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NATIONAL MARINE FISHERIES SERVICE
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Environmental Assessment For Issuance of a Scientific Research Permit to the NMFS Pacific Islands Fisheries Science Center (File No. 15240) for Cetacean Research in the Pacific Ocean

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Abstract: The National Marine Fisheries Service (NMFS) proposes to issue a scientific research permit for takes of marine mammals in the wild, pursuant to the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 et seq.) and the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 et seq.). The permit would be valid for five years from the date of issuance and would authorize research on 27 cetacean species. The purpose of the research is to determine the abundance, distribution, stock structure, movement patterns, and ecological relationships of cetaceans occurring in U.S. and international waters of the Pacific Islands Region. Research methodologies include aerial and vessel surveys, photo-identification, acoustic recording, biological sample collection, and dart and suction cup tagging. Salvage and import/export of cetacean parts, specimens, and biological samples would also occur.

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1.0 PURPOSE OF AND NEED FOR ACTION

Proposed Action
NMFS proposes to issue a scientific research permit that authorizes "takes"[1] of marine mammals in the wild pursuant to the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 et seq.), the regulations governing the taking and importing of marine mammals (50 CFR Part 216), the Endangered Species Act of 1973 (ESA; 16 U.S.C. 1531 *et seq.*), and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR Parts 222-226) to:

- NMFS Pacific Islands Fisheries Science Center (PIFSC) (Responsible Party: Frank A. Parrish, Ph.D.; Principal Investigator: Erin Oleson, Ph.D.), Honolulu, Hawaii (File No. 15240).

Purpose of and Need for Action: The MMPA and ESA prohibit "takes" of marine mammals and of threatened and endangered species, respectively, with only a few specific exceptions. The applicable exceptions in this case are an exemption for *bona fide* scientific research under Section 104 of the MMPA and for scientific purposes related to species recovery under Section 10(a)(1)(A) of the ESA.

The purpose of the permit is to provide the applicant with an exemption from the take prohibitions under the MMPA and ESA for harassment (including level A and B harassment as defined under the MMPA[2]) of marine mammals, including those listed as threatened or endangered, during conduct of research that is consistent with the MMPA and ESA issuance criteria.

The need for issuance of the permit is related to the purposes and policies of the MMPA and ESA. NMFS has a responsibility to implement both the MMPA and the ESA to protect, conserve, and recover marine mammals and threatened and endangered species under its jurisdiction. Facilitating research about species' basic biology and ecology or that identifies, evaluates, or resolves specific conservation problems informs NMFS management of protected species.

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1 Under the MMPA, "take" is defined as to "harass, hunt, capture, kill or collect, or attempt to harass, hunt, capture, kill or collect." [16 U.S.C. 1362(18)(A)] The ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The term "harm" is further defined by regulations (50 CFR §222.102) as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns including breeding, spawning, rearing, migrating, feeding, or sheltering."
2 "Harass" is defined under the MMPA as "Any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing a disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but does not have the potential to injure a marine mammal or marine mammal stock in the wild (Level B harassment)."

Scope of Environmental Assessment: This EA focuses primarily on the effects of the proposed action on seven marine mammal species listed as threatened and endangered under the ESA, and one stock proposed for ESA listing, the Hawaiian insular false killer whale (*Pseudorca crassidens*).

The National Oceanic and Atmospheric Administration (NOAA) has, in NOAA Administrative Order 216-6 (NAO 216-6; 1999), listed issuance of permits for research on marine mammals and threatened and endangered species as categories of actions that "do not individually or cumulatively have a significant effect on the human environment..." and which therefore do not require preparation of an environmental assessment (EA) or environmental impact statement (EIS). A possible exception to the use of these categorical exclusions is when the action may adversely affect species listed as threatened or endangered under the ESA (NAO 216-6 Section 5.05c).

There is no evidence from prior analyses[3] of the effects of permit issuance, or from monitoring reports submitted by permit holders[4], that issuance of research permits for take of marine mammals listed under the ESA results in adverse effects on stocks or species. Nevertheless, NMFS has prepared this EA, with a more detailed analysis of the potential for adverse impacts on threatened or endangered species resulting from takes of a specified number of individual whales, to assist in making the decision about permit issuance under the MMPA and ESA.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

Alternative 1- No Action

Under the No Action alternative, Permit No. 15240 would not be issued and the applicant would not receive an exemption from the MMPA and ESA prohibitions against take.

Alternative 2 – Proposed Action (Issuance of permit with standard conditions)

Under the Proposed Action alternative, a five-year research permit would be issued for takes of 27 cetacean species during activities proposed by the applicant. Takes would also be authorized for five categories of unidentified cetaceans (dolphins, beaked whales, Mesoplodon spp., rorquals, and Kogia spp.) and one pinniped species (Hawaiian monk seal). The permit would include terms and conditions standard to such permits issued by NMFS.

The research activities as proposed by the applicant would include aerial surveys and close vessel approaches for: abundance and distribution surveys, behavioral observations, photo-identification, biopsy sampling, passive acoustic recordings, skin and fecal sample collection, and to attach instrumentation using suction cups or implanting darts. Import and export of

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3 Since 2005, NMFS has prepared over 100 EAs for issuance of permits under the MMPA and ESA. In every case, the EA supported a finding of no significant impact regardless of the nature of the permitted take or the status of the species that were the subject of the permit or batched permits. These EAs were accompanied by Biological Opinions prepared pursuant to interagency consultation under section 7 of the ESA and further document that such permits are not likely to adversely affect listed species. A listing of recently completed EAs is provided in Appendix A.

4 All NMFS permits for research on marine mammals require submission of annual reports, which include information on responses of animals to the permitted takes.

samples would also be authorized. No research-related mortalities would be authorized. Proposed species are listed in Appendix A; proposed take numbers are in the application.

The following is a summary of the applicant's request to take marine mammals, including those listed as threatened or endangered under the ESA.

Methods:
The research protocols are described in detail in the application on file for this action and are briefly summarized here. Proposed research would take place throughout the year, with the majority of effort likely to be around the Hawaiian Islands. Additional effort would occur near Palmyra, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands (CNMI), or in international waters throughout the Pacific Ocean.

Aerial surveys
Conventional line-transects would be flown at roughly 700 ft. altitude with an approximate airspeed of 165-175 km/hr, preferably using a twin-engine, high wing aircraft, to determine the distribution and abundance of dolphin and whale stocks. Aerial surveys would occur from the coast to 200 nmi offshore. The aircraft would circle high (500-1000 ft) over animals to confirm species identification and to estimate group size. The maximum amount of time spent with a group would be one hour.

Vessel surveys
Data would be collected during research vessel surveys using line-transect methodology to estimate population abundance by species/stock. The following methods (including the configuration of the large vessel observation platform) are designed to match those used by the NMFS Southwest Fisheries Science Center (SWFSC) to maximize the comparability of scientific data collected by both Centers, which have overlapping responsibilities for cetacean research in the Pacific.

Although procedures may vary slightly depending on the specific objective of the survey, in general, the following protocol would be used on PIFSC research vessel surveys:

- Large research vessel (224 ft NOAA ship *Oscar Elton Sette* or similar vessel) traverses predetermined randomly-placed systematic tracklines within the study area at a constant speed (usually 10 knots).
- Marine mammal observers stationed on the flying bridge deck of the vessel search the area from directly ahead to abeam of the ship using pedestal-mounted 25X150 binoculars.
- Data on sea state, visibility, glare, observer, etc. are recorded at regular intervals for subsequent distance sampling analysis.
- Depending on the species sighted and the data collecting priorities at the time, the vessel may turn off the trackline and approach marine mammals in order to confirm species identification and to make group size estimates. Approaches of cetaceans in the large vessel are conducted at the minimum speed needed to close the distance between the ship and the group of animals, typically 10 knots or less. Approaches would usually cease when the ship is within 300 meters of the school as researchers would try to avoid

disrupting the school or cause it to break into smaller groups. Approaches are from behind or from the side of animals.

Small boat research

Concurrent with visual observations from large vessels, 5-10 m rigid hull inflatable boats (RHIB) or fiberglass boats may be launched to collect biological samples (skin/blubber biopsy or sloughed skin, feces, or parts of salvaged animals found at sea) and digital photographs. Tagging activities may also be conducted from the small boats during vessel surveys. Small boat approaches would be conducted in a manner that minimizes boat noise, does not involve any sudden changes in speed or course, and approaches an animal from behind or from the side while not greatly exceeding the animal's travel speed. Time spent in the vicinity of target animals, as well as the number of attempts made, to collect photographs, biopsy samples or to deploy tags would be limited in order to minimize any incidental harassment or disturbance from the presence of the small boat or the activities themselves.

Small vessels would also be used year-round in coastal waters to conduct surveys. These visual surveys could be focused on determining species presence, collecting biopsy samples, tagging, and/or conducting photo-identification. In such cases, quantitative line transect methods may or may not be used.

Photo-identification

Photographs would be used to estimate abundance, document movements and scarring rates, and in some cases (e.g., spinner dolphins) estimate vital parameters such as survival and calving rates. Photo-identification studies are expected to be most useful for island-associated (or otherwise localized) stocks and migratory species exhibiting site fidelity. They are also used for stock identification.

Activities would primarily be conducted from small boats (5-10 m) with 120 hp to 150 hp four-stroke outboard engines either on an opportunistic basis during large vessel surveys or during small boat surveys off Hawaii, Palmyra, American Samoa, Guam, CNMI, or in international waters. Animals would be approached close enough to optimize photographic quality (i.e., well-focused images, utilizing at least one half of the slide viewing area) while approaching from behind at a consistent speed and avoiding sudden changes in speed or direction. Distances for optimal approach vary with the species being photographed. Generally, large whales would be approached within approximately 15-20 m. Smaller animals, such as delphinids, would be approached within approximately 5-10 m. Photographs of bow-riding animals would also be taken on an opportunistic basis from large or small vessels. As these animals approach the vessel on their own, researchers would maintain a consistent speed to avoid startling any animals.

Passive acoustic recordings

Various towed hydrophones arrays would be used to listen for and locate vocal cetaceans to increase encounter rate during large-scale vessel surveys. Arrays are typically towed at full ship speed (10 kts), though can remain in the water even at slower speed, down to 2 kts. All towed arrays would employ only passive listening. There are no active acoustic elements within the towed arrays. The towed array generally extends up to 300 m behind the vessel and is deployed

and retrieved using a hydraulic-powered winch aboard the ship. Arrays have from 2 to 5 hydrophone elements spaced to allow localization of most cetacean vocalizations.

Mitigation measures that would be implemented during Level B harassment activities:

- Potential disturbance from aerial surveys is minimized by flying at a constant speed and altitude.
- Aerial photographic passes would be limited in number to reduce the potential for harassment of individual animals.
- If an animal or group reacts behaviorally to the plane, researchers would move on to a different group of animals.
- Vessels approaches would be from behind or from the side of animals.
- Small boat approaches are conducted by specific crew members with extensive experience handling small boats around cetaceans during PIFSC research surveys.
- Small boat approaches would be conducted in a manner that minimizes boat noise, does not involve any sudden changes in speed or course, and approaches an animal from behind or from the side while not greatly exceeding the animal's travel speed.
- Time spent in the vicinity of target animals would be limited in order to minimize any incidental harassment or disturbance from the presence of the small boat or the activities themselves.
- Animals exhibiting aerial behaviors or tail slaps would not be approached.
- During photo-identification research, animals would be approached from behind at a consistent speed and avoiding sudden changes in speed or direction.
- Researchers would maintain a consistent speed to avoid startling any bowriding animals.
- Photo-identification would cease when clear photos have been obtained of all individuals present, or when excessive avoidance behavior is displayed by the group.
- Females accompanied by calves may be approached for photo-identification, but efforts would cease immediately if there is any evidence that the activity may be interfering with pair bonding, nursing, reproduction, feeding or other vital functions.

Level A harassment would occur during biopsy sampling and tagging activities. Level B harassment from vessel-based activities, as described above, would occur concurrently.

Biological sample collection

Biopsy samples would be collected using either a crossbow, adjustable-pressure modified air-gun, or pole during both small boat and large vessel surveys. Animals within approximately 5 to 30 m of the bow of the vessel or small boat would be targeted (Palsbøll et al. 1991). If animals ride the bow of the large vessel, samples would be obtained using a tethered biopsy dart. The PIFSC would use one of two basic configurations:

1. Tethered line: This technique is used for bow-riding dolphins. One end of a length of line is tied to a handrail on the ship and the other end is tied to the dart. The line is just long enough to go straight down to the water surface and back up. A metal washer is tied to the lower end to keep the line somewhat taught in case of wind. Most of the time, the dolphins are hit on the back close to the dorsal fin. Typically the dart bounces up and back or away from the dolphin. Occasionally a miss occurs and the dart goes down alongside the dolphin and passes behind it; the dart is retrieved via the tether and another

attempt is made. The SWFSC has biopsied thousands of dolphins from 15 or more species this way with no entanglements. Quite often sampled dolphins do not even leave the bow, or if they do, researchers often see them again a short time later.

2. Spooled line: A spool is attached to the crossbow and the other end of the line is attached to the dart. This set-up is most often used when attempting to sample large whales from a ship where dart retrieving is unfeasible. The line is light enough that it would be easily snapped by a large whale were it to become entangled, but the PIFSC has never seen an entanglement using this method.

In general, except for bowriders, the PIFSC prefers not to use tethered systems because the trajectory of a tethered dart is more easily affected by the wind but it can be useful at times.

For small cetaceans, the tissue sample is a small plug of skin and blubber, approximately 7mm in diameter and 20mm long. It is collected from the area behind the blowhole and in front of the dorsal fin. The depth of the biopsy tip is controlled by a cushioned stop (25mm in diameter) of neoprene vacuum hose encircling the biopsy head. Biological samples may be collected from small cetacean adults, juveniles and calves of one year or older. For large cetaceans, small samples (<1 gram) would be obtained from free-ranging individuals using a biopsy dart with a stainless steel tip measuring approximately 4 cm in length with an external diameter of 9mm and fitted with a 2.5 cm stop to ensure recoil and prevent deeper penetration (so that only 1.5cm of the tip is available to penetrate the animal). Between sample periods, the biopsy tips are thoroughly cleaned and sterilized with bleach. Biological samples may be collected from adults, juveniles and calves six months or older.

In addition to biopsy darts, sloughed skin and feces would be collected opportunistically using a net or sieve. Sloughed skin would also be collected when attached to a tag that has been retrieved.

Samples would initially be stored on ice, and then as soon as they are processed they would be stored in a cryovial and either stored immediately in a -80°C freezer, frozen in a cryovial with 90% ethanol in a -20°C until a -80°C freezer is available, or frozen in a cryovial which is placed in liquid nitrogen until a freezer is available or stored in DMSO. Labels with the field id would be put both on the outside of the vial and inside with the sample. The samples would then either be stored in the PIFSC genetics freezer, or sent to SWFSC for entry into their archive. If the samples are to be shipped they would be sent overnight in Styrofoam packaging with dry ice to keep the samples frozen.

Tagging

A number of tag types (e.g., VHF transmitting tags, time depth recorder (TDR) tags, acoustic recording tags, GPS-location tags, and satellite tags) would be used during both large vessel surveys and coastal small boat surveys. The two methods of attaching a tag to the animals are suction cup and darts/barbs. The choice of tag or tags would depend on the primary research question being addressed. Suction cup attached time-depth recorder tags, which generally fall off within 72 hours, would be used to study diving and foraging behavior. Satellite-linked

position and TDR tags would be used to study animal movements and behavior over a longer period of time.

Suction-cup tags: Each tag consists of one to six suction cups, attached to a syntactic foam housing (to float the package once it falls off). Attached to the foam would be a variety of sensors that collect data such as time, depth, temperature, light levels, acoustics, GPS locations during surface events, photographs, video, and a VHF transmitter. The size and dimensions of suction-cup attached tags vary by tag type, but representative sizes are listed here:

- Most tags (containing a time-depth recorder or a Mk10a fastloc GPS unit): measure approximately 33 cm x 12 cm x 3 cm, not including the VHF antenna, and weigh 0.45 kg.
- DTAGs: approximately 6 in x 3 in x 2 in with four, one-inch diameter suction cups.
- Bioacoustic Probes and Acousondes: 1.25 in diameter x 8.7 in long, and weighs 0.30g in air. Attached with two 2.5 in diameter suction cups.
- New hydrodynamic Acousonde: 8.8 in long, weighs 0.36kg in air, and contains the flotation and VHF transmitter within the tag body. Also attached with two 2.5 in diameter suction cups.
- Crittercam: tag (not including suction cup) is approximately 25 cm long by 6 cm in diameter and weighs about 0.8 kg (see Marshall et al. 2008). The suction cups for Crittercam tags may be either 23 cm in diameter (weighing 1.1 kg) or 16 cm in diameter (weighing 0.65 kg).

All of the suction-cup attached tags are slightly positively buoyant so they will float when they detach from an animal.

Suction cup attached tags would be applied to an individual animal using a long pole (4-7m) to press the suction cup(s) onto the skin of the animal during a surfacing series. Many of the species which would be suction-cup tagged during this project are small odontocetes that frequently bowride, and therefore are not actively approached by the vessel. For those species which do not typically bowride, the vessel would usually approach the target individual from behind and attempt to match the animals speed, closing to the length of the pole. Tags would be attached up high on the back around the dorsal area of the animal, and no attachments would be targeted forward of the pectoral fins. The suction cup-attached tags would generally remain attached for a few hours to a few days, and simply fall off the individual when they lose suction. The tags would then float to the surface and can be recovered by using the VHF signal emitted by the tag. Occasionally, skin samples would be attached to the tag when it is retrieved. These would be collected for analysis.

Dart/barb tags:
The Low Impact Minimally Percutaneous External-electronics Transmitter (LIMPET) tag (Andrews et al. 2008, Schorr et al. 2009), system would be used for satellite tagging. This system is currently in use by other researchers working with killer whales in Alaska and in the Antarctic, as well as beaked whales and several other species in the Bahamas. These tags have been successfully deployed by the PIFSC research team in collaboration with Cascadia Research Collective on 15 different species: bottlenose and Risso's dolphins; killer, short-finned pilot, false killer, melon-headed, pygmy killer, Cuvier's beaked, Blainville's beaked, sperm, sei, fin,

blue, minke, and humpback whales (under NMFS Scientific Research Permits No. 540-1811, 774-1714, 782-1719, 781-1824, and/or 731-1774).

The location-only tag body is dome-shaped in the current configuration (a Wildlife Computers Spot-5 PTT), approximately 6.3 cm in length, 3 cm in width, and 2.2 cm in height, with a 17 cm long antenna sticking out of the center of the half dome. In current configurations location-only satellite tags weigh 44-49 grams. The location-depth tag (Wildlife Computers Mk10a) is approximately 5.3 cm in length, 5.2 cm in width, and 2.4 cm in height and weighs 54-59 grams. As well as location, this tag allows for the collection of basic dive parameters including max depth and dive and surface interval and duration.

On the flat side (bottom) of the tag is the dart retention system. Currently this uses two medical-grade titanium darts, approximately 0.6 cm in diameter, with 3 to 6 backwards facing petals that act to anchor the tag. Alternative darts are under consideration and testing, including a hollow design with very small backward facing barbs. Dart length may vary by species; tags used on smaller species (e.g., bottlenose and Risso's dolphins) would have shorter dart lengths (~3.5 cm). Currently, the longest darts in use are 7 cm in length such that when the transmitter is deployed flush on the fin the backward facing petals will be located below the vertical sheath of the dorsal fin (the tissue layer with the greatest structural integrity) in order to provide the most secure anchoring.

Tags would be deployed with a pneumatic projector, a crossbow, or a pole, at distances from 2-30 m. The tag would be attached to an arrow using a holder and water-soluble tape which secures the tag to the arrow until contact with the whale is made. Upon impact with the whale, the arrow would most often immediately bounce free. In the few cases where the arrow holds on, it would generally separate from the tag upon submersion in the water. Tags are expected to stay attached for periods ranging from approximately 1-25 weeks and all release within a year. High resolution photographs would be taken of all tagged animals whenever possible for individual photo-identification (to assess population identity and for examining tag impacts), to confirm sex (e.g. with beaked whales), to document tag deployment location on the body and to document tag orientation (e.g., whether the tag is flush against the dorsal fin).

Figure 1. Photos: Left- Location-only satellite tag deployed on adult male short-finned pilot whale. (Cascadia Research). Right- Location-only satellite tag deployed on adult false killer whale. (PIFSC)

Mitigation measures that would be used during Level A harassment activities:

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

Import/Export

The PIFSC would be authorized to import/export/re-export biological samples collected during research activities. In addition, they would be authorized to import/export/re-export parts and specimens salvaged by them and biological samples or parts and specimens collected by other researchers. Such sample material would be archived and analyzed for information such as molecular genetics, life history, stable isotopes ratios and fatty acid composition.

Permit Duration:

The proposed permit would be valid for five years from the date of issuance, which is the maximum duration of an MMPA permit. A single one-year extension of the permit may be authorized and would be considered a modification, pursuant to NMFS regulations at 50 CFR §222.306.

If granted, a one-year extension of the permit would only authorize another full year of research that may result in the same kind of take. The extension would not change any other terms or conditions of the permit. NMFS does not consider a one-year extension of this nature to represent a substantial change to the proposed action that involves changes in environmental impacts. As such, NMFS would not prepare a supplemental EA for the one-year extension unless significant new information or circumstances relating to environmental impacts is available (e.g., a change in the status of the target species, listing of new threatened or endangered species in the project area).

3.0 AFFECTED ENVIRONMENT

Location

Research would occur in the central and western North Pacific Ocean, focused mainly on U.S. waters off: Hawaii, Palmyra, American Samoa, Guam, CNMI, Johnston Atoll, Kingman Reef, Howland Island, Baker Island, Jarvis Island, and Wake Island. State and international waters would also be surveyed.

Biological Environment

Target species/stocks:

NMFS is responsible for the conservation and recovery of most endangered and threatened marine mammals, and the PIFSC is responsible for conducting scientific research to conserve and recover the species found in the action area. The applicant's research would be directed at 27 species of cetaceans, including six species listed as endangered and one stock proposed to be listed as endangered. One pinniped species, the endangered Hawaiian monk seal (*Monachus schauinslandi)*, may be incidentally harassed as a result of the cetacean research. These species are considered part of the affected biological environment. Specific species that would be taken during the proposed action are listed in Appendix A. A brief description of the species and stocks targeted for research under the proposed action is below, summarized from NMFS Stock Assessment Reports (SARS); additional information on the status of these species can be found in the SARS and in the NMFS Recovery Plans for these species. All marine mammals stocks/species listed under the ESA are also considered depleted under the MMPA.

ESA-Listed Species

Blue whale *(Balaenoptera musculus):* Blue whales are found in oceans worldwide in sub-polar to sub-tropical latitudes. They follow a seasonal migration pattern between summering and wintering areas, but some evidence suggests that individuals remain in certain areas year-round. Although the extent of knowledge concerning distribution and movement varies by area and migratory routes are not well known, in general, distribution is driven largely by food requirements (NMFS 1998). Poleward movements in spring allow the whales to take advantage of high zooplankton production in summer. Movement toward the subtropics in the fall allows blue whales to use less energy while fasting, avoid ice entrapment in some areas, and engage in reproductive activities in warmer waters of lower latitudes (NMFS 1998). However, given the high productivity of the lower latitude areas and observations of blue whale feeding, blue whales can be assumed to feed year-round (NMFS 1998).

The primary and preferred diet of blue whales is krill. Although other prey species, including fish and copepods, have been mentioned in the scientific literature, they likely do not contribute significantly to the diet of blue whales.

For management purposes under the MMPA, blue whales inhabiting U.S. waters in the North Pacific are divided into two stocks: Central (formerly "Hawaiian") and Eastern.

Central Pacific stock
Blue whales belonging to the central Pacific stock appear to feed in summer southwest of Kamchatka, south of the Aleutians, and in the Gulf of Alaska (Stafford 2003; Watkins et al. 2000), and in winter they migrate to lower latitudes in the western Pacific and less frequently in the central Pacific, including Hawaii (Stafford et al. 2001). The only published sighting record of blue whales near Hawaii is that of Berzin and Rovnin (1966). Two sightings have been made by observers on Hawaii-based longline vessels (NMFS/PIR, unpublished data). Additional evidence that blue whales occur in this area comes from acoustic recordings made off Oahu and Midway Islands (Northrop et al. 1971; Thompson and Friedl 1982), which included at least some within the U.S. Exclusive Economic Zone (EEZ). The recordings made off Hawaii showed bimodal peaks throughout the year (Stafford et al. 2001), with central Pacific call types heard during winter and eastern Pacific calls heard during summer.

No estimate of abundance is available for the central Pacific blue whale stock (Carretta et al. 2011).

Eastern Pacific stock
This stock includes animals found in the eastern North Pacific from the northern Gulf of Alaska to the eastern tropical Pacific. This definition is consistent with both the distribution of the northeastern call type, photogrammetric length determinations and with the known range of photographically identified individuals. Some individuals may range as far west as Wake Island and as far south as the Equator (Stafford et al. 1999, 2001). The U.S. West Coast is one of the most important feeding areas in summer and fall, but, increasingly, blue whales from this stock have been found feeding to the north and south of this area during summer and fall. Most of this stock is believed to migrate south to spend the winter and spring in high productivity areas off Baja California, in the Gulf of California, and on the Costa Rica Dome. Some individuals from this stock may be present year-round on the Costa Rica Dome (Reilly and Thayer 1990).

Recent mark-recapture surveys for blue whales in this area yield a best estimate of abundance of 2,497 (Carretta et al. 2011). There is some indication that blue whales increased in abundance in California coastal waters between 1979/80 and 1991 (Barlow 1994) and between 1991 and 1996 (Barlow 1997). Although this may be due to an increase in the stock as a whole, it could also be the result of an increased use of California as a feeding area.

At least 9,500 blue whales were taken in the North Pacific between 1910 and 1965 by commercial whalers (Ohsumi and Wada, 1972). Approximately 3,000 of these were taken from the west coast of North America from Baja California, Mexico to British Columbia, Canada (Clapham et al. 1997, Rice 1974, Tonnessen and Johnsen 1982). Other takes may have been from the Central Pacific stock (Carretta et al. 2011).

The primary threats currently facing blue whales are vessel strikes and fisheries interactions, but also include anthropogenic noise, natural mortality, vessel disturbance, habitat degradation, and competition for prey resources. Between 2004-2008, there were five blue whale deaths resulting from ship strikes (Carretta et al. 2011). An additional eight unidentified whales are injured by ship strikes during that time. NOAA has implemented a mitigation plan in response to this growing threat.

False killer whale, Hawaiian Insular stock (*Pseudorca crassidens*): NMFS has proposed that the Hawaiian Insular stock of false killer whales is a distinct population segment and should be listed as endangered under the ESA. Thus, for this analysis will be treated as if it is listed under the ESA.

The species is a slender, large delphinid, with maximum reported sizes of 6 m for males and 5 m for females (Jefferson et al., 2008). Large individuals may weigh up to 2,000 kg. Little is known about the breeding behavior of false killer whales in the wild, but some information is available from false killer whales held in oceanaria (Brown et al. 1966). Gestation has been estimated to last 11 to 16 months, (Kasuya 1986; Odell and McClune 1999). Females with calves lactate for 18 to 24 months (Perrin and Reilly 1984). Estimated age at sexual maturity is about 8 to 11 years for females, while males may mature 8 to 10 years later (Kasuya, 1986). The maximum reported age has been estimated as 63 years for females and 58 years for males (Kasuya, 1986). Both sexes grow 40 to 50 percent in body length during their first year of life. Growth ceases between 20 and 30 years of age (Ferreira, 2008).

False killer whales are top predators, eating primarily fish and squid, but also occasionally taking marine mammals (see references in Oleson et al. 2010). False killer whales feed both during the day and night (Evans and Awbrey 1986; Baird et al. 2008a) and they can dive between 20 to 150 m looking for prey.

Within waters of the central Pacific, NMFS recognizes four stocks of false killer whales: the Hawaii insular stock, the Hawaii pelagic stock, the Palmyra Atoll stock, and the American Samoa stock (Carretta et al. 2011). Below are the most recent data for each stock.

Stock	Best population estimate	Population trend
Hawaiian insular	123	Statistically significant decline
Hawaiian pelagic	484	No data available
Palmyra Atoll	1329	No data available
American Samoa	87 – 1538 (plausible estimate)	No data available

The proposed research would result in takes of false killer whales from all four stocks. Because the Hawaiian insular stock is proposed to be listed as endangered under the ESA, takes of this stock would be separated out in the permit take table. The rest of this section will focus on this stock.

NMFS has determined that Hawaiian insular false killer whales are discrete from other false killer whales and are significant to the taxon based on genetic discontinuity and behavioral factors (the uniqueness of their behavior related to habitat use patterns).

Hawaiian insular false killer whales share a portion of their range with the genetically distinct pelagic population (Forney et al., 2010). Therefore, the 2010 Stock Assessment Report for false killer whales recognizes an overlap zone between insular and pelagic false killer whales between 40 km and 140 km from the main Hawaiian Islands based on sighting, telemetry, and genetic

data (based on justification in Forney et al. 2010; Carretta et al. 2011 as well as the original boundary recommendation of Chivers et al. (2008). Individuals utilize habitat overlaying a broad range of water depths, varying from shallow (<50m) to very deep (>4,000m) (Baird et al. 2010).

Hawaiian insular false killer whales are behaviorally unique because they are the only population of the species known to have movements restricted to the vicinity of an oceanic island group. This behavioral separation is supported by their linkage through a tight social network, without any linkages to animals outside of the Hawaiian Islands. Their habitat differs as well from other false killer whale populations because they are found primarily in island-associated waters that are relatively shallow and productive compared to surrounding oligotrophic waters. False killer whales are highly social mammals with long interbirth intervals and reproductive senescence suggesting transfer of knowledge is important to successfully persist in this unique Hawaiian habitat.

The calculated PBR for the insular stock is 0.61 animals per year (Caretta et al. 2010). The primary threats to insular false killer whales are the deep and shallow set long line fisheries with an estimated mortality or serious injury of 0.6 animals per year. Additional anthropogenic threats include habitat degradation and bioaccumulation of toxins.

Fin whale *(Balaenoptera physalus):* Fin whales are the second-largest species of whale, with animals in the Northern hemisphere having a maximum length of about 22 m. Fin whales occur in all major oceans worldwide, primarily in temperate to polar latitudes, and less commonly in the tropics. They occur year-round in a wide range of latitudes and longitudes, but the density of individuals in any one area changes seasonally.

During the summer, fin whales feed on krill, small schooling fish (e.g., herring, capelin, and sand lance), and squid by lunging into schools of prey with their mouth open, using their throat pleats to gulp large amounts of food and water, filtering out food particles using baleen plates on each side of the mouth. Fin whales fast in the winter while they migrate to warmer waters.

Fin whales seasonally migrate between temperate and polar waters (Perry et al 1999). In the North Pacific, the International Whaling Commission (IWC) recognizes two stocks of fin whales, the east China Sea stock and the rest of the North Pacific (Donovan 1991). For management purposes under the MMPA, three stocks of fin whales are recognized in Pacific U.S. waters: the California/Oregon/Washington stock, the Northeast Pacific (Alaska) stock, and the Hawaii stock.

California/Oregon/Washington stock: This stock is found along the U.S. west coast from California to Washington in waters out to 300 nmi. Because fin whale abundance appears lower in winter/spring in California (Dohl et al. 1983; Forney et al. 1995) and in Oregon (Green et al. 1992), it is likely that the distribution of this stock extends seasonally outside these coastal waters. The best available estimate of the stock's population size is 3,044 whales with a PBR of 16 whales (Carretta et al. 2011). Some data indicate that fin whales have increased in abundance in California coastal waters (Barlow 1994, 1997), but these trends are not significant. Ship

strikes average one serious injury or mortality each year. Fishery interactions may be approaching zero mortality and serious injury rate.

Northeast Pacific (Alaska) stock: Whales in this stock are found from Canadian waters north to the Chukchi Sea. Reliable estimates of current and historical abundance of fin whales in the entire northeast Pacific are currently not available. Based on surveys which covered only a small portion of the range of this stock, a minimum estimate of the size of the population west of the Kenai Peninsula is 5,700 with a PBR level of 11.4 whales (Allen and Angliss 2011). Data suggests that this stock may be increasing at an annual rate of 4.8 percent; however, this is based on uncertain population size and incomplete surveys of its range (Allen and Angliss 2011). Fishery interactions may threaten this stock but fishery-related mortality levels can be determined to have met a zero mortality and serious injury rate.

Hawaii stock: The best available abundance estimate for this stock is 174 whales based on a 2002 survey of the entire Hawaiian Islands EEZ (Barlow 2003) with a PBR of 0.2 whales per year (Carretta et al. 2010). Data is not available to determine a population trend for this stock. Insufficient information is available to determine whether the total fishery mortality and serious injury for fin whales is insignificant and approaching zero mortality and serious injury rate.

Commercial whaling for this species ended in the North Pacific Ocean in 1976. Other current threats not listed by stock include reduced prey abundance due to overfishing, habitat degradation, disturbance from low-frequency noise and the possibility that illegal whaling or resumed legal whaling would cause removals at biologically unsustainable rates. Of all species of large whales, fin whales are most often reported as hit by vessels (Jensen and Silber 2003).

Humpback whale *(Megaptera novaeangliae):* The humpback whale is a mid-sized baleen whale with a humped dorsal, long pectoral flippers and a distinctive individually identifiable ventral fluke pattern. They occur throughout the world's oceans, generally over continental shelves, shelf breaks, and around some oceanic islands (Balcomb and Nichols 1978; Whitehead 1987). Humpback whales exhibit seasonal migrations between warmer temperate and tropical waters in winter and cooler waters of high prey productivity in summer. They exhibit a wide range of foraging behaviors, and feed on many prey types including small schooling fishes, krill, and other large zooplankton.

Their summer range includes coastal and inland waters from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk (Tomlin 1967; Nemoto 1957; Johnson and Wolman 1984). Humpback whales also summer throughout the central and western portions of the Gulf of Alaska, including Prince William Sound, around Kodiak Island, and along the southern coastline of the Alaska Peninsula. Japanese scouting vessels continued to observe high densities of humpback whales near Kodiak Island during 1965–1974 (Wada 1980). In Prince William Sound, humpback whales have congregated near Naked Islands, in Perry Passage, near Cheega Island, in Jackpot, Icy and Whale Bays, in Port Bainbridge and north of Montague Islands between Green Island and the Needle (Hall 1979, 1982; von Ziegesar 1984; von Ziegesar and Matkin 1986). The few sightings of humpback whales in offshore waters of the central Gulf of

Alaska are usually attributed to animals migrating into coastal waters (Morris et al. 1983), although use of offshore banks for feeding is also suggested (Brueggeman et al. 1987).

Winter breeding areas are known to occur in Hawaii, Mexico, and south of Japan. Newborn and nursing calves with cows are seen throughout the winter and comprise 6-11% of all humpbacks sighted during aerial surveys. Humpbacks from the Mexican wintering grounds are found with greatest frequency on the central California summering ground (NMFS 1991). In the western Pacific, humpbacks have been observed in the vicinity of Taiwan, Ogasawara Islands, and Northern Mariana Islands (NMFS 1991).

Population estimates for the entire North Pacific increased from 1,200 in 1966 to 6,000-8,000 in 1992. More recently, photo-identification results from SPLASH, an international collaborative research program on the abundances, population structure, and potential human impacts on humpback whales in the North Pacific involving more than 50 research groups and 300 researchers, estimated the abundance of humpback whales in the North Pacific to be just under 20,000 animals (Calambokidis et al. 2008). The population is estimated to be growing six to seven percent annually (Calambokidis et al. 2008). The SPLASH study collected data from all known wintering and feeding areas for humpback whales in the North Pacific, and the data suggest the likely existence of missing wintering areas that have not been previously described. Humpback whales that feed off the Aleutians and in the Bering Sea were not well represented on any of the sampled wintering areas and must be going to one or more unsampled winter locations (Calambokidis et al. 2008).

Four management units of humpback whales are recognized within the North Pacific: the California/Oregon/Washington stock, the Central North Pacific Stock (with feeding areas from Southeast Alaska to the Alaska Peninsula), the Western North Pacific Stock (with feeding areas from the Aleutian Islands, the Bering Sea, and Russia), and the American Samoa Stock (with largely undocumented feeding areas as far south as the Antarctic Peninsula).

California/Oregon/Washington stock: this stock is defined as humpback whales that feed off the west coast of the United States. The winter migratory destination of this stock is primarily in coastal waters of Mexico and Central America. In the summer/fall, this stock migrates to the coast of California to southern British Columbia (Steiger et al. 1991; Calambokidis et al. 1993). The best available abundance estimate for this stock is 2,043 whales and appears to be increasing in abundance (Carretta et al. 2010). The estimated annual mortality and injury due to entanglement (3.2 whales/yr), other anthropogenic sources (zero), plus ship strikes (0.4) in California is less than the PBR allocation of 11.3 whales annually for U.S. waters. Recent studies indicate humpbacks are sensitive to anthropogenic noise in the mid-frequency range but the long term effects of this on the stock have yet to be determined.

Central North Pacific stock: These humpback whales spend winter/spring near the Hawaiian Islands. In summer the majority of whales from the central North Pacific stock are found in the Aleutian Islands, Bering Sea, Gulf of Alaska, and Southeast Alaska/northern British Columbia (Allen and Angliss 2010). In the SPLASH study sampling occurred on Kauai, Oahu, Penguin Bank (off the southwest tip of the island of Molokai), Maui and the island of Hawaii. From the SPLASH study estimates of abundance for Southeast Alaska/northern British Columbia ranged

from 2,883 to 6,414 (Allen and Angliss 2010). The stock appears to be increasing. It is impacted by fishery interactions (3.8 whales seriously injured or killed annually) and ship strikes (1.6 animals/year).

Western North Pacific stock: The western North Pacific Stock is referred to as the winter/spring population of Japan, the Philippines, and South China Sea. Individual movement information from the SPLASH study documents that Russia is likely the primary winter destination for whales in Okinawa and the Philippines, but also re-confirms that some Asian whales go to Ogasawara, the Aleutian Islands, Bering Sea, and Gulf of Alaska (Calambokidis et al. 2008). This minimum population estimate for this stock is 732 individuals and the PBR is calculated to be 2.6. Current data indicate the population size is trending upwards but no confidence limits are available. Fisheries interactions result in an annual mortality rate of 0.2 whales.

American Samoa stock: The IUCN defines the Oceania humpback whale subpulation as those animals that range throughout the South Pacific, except the west coast of South America, and from the equator to the edges of the Antarctic ice. Under the MMPA, NMFS recognizes a humpback whale stock that is present with the U.S. EEZ surrounding American Samoa. The minimum population estimate for this stock is 150 whales, which is the number of individual humpbacks identified in the waters around American Samoa between 2003-2008 by photo-identification (Carretta et al. 2010). No data are available on current population trend. This stock of humpback whales is migratory and thus, it is reasonable to expect that animals spend at least half the year outside of the relatively small American Samoa EEZ. Therefore, the PBR allocation for U.S. waters is half of 0.8, or 0.4 whales. No human-related mortalities of humpback whales have been recorded in American Samoan waters (Carretta et al. 2010).

North Pacific right whale *(Eubalaena japonica):* North Pacific right whales inhabit the Pacific Ocean, particularly between 20° and 60° latitude. Before commercial whalers heavily exploited right whales in the North Pacific, concentrations were found in the Gulf of Alaska, eastern Aleutian Islands, south central Bering Sea, Sea of Okhotsk, and Sea of Japan. Recently, there have been few sightings of right whales in the central North Pacific and Bering Sea. Sightings have been reported as far south as central Baja California in the eastern North Pacific, as far south as Hawaii in the central North Pacific, and as far north as the sub-Arctic waters of the Bering Sea and sea of Okhotsk in the summer (Herman et al. 1980, Berzin and Doroshenko 1982, Brownell et al. 2001). Since 1996, right whales have been consistently observed in Bristol Bay, southeastern Bering Sea, during the summer months. North Atlantic (*E. glacialis*) and Southern Hemisphere (*E. australis*) right whales calve in temperate coastal waters during the winter months; however, in the eastern North Pacific no such calving grounds have been identified (Scarff 1986).

The minimum estimate of abundance of North Pacific right whales is 17 based on photo-identification of uniquely identifiable individuals. An estimate of abundance is not yet available (Allen and Angliss 2011) nor is any information regarding population trends.

In the North Pacific, ship strikes and entanglements may pose a threat to right whales. However, because of the whales' rare occurrence and scattered distribution, it is impossible to assess the

impact of anthropogenic threats at this time. The reasons for the apparent lack of recovery for right whales in this region are unknown.

Sei whale *(Balaenoptera borealis):* Sei whales are widely distributed in all oceans, although this species is not found as far into polar waters as other rorquals (Gambell 1985). Several stocks of sei whales have been identified, but updated estimates of the number of sei whales worldwide are not available. Commercial whaling reduced sei whale numbers in the North Pacific from 42,000 whales to approximately 7,000 to 12,000 animals by 1974 (Tillman 1977). For management purposes, sei whales within the Pacific U.S. EEZ are divided into two discrete, non-contiguous areas: 1) waters around Hawaii, and 2) California, Oregon and Washington waters.

Eastern North Pacific stock: The IWC recognizes only one stock of sei whales in the North Pacific, but some evidence exists for multiple populations (Masaki 1977; Mizroch et al. 1984; Horwood 1987). Lacking additional information on sei whale population structure, sei whales in the eastern North Pacific (east of longitude 180°) are considered a separate stock for management purposes under the MMPA. The best abundance estimate for whales off the coasts of California, Oregon and Washington is 126 animals with an annual PBR level of 0.17 (Carretta et al. 2011). No population trend is available for this stock. The offshore drift gillnet fishery may threaten this stock but no mortalities or serious injuries have been reported. The current rate of sei whale ship strike deaths or injuries is zero; however, it is likely that some ship strikes are unreported.

Hawaii stock: Little information is known about animals in Hawaii waters. The best abundance estimate for whales off Hawaii is 77 animals with an annual PBR level of 0.1 (Caretta et al. 2010). No population trend is available for this stock. There have been no reported fishery related mortality or serious injuries of sei whales in the Hawaiian Islands EEZ and is not considered to be a significant concern. The increasing levels of anthropogenic noise in the marine environment is a concern and may have habitat associated impacts (Carretta et al. 2011).

Sperm whale *(Physeter macrocephalus):* Sperm whales inhabit all oceans of the world. They tend to occupy areas with a water depth of 600 m or more, and are uncommon in waters less than 300 m deep. They can be seen close to the edge of pack ice in both hemispheres and are also common along the equator, especially in the Pacific. Their distribution is dependent on their food source and suitable conditions for breeding, and varies with the sex and age composition of the group. Their migrations are not as predictable or well understood as migrations of most baleen whales. In some mid-latitudes, there seems to be a general trend to migrate north and south depending on the seasons, moving poleward in summer. However, in tropical and temperate areas, there appears to be no obvious seasonal migration.

Sperm whales are the largest of the odontocetes and the most sexually dimorphic cetacean, with males considerably larger than females. Sperm whales are deep divers and their principle prey is large squid, but they will also eat large demersal and mesopelagic sharks, skates, and fishes. The average dive lasts about 35 minutes and is usually down to 400 m, however dives may last over an hour and reach depths over 1,000 m.

It is estimated that at least 436,000 sperm whales were taken in the North Pacific during whaling operations between 1800 and the end of commercial whaling for this species in 1987 (Carretta et al. 2011). Today, sperm whales may be impacted by shipping traffic, noise disturbance, and fishing operations. Sperm whales have the potential to be harmed by ship strikes and entanglements in fishing gear, although these are not as great of a threat to sperm whales as they are to more coastal cetaceans. Disturbance by anthropogenic noise may prove to be an important habitat issue in some areas of this population's range, notably in areas of oil and gas activities or where shipping activity is high. Another potential human-caused source of mortality is from accumulation of stable pollutants (e.g. polycholorobiphenyls, chlorinated pesticides, polycyclic aromatic hydrocarbons, and heavy metals). Stable pollutants might affect the health or behavior of sperm whales.

Currently, no good estimate is available for the total number of sperm whales in the Pacific. For management purposes, sperm whales inhabiting U.S. Pacific waters have been divided into three stocks:

California-Oregon-Washington stock: Sperm whales are found year-round in California waters (Dohl et al. 1983; Barlow 1995; Forney et al. 1995), but they reach peak abundance from April through mid-June and from the end of August through mid- November (Rice 1974). They have been seen in every season except winter in Washington and Oregon (Green et al. 1992). The most precise and recent estimate of sperm whale abundance for this stock is 971 animals from the ship surveys conducted in 2005 (Forney 2007) and 2008 (Barlow 2010). Survey data from the last few decades indicate that sperm whale abundance has been variable and does not show obvious trends. The offshore drift gillnet fishery is the main fishing threat to this stock. One sperm whale died in Oregon in 2007 as a result of a ship strike (Carretta et al. 2011). The PBR for this stock is set at 1.5 whales per year.

North Pacific (Alaska) stock: This stock is distributed widely, with the northernmost boundary extending from Cape Navarin (62°N) to the Pribilof Islands (Omura 1955). Although females and young sperm whales were thought to remain in tropical and temperate waters year-round, Mizroch and Rice (2006) showed that there were extensive catches of female sperm whales above 50°N. Males are thought to move north in the summer to feed in the Gulf of Alaska, Bering Sea, and waters around the Aleutian Islands (Kasuya and Miyashita 1988). There are no available estimates of sperm whale abundance in Alaska waters. Consequently, the PBR for this stock is unknown. Potential entanglement in fishing gear is a growing concern for this stock as whales have been observed depredating in several commercial Alaskan fisheries.

Hawaiian stock: Summer/fall surveys in the eastern tropical Pacific show that although sperm whales are widely distributed in the tropics, their relative abundance tapers off markedly westward towards the middle of the tropical Pacific and tapers off northward towards the tip of Baja California. The best estimate for sperm whales occurring in U.S. waters of Hawaii is 6,919 (Barlow 2006); however, no population trend is available. The PBR for this stock is 15 animals per year. Commercial longline fisheries are a threat to this stock, though no serious injuries or mortalities of sperm whales were reported from 2004 to 2008 (McCracken and Forney 2010).

Hawaiian Monk Seal (*Monachus schauinslandi*): The Hawaiian monk seal is listed as endangered under the ESA and depleted under the MMPA, and is listed on CITES Appendix I. Hawaiian monk seals are distributed predominantly in six Northwestern Hawaiian Islands (NWHI) subpopulations at French Frigate Shoals, Laysan and Lisianski Islands, Pearl and Hermes Reef, and Midway and Kure Atoll. Small numbers also occur at Necker, Nihoa, and the main Hawaiian Islands (MHI). On average, 10-15% of the seals migrate among the NWHI subpopulations (Johnson and Kridler 1983; Harting 2002). Thus, the NWHI subpopulations are not isolated, though the different island subpopulations have exhibited considerable demographic independence. Observed interchange of individuals among the NWHI and MHI regions is rare, yet preliminary genetic stock structure analysis (Schultz et al. in prep.) suggests the species is appropriately managed as a single stock.

The best estimate of the total population size is 1,161 (Caretta *et al.* 2011). This is the sum of estimated abundance at the six main Northwest Hawaiian Islands subpopulations, an extrapolation of counts at Necker and Nihoa Islands, and an estimate of minimum abundance in the main Hawaiian Islands.

In the NWHI, the 2007 total of mean non-pup beach counts at the six main reproductive subpopulations is 68% lower than in 1958. On the other hand, the monk seal population in the main Hawaiian Islands and at Necker and Nihoa Islands suggest positive growth (Carretta et al. 2011). There are multiple sources of mortality and serious injury impending recovery of the species and include fisheries interactions (entanglement in active and ghost gear), food limitation, male aggression, shark predation and disease/parasitism (Carretta et al. 2011).

Non-ESA Listed Species

The remaining non-listed species marine mammals are from populations that are considered either stable or increasing in size. See Appendix A for a complete list of species. More information about each stock may be found in the respective SARS, which are available online at http://www.nmfs.noaa.gov/pr/sars/species.htm.

Non-Target Marine Animals

In addition to the Hawaiian monk seal, an assortment of sea birds, sea turtles, fish and invertebrates may be found in the action area during the proposed research. However, merely being present does not mean a marine organism will be affected by the proposed action. Research would be directed only at marine mammals, and thus is not expected to affect non-target marine animals. For these reasons, the effects on non-target species are not considered further.

Biodiversity and Ecosystem Function

The proposed action is directed at marine mammals and does not interfere with benthic productivity, predator-prey interactions or other biodiversity or ecosystem functions. Marine mammals would not be removed from the ecosystem or displaced from habitat, nor would the permitted takes affect their diet or foraging patterns. Further, the proposed action does not involve activities known or likely to result in the introduction or spread of non-indigenous species, such as ballast water exchange or movement of vessels among water bodies. Thus, effects on biodiversity and ecosystem function would not be considered further.

Ocean and Coastal Habitats
The action area includes a variety of designated critical habitat, however the proposed action is directed at marine mammals and would not affect habitat. It does not involve alteration of substrate, movement of water or air masses, or other interactions with physical features of ocean and coastal habitat. Thus, effects on habitat are not considered further.

Unique Areas
Research may be conducted in the marine portion of several sanctuaries, monuments, and marine protected areas located within the action area and include:

- Papahānaumokuākea Marine National Monument
- Hawaiian Islands Humpback Whale National Marine Sanctuary
- Rose Atoll Marine National Monument
- Fagatele Bay National Marine Sanctuary
- Line Islands Marine National Monument,
- Marianas Trench Marine National Monument
- Palmyra Atoll National Wildlife Refuge
- Wake Atoll National Wildlife Refuge
- Mariana Arc of Fire National Wildlife Refuge
- Kingman Reef National Wildlife Refuge
- Pacific Remote Islands Marine National Monument
- Johnston Atoll National Wildlife Refuge

Essential fish habitat (EFH) designated for various species of fish, which includes hard and soft bottom substrates is also located throughout the action area. The proposed action is directed at marine mammals and does not alter or affect unique areas, including any components of EFH.

Historic Places, Scientific, Cultural, and Historical Resources
There are no districts, sites, highways or structures listed in or eligible for listing in the National Register of Historic Places in the action area. The proposed action represents non-consumptive use of marine mammals and does not preclude their availability for other scientific, cultural, or historic uses, including subsistence harvest by Alaskan Natives. Thus, effects on such resources will not be considered further.

Social and Economic Resources
The proposed action does not affect distribution of environmental burdens, access to natural or depletable resources or other social or economic concerns. It does not affect traffic and transportation patterns, risk of exposure to hazardous materials or wastes, risk of contracting disease, risk of damages from natural disasters, food safety, or other aspects of public health and safety. Thus, effects on such resources will not be considered further.

4.0 ENVIRONMENTAL CONSEQUENCES

Effects of the No Action Alternative
There are no direct or indirect effects on the environment from not issuing the permit. The takes of marine mammals, including those listed as threatened or endangered, resulting from the applicant's research would not be exempted. It is unlikely the applicant would conduct the research in the absence of a permit, because to do so would risk sanctions and enforcement actions.

Effects of the Proposed Action Alternative
Under this alternative, the permit would be issued with standard permit conditions. The permit would exempt takes for cetacean research, as described in the permit application. Much of the research would be stock assessment surveys, which are mandated by the MMPA. See the application for specific take numbers requested.

The PIFSC has not previously held a scientific research permit for cetacean research. In the past, scientists working at the NMFS laboratories in Hawaii were considered part of the SWFSC. In 2003, NMFS established the PIFSC. Until now, cetacean research continued to be conducted under the SWFSC's permits (File Nos. 774-1714 and 14097). The PIFSC is requesting their own MMPA/ESA permit, so that they directly oversee research in the waters for which they have jurisdiction. Thus, the research is not new, even though this would be the first permit issued to the PIFSC for cetacean research. The SWFSC and PIFSC will continue to collaborate and coordinate so that research is not duplicative and does not unnecessarily result in additional takes of animals.

Although an EA has not been previously prepared for the PIFSC's cetacean research, the methodologies proposed by the PIFSC are standard research techniques and have been analyzed in numerous EAs. For example, EAs were prepared for both SWFSC permits and subsequent major amendments (See Appendix B for relevant EAs). In addition, EAs were recently prepared for Dr. Robin Baird (Permit No. 15330) and the NMFS National Marine Mammal Laboratory (Permit No. 14245). All of these covered the same activities, species, and many of the same locations that would be authorized by the PIFSC permit. Each of these EAs concluded with a Finding of No Significant Impact (FONSI).

Overall, it is expected that research activities may result in short-term behavioral responses by individuals, but would not be expected to result in stock- or species-level effects.

An ESA Section 7 consultation was conducted on the effects of issuance of take exemptions for the proposed research. As a result of the consultation, the Biological Opinion determined that the proposed research is not likely to jeopardize the continued existence of any ESA-listed species or species proposed to be listed, or likely destroy or adversely modify designated critical habitat. Furthermore, the Biological Opinion states that while short-term behavioral interruptions are possible and some animals may experience stress responses, the response are not expected to lead to reduced opportunities for foraging or reproduction. No individual animal is expected to experience a fitness reduction, thus no fitness consequence would be experienced at a population or species level.

The issue most relevant to this analysis is the potential for negative impacts on the target species. It is important to recognize that an adverse effect on a single individual or a small group of animals does not translate into an adverse effect on the population or species unless it results in reduced reproduction or survival of the individual(s) that causes an appreciable reduction in the likelihood of survival or recovery for the species. In order for the proposed action to have an adverse effect on a species, the exposure of individual animals to the research activities would first have to result in:

- direct mortality,
- serious injury that would lead to mortality, or
- disruption of essential behaviors such as feeding, mating, or nursing, to a degree that the individual's likelihood of successful reproduction or survival was substantially reduced.

Subsequently, mortality or reduction in the individual's likelihood of successful reproduction or survival would then have to result in a net reduction in the number of individuals of the species. In other words, the loss of the individual or its future offspring would not be offset by the addition, through birth or emigration, of other individuals into the population. That net loss to the species would have to be reasonably expected, directly or indirectly, to appreciably reduce the likelihood of both the survival and recovery of the listed species in the wild.

Level B harassment, as defined by the MMPA, would occur during large and small vessel surveys, photo-identification activities, passive acoustic recordings, and aerial surveys. Level B harassment may also occur concurrently with those research activities that result in Level A harassment (see below). The effects of closely approaching cetaceans have been analyzed in multiple EAs (see Appendix B for examples). In the EA for the SWFSC's previous permit it was determined that close vessel and aerial approaches could lead to disturbance of marine mammals, but reactions are generally short-term and of a low impact and not likely to disrupt the migration, breathing, nursing, feeding, breeding, or sheltering behavior of marine mammals (NMFS 2004). The research proposed by the PIFSC would not be expected to have any additional effects that were not analyzed in previous EA's.

Behavioral responses would be expected to vary from no response to diving, tail slapping, or changing direction. With experienced boat drivers, any potential effect of vessel approach should be short-lived and minimal. These short-term behavioral responses would not likely lead to mortality, serious injury, or disruption of essential behaviors such as feeding, mating, or nursing, to a degree that the individual's likelihood of successful reproduction or survival would be substantially reduced. Annual reports submitted by the SWFSC, which include research conducted by PIFSC staff, indicate that conduct of activities resulting in Level B harassment have not lead to mortality, serious injury, or disruption of essential behaviors such as feeding, mating, or nursing.

During aerial surveys, animals may respond to changes in engine pitch or shadows projected by the aircraft by diving rapidly. However, in most cases the animals sampled show almost no reaction to the aircraft and any response lasts only seconds. The PIFSC provided the following description of the levels of response and how often they occur for small cetaceans:

Level 1: A few animals look up as the aircraft passes (40%)
Level 2: A few animals look up, small section of the school briefly accelerates as the plane passes over (35%)
Level 3: School briefly accelerates and portion of the school changes course then school returns to polarized swimming (13%)
Level 4: School swims faster (not running just travelling speed) (10%)
Level 5: School accelerates rapidly to a full run and then slows after aircraft passes (2%)
Level 6: School panics and cows with calves may separate (0.00%)

The permit, if issued, would contain conditions requiring the PIFSC to retreat from animals if behaviors indicate the approach may be interfering with reproduction, pair bonding, feeding, or other vital functions.

Level A harassment, as defined by the MMPA, would occur during biopsy sampling and tagging activities, when physical contact is made that has the potential to injure animals. The chance of injury or mortality would be minimized by the PIFSC's methodologies (see Section 2) and by conditions of the permit limiting how sampling and attachment of tags may occur, such as avoiding sensitive areas of the body. The actual biopsy or tagging events are short-lived and relatively non-invasive. SWFSC and PIFSC researchers agree that a majority of reactions to biopsy and tagging events fall into Levels 0-3 as defined below, and they state that they have never witnessed a reaction as strong as Level 6, nor do they expect to given their proposed protocols.

Level 0: no response
Level 1: slight response- animal looks at vessel
Level 2: animal responds with slight direction change, change in dive time
Level 3: immediate but short-lived reaction- jump, tail slap, tail flick
Level 4: repeated tail flick or tail swish, attempts by a whale to shield a calf from vessel
Level 5: sustained behavioral response, abandonment of a previously frequented area
Level 6: severe, prolonged reaction, risk of mother-calf separation

Biopsy sample collection
Biopsy sampling has been used extensively worldwide and is a common and widely accepted method for obtaining tissue samples, especially because the unequivocal value of molecular genetic tools and analyses has been recognized (Noren and Mocklin 2011). The reactions of cetaceans to biopsy sampling have been studied for several species (see Lambertsen 1987, International Whaling Commission 1991, Brown et al. 1991, Weinrich et al. 1991, Weinrich et al. 1992, Clapham and Mattila 1993, Brown et al.1994, Cockcroft 1994, Jahoda et al. 1996, Weller et al. 1997, Gauthier and Sears 1999, Hooker et al. 2001, Krützen et al. 2002, Jahoda et al. 2003, Best et al. 2005). Potential impacts from biopsy sampling and tagging may include behavioral disturbance, injury or infection. Disturbance may result from the biopsy itself or from the approach of the small boat. The most common reactions to biopsy sampling and tagging have been reported to include no reaction, a flinch or startle, or a tail flick and/or a rapid dive. During past research conducted by the SWFSC and PIFSC, reactions by individuals of various species to biopsy sampling generally have been low-level and short-lived, ranging from no

visible response to a "startled" reaction sometimes followed by an animal swimming away or diving; individual animals were more likely to respond to the approach of the small boat than to the biopsy itself. Bowriding dolphins sampled from the main research vessel often continue to ride the bow after the biopsy sample has been collected. In the applicant's experience, individual animals are more likely to respond to the approach of the small boat than to the biopsy itself.

The potential for serious injury and/or long-term effects on individuals from remote biopsy sampling is considered minimal. As with any instance where the dermis is penetrated, there is the possibility of infection associated with biopsy sampling. However, no evidence of infection has been seen at the point of penetration or elsewhere among the many whales re-sighted in days following the taking of a biopsy sample. There have been no documented cases of infection or injury to large whales resulting from biopsies, including well-monitored populations with repeatedly observed identified individuals.

The biopsy darts would not contain any hazardous materials, and the penetration depth of the dart relative to the blubber depth, and the mitigation measures employed to prevent deeper penetration, make it highly unlikely that serious injury would occur to target individuals. Wounds heal quickly in cetaceans (Weller et al. 1997, Krützen et al. 2002, Parsons et al. 2003). In addition to naturally occurring coloration patterns, the marks used to identify individuals include healed wounds from predation attempts (see Heithaus 2001*a* for a review of predator interactions), inter- and intra-species interactions, barnacles, remora, entanglement, and vessel interactions. In Shark Bay, Australia, approximately 74% of non-calf bottlenose dolphins had shark bite scars (Heithaus 2001*b*). A permit application for capture of bottlenose dolphins in the Indian River Lagoon, Florida, indicated that wounds from the collection of a full-thickness skin and blubber wedge biopsy approximately 5 cm length x 3 cm width typically heal in 14-30 days. No known morbidity or mortality has been associated with these procedures as described (G. Bossart, Permit No. 14352). Biopsy samples collected in the proposed action would be approximately 9 mm in diameter and 4 cm in depth from large whales and 7 mm in diameter and 20 mm in depth from small cetaceans; these relatively small wounds would be expected to heal in a similar or faster time frame.

Small cetaceans less than one year of age and large whales less than six months of age would not be biopsy sampled. Females with calves would be sampled.

In the two decades that the SWFSC (including PIFSC staff) has been collecting biopsy samples, no known instance of an injury to a marine mammal has occurred and no entanglements have resulted from using tethered biopsy darts. Bearzi et al. (2000) reported the death of a common dolphin following penetration of a biopsy dart and subsequent handling. The authors concluded that the biopsy dart did not produce a lethal wound, but that the biopsy darting and subsequent handling, perhaps in combination with potential pre-existing health conditions of the animal, produced physical and/or physiological consequences that were fatal to the animal. There is no evidence that the biopsy procedure or associated boat approaches, if conducted responsibly and by experienced individuals, has any significant impact on cetacean populations. Studies to date indicate no long-term consequences on survival, return rates, or fecundity.

Summary of effects of biopsy sample collection

The proposed activities would not be expected to result in more than short-lived, minimal harassment of individual animals of any age class or sex. No serious injury or mortality would be expected from these activities. Vessel collision during research is not likely to occur given the nature of the proposed activities, the researchers' experience in maneuvering boats around cetaceans, and the mitigating measures in the permit. Mitigating measures would also reduce the level of harassment to sensitive groups such as females with calves and repeated harassment of animals during all activities.

The proposed activities would not be expected to reduce the reproductive fitness or success of any cetacean. Re-sightings of sampled animals suggest that animals would not significantly alter their range or habitat use and that any wounds at the biopsy site would heal over time, resulting in no long-term adverse effects to individual health. The proposed biopsy activities would not likely lead to serious injury, mortality, or disruption of essential behaviors such as feeding, mating, or nursing, to a degree that the individual's likelihood of successful reproduction or survival would be substantially reduced; therefore no stock- or species-level effects would be expected.

Tagging

The potential effects of tagging cetaceans would be mitigated by the PIFSC's methodologies (see Section 2) and conditions that would be placed in the permit. All tag types that the PIFSC proposes to use were fully analyzed in the EAs for the SWFSC (Permit No. 14097), Baird (Permit No. 15330) and NMML (Permit No. 14245) (Appendix B). A brief discussion follows:

In addition to the potential for behavioral responses to close approach (described above), potential effects to individuals targeted for tagging include behavioral responses to attachment of the tag, increased hydrodynamic drag, and the possibility for infection at the attachment site of tags that break the skin.

Suction cup tags are considered to have minimal physical risk. They do not penetrate the skin and do not remain on the animal for very long. The primary effect of applying a suction cup tag to an animal is expected to be the behavioral reaction to the boat approach and attachment. Suction-cup attached tags elicit mild, low-level reactions and have proved to be effective for short-term deployments on larger species, such as blue whales (Oleson et al 2007), fin whales (Giard and Michaund 1997, Goldbogen et al 2006), gray whales (Malcolm et al. 1996), humpback whales (Stimpert et al. 2007, Goldbogen et al 2008), Hector's dolphins (Stone et al. 1994), beluga whales (Lerczak et al. 2000), killer whales (Baird 1994), beaked whales (Hooker et al. 2001) and long-finned pilot whales (Baird et al. 2002) but less effective with smaller odontocetes such as Dall's porpoise (Hanson and Baird 1998) and bottlenose dolphins (Schneider et al. 1998).

The dart, or LIMPET, tags proposed by the PIFSC have been safely and successfully deployed on beaked whales (Baird et al. 2008a, Schorr et al. 2009), sperm whales (Schorr et al. 2007), fin whales (Schorr et al unpublished)), pilot whales (Andrews et al. 2011), melon-headed whales (Schorr et al. 2009) and false killer whales (Baird et al. 2008b). Behavioral reactions of 14 cetacean species to dart-tagging activity carried out from 2006-2009, are summarized below (Baird, unpublished data). The few short term strong reactions lasted less than 15 minutes and

no significant long term individual reactions were documented in post-tagging observations of over 40 individuals.

Table 2. Reactions to satellite and VHF dart-tagging by species, 2006 - 2009. Reaction levels follow Weinrich et al. (1992) and Berrow et al. (2002).

Species (N)	No Reaction # (%)	Low Level (e.g. slight acceleration) # (%)	Moderate (e.g. Fast dive, tail flick, acceleration) # (%)	Strong (e.g. several tail flicks, breaches) # (%)
Short-finned pilot whale (40)	0 (0)	1 (3)	38 (95)	1 (3)
False killer whale (23)	2 (9)	0 (0)	21 (91)	0 (0)
Melon-headed whale (13)	0 (0)	0 (0)	13 (100)	0 (0)
Pygmy killer whale (4)	0 (0)	0 (0)	4 (100)	0 (0)
Killer whale (9)	1 (11)	2 (22)	6 (67)	0 (0)
Risso's dolphin (2)	0 (0)	1 (50)	1 (50)	0 (0)
Bottlenose Dolphin (1)	0 (0)	0 (0)	0 (0)	1 (100)
Blainville's beaked whale (11)	0 (0)	0 (0)	11 (100)	0 (0)
Cuvier's beaked whale (8)	0 (0)	0 (0)	8 (100)	0 (0)
Sperm whale (12)	0 (0)	2 (17)	10 (83	0 (0)
Fin whale (16)	7 (44)	4 (25)	5 (31)	0 (0)
Minke whale (1)	0 (0)	0 (0)	0 (0)	1 (100)
Blue whale (3)	1 (33)	1 (33)	1 (33)	0 (0)
Humpback whale (1)	0 (0)	1 (100)	0 (0)	0 (0)
Total (144)	11 (7.6)	12 (8.3)	118 (81.9)	3 (2.1)

Additional risks from tagging include infection and interruption of blood flow to the tagged area of the body. A review of 17 LIMPET tagging events of four species of Hawaiian odontocetes, including false killer whales was conducted by Hanson (2008). Analysis of photographs collected post tagging, indicate that long term effects are scarring along with some tissue inflammation. There was no indication of infection or necrosis as expected based on prior studies of cetacean skin healing processes (Bruce-Allen and Geraci, 1985, Geraci and Bruce-Allen 1987). The wounds associated with tagging fell within the range of naturally sustained tissue damage from sources such as cookie cutter sharks, remoras, con-specifics etc., which are commonly documented in healthy, reproductive cetaceans. (McSweeney et al., 2007, Walker and Hanson 1999, McCann 1974, Heithaus 2001). Additionally, a known successfully reproducing female false killer whale lacking a dorsal fin has been observed in Hawaiian waters (Baird and Gorgone, 2005).

Although the proposed dart tags would be shed into the ocean and are unlikely to be recovered, given the very small amount of debris they would represent and the fact that they do not contain any highly dangerous or radioactive materials, NMFS does not expect them to have any significant effect on the environment.

Summary of effects of biopsy sample collection

There is no evidence that responses of individual whales to tagging would exceed short-term stress and discomfort. No long-term effects would be anticipated. Tagging activities would not be expected to have any additional effects that were not analyzed by previous EAs. The short-term behavioral responses that might result from research activities would not likely lead to mortality, serious injury, or disruption of essential behaviors such as feeding, mating, or nursing, to a degree that the individual's likelihood of successful reproduction or survival would be substantially reduced. In addition, conditions and mitigation measures would be placed in the permit to further limit the potential for negative effects from these activities.

Controversy

Federal agencies are required to consider "the degree to which effects on the quality of the human environment are likely to be highly controversial" when evaluating potential impacts of a proposed action. [40 CFR §1508.27] The application for the proposed permit was made available for public review and comment (76 CFR 78890, December 20, 2011). No substantive public comments were received.

The application was also sent to the Marine Mammal Commission (MMC) for review at the same time as the comment period, pursuant to 50 CFR §216.33 (d)(2). The MMC recommended issuance of the permit with the following caveats.

That NMFS condition the permit to:

- require the Center to minimize disturbance of the subject animals by exercising caution when approaching animals, particularly female/calf pairs, and stopping an approach if any evidence indicates that the activity is interfering with female/calf behavior, feeding, or other vital functions;
- allow tagging of females with all but neonate calves (e.g., calves with fetal folds) and require the Center to make observations sufficient to detect possible short and long-term effects of biopsy sampling and tagging and report the effort made and the information collected to the Service; and
- ensure that activities to be conducted under this permit and those of other permit holders who might be conducting research on the same species in the same areas are coordinated and, as possible, data and samples shared.

The permit will contain conditions to minimize disturbance and to require annual reporting of activities. The take table clearly lists which age groups, by species, the PIFSC will be allowed to tag and biopsy sample. The permit also contains conditions that require PIFSC to notify the Pacific Islands Region so that they can coordinate researchers; another condition recommends that permit holders coordinate with each other.

The MMC also said that NMFS should verify the experience of each co-investigator and condition the permit to allow them to oversee certain procedures (e.g., biopsy sampling, suction-cup tag deployment, dart tag deployment) only if they have demonstrated proficiency with those procedures. The PIFSC has provided CVs or resumes for all of their co-investigators (CIs) and, based on the individual's experience, have designated which activities each CI will be authorized to conduct. Future CIs would be added to the permit in a similar manner.

Lastly, the MMC wanted to make sure that NMFS notified the PIFSC that they may need:

- to obtain permits under the Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora prior to importing or exporting parts from marine mammals listed in the Convention's appendices; and
- to consult with the relevant entity (e.g., National Marine Sanctuary, National Ocean Service, Marine National Monument) and obtain any required permits prior to conducting the proposed activities in a sanctuary or monument.

The permit includes a condition that states that the PIFSC must obtain all local, state, and federal permits and authorizations. Furthermore, the cover letter of the permit will contain reminders about CITES and other authorizations.

Cumulative Effects

Cumulative effects are defined as those that result from incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (federal or nonfederal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time.

Cetaceans in the proposed study areas are regularly exposed to human activities, including entanglement in fishing gear; vessel activity including whale watching; and anthropogenic noise from vessels, military and industrial activities. A summary of the identified anthropogenic activities that may impact whales and dolphins is presented here to assess the potential for cumulatively significant impacts resulting from the proposed action. Impacts may be chronic as well as sporadic effects like behavioral changes that can stress the animal and ultimately lead to increased vulnerability to parasites and disease. The net effect of disturbance is dependent on the size and percentage of the population affected, the ecological importance of the disturbed area to the animals, the parameters that influence an animal's sensitivity to disturbance or the accommodation time in response to prolonged disturbance (Geraci and St. Aubin 1980).

Considering the nature of the proposed research activities, the minimal, temporary harassment that target animals would experience, the mitigation measures that would be employed, and that these types of research activities are not novel in the marine environment, the proposed research would contribute a negligible increment over and above the effects of the baseline activities currently occurring in the marine environment where the proposed research would occur.

The following activities have been identified as factors that may impact cetaceans.

Entanglement: Because cetacean distribution overlaps with fishing areas, gear entanglements can occur and cause death by drowning or serious injuries such as lacerations, which in turn can lead to severe infections. Entanglement in fishing gear and ghost gear has been a concern for multiple species in the action area. Furthermore, the number of deaths attributed to fishing gear interactions may be grossly underestimated. In many cases, veterinarians and researchers are unable to determine a cause of death from a carcass. Another possibility is that some whales become entangled, drown, and fail to resurface, so their carcasses are never recovered and examined.

Ship strikes and noise: In addition to fishing vessels, cetaceans in the study area face traffic from a variety of other vessels, including commercial shipping, whale watching, ferry operations, and recreational boats. Vessels have the potential to affect marine mammals through their physical presence and activity and the increased underwater sound levels generated by boat engines.

Vessel strikes are rare, but do occur and can result in injury or death. Many types and sizes of vessels have been involved in ship strikes, including container/cargo ships/freighters/tankers, steamships, U.S. Coast Guard (USCG) vessels, U.S. Navy vessels, cruise ships, ferries, recreational vessels, fishing vessels, whale watching vessels, and other vessels (Jensen and Silber 2003). Vessel speed (when recorded) at the time of a large whale collision has ranged from two to 51 knots (Jensen and Silber 2003).

Harassment from whale-watching is not regulated by permits, nor are the effects monitored. The growth of whale watching during the past two decades has meant that whales in some areas (Hawaii, Puget Sound, Monterey Bay) are experiencing increased exposure to vessel traffic and sound. This brings added risk for vessel strikes, displacement from habitat and interference with social interaction and communication (Kovacs and Innes 1990; Kruse 1991; Wells and Scott 1997; Samuels and Bejder 1998; Bejder et al. 1999; Colborn 1999; Cope et al. 1999; Mann et al. 2000; Samuels et al. 2000; Boren et al. 2001; Constantine 2001; Nowacek et al. 2001). Not only do greater numbers of boats accompany the whales for longer periods of the day, but there has also been a gradual lengthening of the viewing season in some areas. Federal regulations, prohibiting approaches to humpback whales within 100 yards, are established for Hawaii and Alaska. NMFS has developed viewing guidelines for all marine mammal species for the Alaska, Northwest, Southwest, and Pacific Islands regions.

There is evidence that anthropogenic noise has substantially increased the ambient level of sound in the ocean over the last 50 years (Andrew et.al. 2002, McDonald et.al. 2006). Much of this increase is due to increased shipping activity, industrial activity and military operations. Some individuals or populations are regularly exposed to natural and anthropogenic sounds and may tolerate, or have become habituated to, certain levels of exposure to noise (Richardson 1995). The net effect of disturbance is dependent on the size and percentage of the population affected, the ecological importance of the disturbed area to the animals, and their behavioral plasticity (Geraci and St. Aubin 1980).

The military uses acoustics to test the construction of new vessels as well as for naval operations, and has recently requested MMPA 101(a)(5)(A) authorization for activities in the Gulf of Alaska Temporary Maritime Activities Area and Northwest Training Range Complex; as well as having been issued Incidental Harassment Authorizations (IHAs) for training activities in their Hawaii Range Complex, Southern California Range Complex, and Mariana Islands Range Complex.

In some areas where industrial and commercial activity takes place, noise originates from the construction, operation, and vessel and aircraft support. Many researchers have described behavioral responses of marine mammals to sounds produced by helicopters and fixed-wing aircraft, boats and ships, as well as dredging, construction, and geological explorations (Richardson 1995; Nowacek et.al. 2007). Most observations have been limited to short-term

behavioral responses, which included cessation of feeding, resting, or social interactions. Several studies have demonstrated short-term effects of disturbance on humpback whale behavior (Hall 1982; Baker et al. 1983; Krieger and Wing 1984; Bauer and Herman 1986, Miller et.al. 2000), but the long-term effects, if any, are unclear or not detectable. Actions such as repair of bridges and ports, as well as explosive removal of structures have been analyzed previously and been found to have a negligible impact on the marine mammal stocks.

Contaminants: Human actions, such as emitting discharge from wastewater facilities, dredging, ocean dumping and disposal, aquaculture, and coastal development are known to have deleterious impacts on marine mammals and their prey's habitat, ultimately affecting the animals themselves as they are bioaccumulated. Point source pollutants from coastal runoff, at sea disposal of dredged material and sewage effluents, oil spills, as well as substantial commercial and recreational vessel traffic and impacts of fishing operations continue to negatively affect marine mammals in the proposed action areas.

Climate Change: The extent to which climate and/or ecosystem changes impact the target cetacean species is largely unknown. However, NMFS recognizes that such impacts may occur based on the biology, diet, and foraging behavior of dolphins and whales. Inter-annual, decadal, and longer time-scale variability in climate can alter the distribution and biomass of prey available to large whales. The effects of climate-induced shifts in productivity, biomass, and species composition of zooplankton on the foraging success of planktivorous whales have received little attention. Such shifts in community structure and productivity may alter the distribution and occurrence of foraging whales in coastal habitats and affect their reproductive potential as well. Similar shifts in prey resources could likewise impact large whales if climate change alters the density, distribution, or range of prey.

Incidental Harassment Authorizations: In addition to scientific research permits, NMFS issues Letters of Authorization (LOAs) and IHAs under the MMPA for the incidental take of marine mammals. NMFS has issued nine IHAs, seven rulemakings, and nine LOAs for the take of multiple target species in the action area.

Other Scientific Research Permits and Authorizations: Some species and locations within the proposed study area (e.g., humpback whales in Hawaii) are the focus of a high level of research effort. This is due, in part, to intense interest in developing appropriate management and conservation measures to recover these species. Given the number of permits, associated takes and research vessels and personnel present in the environment, repeated disturbance of individual animals is likely to occur in some instances, particularly in coastal areas (due to the proximity to shore). It is difficult to assess the effects of such disturbance. However, NMFS has taken steps to limit repeated harassment and avoid unnecessary duplication of effort through permit conditions requiring coordination among permit holders. NMFS expects that the temporary harassment of individuals would dissipate within minutes, and therefore animals would recover before being targeted for research by another Permit Holder. NMFS would continue to monitor the effectiveness of these conditions in avoiding unnecessary repeated disturbances.

On the other hand, the PIFSC also plans to conduct surveys in remote parts of the Pacific, where few, if any, researchers are authorized to work. In these regions there is no chance of repeated harassment as the PIFSC would be the only group collecting data.

A total of 13 permits authorize the harassment of one or more of the cetacean or pinniped species targeted or incidentally taken in the proposed action area (Appendix C). Nearly all the permits authorize a smaller study area or region within the Pacific Ocean basin, reducing the chance of repeated harassment of individual whales by researchers. Most of this research does not overlap in area or timing. However, some spatial overlap exists for research on species with known feeding or breeding grounds, such as humpback whales. The majority of the takes authorized by these permits are for Level B harassment that would result in no more than disturbance to the target species.

A couple of the permits are currently operating under a one-year extension (Appendix C); an extension does not authorize additional takes of the target species but allows researchers to use authorized takes remaining from the last year of the permit for an additional 12 months or until the remaining takes have been exhausted, whichever occurs first. Several of the active permits would expire before Permit No. 15240 can be issued. NMFS expects that some researchers, such as NMFS Science Centers, which are mandated to assess the status of U.S. marine mammal stocks, will request new permits, or renewals, to continue their work once the current permit expires. NMFS cannot predict with certainty the level of take of each species that may be requested in the future but, conservatively, expects the amount of future research to be similar to or slightly greater than current levels as interest in marine conservation, biology, and management of these species grows.

In addition to the scientific research permits, three Letters of Confirmation (LOC) under the General Authorization have been issued for at least one of the target or incidentally taken species; these LOCs confirm that the research would result in no more than Level B harassment of non-ESA marine mammals.

None of the active research permits or GA's authorize activities likely to result in the serious injury or mortality of any animal. Further, no such incidences have been reported by permitted cetacean researchers. Therefore, the number of takes proposed by the PIFSC is not expected to result in a significant adverse impact on the target species. In addition, all permits issued by NMFS for research on protected species, including the proposed permit, contain conditions requiring the Permit Holders to coordinate their activities with the NMFS regional offices and other Permit Holders conducting research on the same species in the same areas. The permit condition also states that, to the extent possible, Permit Holders should share data to avoid unnecessary duplication of research and disturbance of animals.

In general, harassment of marine mammals during permitted research has not been shown to result in long-term or permanent adverse effects on individual animals, regardless of the number of times the harassment occurs. The frequency and duration of the disturbance under the proposed permit would allow adequate time for animals to recover from adverse effects such that additive or cumulative effects of the action on its own are not expected.

No measurable effects on population demographics are anticipated because any sub-lethal (disturbance) effects are expected to be short-term, and the proposed action is not expected to result in mortality of any animals. There exists the possibility that adverse effects on a species could accrue from the cumulative effects of a large number of permitted takes by harassment relative to the size of a population. However, there is no evidence that current or past levels of permitted takes have resulted in such species level effects.

It is also important to note that many of the target whales are migratory and may transit in and out of U.S. waters and the high seas. NMFS does not have jurisdiction over the activities of individuals conducting field studies in other nations' waters, and cumulative effects from all scientific research on these species across the proposed action area cannot be fully assessed. However, where possible, NMFS attempts to collaborate with foreign governments to address management and conservation of these trans-boundary ESA-listed species.

Summary of Cumulative Effects

There may already be significant adverse impacts on marine mammals from the existing levels of human activities. However, the relative incremental effect of the proposed action would not be significant. The proposed takes of specified numbers of marine mammals by harassment during the life of the permit are not likely to contribute to collectively significant adverse impacts on marine mammal stocks or species, including those listed as threatened or endangered. The effects of the takes would be transitory and recoverable, associated with only minor and short-term changes in the behavior of a limited number of individual marine mammals.

Although the effects of repeated or chronic disturbance from scientific research activities should not be dismissed, the potential long-term benefits and value of information gained on these species also must be considered. The proposed research would provide valuable information on these species' biology and ecology that in turn may be used to improve their management and reduce the effects of human activities on these populations.

5.0 MITIGATION MEASURES

There are no additional mitigation measures beyond those that are part of the applicant's protocols or conditions that would be required by permit, as discussed in the description of the Proposed Action Alternative. The applicant's protocols are incorporated into the permit by reference.

In summary, the permit conditions limit the level of take as described in the take table and require notification, coordination, monitoring, and reporting. Although injury and mortality are not expected, if they occur due to authorized the authorized actions, the permit contains measures requiring researchers to cease activities until protocols have been reviewed and revised with NMFS.

Review of monitoring reports of previous permits for the same or similar research protocols indicate that these types of mitigation measures are effective at minimizing stress, pain, injury, and mortality associated with takes.

6.0 LIST OF PREPARERS AND AGENCIES CONSULTED

Agencies Consulted
Marine Mammal Commission

Prepared By
This document was prepared by the Permits and Conservation Division of NMFS' Office of Protected Resources in Silver Spring, Maryland.

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APPENDIX A: Target and Non-target Species

Target Species: Non- ESA Listed	
Dolphin, bottlenose	Whale, killer (excluding SRKW)
Dolphin, common, short-beaked	Whale, Longman's beaked
Dolphin, Fraser's	Whale, melon-headed
Dolphin, pantropical spotted	Whale, minke
Dolphin, Risso's	Whale, pilot, short-finned
Dolphin, rough-toothed	Whale, pygmy killer
Dolphin, spinner	Whale, pygmy sperm
Dolphin, striped	Whale, unidentified Kogia
Dolphin, unidentified	Whale, unidentified rorqual
Whale, Blainville's beaked	Whale, unidentified beaked
Whale, Bryde's	Whale, unidentified Mesoplodon
Whale, Cuvier's beaked	
Whale, dwarf sperm	
Whale, false killer	

Target Species: ESA Listed or Proposed for Listing (*)	
Whale, blue	Whale, North Pacific right
Whale, false killer*	Whale, sei
Whale, fin	Whale, sperm
Whale, humpback	

Non-target Species: ESA Listed
Seal, Hawaiian monk

APPENDIX B: Recent Environmental Assessments for Marine Mammal Research Permits

NMFS Permits Division has prepared EAs with Findings of No Significant Impact (FONSI) for issuance of permits to conduct research on the listed and proposed for listing species, as well as for issuance of permits to conduct tagging studies on numerous species of marine mammals. Those EAs were prepared to take a closer look at potential environmental impacts of permitted research on marine mammals listed as threatened or endangered, and not because the Permits Division determined that significant adverse environmental impacts were expected or that a categorical exclusion was not applicable. As each EA demonstrates, and each FONSI has documented, research on marine mammals generally does not have a potential for significant adverse impacts on marine mammal populations or any other component of the environment.

The NEPA documents that contain analyses relevant to the proposed action include:

- *Supplemental Environmental Assessment on the Effects of Issuance of a Scientific Research Permit Amendment for Research on the Eastern North Pacific Southeren Resident Killer Whale (Orcinus orca) Permit No. 781-1824-02 (NMFS 2011)*

  The NMFS Northwest Fisheries Science Center (NWFSC) requested an amendment to Permit No. 781-1824 to satellite tag endangered Southern resident killer whales (SRKW) and to increase the number of suction cup tags deployed on this species. The objective of the research is to investigate winter distribution, movement patterns, and habitat use of SRKWs via satellite tagging (i.e., LIMPET dart tags). The EA described and analyzed the effects of the proposed tagging on the target species. A FONSI was signed on November 22, 20111.

- *Environmental Assessment for Issuance of a Scientific Research Permit for Cetacean Studies (File No. 15330)* (NMFS 2011)

  For issuance of File No. 15330, issued to Dr. Robin Baird, an EA was prepared. The purpose of research is to determine the abundance, distribution, stock structure of cetaceans, movement patterns, habitat use, and diving behavior of cetaceans. The majority of research would occur around the Hawaiian Islands; although additional effort would occur along the west coast of North America, and possibly in other U.S. territories (e.g., Palmyra, Wake, Johnston, Guam, and American Samoa) as well as international waters of the Pacific Ocean. The proposed research covers seven species of pinnipeds, 40 species of cetaceans, and unidentified mesoplodon species. This EA described and analyzed the effects of vessel surveys, aerial surveys, photo-identification, acoustic recording, breath sampling, biopsy sampling, and dart and suction cup tagging. A FONSI was signed on July 26, 2011 based on the best available information suggesting that the proposed permit actions elicit only moderate to minimal reactions, that most animals show no observable change in behavior in response to Level A activities, such as biopsy sampling or tagging, and no long term impact or reduction in fecundity are expected.

- *Environmental Assessment for Issuance of a Scientific Research Permit for Cetacean Studies in the Pacific, Arctic and Atlantic Oceans* (April 2011) (File No. 15215)

  For issuance of a new permit to the NMFS National Marine Mammal Laboratory (NMML), an EA was prepared. The proposed research covers 33 species of cetaceans and the incidental harassment of nine species of pinnipeds. The study area encompasses the Pacific, Arctic and Atlantic Oceans. The purpose of the research is to continue studies that evaluate trends, abundance, distribution, movement patterns, habitat use, health and stock structure of cetaceans in U.S. and international waters over long periods of time. The EA described and analyzed the effects of a variety of research techniques, including: vessel and aerial surveys, photo-identification, feeding studies, biological sampling, tagging, live capture and release, and a suite of procedures associated with captures. A small number of unintentional mortalities would be authorized for capture activities and these were also analyzed in the EA. A FONSI was signed on April 22, 2011. The FONSI determined that the proposed research is not expected to result in any cumulative adverse effects to the target species or non-target species found in the study area. For targeted species, the research would not be expected to have more than short-term effects to individuals and the loss of a limited number of animals during captures. These impacts are expected to be negligible to marine mammal stocks and species. No cumulative adverse effects that could have a substantial effect on any species, target or non-target, would be expected.

- *Environmental Assessment for The Issuance of Scientific Research Permits for Research on Humpback Whales and Other Cetaceans* (NMFS 2010)

  The objective of the eight permits is to collect information on the biology, foraging ecology, behavior, and communication of a variety of marine mammal species in the Pacific Ocean, with a focus on humpback whales. This EA described and analyzed the effects of aerial surveys, vessel surveys for behavioral observations, photo-identification, underwater photography and videography, collection of sloughed skin and feces, sampling whale blows, passive acoustic recordings, export and re-import of parts, tags attached by suction cup or by implanting darts, barbs, or a portion of the tag into the skin and blubber, biopsy sample collection, and acoustic playbacks. A FONSI was signed July 14, 2010 based on the best available information suggesting that the proposed permit actions elicit only moderate to minimal reactions, that most animals show no observable change in behavior in response to biopsy sampling or tagging and no long term impact or reduction in fecundity are expected.

- *Environmental Assessment on the Effects of the Issuance of a Scientific Research Permit [File No. 14097] for Pinniped, Cetacean, and Sea Turtle Studies* (NMFS 2010).

  For issuance of a new permit to the NMFS Southwest Fisheries Science Center (File No. 14097), an EA was prepared. The objectives of the study are to conduct population assessments to determine abundance, distribution patterns, foraging ecology, behavior, and communication for most marine mammal and sea turtle species in U.S. territorial and international waters. Research would be conducted through vessel surveys, aerial surveys, photogrammetry, photo-identification, biological sampling, radio tagging, and

satellite tagging. Cetacean, pinniped, and sea turtle parts, specimens, and biological samples would also be salvaged and imported/exported. This EA described and analyzed the effects of research activities ranging from close approaches during aerial and vessel surveys for photo-identification to biopsy sampling and acoustic playbacks. Two alternatives were proposed: 1) no action and 2) authorize all the proposed activities; one was found to be unsuitable because they would fail to provide critical information on the ecology and biology of marine mammals that would help conserve, manage, and recover these species. A FONSI was signed July 01, 2010 based on the best available information suggesting that the proposed permit actions elicit only moderate to minimal reactions, that most animals show no observable change in behavior in response to biopsy sampling or tagging and no long term impact or reduction in fecundity are expected.

- *Supplemental Environmental Assessment on the Effects of the Issuance of Nine National Marine Fisheries Service Permit Actions for Scientific Research Activities on Marine Mammal Species in the U.S. Territorial Waters and High Seas of the Eastern, Central, and Western North Pacific Ocean, with a Primary Focus on the Waters Off Hawaii and from California Northward to Southeast Alaska (Including Gulf of Alaska and Aleutian Islands), and Including Foreign Territorial Waters of Japan* (NMFS 2005).

  For issuance of File No. 731-1774 and 8 other permits, an SEA was prepared that analyzed the effects of increased action and cumulative impacts of research on primarily humpback and also blue, sei, and fin whales during the Pacific basin wide study termed SPLASH. It concluded that no significant cumulative effect of the requests were expected. A FONSI was signed September 16, 2005.

- *Environmental Assessment on the Effects of the Issuance of Eleven National Marine Fisheries Service Permitted Scientific Research Activities on Marine Mammal and Sea Turtle Species in the U.S. Territorial Waters and High Seas of the North Pacific Ocean (including the Gulf of Alaska and Bering Sea), Arctic Ocean (including the Chukchi Sea and Beaufort Sea), Southern Ocean (including waters off Antarctica), and Foreign Territorial Waters of Mexico (Gulf of California only), Canada, Russia, Japan and the Philippines* (NMFS 2004).

  This was a batched EA which analyzed the issuance of 11 research permits. The objective of the various permits was to collect information on the biology, foraging ecology, behavior, and communication of a variety of marine mammal and sea turtle species in the action area, with a focus on humpback whales in the North Pacific. This EA described and analyzed the effects of research activities ranging from close approaches during aerial and vessel surveys for photo-identification to biopsy sampling and acoustic playbacks. Four alternatives were proposed: 1) no action; 2) authorizing the proposed activities except invasive sampling; 3) authorize all the proposed activities; and 4) retraction of all permits and no further issuance of permit requests. All but alternative 3 were found to be unsuitable because they would fail to provide critical information on the ecology and biology of marine mammals that would help conserve, manage, and recover these species. A FONSI was signed June 30, 2004 based on the best available information suggesting that careful approaches to cetaceans, even repeated approaches,

elicit only moderate to minimal reactions, and that most animals show no observable change in behavior in response to biopsy sampling or tagging.

APPENDIX C: Active Marine Mammal Scientific Research Permits in the Action Area

Permit No.	Permit Holder	Expiration date	Location	Harassment
10018	Cartwright	6/30/2013	AK, HI	Level B only
10137	NMFS PIFSC	6/30/2014	HI	Level A & B (monk seal permit)
13427	Pacific Whale Foundation	6/15/2013	HI	Level B (LOC)
13846	Whale Trust (Darling)	7/31/2015	AK, WA, HI	Level A & B
14097	NMFS SWFSC	6/30/2015	AK, WA, OR, CA , HI	Level A & B
14245	NMFS NMML	5/1/2016	AK, CA, HI, OR, WA	Level A & B
14353	Zoidis	7/31/2015	HI	Level A & B
14451	University of Hawaii at Manoa	7/31/2015	AK, WA, OR, CA , HI, CNMI, Guam	Level B only
14585	University of Hawaii at Hilo (Pack)	7/31/2015	AK, HI	Level A & B
14682	University of Hawaii (Au)	11/15/2015	HI	Level A & B
15330	Cascadia Research Collective (Baird)	8/1/2016	AK, CA, HI, OR, WA, Palmyra, Guam, American Samoa	Level A & B
15409	Duke University	6/15/2015	HI, American Samoa	Level B only (GA LOC)
587-1767	Hawaii Whale Research Foundation (Salden)	9/30/2012	AK, HI	Level B only
717-1909	Kula Nai'a Wild Dolphin Research Foundation	3/31/2012	HI	Level B only (GA LOC)
727-1915	Scripps Institute of Oceanography	2/1/2013	WA, OR, CA, HI	Level A & B
1127-1921	Hawaii Marine Mammal Consortium	6/30/2013	HI	Level A & B