areas, important to foraging and calving. Mudflats and shallow areas adjacent may allow for molting and escape from predators. Area 2 consists of 5,891 km^2 south of Area 1 including: Tuxedni, Chinitna and Kamishak Bays on the west coast, a portion of Kachemak Bay on the east coast and south of Kalgin Island. During the fall and winter, belugas typically occur in smaller densities or deeper waters of this feeding and transit area. Areas 1 and 2 contain the following physical or biological features essential to the conservation of this DPS (76 FR 20180):

(1) Intertidal and subtidal waters of Cook Inlet with depths less than 30 feet (9.1 m) and within 5 miles (8 km) of high and medium flow anadromous fish streams.

(2) Primary prey species consisting of four species of Pacific salmon (Chinook, sockeye, chum and coho), Pacific eulachon, Pacific cod, walleye pollock, saffron cod and yellowfin sole.

(3) Waters free of toxins or other agents of a type and amount harmful to Cook Inlet beluga whales.

(4) Unrestricted passage within or between the critical habitat areas.

(5) Waters with in-water noise below levels resulting in the abandonment of critical habitat areas by Cook Inlet beluga whales.

The proposed activities would not adversely affect prey species and, therefore, are not expected to affect prey quality, quantity, or availability. Any effects on water quality, noise 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 critical habitat for Cook Inlet beluga whale, or result in its destruction or adverse modification. Cook Inlet beluga whale critical habitat is not addressed further in this Opinion.

4.1.2.8 Black Abalone Critical Habitat

On October 27, 2011, critical habitat was designated for black abalone (76 FR 66806). Designated critical habitat areas include approximately 360 square kilometers of rocky intertidal and subtidal habitat within five segments of the California coast between the Del Mar Landing Ecological Reserve to the Palos Verdes Peninsula, as well as on the Farallon Islands, Año Nuevo Island, San Miguel Island, Santa Rosa Island, Santa Cruz Island, Anacapa Island, Santa Barbara Island, and Santa Catalina Island. The rule identifies several PCEs required by black abalone, such as: rocky substrates, food resources, juvenile settlement habitat, suitable water quality, and suitable nearshore circulation patterns.

The proposed action involves boating, observation and incidental disturbance, capture and sampling of ESA-listed sea turtles and cetaceans. These proposed research activities would not alter or impair any PCEs for designated black abalone critical habitat, and is not considered further in this Opinion.

4.1.2.9 Hawaiian Monk Seal Critical Habitat

Hawaiian monk seal critical habitat was originally designated on April 30, 1986 (51 FR 16047) and was extended on May 26, 1988 (53 FR 18988) and extended again on August 21, 2015 (80 FR 50925). It includes all beach areas, sand spits and islets (including all beach crest vegetation to its deepest extent inland), lagoon waters, inner reef waters, and ocean waters out to a depth of 500 m around the Northwestern Hawaiian Islands breeding atolls and islands (including Sand Island at Midway Atoll) and designating six new areas in the Main Hawaiian Islands: the terrestrial and marine habitat from 5 m inland from the shoreline extending seaward to the 500 m depth contour around Kaula, Niihau, Kauai, Oahu, Maui Nui, and Hawaii Islands. The marine component of this habitat serves as foraging area, and terrestrial habitat provides resting, pupping and nursing habitat. NMFS believes the proposed action is not likely to affect the quantity, quality, or availability of the physical or biological features described above and therefore is not likely to adversely affect Hawaiian monk seal critical habitat.

4.1.2.10 North Atlantic Right Whale Critical Habitat

On June 3, 1994, NMFS designated critical habitat for the North Atlantic right whale (59 FR 28805). Northern designated areas (Great South Channel, Massachusetts Bay, Cape Cod Bay and Stellwagen Bank) include complex oceanographic features that drive prey density and distribution. Southern areas (waters from the coast out 15 nautical miles between the latitudes of 31°15’ N and 30°15’ N and from the coast out five nautical miles between 30°15’ N and 28°00’ N) were designated to protected calving and breeding grounds.

On January 27, 2016, NMFS issued a final rule to expand critical habitat for the North Atlantic right whale (81 FR 4837). The new designation includes marine habitat in two regions—a unit for foraging in the Gulf of Maine and Georges Bank region, and a unit for calving habitat off the southeastern U.S. coast. The rule identified physical and biological features essential for conservation of the species in each unit of designated critical habitat. For the foraging unit in the Gulf of Maine and Georges Bank, oceanographic conditions that support copepod prey aggregations are identified as essential features. These include prevailing currents and circulation patterns, bathymetric features, oceanic fronts, density gradients and temperature regimes. In the unit for calving habitat off the southeastern U.S. coast, the following features were identified as essential: calm surface conditions, appropriate sea surface temperatures and water depths between 6 and 28 m.

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

4.1.2.11 North Pacific Right Whale Critical Habitat

In 2008, NMFS designated critical habitat for the North Pacific right whale, that includes an area in the Southeast Bering Sea and an area south of Kodiak Island in the Gulf of Alaska (73 FR 19000). These areas are influenced by large eddies, submarine canyons, or frontal zones which enhance nutrient exchange and act to concentrate prey and are characterized by relatively low circulation and water movement. Both critical habitat areas support feeding by North Pacific right whales because they contain the designated PCEs, which include: nutrients, physical oceanographic processes, certain species of zooplankton, and a long photoperiod due to the high latitude (73 FR 19000). NMFS believes the proposed action is not likely to affect the quantity, quality, or availability of the physical or biological features described above and, therefore, is not likely to adversely affect North Pacific right whale critical habitat.

4.1.2.12 Ringed Seal Critical Habitat (Proposed)

On December 9, 2014, NMFS published a proposal to designate critical habitat for the Arctic subspecies (*Phoca hispada hispada*) of the ringed seal (79 FR 73010). The proposed critical habitat would include the area extending to the outer limit of the U.S. exclusive economic zone in the Chukchi and Beaufort Seas, and south into the Bering Sea, as far south as Bristol Bay in years with extensive ice coverage. The proposed critical habitat includes the following physical and biological features deemed essential to the conservation of the Arctic ringed seal: Sea ice habitat suitable for the formation and maintenance of subnivean birth lairs used for sheltering pups during whelping and nursing; sea ice habitat suitable as a platform for basking and molting; and primary prey resources including Arctic cod, saffron cod, shrimps, and amphipods. NMFS believes the proposed action is not likely to affect the quantity, quality, or availability of the physical or biological features described above and therefore is not likely to adversely affect ringed seal proposed critical habitat.

4.1.2.13 Elkhorn and Staghorn Coral Critical Habitat

NMFS published a final rule to designate critical habitat for elkhorn and staghorn corals on November 26, 2008 (73 FR 72210). This habitat serves as substrate of suitable quality and availability, in water depths from the mean high water line to 98 feet (except along some areas of Florida, where the 6 foot contour is the shoreward limit), to support successful larval settlement, recruitment, and reattachment of fragments. NMFS designated marine habitat in four specific areas: Florida (1,329 square miles), Puerto Rico (1,383 square miles), St. John/St. Thomas (121 square miles), and St. Croix (126 square miles). These areas support the following physical or biological features that are essential to the conservation of the species: substrate of suitable quality and availability to support successful larval settlement and recruitment and reattachment and recruitment of fragments. The lone PCE identified is natural consolidated hard substrate or dead coral skeleton that are free from fleshy or turf macroalgae cover and sediment cover. This feature is essential to the conservation of these two species because of the extremely limited recruitment observed and the need for this species to have suitable recruitment habitat.

The proposed action may take place in the Atlantic Ocean, within the vicinity of elkhorn and staghorn critical habitat. However, the research activities will be directed at ESA-listed sea turtles and cetaceans and will not impact the PCE for elkhorn and staghorn coral. As such, elkhorn and staghorn critical habitat will not be considered further in this opinion.

4.1.2.14 Johnson's Seagrass Critical Habitat

Critical habitat for Johnson's seagrass was designated on April 5, 2000 (65 FR 17786) and includes (1) locations with populations that have persisted for 10 years; (2) locations with persistent flowering populations; (3) locations at the northern and southern range limits of the species; (4) locations with unique genetic diversity; and (5) locations with a documented high abundance of Johnson's seagrass compared to other areas in the species's range. These PCEs are critical to the conservation of the species because they protect persistently reproductive and genetically diverse populations, allow for protective buffers along the distribution limits (i.e., edges of survival) and protect regions of high density that without further knowledge of species biology appear to serve the needs of Johnson's seagrass. Ten regions of sheltered bay and inlet waters are designated, including north and south of Sebastian Inlet, near Fort Pierce Inlet, north of St. Lucie Inlet, a portion of Hobe Sound, the southern side of Jupiter Inlet, Lake Worth Lagoon (north of Bingham Island and Boynton Inlet), waters of Lake Wyman, and wide areas of northern Biscayne Bay. These regions occupy approximately 22,574 acres or 9,139 hectares. The proposed action may take place in the Atlantic Ocean, within the vicinity of Johnson's seagrass critical habitat. However, the research activities will be directed at ESA-listed sea turtles and cetaceans and will not impact the PCEs for Johnson's seagrass. As such, Johnson's seagrass critical habitat will not be considered further in this opinion.

4.1.2.15 Gulf Sturgeon Critical Habiat

Critical habitat has been designated for Gulf sturgeon (68 FR 13370) in coastal rivers and estuarine areas of the Gulf of Mexico from Florida to Louisiana. Abundant food items were identified as a primary constituent element in Gulf sturgeon critical habitat. The proposed action may take place in the Atlantic Ocean, within the vicinity of Gulf sturgeon critical habitat. However, the research activities will be directed at ESA-listed sea turtles and cetaceans and will not impact the PCE for Gulf sturgeon. As such, Gulf sturgeon critical habitat will not be considered further in this opinion.

4.1.2.16 Smalltooth Sawfish Critical Habitat

On September 2, 2009, critical habitat was designated for smalltooth sawfish along the central and southwest coast of Florida (74 FR 45353). Although PCEs were not identified, the mangrove and adjacent shallow, euryhaline habitat are important nursery habitat for smalltooth sawfish. Nursery habitat consisting of areas adjacent to red mangroves and euryhaline habitats less than 0.9 m deep in southwestern Florida were later determined to be particularly significant (Norton et al. 2012). Any potential effects to this critical habitat would be insignificant because the proposed activities would not cause any significant changes for critical habitat areas to support nursery habitat for smalltooth sawfish. Therefore, the proposed activities are not expected to adversely affect the conservation value of designated critical habitat for this species, and will not be considered further in this opinion.

4.1.2.17 Hawksbill Sea Turtle Critical Habitat

On September 2, 1998, NMFS established critical habitat for hawksbill sea turtles around Mona and Monito Islands, Puerto Rico (63 FR 46693). Aspects of these areas that are important for hawksbill sea turtle survival and recovery include important natal development habitat, refuge from predation, shelter between foraging periods and food for hawksbill sea turtle prey.

The proposed action may take place in the Atlantic Ocean, within the vicinity of hawksbill sea turtle critical habitat. However, the research activities will be directed at ESA-listed sea turtles and cetaceans and will not include land-based activities that might impact the aspects of hawksbill sea turtle critical habitat important for recovery. As such, hawksbill sea turtle critical habitat will not be considered further in this opinion.

4.1.2.18 Loggerhead Sea Turtle Northwest Atlantic Ocean Critical Habitat

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

In this portion of the action area (the Atlantic Ocean), all the research activities will be conducted from vessels. There will be no land-based activities that would take place on the designated critical habitat nesting beaches. We do not expect any aspect of the proposed action to “result in a loss of habitat conditions that allow for (a) hatchling egress from the water's edge to open water; and (b) nesting female transit back and forth between the open water and the nesting beach during nesting season”, which are identified in the proposed critical habitat designation as issues that will impact the critical habitat (78 FR 43005). Therefore, the proposed activities are not expected to adversely affect the conservation value of designated critical habitat for loggerhead sea turtles and will not be considered further in this opinion.

4.1.2.19 Green Sea Turtle Critical Habitat

On September 2, 1998, NMFS designated critical habitat for green sea turtles (63 FR 46694), which include coastal waters surrounding Culebra Island, Puerto Rico. Seagrass beds surrounding Culebra provide important foraging resources for juvenile, subadult and adult green sea turtles. Additionally, coral reefs surrounding the island provide resting shelter and protection from predators. This area provides important developmental habitat for the species. However, the research activities will be directed at ESA-listed sea turtles and cetaceans and will not include land-based activities that might impact the aspects of green sea turtle critical habitat important developmental habitat. As such, hawksbill sea turtle critical habitat will not be considered further in this opinion.

4.2 ESA-listed Species and Critical Habitat Likely to be Adversely Affected

This opinion examines the status of each species that would be affected by the proposed action. The status is determined by the 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" as described in 50 CFR 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 these NMFS Web sites: http://www.nmfs.noaa.gov/pr/species/index.htm.

The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area and discusses the current function of the essential physical and biological features that help to form that conservation value.

One factor affecting the rangewide status of ESA-listed whales and sea turtles and aquatic habitat at large is climate change. Climate change will be discussed in the Environmental Baseline.

4.2.1 Steller Sea Lion Critical Habitat

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.

In 1997, NMFS designated critical habitat for the Steller sea lion (58 FR 45269). 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.

In Alaska, areas include major Steller sea lion rookeries, haulouts and associated terrestrial, air, and aquatic zones. Critical habitat includes a terrestrial zone extending 3,000 feet (0.9 km) landward from each major rookery and haulout; it also includes air zones extending 3,000 feet (0.9 kin) above these terrestrial zones and aquatic zones. Aquatic zones extend 3,000 feet (0.9 km) seaward from the major rookeries and haulouts east of 144°W. 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 kin) seaward.

In addition, NMFS designated special aquatic foraging areas as critical habitat for the Steller sea lion. These areas include the Shelikof Strait (in the Gulf of Alaska), Bogoslof Island, and Seguam Pass (the latter two are in the Aleutians). 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.

4.2.2 Southern Resident Killer Whale

Species description and distribution

Killer whales (or orcas) are distributed worldwide, but populations are isolated by region and ecotype (i.e., different morphology, ecology and behavior). Southern Resident killer whales occur in the inland waterways of Puget Sound, Strait of Juan de Fuca and Southern Georgia Strait during the spring, summer and fall. During the winter, they move to coastal waters primarily off Oregon, Washington, California and British Columbia. The DPS was listed as endangered under the ESA on November 18, 2005 (70 FR 69903). We used information available in the final rule, the 2012 Status Review (NMFS 2012) and the 2014 Stock Assessment Report (http://www.fisheries.noaa.gov/pr/sars/pdf/stocks/pacific/2014/po2014_killer_whale-enpsr.pdf) to summarize the status of this species, as follows.

Life history

Southern Resident killer whales are geographically, matrilineally and behaviorally distinct from other killer whale populations (70 FR 69903). The DPS includes three large, stable pods (J, K and L), which occasionally interact (Parsons et al. 2009). Most mating occurs outside natal pods, during temporary associations of pods, or as a result of the temporary dispersal of males (Pilot et al. 2010). Males become sexually mature at 10 – 17 years of age. Females reach maturity at 12 – 16 years of age and produce an average of 5.4 surviving calves during a reproductive life span of approximately 25 years. Mothers and offspring maintain highly stable, life-long social bonds and this natal relationship is the basis for a matrilineal social structure. They prey upon salmonids, especially Chinook salmon (Hanson et al. 2010).

Population dynamics

The most recent abundance estimate for the Southern Resident DPS is 82 whales in 2014. Population abundance has fluctuated during this time with a maximum of 99 whales in 1995 (http://www.fisheries.noaa.gov/pr/sars/pdf/stocks/pacific/2014/po2014_killer_whale-enpsr.pdf). As compared to stable or growing populations, the DPS reflects a smaller percentage of juveniles and lower fecundity (NMFS 2011) and has demonstrated weak growth in recent decades.

Status

The Southern Resident killer whale DPS was listed as endangered in 2005 in response to the population decline from 1996 – 2001, small population size and reproductive limitations (i.e., few reproductive males and delayed calving). Current threats to its survival and recovery include: contaminants, vessel traffic and reduction in prey availability. Chinook salmon populations have declined due to degradation of habitat, hydrology issues, harvest and hatchery introgression; such reductions may require an increase in foraging effort. In addition, these prey contain environmental pollutants (e.g., flame retardants; PCBs; and DDT). These contaminants become concentrated at higher trophic levels and may lead to immune suppression or reproductive impairment (70 FR 69903). The inland waters of Washington and British Columbia support a large whale watch industry, commercial shipping and recreational boating; these activities generate underwater noise, which may mask whales' communication or interrupt foraging. The factors that originally endangered the species persist throughout its habitat: contaminants, vessel traffic and reduced prey. The DPS's resilience to future perturbation is reduced as a result of its small population size (N = 82); however, it has demonstrated the ability to recover from smaller population sizes in the past and has shown an increasing trend over the last several years. NOAA Fisheries responded to a petition to delist the DPS based on new information with a negative finding (78 FR 47277).

4.2.3 Sperm Whale

Species description and distribution

Sperm whales are the largest of the toothed whales, reaching between 36-52 feet in length, and weighing up to 46 tons. Sperm whales have a large, distinctive head and are dark gray in color. The species was originally listed as endangered on December 2, 1970 (35 FR 18319). No critical habitat has been designated for sperm whales. We used information available in the recovery plan (NMFS 2010) and recent stock assessment and status reviews (NMFS 2015b) to summarize the status of the species, as follows.

Life history

Mature males range between 70º N in the North Atlantic and 70º S in the Southern Ocean (Perry et al. 1999; Reeves and Whitehead 1997), whereas mature females and immature individuals of both sexes are seldom found higher than 50º N or S (Reeves and Whitehead 1997). In winter, sperm whales migrate closer to equatorial waters (Kasuya and Miyashita 1988; Waring et al. 1993) where adult males join them to breed. Movement patterns of Pacific female and immature male groups appear to follow prey distribution and, although not random, movements are difficult to anticipate and are likely associated with feeding success, perception of the environment, and memory of optimal foraging areas (Whitehead et al. 2008). Sperm whales have a strong preference for waters deeper than 1,000 m (Reeves and Whitehead 1997; Watkins 1977).

Female sperm whales become sexually mature at an average of 9 years or 8.25-8.8 m (Kasuya 1991). Males reach a length of 10 to 12 m at sexual maturity and take 9-20 years to become sexually mature, but require another 10 years to become large enough to successfully breed (Kasuya 1991; Würsig et al. 2000). Mean age at physical maturity is 45 years for males and 30 years for females (Waring et al. 2004). Adult females give birth after roughly 15 months of gestation and nurse their calves for 2-3 years (Waring et al. 2004). The calving interval is every four to six years between the ages of 12 and 40 (Kasuya 1991; Whitehead et al. 2008).

Population dynamics

The IWC currently recognizes four sperm whale stocks: North Atlantic, North Pacific, northern Indian Ocean, and Southern Hemisphere (Dufault et al. 1999; Reeves and Whitehead 1997). The NMFS recognizes six stocks under the MMPA– three in the Atlantic/Gulf of Mexico and three in the Pacific (Alaska, California-Oregon-Washington, and Hawaii; (Perry et al. 1999; Waring et al. 2004). Genetic studies indicate that movements of both sexes through expanses of ocean basins are common, and that males, but not females, often breed in different ocean basins than the ones in which they were born (Whitehead 2003). Sperm whale populations appear to be structured socially, at the level of the clan, rather than geographically (Whitehead 2003; Whitehead et al. 2008). Matrilineal groups in the eastern Pacific share nuclear DNA within broader clans, but North Atlantic matrilineal groups do not share this genetic heritage (Whitehead et al. 2012).

All sperm whales of the Southern Hemisphere are treated as a single stock with nine divisions, although this designation has little biological basis and is more in line with whaling records (Donovan 1991). Sperm whales that occur off the Galapagos Islands, mainland Ecuador, and northern Peru may be distinct from other sperm whales in the Southern Hemisphere (Dufault and Whitehead 1995; Rice 1977; Wade and Gerrodette 1993). Gaskin (1973) found females to be absent in waters south of 50º and decrease in proportion to males south of 46-47º.

Status

The sperm whale is endangered as a result of past commercial whaling, which inhibits recovery due to the loss of adult females and their calves, leaving sizeable gaps in demographic and age structuring (Whitehead 2003). From 1800 to 1900, the IWC estimated that nearly 250,000 sperm whales were killed by whalers, with another 700,000 from 1910 to 1982 (IWC Statistics 1959-1983). However, other estimates have included 436,000 individuals killed between 1800-1987 (Carretta et al. 2005). However, all of these estimates are likely underestimates due to illegal and inaccurate killings by Soviet whaling fleets between 1947-1973. In the Southern Hemisphere, these whalers killed an estimated 100,000 whales that they did not report to the IWC (Yablokov et al. 1998). Additionally, Soviet whalers disproportionately killed adult females in any reproductive condition (pregnant or lactating) as well as immature sperm whales of either gender. Commercial whaling no longer occurs, but sperm whales are threatened by ship strikes, entanglement in fishing gear, pollution and noise.

4.2.4 Southern Right Whale

Species description and distribution

Southern right whales are between 45-55 feet in length, weighing up to 120,000 pounds. They are usually black in color, with distinctive large, white callosities on their heads. The species was originally listed as endangered on June 2, 1970 (35 FR 8491). No critical habitat has been designated for southern right whales. We used information available in the status review (NMFS 2015a) to summarize the status of the species, as follows.

Life history

Southern right whales occur exclusively in the southern hemisphere, currently up to 18˚ S latitude in the Atlantic and 12˚ S in the eastern Pacific (Iniguez et al. 2003; Richards 2009; Van Waerebeek et al. 1992; Van Waerebeek et al. 2009). The northern most recent sighting of a southern right whale in the western Pacific was at ~25˚ S of a mother-calf pair in Hervey Bay, Australia in 2000 and 2009 (Richards 2009). Townsend (1935) and Maury (1851; 1854) support historical distribution generally up to roughly 25-30˚ S latitude in the Pacific and Atlantic (Richards 2009). Sex ratios on summer feeding grounds in South Georgia and western Australia were 1:1 (Patenaude et al. 2007).

Southern right whales migrate between winter breeding areas in coastal waters of the South Atlantic, Pacific, and Indian Oceans from May to December and offshore summer (January to April) foraging locations in the Subtropical and Antarctic Convergence zones (Azevedo et al. 1999; Bannister et al. 1999; De Oliveira et al. 2009; Tormosov et al. 1998).

Population dynamics

Southern right whale populations in general appear to be increasing at a robust rate. De Oliveira (2009) estimated that roughly 7,000 individuals exist today; 5-10% of the species' former abundance. The Australian recovery plan for southern right whales estimates that 60,000 southern right whales existed prior to commercial whaling; 1,500 individuals are estimated to visit waters around Australia (NHT 2005). Population growth off Australia is believed to be 7-13% annually (Bannister 2001). Southern right whale populations in Argentina and South Africa are increasing at about 6.9% per year (Belgrano et al. 2011). New Zealand has estimated that 16,000 individuals visited its waters prior to commercial exploitation; this number was believed to have been reduced to between 14-52 individuals and current abundance is less than 5% of historic levels (Patenaude 2003).

Status

Southern right whales underwent severe decline due to whaling during the 18th and 19th centuries (Costa et al. 2005; NHT 2005). Southern right whales are currently subject to many of the same anthropogenic threats as other large whales face. In the Southern Hemisphere, southern right whales are by far the most ship struck cetacean, with at least 56 reported instances; nearly four-fold higher than the second most struck large whale (Van Waerebeek et al. 2007). Additional threats identified in Australian waters include water quality and pollution and near shore habitat degradation due to development (NHT 2005). Because populations appear to be increasing in size, the species appears to be somewhat resilient to current threats; however, it has not recovered to pre-exploitation levels.

4.2.5 Blue Whale

Species description and distribution

The blue whale is the largest animal on earth. Three subspecies comprise the species, which occurs in coastal and pelagic waters in all oceans. Though often found in coastal waters, blue whales generally occur in offshore waters, from subpolar to subtropical latitudes. The species was originally listed as endangered on December 2, 1970 (35 FR 18319). We used information available in the recovery plan (NMFS 1998) and recent stock assessment and status reports (NMFS 2011; Sears and Calambokidis 2002) to summarize the status of the species, as follows.

Life history

The gestation period of blue whales is approximately 10 – 12 months and calves are nursed for 6 – 7 months. The average calving interval is 2 – 3 years. Blue whales reach sexual maturity at 5 – 15 years of age. Parturition and mating occurs in lower latitudes during the winter season and weaning probably occurs in or en route to summer feeding areas in higher, more productive latitudes. Blue whales forage almost exclusively on krill (i.e., relatively large euphausiid crustaceans) and can eat approximately 3,600 kg daily. Feeding aggregations are often found at the continental shelf edge, where upwelling produces concentrations of krill at depths of 90 – 120 m.

Population dynamics

There are an estimated 5,000 – 12,000 blue whales worldwide. Three stocks occur in U.S. waters: the eastern North Pacific, the western North Atlantic and Hawaii. For the eastern North Pacific stock, the best estimate of abundance is 2,497 whales, with an estimated annual growth rate of approximately three percent annually. The western North Atlantic stock has a minimum population size of 440 individuals and abundance appears to be increasing, though there are insufficient data to provide reliable population trends. Blue whale sightings are rare in Hawaii and no data are available from which to estimate abundance or trends.

Status

The blue whale is endangered as a result of past commercial whaling. In the North Atlantic, at least 11,000 blue whales were taken from the late 19th to mid-20th centuries. In the North

Pacific, at least 9,500 whales were killed between 1910 and 1965. Commercial whaling no longer occurs, but blue whales are threatened by ship strikes, entanglement in fishing gear, pollution and noise. Because populations appear to be increasing in size, the species appears to be somewhat resilient to current threats; however, it has not recovered to pre-exploitation levels.

4.2.6 Fin Whale

Species description and distribution

The fin whale is a large, widely distributed baleen whale, comprised of two (or possibly three) subspecies. Fin whales are found in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes. The species was originally listed as endangered on December 2, 1970 (35 FR 18319). We used information available in the recovery plan (NMFS 2010), the five-year review (NMFS 2011) and recent stock assessment reports to summarize the status of the species, as follows.

Life history

The gestation period of fin whales is less than one year and calves are nursed for 6 – 7 months. The average calving interval is 2 – 3 years. Fin whales reach sexual maturity at 6 – 10 years of age. Parturition and mating occurs in lower latitudes during the winter season. Intense foraging occurs at high latitudes during the summer. Fin whales eat pelagic crustaceans (mainly euphausiids or krill) and schooling fish such as capelin, herring and sand lance. The availability of sand lance, in particular, is thought to have had a strong influence on the distribution and movements of fin whales along the east coast of the United States.

Population dynamics

There are over 100,000 fin whales worldwide. Though only two subspecies are recognized (Northern Hemisphere and Southern Hemisphere), North Atlantic, North Pacific and Southern Hemisphere fin whales appear to be reproductively isolated. Of the 3 – 7 stocks in the North Atlantic (N ~ 50,000), one occurs in U.S. waters, where the best estimate of abundance is 3,985 whales. There are three stocks in U.S. Pacific waters: Alaska (N_{min} =5,700), Hawaii (N_{min} = 101) and California/Oregon/Washington (N_{min} = 3,269). Abundance appears to be increasing in Alaska (4.8 percent annually) and possibly California. Trends are not available for other stocks due to insufficient data. Abundance data for the Southern Hemisphere stock are limited; however, there were an estimated 85,200 whales in 1970.

Status

The fin whale is endangered as a result of past commercial whaling. In the North Atlantic, at least 55,000 fin whales were killed between 1910 and 1989. In the North Pacific, at least 74,000 whales were killed between 1910 and 1975. Approximately 704,000 whales were killed in the Southern Hemisphere from 1904 to 1975. Fin whales are still killed under the International Whaling Commission's "aboriginal subsistence whaling" in Greenland, under Japan's scientific whaling program and via Iceland's formal objection to the Commission's ban on commercial whaling. Additional threats include: ship strikes, reduced prey availability due to overfishing or climate change and noise. Though the original cause of endangerment remains, whaling has been significantly reduced. The large population size may provide some resilience to current threats, but trends are largely unknown.

4.2.7 Sei Whale

Species description and distribution

The sei whale is a widely distributed baleen whale. Sei whales prefer subtropical to subpolar waters on the continental shelf edge and slope worldwide. They are usually observed in deeper waters of oceanic areas far from the coastline. The species was originally listed as endangered on December 2, 1970 (35 FR 18319). We used information available in the recovery plan (NMFS 2011), the five-year review (NMFS 2012) and recent stock assessment reports to summarize the status of the species, as follows.

Life history

The gestation period of sei whales is 10 – 12 months and calves are nursed for 6 – 9 months. The average calving interval is 2 – 3 years. Sei whales reach sexual maturity at 6 – 12 years of age. They winter at relatively low latitudes and summer at relatively higher latitudes. Throughout their range, sei whales occur predominantly in deep water; they are most common over the continental slope. Sei whales in the North Atlantic reportedly feed primarily on calanoid copepods, with a secondary preference for euphausiids. In the Pacific, they also feed on fish (e.g., anchovies, saury, whiting, lamprey and herring).

Population dynamics

There are ~80,000 sei whales worldwide, in the North Atlantic, North Pacific and Southern Hemispere. Three stocks occur in U.S. waters: Nova Scotia (N = 357), Hawaii (N_{min} = 37) and Eastern North Pacific (N_{min} = 83). Population trends are not available due to insufficient data. It is unknown whether the population size is stable or fluctuating.

Status

The sei whale is endangered as a result of past commercial whaling. There are no estimates of pre-exploitation abundance for the North Atlantic. Models indicate that total abundance declined from 42,000 to 8,600 individuals between 1963 and 1974, in the North Pacific. In the Southern Hemisphere, pre-exploitation abundance is estimated at 65,000 whales, with recent abundance estimated at 9,700 whales. Now, only a few individuals are taken each year by Japan; however, Iceland has expressed an interest in targeting sei whales. Current threats include ship strikes, fisheries interactions (including entanglement), climate change (habitat loss and reduced prey availability) and noise. Its large population size may provide some resilience to current threats, but trends are largely unknown.

4.2.8 Humpback Whale

Species description and distribution

The humpback whale is a widely distributed baleen whale, distinguishable by its long flippers. The species inhabits all major oceans from the equator to sub-polar latitudes and generally prefers coastal waters. We used information available in the recovery plan (NMFS 1991), proposed rules and recent stock assessment reports to summarize the status of the species, as follows.

The humpback whale was originally listed as endangered on December 2, 1970 (35 FR 18319). On April 21, 2015, NMFS proposed to revise the listing status of humpback whales by designating 14 DPSs (Figure 1) (80 FR 22303). The Cape Verde Islands/Northwest Africa and Arabian Sea DPSs are proposed for listing as endangered. The Western North Pacific and Central America DPSs are proposed for listing as threatened. The other 10 DPSs were determined to be not at risk and are not proposed for listing. The proposed rule also solicited information for a future critical habitat designation for the proposed DPSs that occur in U.S. waters.

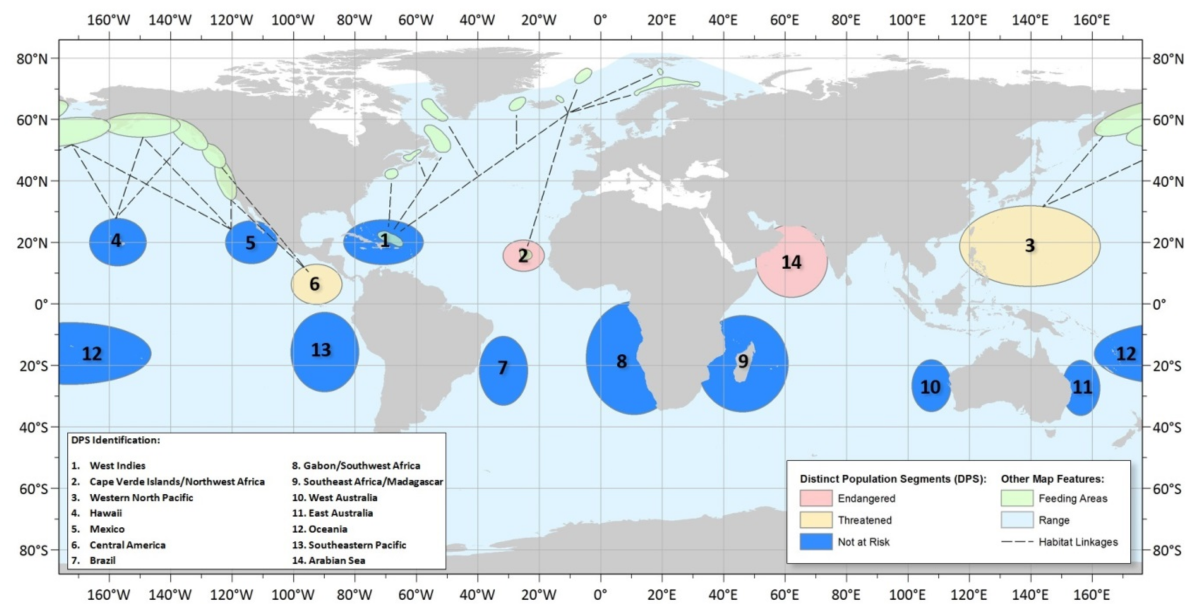

Figure 1. Map of the distribution of the 14 proposed humpback whale distinct population segments.

Life history

The gestation period of humpback whales is 11 months and calves are nursed for 12 months. The average calving interval is 2 – 3 years and sexual maturity is reached at 5 – 11 years of age. Humpback whales inhabit waters over or along the continental shelf and oceanic islands. They winter at low latitudes, where they calf and nurse and summer at high latitudes, where they feed.

Humpbacks exhibit a wide range of foraging behaviors and feed on a range of prey types, including: small schooling fishes, euphausiids and other large zooplankton.

Population dynamics

There are over 60,000 humpback whales worldwide, occurring primarily in the North Atlantic, North Pacific and Southern Hemisphere. Current estimates indicate approximately 20,000 humpback whales in the North Pacific, with an annual growth rate of 4.9 percent (Calambokidis 2010). Stocks in U.S. waters include: American Samoa, California/Oregon/Washington and Central North Pacific. As of 1993, there was an estimated 11,570 humpback whales in the North Atlantic, growing at a rate of three percent annually (Stevick et al. 2003). The Southern Hemisphere supports more than 36,000 humpback whales and is growing at a minimum annual rate of 4.6 percent (Reilly et al. 2008). The abundance of the proposed Cape Verde Islands/Northwest Africa DPS is unknown, although a photo-identification catalog (1990-2009) identified 88 individuals (Wenzel et al. 2010). There are an estimated 1,000 individuals comprising the Western North Pacific DPS, with a growth rate of 6.9% (Calambokidis et al. 2008). The Central America DPS has between 500 and 600 individuals (Barlow et al. 2011; Calambokidis et al. 2008), and its abundance trend is unknown. The abundance of the proposed Arabian Sea DPS is estimated at 82 individuals, and there is no trend data available (80 FR 22303).

Status

The humpback whale is endangered as a result of past commercial whaling. Prior to commercial whaling, hundreds of thousands of humpback whales existed. Global abundance declined to the low thousands by 1968, the last year of substantial catches (Reilly et al. 2008). Humpback whales may be killed under "aboriginal subsistence whaling" and "scientific permit whaling" provisions of the International Whaling Commission. Additional threats include ship strikes and fisheries interactions (including entanglement) and noise. The species' large population size and increasing trends indicate that it is resilient to current threats range-wide; however, the proposed listing revision would refine the population designations to focus conservation efforts to DPSs that require continued protection.

4.2.9 North Atlantic Right Whale

Species description and distribution

The North Atlantic right whale is a narrowly distributed baleen whale, distinguished by its stocky body and lack of a dorsal fin. North Atlantic right whales inhabit coastal waters of the Atlantic Ocean, particularly between 20° and 60° latitude. For much of the year, their distribution is strongly correlated to the distribution of their prey. The species was originally listed as endangered on December 2, 1970 (35 FR 18319). We used information available in the 5-year review (NMFS 2012) and recent stock assessment reports to summarize the status of the species, as follows.

Life history

The gestation period of North Atlantic right whales is 12 – 13 months and calves are nursed for 8 – 17 months. The average calving interval is 3 – 5 years. Right whales reach sexual maturity at 9 years of age. They migrate to low latitudes during the winter to give birth in shallow, coastal waters. In the summer, they feed on large concentrations of copepods in the high latitudes.

Population dynamics

Right whales occur in the eastern and western North Atlantic; however, less than 20 individuals exist in the eastern North Atlantic, and the population may be functionally extinct. There are at least 396 individuals in the western North Atlantic population. Despite two periods of increased mortality, the species has demonstrated overall growth rates of two percent over 17 years (1990 – 2007). This variability may indicate loss of resilience and susceptibility to population collapse (Dai et al. 2012; Scheffer et al. 2012).

Status

The North Atlantic right whale is endangered as a result of past commercial whaling. Pre-exploitation abundance has been estimated at more than 1,000 individuals, distributed throughout temperate, subarctic, coastal and continental shelf waters of the North Atlantic Ocean. Commercial whaling reduced the population size to ~50 individuals and truncated the range of the species; however, whaling is now prohibited. The two major threats to the survival of the species are ship strike and fisheries interactions (including entanglement). While population trends are positive, the species's resilience to future perturbations is low due to its small population size and continued threats of ship strike and entanglement.

4.2.10 North Pacific Right Whale

Species description and distribution

The North Pacific right whale is a baleen whale, distinguished by its stocky body and lack of a dorsal fin. It inhabits the Pacific Ocean, particularly between 20° and 60° latitude. The species was originally listed with the North Atlantic right whale (i.e., "Northern" right whale) as endangered on December 2, 1970 (35 FR 18319). It was listed separately as endangered on March 6, 2008 (73 FR 12024). We used information available in the 5-year review (NMFS 2012) and recent stock assessment reports to summarize the status of the species, as follows.

Life history

The gestation period of North Pacific right whales is approximately one year and calves are nursed for approximately one year. Right whales reach sexual maturity at 9 – 10 years of age. Little is known about migrating patterns, but whales have been observed in lower latitudes in the winter (Japan, California and Mexico). In the summer, they feed on large concentrations of copepods in the Alaskan waters.

Population dynamics

The North Pacific right whale remains one of the most endangered whale species in the world, likely numbering fewer than 1,000 individuals. There are no reliable estimates of current abundance or trends for right whales in the North Pacific, and we do not know whether the population size is stable or fluctuating.

Status

The North Pacific right whale is endangered as a result of past commercial whaling. Pre-exploitation abundance has been estimated at more than 11,000 individuals. Current threats to the survival include poaching, ship strike, fisheries interactions (including entanglement). The species' resilience to future perturbations is low due to its small population size and continued threats of poaching, ship strike and entanglement.

4.2.11 Leatherback Sea Turtle

Species description and distribution

The leatherback sea turtle is unique among sea turtles for its large size, wide distribution (due to thermoregulatory systems and behavior) and lack of a hard, bony carapace. The species ranges from tropical to subpolar latitudes, worldwide. Leatherback sea turtles have a primarily black shell with pinkish-white coloring on their belly. A leatherback's top shell (carapace) is about 1.5 inches (4 cm) thick and consists of leathery, oil-saturated connective tissue overlaying loosely interlocking dermal bones. Their carapace has seven longitudinal ridges and tapers to a blunt point, which help give the carapace a more hydrodynamic structure. Adults weigh up to 2,000 pounds (900 kg) and measure 6.5 feet (2 m) long. Hatchlings weigh 1.5-2 ounces (40-50 g) and are 2-3 inches (50-75 cm) in length.

The species was first listed under the Endangered Species Conservation Act (35 FR 8491) and has been listed as endangered under the ESA since 1973. We used information available in the 5-year review (NMFS 2007) and the critical habitat designation (77 FR 61573) to summarize the status of the species, as follows.

Life history

Age at maturity remains elusive, with estimates ranging from 5 to 29 years (Avens et al. 2009; Spotila et al. 1996). Females lay up to seven clutches per season, with more than 65 eggs per clutch and eggs weighing >80 g (Reina et al. 2002; Wallace et al. 2007). The number of leatherback hatchlings that make it out of the nest on to the beach (i.e., emergent success) in approximately 50% worldwide (Eckert et al. 2012). Females nest every 1 – 7 years. Natal homing, at least within an ocean basin, results in reproductive isolation between five broad geographic regions: eastern and western Pacific, eastern and western Atlantic and Indian Oceans. Leatherback sea turtles migrate long, transoceanic distances between their tropical nesting beaches and the highly productive temperate waters where they forage, primarily on jellyfish and tunicates. These gelatinous prey are relatively nutrient-poor, such that leatherbacks must consume large quantities to support their body weight. Leatherbacks weigh ~33 percent more on their foraging grounds than at nesting, indicating that they probably catabolize fat reserves to fuel migration and subsequent reproduction (James et al. 2005a; Wallace et al. 2006). Sea turtles must meet an energy threshold before returning to nesting beaches (Casey et al. 2010; Rivalan et al. 2005; Sherrill-Mix and James 2008). Therefore, their remigration intervals (the time between nesting) are dependent upon foraging success and duration (Hays 2000; Price et al. 2004).

Population dynamics
The global population of adult females has declined over 70 percent in less than one generation, from an estimated 115,000 adult females in 1980 to 34,500 adult females in 1995 (Pritchard 1982; Spotila et al. 1996). There may be as many as 34,000 – 94,000 adult leather backs in the North Atlantic alone (TEWG 2007), but dramatic reductions (> 80 percent) have occurred in several populations in the Pacific, which was once considered the stronghold of the species (Sarti Martinez 2000).

Status

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

4.2.12 Hawksbill Sea Turtle

Species description and distribution
The hawksbill sea turtle has a sharp, curved, beak-like mouth. It has a circumglobal distribution throughout tropical and, to a lesser extent, subtropical oceans. The species was first listed under the Endangered Species Conservation Act (35 FR 8491) and has been listed as endangered under the ESA since 1973. We used information available in the 5-year reviews (NMFS 2007 and NMFS 2013) to summarize the status of the species, as follows.

Life history
Hawksbill sea turtles reach sexual maturity at 20 – 40 years of age. Females return to their natal beaches every 2 – 5 years to nest (an average of 3 – 5 times per season). Clutch sizes are large (up to 250 eggs). Sex determination is temperature dependent, with warmer incubation producing more females. Hatchlings migrate to and remain in pelagic habitats until they reach approximately 22 – 25 cm in SCL. As juveniles, they take up residency in coastal waters to forage and grow. As adults, hawksbills use their sharp beak-like mouths to feed on sponges and corals.

Population dynamics

Surveys at 88 nesting sites worldwide indicate that 22,004 – 29,035 females nest annually (NMFS 2013). In general, hawksbills are doing better in the Atlantic and Indian Ocean than in the Pacific Ocean, where despite greater overall abundance, a greater proportion of the nesting sites are declining.

Status

Long-term data on the hawksbill sea turtle indicate that 63 sites have declined over the past 20 to 100 years (historic trends are unknown for the remaining 25 sites). Recently, 28 sites (68 percent) have experienced nesting declines, 10 have experienced increases, 3 have remained stable and 47 have unknown trends. The greatest threats to hawksbill sea turtles are overharvesting of turtles and eggs, degradation of nesting habitat and fisheries interactions. Adult hawksbills are harvested for their meat and carapace, which is sold as tortoiseshell. Eggs are taken at high levels, especially in Southeast Asia where collection approaches 100 percent in some areas. In addition, lights on or adjacent to nesting beaches are often fatal to emerging hatchlings and alters the behavior of nesting adults. The species's resilience to additional perturbation is low.

4.2.13 Kemp's ridley Sea Turtle

Species description and distribution

The Kemp's ridley is the smallest of all sea turtle species and considered to be the most endangered sea turtle internationally (Groombridge 1982; TEWG 2000; Zwinenberg 1977). Its range extends from the Gulf of Mexico to the Atlantic coast, with nesting beaches limited to a few sites in Mexico and Texas. The species was first listed under the Endangered Species Conservation Act (35 FR 8491) and has been listed as endangered under the ESA since 1973. We used information available in the revised recovery plan (NMFS et al. 2010) and the 5-Year Review (USFWS 2015) to summarize the status of the species, as follows.

Life history

Adult Kemp's ridley sea turtles have an average SCL of 2.1 ft (65 cm). Females mature at 12 years of age. The average remigration is two years. Nesting occurs from April to July in large arribadas, large aggregations coming ashore at the same time and location, primarily at Rancho Nuevo, Mexico. Females lay an average of 2.5 clutches per season. The annual average clutch size is 97 – 100 eggs per nest. The nesting location may be particularly important because hatchlings can more easily migrate to foraging grounds in deeper oceanic waters, where they remain for approximately two years before returning to nearshore coastal habitats. Juvenile Kemp's ridley sea turtles use these nearshore coastal habitats from April through November, but move towards more suitable overwintering habitat in deeper offshore waters (or more southern waters along the Atlantic coast) as water temperature drops. Adult habitat largely consists of sandy and muddy areas in shallow, nearshore waters less than 120 ft (37 m) deep, although they can also be found in deeper offshore waters. As adults, Kemp's ridleys forage on swimming crabs, fish, jellyfish, mollusks and tunicates.

Population dynamics

Of the seven species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. Nesting aggregations at a single location (Rancho Nuevo, Mexico) were estimated at 40,000 females in 1947. By the mid-1980s, the population had declined to an estimated 300 nesting females. From 1980 to 2003, the number of nests increased 15 percent annually. In 2009, an estimated 8,000 nesting females produced over 20,000 nests. There were over 16,000 nests recorded at Rancho Nuevo in 2011 and 2012, and nearly 12,000 nests for the Rancho Nuevo, Tepehuajes, and Playa Dos, Mexico, beaches in 2015.

Status

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

4.2.14 Olive Ridley Sea Turtle (breeding populations on the Pacific Coast of Mexico)

Species description and distribution

The olive ridley sea turtle is a small, mainly pelagic, sea turtle with a circumtropical distribution. The species was listed under the ESA on July 28, 1978 (43 FR 32800). The species was separated into two listing designations: endangered for breeding populations on the Pacific coast of Mexico and threatened wherever found except where listed as endangered (i.e., in all other areas throughout its range). We used information available in the 2014 5-Year Review to summarize the status of the species, as follows.

Life history

Olive ridley females mature at 10 – 18 years of age. They lay an average of two clutches per season (3-6 months in duration). The annual average clutch size is 100 – 110 eggs per nest. Olive ridleys commonly nest in successive years. Females nest in solitary or in arribadas. As adults, Olive ridleys forage on crustaceans, fish, mollusks and tunicates, primarily in pelagic habitats.

Population dynamics

The eastern Pacific lineage is genetically and geographically isolated from other olive ridley lineages.

Status summary

Prior to 1950, abundance was conservatively estimated to be 10 million adults. Years of adult harvest reduced the population to just over one million adults by 1969. Shipboard transects along the Mexico and Central American coasts between 1992 and 2006 indicate an estimated 1.39 million adults. At-sea abundance estimates support an overall increase in the Pacific Coast of Mexico population. Based on the number of olive ridleys nesting in Mexico, populations appear to be increasing in one location (La Escobilla: from 50,000 nests in 1988 to more than one million in 2000) and stable at all others. Harvest prohibitions and the closure of a nearshore turtle fishery resulted in a partial recovery; however, remaining threats include bycatch in longline and trawl fisheries and the illegal harvest of eggs and turtles. Given its large population size, it is somewhat resilient to future perturbation.

4.2.15 Olive ridley sea turtle (all other areas)

Species description
The olive ridley sea turtle is a small, mainly pelagic, sea turtle with a circumtropical distribution. The species was listed under the ESA on July 28, 1978 (43 FR 32800). The species was separated into two listing designations: endangered for breeding populations on the Pacific coast of Mexico and threatened wherever found except where listed as endangered (i.e., in all other areas throughout its range). We used information available in the 2014 5-Year Review (USFWS 2014) to summarize the status of the threatened listing, as follows.

Life history
See above (Olive ridley sea turtle, Mexico's Pacific coast breeding colonies).

Population dynamics
Threatened olive ridley sea turtles nest in arribadas at a few beaches in the eastern Pacific, western Atlantic and northern Indian Oceans. Solitary nesting is observed on many tropical beaches throughout the Atlantic, Pacific and Indian Oceans. Arribadas now range in size from 335 to 2,000 nests in the western Atlantic, from 1,300 to 200,000 turtles in the eastern Pacific and from 1,000 to 200,000 in the Indian Ocean.

Status summary
It is likely that solitary nesting locations once hosted large arribadas; since the 1960s, populations have experienced declines in abundance of 50 – 80 %. Many populations continue to decline. Olive ridley sea turtles continue to be harvested as eggs and adults, legally in some areas and illegally in others. Incidental capture in fisheries is also a major threat. The olive ridley sea turtle is the most abundant sea turtle in the world; however, several populations are declining as a result of continued harvest and fisheries bycatch. Its large population size, however, allows some resilience to future perturbation.

4.2.16 Loggerhead sea turtle

Species description and distribution
Adult loggerhead sea turtles have relatively large heads, which support powerful jaws. They have a reddish-brown, slightly heart-shaped top shell with pale yellowish bottom shell. The neck and flippers are usually dull brown to reddish brown on top and medium to pale yellow on the

sides and bottom. They weigh 250 pounds (113 kg) and measure 3 feet (~1 m) in length. Hatchlings are brown to dark gray with a yellowish to tan bottom shell. Their flippers are dark gray to brown above with white to white-gray margins. They weigh 0.05 pounds (20 g) and are 2 inches (4 cm) long.

The species was first listed as threatened under the Endangered Species Act in 1978 (43 FR 32800). In 2011, the listing was revised, and nine DPSs were designated under the ESA (Figure 2) (76 FR 58868). Four DPSs were listed as threatened: Northwest Atlantic Ocean, South Atlantic Ocean, Southeast Indo-Pacific Ocean, and the Southwest Indian Ocean. Five DPSs were listed as endangered: Northeast Atlantic Ocean, Mediterranean Sea, North Indian Ocean, North Pacific Ocean, and South Pacific Ocean.

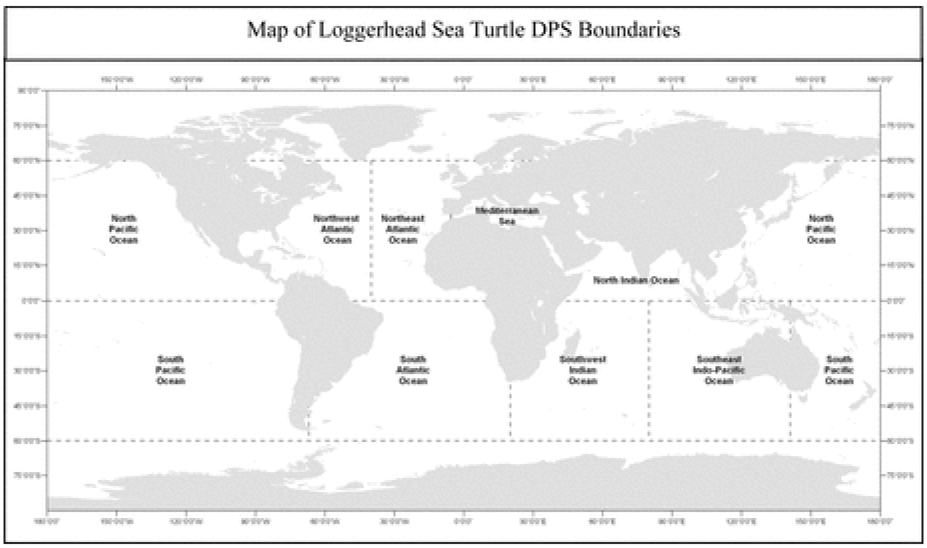

Figure 2 Map depicting the loggerhead sea turtle DPS boundaries.

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

Life history

Mean age at first reproduction for female loggerhead sea turtles is 30 years (*SD* = 5). Females lay an average of three clutches per season. The annual average clutch size is 112 eggs per nest. The average remigration interval is 2.7 years. Nesting occurs primarily on beaches, where warm, humid sand temperatures incubate the eggs. Temperature determines the sex of the turtle during the middle of the incubation period. Turtles spend the post-hatchling stage in pelagic waters. The juvenile stage is spent first in the oceanic zone and later in the neritic zone (i.e., coastal waters). Coastal waters provide important foraging habitat, inter-nesting habitat and migratory habitat for adult loggerheads. Juveniles are omnivorous and forage on crabs, mollusks, jellyfish and vegetation at or near the surface (Dodd 1988). Sub-adult and adult loggerheads prey on benthic invertebrates such as mollusks and decapod crustaceans in hard bottom, coastal habitats.

Population dynamics

There are nine loggerhead DPSs, which are geographically separated and genetically isolated, as indicated by genetic, tagging and telemetry data. The North Pacific DPS has a small nesting population. An 18-year time series of nesting data in Japan indicates a decline in the North Pacific population from 6,638 nests in 1990 to 2,064 nests in 1997. Since then, nesting has gradually increased to 7,000 – 8,000 nests, based on estimates taken in 2009 (Conant et al. 2009). Nesting for the South Pacific DPS occurs mostly in eastern Australia and New Caledonia. For many years, the nesting population at Queensland was in decline; there were approximately 3,500 females in the 1976-1977 nesting season, and less than 500 in 1999. From 2000 to 2009, there has been an increasing number of females nesting. The Southeast Indo-Pacific Ocean DPS nests in Western Australia, where 800-1,500 loggerheads nest annually. The Northwest Atlantic Ocean DPS is considered one of the most significant nesting assemblages in the world, with nesting showing signs of stabilizing. The Northeast Atlantic Ocean DPS’s largest nesting population occurs in the Cape Verde Islands, in particular Boa Vista Island, which reported 12,028 nests in 2008, 20,102 in 2009, 9,174 in 2010 (Marco et al. 2012). However, a population trend cannot be determined due to limited data. For the South Atlantic DPS, nesting mostly occurs along the coast of Brazil, with signs that nesting abundance is increasing (Marcovaldi and Chaloupka 2007).

Status

The loggerhead sea turtle was listed under the ESA as a result of bycatch mortality, resulting from domestic and international commercial fishing, particularly in gillnet, longline and trawl fisheries. Additional causes for the decline stem from directed harvest, coastal development, increased human use of nesting beaches and pollution. These threats are expected to continue into the future. The global abundance of nesting female loggerhead turtles is estimated at 43,320–44,560 (Spotila 2004).

4.2.17 Green Sea Turtle

Species description and distribution

The green sea turtle is the largest of the hardshell marine turtles, growing to a weight of 350 lb (159 kg) and a SCL of greater than 3.3 ft (1 m). It has a circumglobal distribution, occurring throughout nearshore tropical, subtropical and, to a lesser extent, temperate waters.

The species was listed under the ESA on July 28, 1978 (43 FR 32800). The species was separated into two listing designations: endangered for breeding populations in Florida and the Pacific coast of Mexico and threatened in all other areas throughout its range. On April 6, 2016, NMFS listed 11 DPSs of green sea turtles as threatened or endangered under the ESA (Figure 3) (81 FR 20057). Eight DPSs are listed as threatened: Central North Pacific, East Indian-West Pacific, East Pacific, North Atlantic, North Indian, South Atlantic, Southwest Indian, and Southwest Pacific. Three DPSs are listed as endangered: Central South Pacific, Central West Pacific, and Mediterranean.

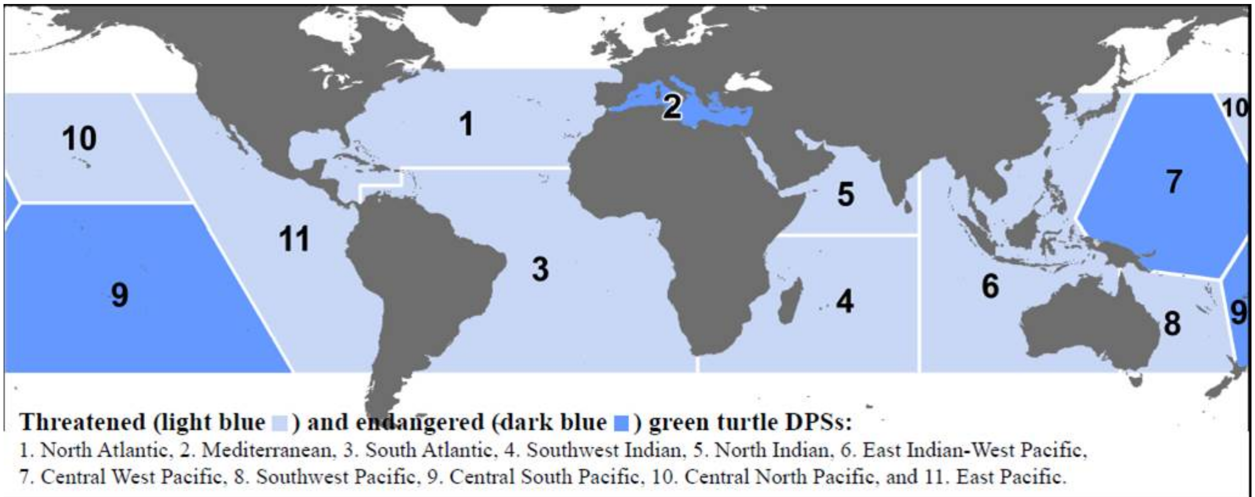

Figure 3. Map depicting DPS boundaries for green turtles.

We used information available in the 2007 5-Year Review (USFWS 2007) and 2015 Status Review (Seminoff 2015) to summarize the status of the species, as follows.

Life history

Age at first reproduction for females is 20 - 40 years. They lay an average of three nests per season with an average of 100 eggs per nest. The remigration interval (i.e., return to natal beaches) is 2 – 5 years. Nesting occurs primarily on beaches with intact dune structure, native vegetation and appropriate incubation temperatures during summer months. After emerging from the nest, hatchlings swim to offshore areas and go through a post-hatchling pelagic stage where they are believed to live for several years. During this life stage, green sea turtles feed close to the surface on a variety of marine algae and other life associated with drift lines and debris. Adult turtles exhibit site fidelity and migrate hundreds to thousands of kilometers from nesting beaches to foraging areas. Green sea turtles spend the majority of their lives in coastal foraging grounds, which include open coastlines and protected bays and lagoons. Adult green turtles feed primarily on seagrasses and algae, although they also eat jellyfish, sponges and other invertebrate prey.

Population dynamics

Worldwide, nesting data at 46 sites from 1990-2006 indicate that 108,761 to 150,521 females nest each year. Nesting populations are doing relatively well in the Pacific, Western Atlantic and Central Atlantic Ocean; whereas, populations are doing poorly in Southeast Asia, Eastern Indian Ocean and Mediterranean. The North Atlantic DPS displays high nester abundance, with approximately 167,424 females at 73 nesting sites, and available data indicate an increasing trend in nesting. The South Atlantic DPS also exhibits high nesting abundance, with about 63,332 nesting females. Where abundance data are available, nesting trends are increasing for the South Atlantic DPS. The East Indian-West Pacific DPS has high abundance, with about 77,009 nesting females over 50 nesting sites (the largest being in northern Australia, supporting about a third of the nesting females for the DPS). Nesting trends (stable, increasing or decreasing) vary between nesting sites. The Central West Pacific DPS has low nesting abundance, with about 6,518 nesting females at 50 sites; only one of the sites shows an increasing trend, all others show decreasing trends. The Southwest Pacific DPS has high nesting abundance, with an estimated 83,058 nesting females at 21 sites, and sites exhibiting slightly increasing trends.

Status

Once abundant in tropical and subtropical waters, globally, green sea turtles exist at a fraction of their historical abundance, as a result of over-exploitation. Egg harvest, the harvest of females on nesting beaches and directed hunting of turtles in foraging areas remain the three greatest threats to their recovery. In addition, bycatch in drift-net, long-line, set-net, pound-net and trawl fisheries kill thousands of green sea turtles annually. Increasing coastal development (including construction, beach erosion and renourishment and artificial lighting) threatens nesting success and hatchling survival. Apparent increases in recent years are optimistic but must be viewed cautiously, as the datasets represent a fraction of a green sea turtle generation, up to 50 years. While the threats of harvest, coastal development and fisheries bycatch continue, the species appears to be somewhat resilient to future perturbations.

5 Environmental Baseline

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

5.1 Climate Change

Natural climatic variability and change may affect whales through changes in habitat and prey availability; however, these effects are not well understood. Possible effects of climatic variability for marine species include the alteration of community composition and structure, changes to migration patterns or community structure, changes to species abundance, increased susceptibility to disease and contaminants, alterations to prey composition and altered timing of breeding (Kintisch 2006; Learmonth et al. 2006; MacLeod et al. 2005; McMahon and Hays 2006; Robinson et al. 2005). Naturally occurring climatic patterns, such as the Pacific Decadal Oscillation and El Niño and La Niña events, are identified as major causes of changing marine productivity worldwide (Beamish et al. 1999; Benson and Trites 2002; Francis et al. 1998; Hare et al. 1999; Mantua et al. 1997). Gaps in information and the complexity of climatic interactions complicate the ability to predict the effects of climate change on whales (Kintisch 2006; Simmonds and Isaac 2007).

For sea turtles, climate change may expand foraging habitats into higher latitude waters and increasing ocean temperatures may also lead to reduced primary productivity and eventual food availability. Climate change could also reduce nesting habitat due to sea level rise, as well as affect egg development and nest success. Rising temperatures may increase feminization of leatherback nests (Hawkes et al. 2007b; James et al. 2006; McMahon and Hays 2006; Mrosovsky et al. 1984). Hawksbill turtles exhibit temperature-dependent sex determination (Wibbels 2003) suggesting that there may be a skewing of future hawksbill cohorts toward strong female bias. Loggerhead sea turtles are very sensitive to temperature as a determinant of sex while incubating. Ambient temperature increase by just 1º-2º C can potentially change hatchling sex ratios to all or nearly all female in tropical and subtropical areas (Hawkes et al. 2007a). Over time, this can reduce genetic diversity, or even population viability, if males become a small proportion of populations (Hulin et al. 2009). Sea surface temperatures on loggerhead foraging grounds has also been linked to the timing of nesting, with higher temperatures leading to earlier nesting (Mazaris et al. 2009; Schofield et al. 2009). Green sea turtles emerging from nests at cooler temperatures likely absorb more yolk that is converted to body tissue than do hatchlings from warmer nests (Ischer et al. 2009). However, warmer temperatures may also decrease the energy needs of a developing embryo (Reid et al. 2009)

5.2 Harvest

Prior to 1900, aboriginal hunting and early commercial whaling on the high seas, using hand harpoons, took an unknown number of whales (Johnson and Wolman 1984). Modern commercial whaling removed ~50,000 whales annually. In 1965, the IWC banned the commercial hunting of whales. Although commercial harvesting no longer targets whales in the proposed action area, prior exploitation may have altered the population structure and social cohesion of the species such that effects on abundance and recruitment can continue for years after harvesting has ceased.

Directed harvest of sea turtles and their eggs for food and other products has existed for years and was a significant factor causing the decline of Kemp’s ridley, olive ridley, green, leatherback, hawksbill and loggerhead sea turtles. At present, despite conservation efforts such as bans and moratoriums by the responsible governments, the harvest of turtles and their eggs still occurs throughout the action area. Countries including Mexico, Peru and the Philippines have made attempts to reduce the threats to sea turtles, but illegal harvesting still occurs. In Vietnam and Fiji, harvest of turtle meat and eggs remains unregulated.

5.3 Fishery Interactions

Entrapment and entanglement in fishing gear is a frequently documented source of human-caused mortality in marine mammals (see Dietrich et al. 2007). These entanglements also make animals more vulnerable to additional dangers (e.g., predation and ship strikes) by restricting agility and swimming speed. Marine mammals that die from entanglement in commercial fishing gear often sink rather than strand ashore thus making it difficult to accurately determine the extent of such mortalities.

Marine mammals probably consume at least as much fish as is harvested by humans (Kenney et al. 1985). Therefore, competition with humans for prey is a potential concern for whales. Reductions in fish populations, whether natural or human-caused, may affect listed whale populations and their recoveries. Whales are known to feed on several species of fish that are harvested by humans (Waring et al. 2008); however, the magnitude of competition is unknown.

Fishery interaction remains a major factor in sea turtle recovery. Wallace et al. (2010) estimated that worldwide, 447,000 turtles are killed each year from bycatch in commercial fisheries. NMFS (2002a) estimated that 62,000 loggerhead sea turtles have been killed as a result of incidental capture and drowning in shrimp trawl gear. Although turtle excluder devices and other bycatch reduction devices have significantly reduced the level of bycatch to sea turtles and other marine species in U.S. waters, mortality still occurs.

5.4 Ship Strikes

Ships have the potential to affect whales through strikes, noise and disturbance by their physical presence. Responses to vessel interactions include interruption of vital behaviors and social groups, separation of mothers and young and abandonment of resting areas (Bejder et al. 1999; Boren et al. 2001; Colburn 1999; Constantine 2001; Cope et al. 1999; Kovacs and Innes. 1990; Kruse 1991; Mann et al. 2000; Nowacek et al. 2001; Samuels et al. 2000; Samuels and Gifford. 1998; Wells and Scott 1997). Whale watching, a profitable and rapidly growing business with more than 9 million participants in 80 countries and territories, may increase these types of disturbance and negatively affect the species (Hoyt 2001).

Ship strikes are considered a serious and widespread threat to marine mammals. This threat is increasing as commercial shipping lanes cross important breeding and feeding habitats and as whale populations recover and populate new areas or areas where they were previously extirpated (Swingle et al. 1993; Wiley et al. 1995). As ships continue to become faster and more widespread, an increase in ship interactions with marine mammals is to be expected. For whales, studies show that the probability of fatal injuries from ship strikes increases as vessels operate at speeds above 14 knots (Laist et al. 2001).

Boat collisions can result in serious injury and death and may pose a threat to sea turtles in the action area although the extent of this threat is unknown.

5.5 Noise

Noise generated by human activity has the potential to affect whales. This includes sound generated by commercial and recreational vessels, aircraft, commercial sonar, military activities, seismic exploration, in-water construction activities and other human activities. These activities all occur within the action area to varying degrees throughout the year. Whales generate and rely on sound to navigate, hunt and communicate with other individuals. As a result, anthropogenic noise can interfere with these important activities. The effects of noise on marine mammals can range from behavioral effects to physical damage (Richardson et al. 1995a).

Commercial shipping traffic is a major source of low-frequency anthropogenic noise in the oceans (NRC 2003). Although large vessels emit predominantly low-frequency sound, studies report broadband noise from large cargo ships that includes significant levels above 2 kHz, which may interfere with important biological functions of cetaceans (Holt 2008). Commercial sonar systems are used on recreational and commercial vessels and may affect marine mammals (NRC 2003). Although, little information is available on potential effects of multiple commercial sonars to marine mammals, the distribution of these sounds would be small because of their short durations and the fact that the high frequencies of the signals attenuate quickly in seawater (Richardson et al. 1995a).

Seismic surveys using towed airguns also occur within the action area and are the primary exploration technique for oil and gas deposits and for fault structure and other geological hazards. Airguns generate intense low-frequency sound pressure waves capable of penetrating the seafloor and are fired repetitively at intervals of 10-20 seconds for extended periods (NRC 2003). Most of the energy from the guns is directed vertically downward, but significant sound emission also extends horizontally. Peak sound pressure levels from airguns usually reach 235-240 dB at dominant frequencies of 5-300 Hz (NRC 2003). Most of the sound energy is at frequencies below 500 Hz. In the U.S., all seismic projects for oil and gas exploration and most research activities involving the use of airguns with the potential to take marine mammals are covered by incidental harassment authorizations under the MMPA.

5.6 U.S. Navy Activities

The U.S. Navy conducts training and other activities throughout coastal areas in the U.S. Throughout the life of this permit, they are likely to conduct anti-submarine, anti-air, anti-surface warfare activities and training exercises in the action area. Anticipated impacts from harassment due to U.S. Navy activities include changes from foraging, resting, milling, and other behavioral states that require lower energy expenditures to traveling, avoidance, and behavioral states that require higher energy expenditures and, therefore, would represent significant disruptions of the normal behavioral patterns of the animals that have been exposed. Behavioral responses that result from stressors associated with these training activities are expected to be temporary and would not affect the reproduction, survival, or recovery of these species. Instances of harm identified generally represent animals that would have been exposed to underwater detonations at 205 dB re μPa^2-s or 13 psi, which corresponds to an exposure in which 50% of exposed individuals would be expected to experience rupture of their tympanic membrane, an injury that correlates with measures of permanent hearing impairment (Ketten 1998). U.S. Navy training activities constitute a federal action and would undergo separate Section 7 consultation.

5.7 Pollution

5.7.1 Marine Debris

Types of marine debris include plastics, glass, metal, polystyrene foam, rubber and derelict fishing gear from human marine activities or transported into the marine environment from land.

The sources of this debris include littering, dumping and industrial loss and discharge from land. Whales become entangled in marine debris, or ingest it, which may lead to injury or death. Given the limited knowledge about the impacts of marine debris on whales, it is difficult to determine the extent of the threats that marine debris poses to whales.

Ingestion of marine debris can be a serious threat to sea turtles. When feeding, sea turtles can mistake debris (e.g., tar and plastic) for natural food items. Some types of marine debris may be directly or indirectly toxic, such as oil. Other types of marine debris, such as discarded or derelict fishing gear, may entangle and drown sea turtles. Plastic ingestion is very common in leatherbacks and can block gastrointestinal tracts leading to death (Mrosovsky et al. 2009).

5.7.2 Pesticides and Contaminants

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

The accumulation of persistent pollutants through trophic transfer may cause mortality and sub-lethal effects in long-lived higher trophic level animals (Waring et al. 2008), including immune system abnormalities, endocrine disruption and reproductive effects (Krahn et al. 2007). Recent efforts have led to improvements in regional water quality and monitored pesticide levels have declined, although the more persistent chemicals are still detected and are expected to endure for years (Grant and Ross 2002; Mearns 2001).

In sea turtles, heavy metals, including arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver and zinc, have been found in a variety of tissues in levels that increase with turtle size (Anan et al. 2001; Barbieri 2009; Fujihara et al. 2003; Garcia-Fernandez et al. 2009; Gardner et al. 2006; Godley et al. 1999; Saeki et al. 2000; Storelli et al. 2008). Cadmium has been found in leatherbacks at the highest concentration compared to any other marine vertebrate (Caurant et al. 1999; Gordon et al. 1998). Newly emerged hatchlings have higher concentrations than are present when laid, suggesting that metals may be accumulated during incubation from surrounding sands (Sahoo et al. 1996). Arsenic has been found to be very high in green sea turtle eggs (Van de Merwe et al. 2009).

Sea turtle tissues have been found to contain organochlorines, including chlorobiphenyl, chlordane, lindane, endrin, endosulfan, dieldrin, PFOS, PFOA, DDT and PCB (Alava et al. 2006; Corsolini et al. 2000; Gardner et al. 2003; Keller et al. 2005; Keller et al. 2004a; Keller et al. 2004b; McKenzie et al. 1999; Miao et al. 2001; Monagas et al. 2008; Oros et al. 2009; Perugini et al. 2006; Rybitski et al. 1995; Storelli et al. 2007). PCB concentrations are reportedly equivalent to those in some marine mammals, with liver and adipose levels of at least one congener being exceptionally high (PCB 209: 500-530 ng/g wet weight; Davenport et al. 1990;

Oros et al. 2009). Levels of PCBs found in green sea turtle eggs are considered far higher than what is fit for human consumption (Van de Merwe et al. 2009).

It appears that levels of organochlorines have the potential to suppress the immune system of loggerhead sea turtles and may affect metabolic regulation (Keller et al. 2004c; Keller et al. 2006; Oros et al. 2009). These contaminants could cause deficiencies in endocrine, developmental and reproductive health (Storelli et al. 2007) and are known to depress immune function in loggerhead sea turtles (Keller et al. 2006). Females from sexual maturity through reproductive life should have lower levels of contaminants than males because contaminants are shared with progeny through egg formation.

Exposure to sewage effluent may also result in green sea turtle eggs harboring antibiotic-resistant strains of bacteria (Al-Bahry et al. 2009).

5.7.3 Hydrocarbons

Exposure to hydrocarbons released into the environment via oil spills and other discharges pose risks to marine species. Marine mammals are generally able to metabolize and excrete limited amounts of hydrocarbons, but exposure to large amounts of hydrocarbons and chronic exposure over time pose greater risks (Grant and Ross 2002). Acute exposure of marine mammals to petroleum products causes changes in behavior and may directly injure animals (Geraci 1990). Cetaceans have a thickened epidermis that greatly reduces the likelihood of petroleum toxicity from skin contact with oils (Geraci 1990), but they may inhale these compounds at the water’s surface and ingest them while feeding (Matkin and Saulitis 1997). Hydrocarbons also have the potential to impact prey populations and therefore may affect listed species indirectly by reducing food availability. Oil can also be hazardous to sea turtles, with fresh oil causing significant mortality and morphological changes in hatchlings, but aged oil having no detectable effects (Fritts and McGehee 1981).

5.8 Conservation and Management Efforts

In 1946, the International Convention for the Regulation of Whaling began regulating commercial whaling. In 1966, the International Whaling Commission prohibited commercial whaling. The species listed above in Table 1 were designated as either "endangered" or threatened under the Endangered Species Act. Marine mammals receive additional protections under the Marine Mammal Protection Act.

Several conservation and management efforts have been undertaken for whales and sea turtles in the action area. Recovery plans guide the protection and conservation of these species (NMFS 1991). NMFS implements conservation and management activities for the species through its Regional Offices and Fishery Science Centers in cooperation with states, conservation groups, the public and other federal agencies. They have placed observers aboard driftnet fishing vessels and vessels engaged in seismic activities to record and monitor takes. The Pacific Offshore Cetacean Take Reduction Plan requires acoustic pingers to help repel marine mammals from fishing operations. NMFS mitigates ship strikes and responds to whales in distress. Together with their partners, they educate the crew of whale watch vessels and other boat operators on safe boating practices. NMFS has implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles from commercial fisheries in the action area. There is an extensive network of Sea Turtle Stranding and Salvage Network participants along the Atlantic and Gulf of Mexico coasts who not only collect data on dead sea turtles, but also rescue and rehabilitate any live stranded sea turtles.

5.9 Science and Research Activities

Scientific research permits issued by the NMFS currently authorize studies of listed species in the North Atlantic Ocean, some of which extend into portions of the action area for the proposed project. Authorized research on ESA-listed whales includes close vessel and aerial approaches, biopsy sampling, tagging, ultrasound, and exposure to acoustic activities, and breath sampling. These research activities were not expected to jeopardize the survival or recovery of ESA-listed species and were largely anticipated to have short-term behavioral or stress effects to impacted individuals.

Authorized research on ESA-listed sea turtles includes capture, handling, and restraint, satellite, sonic, and passive integrated transponder tagging, blood and tissue collection, lavage, ultrasound, captive experiments, laparoscopy, and imaging. Research activities involve “takes” by harassment, with some resulting mortality. There have been numerous permits[2] issued since 2009 under the provisions of both the MMPA and ESA authorizing scientific research on marine mammals and sea turtles all over the world, including for research in the Mediterranean. The consultations which took place on the issuance of these ESA scientific research permits each found that the authorized activities would have no more than short-term effects and would not result in jeopardy to the species or adverse modification of designated critical habitat.

Additional “take” is likely to be authorized in the future as additional permits are issued. It is noteworthy that although the numbers tabulated below 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 Atlantic Ocean, mostly from Florida to Maine, and in the eastern Gulf of Mexico. Although whales and sea turtles are generally wide-ranging, we do not expect many of the authorized “takes” to involve individuals which would also be “taken” under the proposed research.

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[2]. See https://apps.nmfs.noaa.gov/index.cfm for additional details.

5.10 The Impact of the Baseline on ESA-listed Species

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

5.10.1 Marine Mammals

Climate change has wide-ranging impacts, some of which can be experienced by ESA-listed whales in the action area. Climate change has been demonstrated to alter major current regimes and may alter those in the action area as they are studied further (Johnson et al. 2011; Poloczanska et al. 2009). Considering the sensitivity that North Atlantic right whales have to warm water temperatures during their southbound migration, warming water temperatures may delay their migratory movements. The availability and quality of prey outside the action area in northern feeding areas can also influence the body condition of individuals in the action area and potentially reduce the number of individuals that undertake migration through the action area.

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

High levels of morbidity and mortality occur as a result of ship strike (particularly for North Atlantic right whales and humpback whales) and entanglement in fishing gear (right whales). Ship-strike and entanglement occur broadly along the U.S. East Coast, including in the action area. These two factors are the greatest known sources of mortality and impairment to recovery for North Atlantic right whales and represent known mortality sources for all other ESA-listed whales in the action area. Reductions in speed through portions of the action area as well as seasonal or brief closings of areas to fishing are underway to reduce these impacts, but data are not yet available to demonstrate the long-term effectiveness of these strategies. However, these measures are likely reducing the severity and frequency of these interactions.

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

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

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

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

5.10.2 Sea Turtles

Several of the activities described in this environmental baseline have significant and adverse consequences for nesting sea turtle aggregations whose individuals occur in the action area.

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

Even with turtle excluder device measures in place, in 2002, NMFS (2002) expected fisheries to capture about 323,600 sea turtles each year and kill about 5,600 (~1.7%) of the turtles captured. Leatherback sea turtle interactions were estimated at 3,090 captures with 80 (~2.6%) deaths as a result (NMFS 2002b). Since 2002, however, effort in the Atlantic shrimp fisheries has declined from a high of 25,320 trips in 2002 to approximately 13,464 trips in 2009, roughly 47% less effort. Since sea turtle takes are directly linked to fishery effort, these takes are expected to decrease proportionately. However, hundreds to a possible few thousand sea turtle interactions are expected annually, with hundreds of deaths (NMFS 2012). Additional mortalities each year along with other impacts remain a threat to the survival and recovery of this species and could slow recovery for sea turtles.

6 Effects of the Action on ESA-Listed Species and Critical Habitat

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

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

As was stated in Section 0, this biological opinion includes both a jeopardy analysis and an adverse modification analysis.

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 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

The adverse modification analysis considers the impacts on the conservation value of designated critical habitat. We have relied upon the regulatory provisions of the ESA (81 FR 7214) to complete our analysis with respect to critical habitat.

6.1 Stressors Associated with the Proposed Action

The potential stressors we expect to result from the proposed action are as follows:

- vessel noise;
- oil or fuel leakage;
- ship strike due to vessel transit;
- disturbance of non-target listed species;
- disturbance due to aerial survey;

- stressors specific to cetaceans
    - close approach by research vessels;
    - entanglement or interaction with research equipment;
    - skin and blubber biopsy;
    - sloughed skin and feces collection;
    - tagging with suction-cup or implantable tags;

- stressors specific to sea turtles:
    - capture and holding;
    - handling, measuring and weighing;
    - flipper and PIT tagging;
    - blood and tissue sampling;
    - scute sample collection;
    - lavage and fecal sample collection;
    - urine sample collection;
    - satellite tagging;
    - ultrasound and heart rate monitoring;
    - oxytetracycline injection;
    - cloacal and buccal swabbing; and

- temporary marking.

Although noise originating from vessel propulsion will propagate into the marine environment, this amount of noise generated by the research vessel and smaller boats would be negligible. A vessel's passage past a whale or sea turtle would 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 whales to move away from vessels, either as a result of engine noise, the physical presence of the vessel, or both (Lusseau 2006). Because the potential acoustic interference from engine noise would be undetectable or so minor that it could not be meaningfully evaluated, we find that the risk from this potential stressor is insignificant. Therefore, we conclude that acoustic interference from engine noise is not likely to adversely affect ESA-listed marine mammals or sea turtles.

The potential for fuel or oil leaks is unlikely. Leaks would likely pose a significant risk to the vessel and its crew and actions to correct a leak are expected to occur immediately, to the extent possible. In the event that a leak occurs, the amount of fuel and oil onboard the research vessel or boats is unlikely to cause widespread, high dose contamination (excluding the remote possibility of severe damage to the vessel) that would impact listed species directly or pose hazards to their food sources. Because the potential for fuel or oil leaks is 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 marine mammals or sea turtles.

The research vessel and the smaller boats will be traveling at slow speeds, which minimize the amount of noise produced by the propulsion system and the probability of a ship-strike (Kite-Powell et al. 2007; Vanderlaan and Taggart 2007). Our expectation of ship strike is small due to the hundreds of thousands of kilometers the applicant has traveled without a ship strike, general expected movement of marine mammals and sea turtles away or parallel to vessel, as well as the generally slow movement of the vessel during most of its travels (Hauser and Holst 2009; Holst 2009; Holst 2010; Holst and Smultea 2008). All factors considered, we have concluded the potential for ship strike from the research vessel or the smaller boats is highly improbable. Because the potential for ship strike is extremely unlikely to occur, we find that the risk from this potential stressor is discountable. Therefore, we conclude that ship strike is not likely to adversely affect ESA-listed marine mammals or sea turtles.

Research vessels and activities may encounter or disturb non-target ESA-listed whales. However, several factors reduce the likelihood of this occurring. First, Permit No. 19091, once issued, will authorize takes of numerous ESA-listed whales (and every ESA-listed species of sea turtle). The research objectives require the researchers to take full advantage of encounters with ESA-listed species and conduct activities on them, so the applicant has requested take on most ESA-listed cetaceans. This reduces the amount of non-target ESA-listed species that the researchers are likely to encounter while conducting authorized activities. Secondly, the permit conditions will reduce the likelihood of the proposed action disturbing non-target ESA-listed species. The permit requires the use of protected species observers, who are able to identify and avoid any non-target species. The applicant will also be required to obey vessel approach rules for large cetaceans, so the researchers will maintain an appropriate distance to avoid take. Because the potential for disturbance of non-target ESA-listed species is extremely unlikely to occur, we find that the risk from this potential stressor is discountable. Therefore, we conclude that disturbance is not likely to adversely affect non-target ESA-listed marine mammals.

Accordingly, this consultation focused on disturbance due to aerial surveys and the directed research activities for cetaceans and sea turtles, which are the stressors the proposed research activities that may adversely affect ESA-listed species.

6.2 Mitigation to Minimize or Avoid Exposure

The NMFS Permits and Conservation Division's proposed action includes the use of vetted research techniques, qualified and trained researchers and best practices when approaching, handling, tagging and sampling ESA-listed species. They are described in the description of the action sections 2.1 and 2.1.4, as well as the exposure and response analysis sections and were considered throughout our analysis.

6.3 Exposure and Response Analysis

Exposure analyses identify the physical, chemical and biotic stressors produced by a proposed action that co-occur in space and time with ESA-listed species within the action area. The stressors identified for this proposed action that warrant further analysis are disturbance due to aerial surveys, and the directed research activities for cetaceans and sea turtles.

The *Exposure analysis* identifies, as possible, the number, age or life stage and gender of the individuals likely to be exposed to the actions' effects and the population(s) or subpopulation(s) those individuals represent.

As discussed in the *Approach to the assessment* section of this opinion, the *Response analysis* determines how listed resources are likely to respond after being exposed to an action's effects on the environment or directly on listed species themselves. For the purposes of consultation, our assessments try to detect potential lethal, sub-lethal (or physiological), or behavioral responses that might reduce the fitness of individuals. Ideally, response analyses would consider and weigh evidence of adverse consequences as well as evidence suggesting the absence of such consequences.

For this consultation, we are particularly concerned about behavioral disruptions that may result in animals that fail to feed or breed successfully or fail to complete their life history because these responses are likely to have population-level and therefore species level, consequences. The proposed permit would authorize non-lethal "takes" by harassment of listed species during research activities. The ESA does not define harassment nor has NMFS defined the term pursuant to the ESA through regulation. However, the Marine Mammal Protection Act of 1972, as amended, defines harassment as any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal population in the wild or has the potential to disturb a marine mammal or marine mammal population in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [16 U.S.C. 1362(18)(A)]. For this opinion, we define harassment similarly: an intentional or unintentional human act or omission that creates the probability of injury to an individual animal by disrupting one or more behavioral patterns that are essential to the animal's life history or its contribution to the population the animal represents.

6.3.1 Exposure Analysis

The Permits Division proposes to issue a permit for scientific research to the Southwest Fisheries Science Center. Appendix A in Section 12 (Tables A-1-4) identifies the numbers of different listed species that the Southwest Fisheries Science Center would be authorized to take annually until the permit expires in 2021. The research would primarily occur in the Pacific Ocean, but also in the Southern and Atlantic Oceans. Not all species would be affected in all action areas. The tables also indicate which species could be exposed to the procedures included in the proposed permit, as well as whether the numbers have changed from the current permit.

In our assessment of the potential exposure levels of listed species by the proposed permit, we considered the available annual reports from recent years. However, past annual reports are not necessarily good indications of future activities and levels of effort. The frequency, duration, area and focus of research cruises vary annually, as they are dependent on funding and are planned based on the research needs of National Marine Fisheries Service. A research cruise might primarily target non-listed species and opportunistically sample listed species within the limits of the proposed permit, yet annual reports do not necessarily distinguish between targeted and opportunistic sampling. The threshold for reporting certain activities has changed over time, e.g., disturbance due to large and small vessel surveys, aerial surveys and photo-identification activities. The proposed permit has language that instructs the permit holders specifically on what is considered a "take," with the hope that this will lead to more informative annual reports.

We believe that in any given year, not all proposed "takes" would occur. However, because of the high variability of the proposed activities by the Southwest Fisheries Science Center, we did not further refine the expected level of exposure within the proposed permit limits and have assessed the action at the proposed levels.

6.3.2 Response Analysis

Evidence indicates that wild animals respond to human disturbance in the same way they respond to predators (Beale and Monaghan 2004b; Frid 2003; Frid and Dill 2002; Gill et al. 2001; Lima 1998; Romero 2004). These responses may manifest themselves as stress responses, interruptions of essential behavioral or physiological events, alteration of an animal's time budget, or some combinations of these responses (Frid and Dill 2002; Romero 2004; Sapolsky et al. 2000; Walker et al. 2005).

6.3.2.1 Cetacean and Sea Turtle Response to Disturbance from Unmanned Aerial Survey

UAS represents a technological advance of already permitted and analyzed research methodologies (aerial and vessel surveys) and is expected to result in lesser impacts from traditional methods currently permitted. UAS can yield data to meet the same objectives and likely with no disturbances to the target animals, because UAS are smaller and quieter than vessels and the vessels with UASs are kept at a greater distance to the animals when operating UAS. The methods employed under the proposed permit have been safely conducted on marine mammals by several researchers (e.g., (Acevedo-Whitehouse et al. 2010; Durban et al. 2015; Goebel et al. 2015; Hodgson et al. 2013).) In general, UAS platforms elicit fewer, if any, behavioral responses compared to manned aircraft or vessel approaches on targeted marine mammal species (NMFS 2014a; NMFS 2014b; Smith et al. 2016). The Southwest Fisheries Science Center used UAS over killer whales and found that at 30 ft, there were no behavioral reactions to UAS. The use of UAS was permitted in 2008 over humpback whales in Alaska, and no observed reactions were noted in the permit annual report (see Table 1 in Smith et al. 2016). The proposed takes are not expected to result in more than Level B harassment of target animals. In addition, researchers would be required to document any behavioral responses to inform management decisions.

6.3.2.2 Steller Sea Lion Designated Critical Habitat: Impacts from Aerial Survey

Some of the proposed research activities could occur within designated critical habitat for Steller sea lions. Ground surveys would be conducted on rookeries and haulouts for California sea lions, including Año Neuvo Island and the Farallon Islands, where critical habitat has been designated for Steller sea lions. Aerial surveys, typically conducted at 800 feet, could also pass through critical habitat, which extends 3,000 feet into the air. Incremental and transient disturbances are anticipated from increased human presence and noise from aircraft. The proposed research would not affect population ecology or population dynamics of prey species, predators, or competitors of Steller sea lions. We do not expect that changes in prey distribution would be measurable even for the short period of time researchers may be in designated critical habitat. Additionally, we do not expect the physical, chemical and biotic features that form and maintain the critical habitat to be changed, including the space needed for population growth, cover or shelter, sites for breeding and habitats that are protected from disturbance. As a result, the proposed permits are not likely to result in an appreciable reduction in the conservation value of the critical habitat for Steller sea lions.

6.3.2.3 Cetacean Response to Close Approaches by Vessels

For all research activities, the presence of vessels can lead to disturbance of marine mammals, although the animals' reactions are generally short term and low impact. Short-term behavioral disturbance in response to vessel activity and noise are reported for several whale species (Malme et al. 1984; Malme et al. 1989; Richardson et al. 1995b). Whales have been observed to react in a variety of ways to close vessel approaches. Reactions range from little to no observable change in behavior to momentary changes in swimming speed, pattern, orientation, diving, time spent submerged, foraging and respiratory patterns (Au and Green 2000; Baker et al. 1983; Hall 1982; Jahoda et al. 2003a; Koehler 2006; Scheidat et al. 2006). Responses may also include surface displays like tail flicks and lobtailing and may possibly influence distribution of the animals in the area (Baker et al. 1983; Bauer and Herman 1986; Clapham and Mattila 1993; Jahoda et al. 2003a; Watkins 1981).

The type and duration of the whale's response can be influenced by several factors, including some having to do with the vessel and local conditions and others having to do with the whale itself. Changes in whale behavior can correspond to vessel speed, size and distance from the whale, as well as the number of vessels operating in the proximity (Baker et al. 1988). Furthermore, detection of vessel noise by the whale can be dependent on weather, vessel engine type and size, oceanography, species sensitivity, habituation and ambient noise conditions, among others.

Individual factors pertaining to the whale's physical or behavioral state can cause differences in the whale's response to vessels. These can include the age or sex of the whale, the presence of offspring, whether or not habituation to vessels has occurred, individual differences in reactions to stressors; vessel speed, size and distance from the whale; and the number of vessels operating in the proximity (Baker et al. 1988; Gauthier and Sears 1999; Hooker et al. 2001; Koehler 2006; Lusseau 2004; Richter et al. 2006; Weilgart 2007; Wursig et al. 1998). Observations of large whales indicate that cow-calf pairs, smaller pods and pods with calves appear to be particularly responsive to vessel approaches (Bauer 1986; Bauer and Herman 1986; Clapham and Mattila 1993; Hall 1982).

Researchers have noted that different approach techniques have a major influence on the whale's response to vessels (Bauer 1986; Bauer and Herman 1986; Clapham and Mattila 1993; Hall 1982). Responses are reported to be generally minimal to non-existent when close vessel approaches are slow and careful, leading researchers to conclude that experienced, trained personnel approaching whales slowly would result in fewer individuals exhibiting responses that might indicate stress (Clapham and Mattila 1993; Weinrich et al. 1991). Such concerns and rationale led NMFS to implement vessel approach guidelines for humpback whales, limiting approach distances to 100 yards in Hawaii (60 FR 3775) and Alaska (66 FR 29502). Similar vessel approach guidelines have been established for Southern Resident killer whales (76 FR 20870) and North Atlantic right whales (62 FR 6729), with an additional speed restriction implemented in 2008 (73 FR 60173).

Patterns of disturbance in response to vessel activity indicate such approaches may have metabolic consequences or may be stressful for cetaceans (Baker and Herman 1989; Baker et al. 1983; Bauer and Herman 1986; Jahoda et al. 2003a). Available information indicates that individuals exposed to the vessel approaches could exhibit stress responses, interruptions of essential behavioral or physiological events, alteration of an animal's time budget, or some combinations of these responses (Sapolsky et al. 2000; Frid and Dill 2002; Romero 2004; Walker et al. 2005). Behavioral responses that result in a reduced amount of time spent at the surface, less time foraging, or more erratic swimming may suggest an increase in metabolic rates indicative of a stress response to close vessel approaches (Lusseau et al. 2009; Williams et al. 2011; Williams et al. 2002). However, it is difficult to quantify the magnitude or duration of possible stress responses that would allow us to make inferences about possible fitness consequences for individual whales.

Upon issuance, Permit No. 19091 would allow researchers to approach whales for tag attachment, biopsy sampling and photo-identification (and for some species, e.g., humpback whales in the Southern Ocean, up to five times per individual). The permit would contain conditions designed to minimize the effects of approach. During activities conducted under the current permit, researchers rarely witnessed any change in behavior during approach. While conducting multiple biopsy sampling for humpback whales in the previous permit, the Applicant reported that humpback whales responded to the biopsy sampling infrequently and those responses will be discussed below. Based on available information, we would expect most of the whales exposed to close vessel approaches would exhibit no visible response. For the smaller portion that would exhibit observable responses, we expect those to be short-term behavioral reactions to the close approach.

To minimize the effects of close approach, 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. Additional conditions require researchers to exercise caution while closely approaching females with calves (two months of age or older) to minimize or avoid any startle response. Researchers must stop if there is evidence they are interfering with pair-bonding or nursing and must not position the vessel between the mother and its calf. Calves less than two months old or females associated with those calves would not be approached.

Researchers would also apply “good practice” measures to minimize potential risks associated with close approaches. These include avoiding making sudden changes in vessel speed or pitch, avoiding the use of reverse gear, not approaching whales head-on and discontinuing efforts if the animal displays avoidance behaviors, such as a change in direction of travel or departures from normal breathing or diving patterns. Although threshold levels at which underwater anthropogenic sound negatively impacts cetacean hearing and behavior are poorly understood (NMFS 2008), the proposed activities would be conducted to minimize the effects of vessel noise on humpback whales. We expect the manner of vessel approaches conducted under the proposed permit would minimize risk posed by vessel noise (Bain and Dahlheim 1994; Talus 2000).

For humpback whales in the Southern Ocean, this permit is requesting a specific exemption to the limit on the number of biopsy samples collected from an individual, and this would mean an increase in the overall number of close approaches. Available information suggests the cumulative effect of close approaches could be greater than the effect of each individual approach (e.g., Weinrich et al. 1991; Beale and Monaghan 2004). To minimize repeated disturbances to individual whales, the proposed permit limits takes due to close approach to three per individual in one day and no more than five approaches per individual. According to the applicant, the timing of these approaches would be one week to one month apart. 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.

The permit conditions, the experience of the researchers and best practices for close approaches would help minimize any risk of vessel collisions 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.

6.3.2.4 Cetacean Response to Skin and Blubber Biopsy

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

Additionally, the fact that known individual humpback whales are observed by the researchers on separate occasions on both feeding and breeding grounds supports that biopsy activities are low impact. The responses to biopsy sampling observed by the applicant varied by individual whale and ranged from a flinch response, diving, tail slapping, or change in direction to no response at all. The applicant also stated that at no point have researchers observed an extended response to biopsy sampling.

As described in the *Description of the Action*, the biopsy dart is 6 mm in diameter and 15 mm deep. The footprint of even three biopsy samples combined relative to the overall size of the whale does not represent a significant proportion of the whale's total surface area. The researchers would be restricted by the permit conditions to only taking samples posterior to the pectoral fins (i.e., in order to protect the face and head of the whale).

The applicant proposes to collect repeated biopsy samples from individual humpback whales in the Southern Ocean up to five times, with samples collected anywhere from one week to one month apart. This period has been stated by the applicant to be optimal to achieve the modified research goals. Based on the available information, we expect that the wounds from the biopsy sampling to be minor and that healing would occur rapidly. The applicant has stated that the researchers will use techniques to minimize the risk of infection (i.e., sterile equipment) and protocol that prohibits collecting samples from areas near the face and head of the whale. The permit will contain conditions that require the research to be carried out in this same safe and protective manner.

6.3.2.5 Cetacean response to sloughed skin and feces collection

The collection of sloughed skin and feces would not involve contact with the whale and would not be invasive. Collections could potentially be done in the vicinity of a whale, but we would not expect this to have any impact beyond the effect of the close approaches to whales assessed earlier.

6.3.2.6 Cetacean response to instrument tagging

Tagging involves physical contact with the animal, and is generally categorized as having the potential to injure. A variety of scientific instruments, such as VHF tags and satellite-linked time depth recorders, can be attached to marine mammals for collection of a wide-range of data including location, dive and movement patterns, and ambient noise levels. The duration of the tag placement can be from a few hours to several weeks, depending on the mode of attachment, and ultimately the tag is released from the animal and retrieved by the researcher. Information is then used to infer habitat use, migratory and foraging behavior, and habitat quality, which are in turn used to make management decisions for the conservation and recovery of a species. Tags do not contain any hazardous materials.

Effects of attached devices may range from subtle, short-term behavioral responses to long-term changes that affect survival and reproduction; attached devices may cause effects not detectable in observed behaviors, such as increased energy expenditure by the tagged animal (White and Garrot 1990; Wilson and McMahon 2006). Walker and Boveng (1995) concluded the effects of devices on animal behavior are expected to be greatest when the device-to-body size ratio is large. Although the weight and size of the device may be of less concern for larger animals such as cetaceans, there is still the potential for significant effects – for example, behavioral effects may cause reduced biological performance, particularly during critical periods such as lactation (Walker and Boveng 1995; White and Garrot 1990).

Although several tagging studies have been conducted on marine mammals, few have systematically investigated or recorded the effects on cetaceans from tagging, and available investigations into instrument effects on marine species are often limited to visual assessments of behavior (Walker and Boveng 1995). In addition, reactions to tagging are difficult to differentiate from reactions to close vessel approaches, because in all cases it is necessary to closely approach the whale to ensure proper tag placement.

Evidence available on the short-term effects of tagging whales indicates that responses vary from little to no observable change in behavior to momentary changes such as skin twitching, startle reactions or flinching, altered swimming speed and orientation, diving, rolling, head lifts, high back arching, fluking, and tail swishing (Andrews et al. 2008a; Baird 1994; Goodyear 1981; Goodyear 1989; Goodyear 1993; Hooker et al. 2001; Mate et al. 2007b; Mate et al. 1998; Mate et al. 1997; Watkins et al. 1984; Watkins et al. 1981b). Infrequently, aerial displays like breaching are also noted (Goodyear 1989), and Mate et al. (2007b) reported other infrequent behavioral responses of cetaceans as including fluke slaps and swishes, head lunges, defecation, decreased surfacing rates, disaffiliation with a group of whales, evasive swimming behavior, or cessation of singing (in the case of humpback whales).

Cetaceans frequently react when hit by tags delivered by remote devices such as tagging poles, but are also known to react when tags miss and hit the water. Behavioral responses are noted to be short-term (Mate et al. 2007b), with the likelihood of a reaction possibly depending on an individual's behavioral state at the time of tagging (Hooker et al. 2001). Mate et al. (1998) concluded the responses observed were usually the same as those elicited by close vessel approaches alone.

Hanson et al. (2008) tagged four species of Hawaiian odontocetes (Blainville's and Cuvier's beaked whales, short-finned pilot whale, and false killer whale). Eight days after tagging, one short-finned pilot whale had evidence of swelling of the dermis around the base of a dart, and it and another pilot whale had bumps on the opposite side of the dorsal fin from the darts, with clear signs of chronic inflammation at the dart site. In both cases, the tags had not been flush with skin at deployment. For the 13 tagged whales re-sighted after tagging, all the tags out-migrated through tag attachment holes, and did not migrate backwards through the fin, with no evidence of major tissue damage or disfigurement, nor the previously observed bumps. Four whales had minor depression at tag site, four had slightly raised tissue, and seven had depigmentation around the tag site. Hanson et al. (2008) suggested that tags that are not deployed to sit flush on fin surface will increase drag, which can lead to increasing load (as the tag pulls away from skin), tissue breakdown, and earlier tag loss. Chronic inflammation and the formation of granulation tissue were observed, but there was no indication of infection, cutaneous erythema, ulceration, discoloration, or necrosis.

Behavioral responses of whales to non-invasive suction cup tags are also noted by a few researchers. Goodyear (1981) attached a suction cup tag to one humpback whale and found behaviors of the tagged whale and a closely associated whale did not appear to change due to tagging. More recently, Goodyear (1989) tagged 12 humpback whales with suction cup tags and found responses to tagging were minimal with no long-term changes in behavior detected. Of the tagged whales, 69 percent showed no immediate reaction to tagging, and 31 percent exhibited a detectable reaction including quickened dive, high back arch, and tail swish. One breach was seen in over 100 tagging attempts. After all tagging attempts, the author noted that pre-tagging behavior resumed within a few minutes and that some whales curiously approached the tagging vessel. Additionally, the suction cup did not appear to harm whales' skin. Baird et al. (2000) deployed 15 suction-cup tags in 31 tagging attempts. No strong reactions were observed, all reactions appeared to be short-term, whales returned to pre-tagging behavior, and no reactions from non-target whales were observed.

Long-term effects from tagging remain largely unknown. Goodyear (1989) noted that humpback whales monitored several days after being suction cup tagged did not appear to exhibit altered behavior. In addition, Mate et al. (2007b) found that tagged whales re-sighted up to three years later did not appear in poor health and did not appear to behave differently than untagged whales. Hanson et al. (2008) observed a Cuvier's beaked whale with a young calf after tag loss, suggesting that tagging does not adversely affect reproduction.

After reviewing available information on the responses of large whales to both dart and suction-cup tagging procedures, we do not expect any mortality to occur due to the tagging under the proposed permit. Injury from the dart tags would be small and localized on the dorsal fin of targeted whales and is expected to heal completely and not result in any permanent scarring or other long-term physical damage. Rates of wound healing are expected to vary across regions and are not easily predicted in advance of the proposed tagging studies; however, photo monitoring would be conducted to determine healing or infection rates during the proposed study. Resighting of tagged whales is expected to occur multiple times during the year and cover a range of healing times.

Although tags have the potential to create hydrodynamic drag, which may have an effect on the tagged animal (Hooker et al. 2007), the proportion of the proposed tags to be used under permit 19091 relative to the size and weight of the targeted whales is such that the energetic demand on the animal would likely be insignificant. We also believe there is minimal risk of non-target whales being hit with a dart tag given the close proximity of researchers to the targeted whale, the experience of researchers in positioning the vessel around this species, and the very low likelihood that a non-target whale would surface between the vessel and the target animal during a tagging attempt. Some tags could fail soon after deployment (within 1-2 days) due to poor attachments, electronic failure due to impact, or damage to the electronics due to pressure from deep dives, resulting in an individual being retagged unintentionally in one year, but the retagging would not be expected to result in a different behavioral response.

Based on the evidence available, the experience of researchers, the proposed research protocol including the limited number of tags to be deployed, and the permit conditions to be implemented with the proposed tagging studies, we expect all whales tagged under permit 19091 would exhibit either no visible reaction or short-term behavioral responses to tagging. Strong behavioral responses, significant bleeding and infection are not expected during the proposed tagging studies. In a few individuals, we assume short-lived stress responses are possible as are short-term interruptions in behaviors such as foraging; however, we do not expect these responses to lead to reduced opportunities for foraging or reproduction for tagged individuals. Because any responses to tagging are expected to be short-lived and assuming an animal is no longer disturbed after it returns to its pre-tagging behavior, we do not expect a negative fitness consequence for the tagged individuals.

6.3.2.7 Sea Turtle Response to Capture and Holding

Capture and holding of sea turtles can result in raised levels of stress hormones. The harassment of individual turtles during capture and handling could disrupt their resting or foraging cycles. The main source of concern for capturing sea turtles is the risk of entanglement in nets or other gear used to capture the individuals; however, the researchers would not be permitted to perform net captures other than dip net and breakaway hoop net captures. Sea turtles would be captured as described in the description of the proposed action. The turtle would then be transferred to personnel on the boat to be processed. The capture methods are simple and not invasive. The turtles would be held in a manner to minimize the stress to them. NMFS does not expect that individual turtles would experience more than short-term stresses during this type of capture activity. No injury or mortality would be expected.

6.3.2.8 Sea Turtle Response to Measuring and Weighing

Handling, measuring, and weighing can result in raised levels of stress hormones in sea turtles. However, the procedures are simple and not invasive. NMFS expects that individual turtles would normally experience no more than short-term stresses as a result of these activities. No injury would be expected from these activities, and turtles would be measured and weighed as quickly as possible to minimize stresses resulting from their capture. The applicant would also be required to follow procedures designed to minimize the risk of either introducing a new pathogen into a population or amplifying the rate of transmission from animal to animal of an endemic pathogen when handling animals.

Given the precautions that would be taken by the researchers to ensure the safety of the turtles and the permit conditions relating to handling, NMFS expects that the activities would have minimal and insignificant effects on the animals. All animals would be handled with care, kept moist, protected from temperature extremes and later returned to the sea.

6.3.2.9 Sea Turtle Response to Flipper and PIT Tagging

Tagging activities are minimally invasive and all tag types have negative effects associated with them, especially concerning tag retention. Plastic tags can become brittle, break and fall off underwater, and titanium tags can bend during implantation and thus not close properly, leading to tag loss. Tag malfunction can result from rusted or clogged applicators or applicators that are worn from heavy use (Balazs 1999). Turtles that have lost external tags would be re-tagged if captured again at a later date, which subjects them to additional effects of tagging. Turtles would experience some discomfort during the tagging procedures, and these procedures would produce some level of pain. The discomfort would usually be short and highly variable between individuals (Balazs 1999). Most barely seem to notice, while a few others exhibit a marked response. However, NMFS expects the stresses to be minimal and short-term and that the small wound-site resulting from a tag would heal completely in a short period of time. Similarly, turtles that must be re-tagged would also experience minimal short-term stress and heal completely in a short period of time. Re-tagging would not be expected to appreciably affect these turtles. The proposed tagging methods have been regularly employed in sea turtle research with little lasting impact on the individuals tagged and handled (Balazs 1999).

Given the precautions that would be taken by the researchers to ensure the safety of the turtles and the permit conditions relating to handling, NMFS expects that the activities would have minimal and insignificant effects on the animals. All animals would be handled with care, kept moist, protected from temperature extremes and later returned to the sea.

6.3.2.10 Sea Turtle Response to Blood and Tissue Sampling

Taking a blood sample from the sinuses in the dorsal side of the neck is now a routine procedure (Owens 1999). According to Owens (1999), with practice it is possible to obtain a blood sample 95% of the time, and the sample collection time would be expected to be about 30 seconds in duration. Sample collection sites would be disinfected with alcohol or other antiseptic prior to sampling. Blood sampling volume would be conditioned to only allow a conservative amount of blood (conditioned in the permit) to be drawn.

NMFS expects that individual turtles would experience no more than short-term stresses during a tissue biopsy. NMFS expects that the collection of a tissue sample would not cause any additional significant stress or discomfort to the turtle beyond what was experienced during the other research activities. Sterile techniques would help prevent infection from pathogens. All tissue biopsy samples would be collected, handled, stored, and shipped in such a manner as to ensure human safety from injury or zoonotic disease transmission as well as provide for the protection of the sea turtles that are sampled.

6.3.2.11 Sea Turtle Response to Scute Sample Collection

NMFS does not expect that individual turtles would experience more than short-term stress during scute sampling. Scute sampling is a minimally invasive procedure that involves collecting a small amount of keratin from the outermost edge of the scutes of the carapace. Because the keratin layer has no nerve endings or blood vessels, scute scraping would not be expected to result in bleeding, discomfort or pain to the turtle.

6.3.2.12 Sea Turtle Response to Lavage and Fecal Sample Collection

This technique has been successfully used on several sea turtle species ranging in size from 25 to 115 inches curved carapace length. Many individual turtles have been lavaged more than three times without any known detrimental effect (Forbes 1999). Individuals have been recaptured from the day after the procedure up to three years later and they appear healthy and feed normally. Laparoscopic examination following the procedure has not detected any swelling or damage to the intestines. While individual turtles are likely to experience discomfort during this procedure, NMFS does not expect individual turtles to experience more than short-term stress. Injuries and mortalities are not anticipated.

6.3.2.13 Sea Turtle Response to Urine Sample Collection

Urine sample collection will be collected on an opportunistic basis and is not expected to adversely affect sea turtles. Researchers would not attempt to expel urine from captured sea turtles. Any discomfort experienced by the turtle would be temporary and would not have any lasting effects.

6.3.2.14 Sea Turtle Response to Instrumentation and Tagging

Transmitters attached to the carapace of turtles have the potential to increase hydrodynamic drag and affect lift and pitch (Watson and Granger 1998). It is possible that transmitter attachments would negatively affect the swimming energetics of the turtle. During a study of sonic-tracked turtles by Seminoff et al. (2002), green turtles returned to areas of initial capture, suggesting that the transmitters and the tagging experience left no lasting effect on habitat use patterns. In a study of video camera-equipped green turtles, telemetered turtles exhibited normal diving behavior, and sufficient swimming speeds (Seminoff et al. 2006). However, none of the instruments in the proposed research are as large as the video cameras, and so therefore, lesser potential impacts would be expected from the proposed action than from use of video cameras.

The short-term stresses resulting from transmitter attachment and tracking would be expected to be minimal and not add significantly to any stress that turtles have already experienced from capture or other the research activities. The permit would contain conditions to mitigate adverse impacts to turtles from the transmitters. Turtles would be satellite tagged as quickly as possible to minimize stresses resulting from the research. Total weight of any transmitter or tag attachment for any one turtle must not exceed 5% of the body mass of the animal. The attachment must be made so that there is minimal risk to the turtle of entanglement and the attachment is as hydrodynamic as possible.

Based on past experience with these techniques used by turtle researchers and the documented effects of transmitter attachments, we expect that the turtles would experience some small additional stress from attaching transmitters during this research, but turtles would not experience significant increases in stress or discomfort beyond what was experienced during capture and other research activities. The transmitters would not result in any serious injury. We expect that the transmitters would not significantly interfere with the turtles’ normal activities after they are released.

6.3.2.15 Sea Turtle Response to Ultrasound and Heart Rate Monitoring

Ultrasound and heart rate monitoring procedures would involve handling and restraint, as well as imaging with a device emitting sound pulses well above the levels audible to sea turtles. Handling was addressed separately (see Section 6.3.2.7) and we otherwise believe ultrasound and heart rate monitoring procedures will not have any more than short-term effects on sea turtles.

6.3.2.16 Sea Turtle Response to Oxytetracycline Injection

Tetracycline injections are performed in many species to establish tracers in bone growth so that once the animal dies, post-mortem procedures can determine the individual's growth rate (Coles et al. 2001). In addition, this antibiotic likely has a short term effect of boosting health by acting against many types of pathogenic bacteria, although a recent study showed significant bacterial resistance to oxytetracycline in sea turtles (Foti et al. 2009). A study of the pharmacokinetics of oxytetracycline in loggerhead sea turtles did not identify any negative effects (including lack of response at the injection site, food consumption, flipper movement, and activity) (Harms et al. 2004). However, a Kemp's ridley responded with skin exfoliation and ventral erythema after repeated injection; both conditions disappeared after oxytetracycline was discontinued (Harms et al. 2004). The applicant also indicates that oxytetracycline therapy, a treatment that involves more and higher doses than those proposed for Permit No. 19091, can result in anorexia, vomiting, or diarrhea, mild inflammation at the injection site, photosensitivity reactions, and staining of developing bones and teeth (an intended effect). To date, no indication of these adverse effects have been found by the applicant and we do not expect any to occur under the proposed permit.

6.3.2.17 Sea Turtle Response Cloacal and Buccal Swabbing

Swabbing is minimally invasive or opportunistic and not expected to adversely affect sea turtles. Any discomfort experienced by the turtle would be temporary and would not have any lasting effects.

6.3.2.18 Sea Turtle Response to Temporary Marking

Temporary marks would be non-toxic. Previous permit holders reported that temporary marks wore off of the shell within weeks and showed no evidence of any problems associated with it. NMFS does not expect that individual turtles would normally experience more than short-term stresses as a result of these activities. No injury is expected from this activity, and turtles will be marked as quickly as possible to minimize stress.

6.4 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 CFR 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.

The Southern and Indian Ocean portions of the action area is outside of territorial waters of the United States, which precludes the possibility of future state, tribal, or local action in the action area that would not require some form of federal funding or authorization. Therefore we limited our assessment of cumulative effects to the effects of future actions within the EEZ of the Pacific and Atlantic Oceans, specifically for the states of California, Oregon, Washington, Alaska, and Hawaii.

After reviewing available information, NMFS is not aware of effects from any additional future non-federal activities in the action area that would not require federal authorization or funding and are reasonably certain to occur during the foreseeable future.

6.5 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 6) to the environmental baseline (Section 5) and the cumulative effects (Section 6.4) to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a ESA-listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 0).

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

The NMFS Permits and Conservation Division proposes to issue a scientific research permit to the Southwest Fisheries Science Center authorizing studies on bowhead, sei, blue, fin, Southern right, North Pacific right, humpback, sperm, and Southern Resident killer whales, and olive ridley, green, leatherback, hawksbill, and loggerhead sea turtles in the Pacific, Atlantic, and Southern Oceans.

The *Status of listed resources* described the factors that have contributed to the reduction in population size for the listed species considered in this Opinion. Commercial whaling is a primary reason for the reduction in population size of cetaceans. Other worldwide threats to the survival and recovery of listed whale species include ship strike, entanglement in fishing gear, climate change, toxic chemical burden and biotoxins, and ship noise. Sea turtle populations have been affected by human-induced factors such as commercial fisheries, direct harvest, climate change, and modification or degradation of habitat.

NMFS expects that the current natural anthropogenic threats described in the *Environmental Baseline* will continue, including predation, disease and parasitism, commercial and subsistence harvest, fisheries interaction, ship strikes, contaminants, marine debris, noise, and habitat degradation and climate change, as well as ongoing scientific research. Reasonably likely future actions were described in the *Cumulative effects* section.

Cetaceans would be exposed to aerial and vessel surveys (including close approaches), skin and blubber biopsy, suction-cup and implantable tagging, and sloughed skin and feces collection. Sea turtles would be exposed to capture, handling, flipper tagging, blood and tissue collection, stomach contents collection by gastric lavage, and satellite tagging.

Each year of the five-year proposed permit, sei, blue, fin, Southern right, North Atlantic right, North Pacific right, humpback, Southern Resident killer whales, and Kemp's ridley, olive ridely, green, leatherback, hawksbill, and loggerhead sea turtles could be affected by this permit in the manner as described in Appendix A. However, the details of individual research cruises would vary from year to year, and it is not possible to further refine how many individuals would be affected by the proposed actions. Due to the high variability of the proposed activities, we do not believe that all proposed takes would occur in a given year.

For cetaceans, we believe short-lived stress responses due to close approach, skin and blubber biopsies, and suction-cup and implantable tagging are possible for a few individuals, as are short-term interruptions in behaviors such as foraging; however, we do not expect these responses to lead to reduced opportunities for foraging or reproduction for targeted individuals. Infection or disease transfer from biopsy procedures is unlikely given the practice of disinfecting biopsy tips. Injury from the dart tags would be small and localized on the dorsal fin of targeted whales and is expected to heal completely and not result in any permanent scarring or other long-term physical damage. Resighting and photo monitoring of biopsied or tagged whales (including after tag has detached) would add to our understanding of the effects of these actions. Overall, no individual whale is expected to experience a fitness reduction, and therefore, no fitness consequence would be experienced at a population or species level.

Due to the expected effectiveness of research protocols proposed by the applicant to minimize harm and special conditions placed on the permit, it is anticipated that the turtles would experience only short-term, non-lethal increases in stress during the research activities. The proposed research actions would not affect the turtles' ability to reproduce and contribute to the maintenance or recovery of the species. Turtles could experience some discomfort during research activity procedures. Based on past observations of similar research, these effects are expected to dissipate within approximately a day or so. Overall, no individual turtle is expected to experience a fitness reduction, and therefore no fitness consequence would be experienced at a population or species level.

Research activities could take place within designated critical habitat for Steller sea lions. However, the proposed research would not affect population ecology, or population dynamics of prey species, predators, or competitors of Steller sea lions. Therefore, the proposed permit is not likely to adversely modify or destroy critical habitat that has been designated for Steller sea lions.

7 CONCLUSION

After reviewing the current status of the ESA-listed species, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent actions and cumulative effects, it is NMFS's biological opinion that the proposed action is not likely to jeopardize the continued existence of Southern Resident killer whale, blue whale, fin whale, sei whale, humpback whale, southern right whale, sperm whale, North Atlantic right whale, North Pacific right whale, leatherback sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, olive ridley sea turtle, loggerhead sea turtle, and green sea turtle or to destroy or adversely modify Steller sea lion designated critical habitat.

8 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include 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. 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(b)(4) and 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.

As discussed in the Opinion, only the species targeted by the proposed research activities would be harassed as part of the intended purpose of the proposed action. Therefore, the NMFS does not expect the proposed action would incidentally take threatened or endangered species.

9 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 CFR 402.02).

- The Endangered Species Act Interagency Cooperation Division recommends that annual reports submitted to the Permits and Conservation Division require detail on the response of listed individuals to permitted activities. General comments on response can be informative regarding methodological, population, researcher-based responses in future consultations. The number and types of responses observed should be summarized and include responses of both target and non-target individuals. This will greatly aid in analyses of likely impacts of future activities.

In order for NMFS's 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.

10 Reinitiation of Consultation

This concludes formal consultation for NMFS Permits and Conservation Division's proposal to issue a scientific research Permit No. 19091 for research on ESA-listed whales and sea turtles. As 50 CFR 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 incidental take 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 considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the ESA-listed species or critical habitat that was not considered in this opinion, or (4) a new species is ESA-listed or critical habitat designated that may be affected by the action.

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12 APPENDICES

Appendix A. Authorized Annual Takes of Cetaceans and Sea Turtles under Permit No. 19091

Table A-1. Authorized Annual Takes of Cetaceans in the Atlantic Ocean from Florida to Maine, Caribbean Sea, and Gulf of Mexico.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[3]	Take Action	Observe/Collect Method	Procedures	Details
Whale, fin	Range-wide (NMFS Endangered)	All	5,000	Harass/Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal	Breath sample by UAS
		Calf	5			Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	For calves 6 months or older
		Adult/ Juvenile	50	Harass/Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	

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

Table A-1. Authorized Annual Takes of Cetaceans in the Atlantic Ocean from Florida to Maine, Caribbean Sea, and Gulf of Mexico.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[3]	Take Action	Observe/Collect Method	Procedures	Details
		All	5,000	Harass	Survey, aerial/vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	UAS
Whale, fin	Range-wide (NMFS Endangered)	Adult/ Juvenile	450	Harass/Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	
		Calf	50			Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	For calves 2 months or older
Whale, humpback	Range-wide (NMFS Endangered)	All	5,000	Harass/Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal	Breath sample by UAS
		Adult/ Juvenile	50		Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	

Table A-1. Authorized Annual Takes of Cetaceans in the Atlantic Ocean from Florida to Maine, Caribbean Sea, and Gulf of Mexico.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[3]	Take Action	Observe/Collect Method	Procedures	Details
Whale, humpback	Range-wide (NMFS Endangered)	Calf	5	Harass/Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	For calves 6 months or older
		All	5,000	Harass	Survey, aerial/vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL);	UAS
		Adult/ Juvenile	500	Harass/Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	
		Calf	75			Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	For calves 2 months or older
Whale, sperm	Range-wide (NMFS Endangered)	All	1,000	Harass/Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal	Breath sample by UAS

Table A-1. Authorized Annual Takes of Cetaceans in the Atlantic Ocean from Florida to Maine, Caribbean Sea, and Gulf of Mexico.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[3]	Take Action	Observe/Collect Method	Procedures	Details
Whale, sperm	Range-wide (NMFS Endangered)	Adult/ Juvenile	50	Harass/Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	
		Calf	5			Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	For calves 6 months or older
		All	1,000	Harass	Survey, aerial/vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry	
		Calf	25	Harass/Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	For calves 2 months or older
		Adult/ Juvenile	500			Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[4]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
Whale, blue	Range-wide (NMFS Endangered)	Adult/ Juvenile	75	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	
		Calf	15	1			Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	For calves 6 months or older
		Adult/ Juvenile	175	1			Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	
		Calf	25	1			Acoustic,passive recording; Incidental	For calves 2 months or older

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

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.								
Species	**Stock/Listing Unit**	**Life Stage**	**No. Authorized Takes[4]**	**Takes Per Animal**	**Take Action**	**Observe/ Collect Method**	**Procedures**	**Details**
							harassment; Photo-id; Sample, skin and blubber biopsy	
		All	1,000	1		Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal	Breath sample by UAS
		All	500	1	Harass	Survey, aerial/vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	UAS
		All	500	1	Harass	Survey, aerial/vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry	UAS; Indian Ocean
		Adult/ Juvenile	1,000	1	Harass/ Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Remote vehicle, aerial (VTOL); Sample, exhaled	Indian Ocean; Breath sample by UAS

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[4]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
							air; Sample, fecal	
		Calf	15	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	Indian Ocean; for calves 6 months or older
Whale, blue	Range-wide (NMFS Endangered)	Adult/ Juvenile	75	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	Indian Ocean
		Adult/ Juvenile	175	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	Indian Ocean

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[4]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
		Calf	25	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	Indian Ocean; for calves 6 months or older
		Adult/ Juvenile	25	6	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	Multiple biopsy sampling study
		All	1,000	1	Harass/ Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal	Breath sample by UAS
		All	500	1	Harass	Survey, aerial/vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	UAS
Whale, fin	Range-wide (NMFS Endangered)	Adult/ Juvenile	25	6	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber	Multiple biopsy sampling study

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[4]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
							biopsy	
		Adult/ Juvenile	20	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Photo-id; Sample, skin and blubber biopsy	
Whale, fin	Range-wide (NMFS Endangered)	Adult/ Juvenile	50	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	
		Calf	15	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	For calves 6 months or older
		Adult/ Juvenile	750	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id;	

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[4]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
							Sample, skin and blubber biopsy	
		Calf	75	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	For calves 2 months or older
		All	5,000	1	Harass/ Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal	Breath sample by UAS
		All	5,000	1	Harass	Survey, aerial/vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	UAS
Whale, humpback	Range-wide (NMFS Endangered)	Adult/ Juvenile	50	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample,	

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[4]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
							skin and blubber biopsy	
		Calf	15	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	For calves 6 months or older
		Adult/ Juvenile	500	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	
		Calf	75	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	For calves 2 months or older
		All	5,000	1	Harass/ Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id;	Breath sample by UAS

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[4]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
							Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal	
		All	5,000	1	Harass	Survey, aerial/vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	UAS
		Adult/ Juvenile	25	6	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	Multiple biopsy sampling study
Whale, killer	Eastern North Pacific Southern Resident Stock (NMFS Endangered)	Adult/ Juvenile	90	30	Harass	Survey, aerial/vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	30 UAS surveys per year of the population
		Adult/ Juvenile	25	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[4]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
		Calf	5	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	For calves 1 year or older
		All	50	1	Harass/ Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal	Breath sample by UAS
Whale, right, North Pacific	Range-wide (NMFS Endangered)	Adult/ Juvenile	15	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	
		Calf	4	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	For calves 6 months or older

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[4]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
		Adult/ Juvenile	25	1			Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	
		Calf	5	1			Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	For calves 2 months or older
		All	100	1	Harass/ Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal	Breath sample by UAS
			500	1	Harass		Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	UAS
Whale, right, southern	Range-wide (NMFS Endangered)	All	200	1	Harass/ Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id;	Breath sample by UAS

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[4]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
							Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal	
		Adult/ Juvenile	30	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	
		Calf	5	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	For calves 6 months or older
		All	1,000	1	Harass	Survey, aerial/vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	UAS

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	**Stock/Listing Unit**	**Life Stage**	**No. Authorized Takes**[4]	**Takes Per Animal**	**Take Action**	**Observe/ Collect Method**	**Procedures**	**Details**
Whale, sei	Range-wide (NMFS Endangered)	Adult/ Juvenile	25	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	
		Calf	15	1			Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	For calves 6 months or older
		Adult/ Juvenile	90	1			Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	
		Calf	10	1			Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	For calves 2 months or older

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[4]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
Whale, sei	Range-wide (NMFS Endangered)	All	1,000	1	Harass/ Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal	Breath sample by UAS
			250	1	Harass		Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	UAS
Whale, sperm	Range-wide (NMFS Endangered)	Adult/ Juvenile	50	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	
		Calf	5	1			Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	For calves 6 months or older

Table A-2. Authorize Annual Takes of Cetaceans in International and U.S. Waters of the Pacific Ocean, including Eastern Tropical Pacific and U.S. EEZ Waters, primarily CA, OR, WA, and HI.

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[4]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
Whale, sperm	Range-wide (NMFS Endangered)	Adult/ Juvenile	500	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	
Whale, sperm	Range-wide (NMFS Endangered)	Calf	25	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	For calves 2 months or older
Whale, sperm	Range-wide (NMFS Endangered)	All	5,000	1	Harass/ Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Remote vehicle, aerial (VTOL); Sample, exhaled air; Sample, fecal	Breath sample by UAS
Whale, sperm	Range-wide (NMFS Endangered)	All	2,000	1	Harass	Survey, aerial/vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	UAS

Table A-3. Annual Authorized Take of Adult, Subadult and Juvenile Sea turtles in the Pacific Ocean in U.S. and International Waters.

Species	Stock/Listing Unit	No. Animals	Take Action	Observe/Collect Method	Procedures	Details
Turtle, olive ridley sea	Range-wide (NMFS Threatened)	15	Capture/ Handle/ Release	Hand and/or Dip Net	Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Instrument, suction-cup attachment (e.g., camera); Lavage; Mark, flipper and PIT tag; Measure; Other; Photograph/Video; Sample: blood, cloacal swab, fecal, oral swab, scute scraping, and tissue; Ultrasound; Weigh	Other = tetracycline injection; urine sampling; Epoxy attachment TDR, integrated tag
		50			Instrument, suction-cup attachment (e.g., camera); Lavage; Mark, flipper and PIT tag; Measure; Other; Photograph/Video; Sample: blood, cloacal swab, fecal, oral swab, scute scraping, and tissue; Ultrasound; Weigh	Other = tetracycline injection; urine sampling
		235			Instrument, suction-cup attachment (e.g., camera); Mark, flipper and PIT tag; Measure; Other; Photograph/Video; Sample: blood, cloacal swab, fecal, oral swab, scute scraping, and tissue; Ultrasound; Weigh	Other = tetracycline injection; urine sampling
Turtle, green sea	Range-wide (NMFS Threatened)	10	Capture/ Handle/ Release	Hand and/or Dip Net	Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Instrument, suction-cup attachment (e.g., camera); Lavage; Mark, flipper and PIT tag; Measure; Other; Photograph/Video; Sample: blood, cloacal swab, fecal, oral swab, scute scraping, and tissue; Ultrasound; Weigh	Other = tetracycline injection; urine sampling; Epoxy attachment TDR, integrated tag

Table A-3. Annual Authorized Take of Adult, Subadult and Juvenile Sea turtles in the Pacific Ocean in U.S. and International Waters.

Species	Stock/Listing Unit	No. Animals	Take Action	Observe/Collect Method	Procedures	Details
		10			Instrument, suction-cup attachment (e.g., camera); Lavage; Mark, flipper and PIT tag; Measure; Other; Photograph/Video; Sample: blood, cloacal swab, fecal, oral swab, scute scraping, and tissue; Ultrasound; Weigh	Other = tetracycline injection; urine sampling
		40			Instrument, suction-cup attachment (e.g., camera); Mark, flipper and PIT tag; Measure; Photograph/Video; Sample: blood, cloacal swab, fecal, oral swab, scute scraping, and tissue; Ultrasound; Weigh	Other = tetracycline injection; urine sampling
Turtle, leatherback sea	Range-wide (NMFS Endangered)	10	Capture/ Handle/ Release	Net, breakaway hoop net	Instrument, suction-cup attachment (e.g., camera); Mark, flipper and PIT tag; Measure; Photograph/Video; Sample, blood, cloacal swab, fecal, oral swab, and tissue; Ultrasound; Weigh	Tissue sampling via biopsy pole; Other =; urine sampling;
Turtle, hawksbill sea	Range-wide (NMFS Endangered)	5	Capture/ Handle/ Release	Hand and/or Dip Net	Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Instrument, suction-cup attachment (e.g., camera); Lavage; Mark, flipper and PIT tag; Measure; Other; Photograph/Video; Sample, blood, cloacal swab; fecal, oral swab, scute scraping, and tissue; Ultrasound; Weigh	Other = tetracycline injection; urine sampling; Epoxy attachment TDR, integrated tag
		15			Instrument, suction-cup attachment (e.g., camera); Mark, flipper and PIT tag; Measure; Other; Photograph/Video; Sample, blood, cloacal swab; fecal, oral swab, scute scraping, and tissue; Ultrasound; Weigh	Other = tetracycline injection; urine sampling

Table A-3. Annual Authorized Take of Adult, Subadult and Juvenile Sea turtles in the Pacific Ocean in U.S. and International Waters.

Species	Stock/Listing Unit	No. Animals	Take Action	Observe/Collect Method	Procedures	Details
Turtle, loggerhead sea	Range-wide (NMFS Threatened)	20	Capture/ Handle/ Release	Hand and/or Dip Net	Instrument, epoxy attachment (e.g., satellite tag, VHF tag); Instrument, suction-cup attachment (e.g., camera); Lavage; Mark, flipper and PIT tag; Measure; Other; Photograph/Video; Sample, blood, cloacal swab, fecal, oral swab, scute scraping, and tissue; Ultrasound; Weigh	Other = tetracycline injection; urine sampling; Epoxy attachment TDR, integrated tag
		30			Instrument, suction-cup attachment (e.g., camera); Lavage; Mark, flipper and PIT tag; Measure; Other; Photograph/Video; Sample, blood, cloacal swab, fecal, oral swab, scute scraping, and tissue; Ultrasound; Weigh	Other = tetracycline injection; urine sampling
Turtle, loggerhead sea	Range-wide (NMFS Threatened)	650	Harass	Survey, aerial	Photograph/Video; Remote vehicle, aerial (VTOL)	
Turtle, green sea	Range-wide (NMFS Threatened)	200				
Turtle, leatherback sea	Range-wide (NMFS Endangered)	200				
Turtle, olive ridley sea	Range-wide (NMFS Threatened)	200				

Table A-3. Annual Authorized Take of Adult, Subadult and Juvenile Sea turtles in the Pacific Ocean in U.S. and International Waters.

Species	Stock/Listing Unit	No. Animals	Take Action	Observe/Collect Method	Procedures	Details
Turtle, hawksbill sea	Range-wide (NMFS Endangered)	50				

Table A-4. Annual Authorized Takes of Cetaceans in the Southern Ocean in International Waters

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[5]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
Whale, humpback	Range-wide (NMFS Endangered)	Adult/ Juvenile	100	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	
		Calf	10	1			Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	For calves 6 months or older
		Calf	100	1			Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	For calves 2 months or older
		Adult/ Juvenile	25	5			Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	Multiple biopsy sampling
		All	100	1	Harass/ Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Remote vehicle, aerial (VTOL); Sample,	Breath sample by UAS

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

Table A-4. Annual Authorized Takes of Cetaceans in the Southern Ocean in International Waters

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[5]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
							exhaled air; Sample, fecal	
		All	2,000	1	Harass		Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	UAS
Whale, sperm	Range-wide (NMFS Endangered)	Calf	10	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	For calves 2 months or older
		Adult/ Juvenile	20	1			Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, implantable (e.g., satellite tag); Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	
		Calf	10	1			Acoustic,passive recording; Incidental harassment; Instrument, dart/barb tag; Instrument, suction-cup (e.g., VHF, TDR); Photo-id; Sample, skin and blubber biopsy	For calves 6 months or older

Table A-4. Annual Authorized Takes of Cetaceans in the Southern Ocean in International Waters

Species	Stock/Listing Unit	Life Stage	No. Authorized Takes[5]	Takes Per Animal	Take Action	Observe/ Collect Method	Procedures	Details
		Adult/ Juvenile	50	1			Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	
		All	1,000	1	Harass/ Sampling	Survey, aerial/vessel	Acoustic,passive recording; Collect, sloughed skin; Incidental harassment; Photo-id; Sample, exhaled air; Sample, fecal	Breath sample by UAS
Whale, sperm	Range-wide (NMFS Endangered)	All	2,000	1	Harass	Survey, aerial/vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Photogrammetry; Remote vehicle, aerial (VTOL)	UAS
Whale, humpback	Range-wide (NMFS Endangered)	Adult/ Juvenile	200	1	Harass/ Sampling	Survey, vessel	Acoustic,passive recording; Incidental harassment; Photo-id; Sample, skin and blubber biopsy	For routine sampling and Level B activities

<u>Appendix B.</u> Requirements for Handling and Sampling Sea Turtles

Conditions have been included in the permit for research procedures that involve the handling and sampling of sea turtles. These conditions include requirements provided by a suite of expert veterinarians to minimize and mitigate potential impacts to the study animals. This information is being provided to help understand the permit requirements and standard veterinary protocols for sea turtles.

I. <u>Permit requirements for antiseptic practices and research techniques</u>

Measures required to minimize risk of infection and cross-contamination between individuals generally fall under the categories of clean, aseptic, and sterile techniques. Clean technique applies to noninvasive procedures that result in contact with skin or mucous membranes. Aseptic technique is used for brief, invasive procedures that result in any degree of internal contact, e.g. drawing blood. Sterile technique applies to longer invasive procedures, such as laparoscopy or surgery. Reusable instruments for procedures requiring aseptic or sterile technique should be sterilized by standard autoclave or cold sterilization procedures. Instruments that do not have internal contact, e.g. tagging pliers and PIT tag applicators, should be disinfected using a broadcidal solution and the product-recommended contact time between individuals.

<u>Clean technique:</u>

1. Routine hand washing or use of non-sterile disposable gloves.
2. Cleaning and disinfection of equipment between individuals.

<u>Aseptic technique:</u>

1. Disinfection of hands or use of new non-sterile disposable gloves (preferred)
2. Disinfection of the turtle's skin using a surgical scrub (e.g. betadine scrub or chlorhexidine gluconate)† followed by application of 70% alcohol (isopropyl or ethanol) (minimum requirement).*
3. Clean work area.
4. Use of sterile instruments or new disposable items (e.g. needles and punch biopsies) between individuals.

† Alcohol alone may be used in lieu of surgical scrub if necessary to avoid interference with research objectives, e.g. isotopic analysis.

*Multiple applications and scrubbing should be used to achieve thorough cleansing of the procedure site as necessary. A <u>minimum of two</u> alternating applications of surgical scrub and alcohol are to be used for PIT tag application sites and drilling into the carapace, due to potential increased risk of infection.

Sterile technique:

1. To be conducted in accordance with approved veterinary protocol that considers analgesia/anesthesia, use of antimicrobials, anticipated risks and response measures, and exclusionary criteria for animal candidacy.
2. Direct veterinary attendance
3. Disinfection of hands and use of sterile disposable gloves
4. Dedicated site (surgery room) or work area modified to reduce contamination
5. Surgical preparation of skin
6. Sterile instruments

Research Procedure	**Required Technique**
Handling, gastric lavage, and cloacal lavage	Clean technique
Tissue sampling (biopsy punch or comparable)	Aseptic technique
Blood sampling	Aseptic technique
PIT tagging	Aseptic technique; 2 applications of surgical scrub and alcohol
Flipper tagging	Aseptic technique
Carapace drilling for instrument attachment or bone biopsy	Aseptic technique; 2 applications of surgical scrub and alcohol
Bone biopsy (other than carapace)	Sterile
Laparoscopy (+/- biopsy)	Sterile
Large skin, muscle, fat biopsy, other tissue biopsy	Sterile

II. Minimum requirements for pain management and field techniques

Procedures used for sea turtle research include those anticipated to cause short term pain or distress, such as tagging, as well more invasive procedures where relatively longer periods of pain or discomfort may result. The minimum requirements below consider animal welfare and relative benefits and risks of different modes of pain management under field and laboratory conditions. Additional measures are encouraged whenever possible, including sedation or anesthesia for invasive procedures, e.g. laparoscopy, when release does not immediately follow the procedure and full recovery can be assessed.

Research Procedure	**Minimum Requirement**
Tissue sampling (biopsy punch or comparable)	None
Blood sampling	None
PIT tagging	Local anesthetic if <30 cm SCL
Flipper tagging	None
Carapace drilling for instrument attachment or bone biopsy	Systemic analgesic
Bone biopsy (other than carapace)	Local anesthetic and systemic analgesic
Laparoscopy	Local anesthetic and systemic analgesic
Laparoscopy biopsy	Local anesthetic, sedation, and systemic analgesic
Large skin, muscle, fat biopsy, other tissue biopsy	Local anesthetic and systemic analgesic

Procedures for handling and monitoring leatherbacks during leatherback capture-related work.

The following is the protocol for handling captured leatherback sea turtles. These protocols incorporate recommendations made by a panel of veterinarians that reviewed research procedures and participated in capture of leatherbacks in Monterey Bay using the hoop net methodology.

In order to improve monitoring of the animals during capture, and to improve basic understanding of the biology and medical status of leatherbacks, researchers must have a designated observer on each capture outing team. The records of this observer, captured on a "fill-in-the-blank" observation sheet, must be retained as part of each animal's permanent capture record. Whenever possible, this observer must be a veterinarian; however a dedicated observer with training in the techniques required for this position is also acceptable. In this case researchers shall attempt to have access to a veterinarian via cellular or radio as practicable in the case of emergency. Researchers must:

1. Upon capture, perform and record a gross examination, including assessment of body fat (subjective), activity, alertness, pre-existing injuries, weight, length.

2. Record respiratory rate over a 2 minute period logged every 20 minutes.

3. Record response to noxious stimuli (either hind end pinch or blink response) logged every 20 minutes

4. Record heart rate determined by digital or Doppler detection on femoral artery, ultrasound, rectal pulse oximiter, or EKG every 20 minutes

5. Record body temperature detected by anal probe inserted 15 cm and logged every 20 minutes.

6. Assure cooling by overseeing water running ambient seawater over the carapace and forelimbs during the time on deck.

7. Collect 2 tubes of clotted blood and urine or feces if possible.

8. Relate changes in the animal's condition to the chief scientist so that on-going assessment of the animal's condition can be made.

9. Include this information with the permit annual report.

The chief scientist for each outing must be trained by a veterinarian in the following information and procedures:

- Acceptable parameters for heart rate, respiration, temperature, and responsiveness. These parameters will likely be defined and refined by information collected during this project.

- Appropriate response to changes suggesting a need to abort further animal work and initiate release.

- Safe water reintroduction and monitoring of a turtle in possible distress.

- Appropriate first aid measures for animals in distress. These measures may include intubation, artificial respiration, and administration of pharmaceuticals to stimulate respiration and/or cardiac contraction.

Any animal deemed to be in distress at any time during the pre-capture period must be avoided.

In addition to animal monitoring, each outing must include an emergency field kit for intervention. This kit will be available to the field team veterinary observers or the chief scientist and include:

- Oxygen canister and a demand breathing valve
- Endotracheal tubes
- Oral speculum and appropriate sized blade
- K-Y jelly
- Betadine ointment
- Gauze sponges
- Medical tape
- Alcohol
- Needles and syringes (various sizes)
- Doxapram, Epinephrine, Lidocaine, Sodium Bicarbonate, Furosemide, and Dexamethasone sodium phosphate (as required shall be administered by a veterinarian, veterinarian technician, or supervision of a veterinarian)
- Saline solution