UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

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Dr. Kenneth R. Seelely, Ph.D
Chief, Environmental Services
U.S. Department of Agriculture
4700 River Road
Riverdale, MD 20737

Dear Dr. Seeley:

This letter responds to your request for NOAA's National Marine Fisheries Service (NMFS) review of the proposed movement of baled garbage and regulated (domestic) garbage from Hawaii for disposal at landfills in Washington, Oregon, and Idaho. Collectively, garbage and regulated garbage are referred to as GRG for this project. Authorized movement of GRG will occur after compliance agreements between the United States (U.S.) Department of Agriculture Animal and Plant Health Inspection Service (APHIS), the States of Washington, Idaho, or Oregon, the State of Hawaii, and specific applicants, in accordance with APHIS regulations (7 Code of Federal Regulations (CFR) §330.400), have been mutually agreed upon and signed.

APHIS also requested NMFS concurrence under section 7 of Endangered Species Act, 16 U.S.C. §1536, with your determination that the proposed movement of GRG may affect but is not likely to adversely affect threatened or endangered species or their designated critical habitat under NMFS jurisdiction. APHIS' determination is based on: 1) low vessel speeds (average towing speed at 6 to 9 knots); 2) implementation of species protection measures specified in compliance agreements; 3) a minimal increase in vessel traffic along the Columbia River; and 4) insignificant exposure levels from fuel, oil, and copper leaking from vessels involved in GRG transport.

Consultation History

On September 27, 2007, NMFS received your initial request to review APHIS' September Draft Biological Assessment for the project.

On October 18, 2007, NMFS contacted APHIS' Project Point of Contact. Information on NMFS receipt of the September 2007 BA and NMFS Project Lead and contact information was conveyed via voicemail.

On October 25, 2007, U.S. Fish and Wildlife Service and NMFS discussed preliminary project concerns and each agency's coordination with respective field and regional offices located in the affected states. Mutual agency concerns included the overall project duration, landfill capacity, potential spills in the Columbia River, the duration of compliance agreements for approved waste haulers, and regulatory compliance with the

National Environmental Policy Act (NEPA). NMFS also conveyed concerns about a potential increase in vessel traffic and associated vessel collisions with protected species, and a lack of analysis of potential project effects to the endangered Hawaiian monk seal (*Monachus schauinslandi*) in the Draft Biological Assessment (BA).

On October 29, 2007, NMFS coordinated and requested project review and feedback from its staff in the Northwest and Pacific Islands regional offices. NMFS received feedback from both offices on October 31, 2007, and November 7, 2007, respectively.

On November 7, 2007, NMFS contacted APHIS' Project Point of Contact. Information on NMFS availability to discuss the project was conveyed via voice mail.

On November 15, 2007, APHIS and NMFS staff discussed the project via phone. NMFS raised concerns for potential project impacts to endangered Hawaiian monk seals in Hawaii, the number and location of involved harbors, peak months for Humpback whale migration throughout Hawaii, increasing numbers of migrating whales and vessel collisions, volume and scheduling of garbage transport, and regulatory compliance with the NEPA and the Magnuson-Stevens Fishery Conservation and Management Act (MSA). APHIS conveyed only two harbors (Barbers Point, Oahu and Hilo Harbor, Hawaii Island) are involved in the project.

NMFS requested additional information on vessel activities (e.g., cruise lines, Superferry Hawaii, current incoming freight traffic) in Hawaii. NMFS and APHIS also clarified information on ballast water discharge. NMFS also requested APHIS knowledge on the anti-hull fouling agent used by vessels for GRG transport between the states. NMFS acknowledged vessel use of the anti-hull fouling agent is beyond the scope of APHIS authority for this project. However, NMFS will evaluate the effects of this agent to listed fish species during its project analysis. Finally, NMFS recommended APHIS incorporate guidelines and/or protocols into compliance agreements to avoid interactions with marine protected species in Hawaiian waters and the Columbia River. APHIS conveyed its consideration and incorporation of such protective measures language following their receipt from NMFS.

On that same day, NMFS coordinated with its Pacific Islands Fishery Science Center for Hawaiian monk seal sightings for two affected harbors in the State of Hawaii. NMFS also contacted its Pacific Islands Regional Office for recommended guidelines and/or protocols to avoid vessel collisions with listed Hawaiian monk seals, humpback whales (*Megaptera novaengliae*), and sea turtles in Hawaiian waters.

On November 19, 2007, USFWS and NMFS shared project updates on agency discussions with APHIS. NMFS conveyed its information search for the anti-hull fouling agent used by vessels transporting GRG up the Columbia River. NMFS provided preliminary feedback on the anti-hull fouling agent, Interclene, from its Ecotoxicological staff to USFWS. At that time, NMFS requested feedback from USFWS on use of that agent. USFWS conveyed it will follow-up with its technical staff and share any available information when available.

On November 20, 2007, USFWS raised concerns on the ship hull treatment used by vessels traveling up the Columbia River and potential copper exposure effects to listed fish species in that same river. USFWS requested APHIS conduct a risk assessment for dissolved copper at project port sites along the Columbia River for this project. APHIS agreed to conduct this assessment and would include this data into the revised BA.

On November 27, 2007, APHIS contacted NMFS for procedural information on the MSA. Protected Resources Division staff coordinated with appropriate agency Habitat Conservation Division (HCD) staff and conveyed GRG project information and APHIS project point of contact information to the HCD. HCD staff indicated it would contact the APHIS project lead to address essential fish habitat concerns.

On November 28, 2007, APHIS conveyed to NMFS via e-mail that the revised project BA would analyze project effects for Hawaiian monk seals. APHIS would also include recommended protective measures for this species into the compliance agreements with waste haulers as monk seals may occur in Hawaiian harbors during garbage transport.

On November 29, 2007, NMFS conveyed to APHIS recommended protective measures to avoid vessel collisions with listed Hawaiian monk seals, humpback whales, and two turtles species that are commonly recorded in Hawaiian waters. They include the green sea turtle (*Chelonia mydas*) and hawksbill sea turtle (*Eretmochelys imbricata*).

On November 30, 2007, APHIS informed NMFS that a rapid risk assessment for potential copper leaching from vessels moving regulated GRG up the Columbia River would be incorporated into the revised BA. Both agencies also verified the content of an earlier project discussion conducted by phone on November 15, 2007.

On December 5, 2007, NMFS received APHIS' revised December 5, 2007, BA for the project via e-mail. On December 13, 2007, NMFS contacted APHIS and confirmed receipt of the document.

On January 14, 2008, NMFS and APHIS discussed the revised BA. APHIS agreed to add Hawaiian monk seals into its "may affect, not likely to adversely affect determination" for the project. APHIS would also include protective measures for listed species into all compliance agreements between APHIS and applicants as a result of this and/or future consultations with the resources agencies. APHIS would also notify NMFS and USFWS of a GRG or oil spill and initiate emergency consultation with the agencies if there is a catastrophic event. APHIS would also provide such spill reports to the agencies. APHIS transmitted a revised Final BA to NMFS via e-mail. Informal consultation for the project was initiated on that same date.

On January 24, 2008, APHIS transmitted a revised BA via e-mail to NMFS. This version includes risk assessment appendixes previously omitted from earlier version.

On January 29, 2008, APHIS and NMFS discussed including protective measures for all listed whales, Southern Resident killer whales (*Orcinus orca*), and Steller sea lions (*Eumetopias jubatus*) into compliance agreements. On January 30, 2008, NMFS discussed measures for Steller sea lions and Southern Resident killer whales with associated regional office staff.
On February 21, 2008, NMFS and APHIS agreed on species protective language for compliance agreements and the provision of GRG and oil spill reports to the resource agencies. NMFS received a revised Final BA on that same date via e-mail.

Description of the Proposed Action
APHIS proposes to authorize the movement of baled garbage and regulated domestic garbage from Hawaii to the continental U.S. for disposal in landfills in Washington, Oregon, and Idaho. Garbage is defined as urban (commercial and residential) solid waste from municipalities in Hawaii, excluding incinerator ash and collections of agricultural waste and yard waste. Regulated (domestic) garbage refers to articles generated in Hawaii that are restricted from movement to the continental U.S. under various quarantine regulations established to prevent the spread of plant pests (including insects, disease, and weeds) into areas where pests are not prevalent.

GRG Baling Process. On Oahu and Hawaii Island, trucks collect waste and haul it to a sorting facility. Waste is then fed into a compression baler for compression, baling, and wrapping. GRG is compressed to 1,000 kilograms per cubic meter. All GRG bales are wrapped with a minimum of four layers of low density impermeable plastic film to provide an air tight and leak-proof enclosure. Wrapped bales weigh between 1.7 to 4 tons. From the compression baler, bales are sent to a staging area until they are loaded onto a barge for ocean transport. The proposed action includes GRG movement on marine waters and land.

The marine component includes GRG transport via tugboats and barges. Vessels will depart from two separate harbors in the Main Hawaiian Islands (MHI), across the Pacific Ocean, and to the mouth of the Columbia River. Once there, vessels will navigate up river to specified ports and bales will be loaded from the barge onto an asphalt or concrete staging area. The GRG is then loaded onto trucks or rail cars to specified approved landfills in Washington, Oregon, and Idaho.

Description of Barges and Tugs. Barges range in length from 400 to 500 feet (ft) long and between 80 and 100 ft wide. They are powered by tugs with 3,000 to 4,000 horsepower and range in length from 90 to 130 ft. The average towing speed across the ocean is 6 to 9 knots and the maximum tow speed is 11.6 knots. Barges may transport about 5,000 to 9,000 tons of GRG. Bales will be secured to barges by straps or other methods to prevent loss of bales during ocean crossing and river transport.

Barges carry no fuel or oil. Tugs carry between 100,000 and 200,000 gallons of fuel and 500 gallons of oil. No fuel or oil will be discharged during the voyage. A sufficient quantity of fuel will be loaded in tugs before departing Hawaii to accommodate the ocean crossing and Columbia River transport.

Tugs have internal ballast tanks to provide trim and stability for the ocean crossing. Tug ballast water will be drawn from and discharged back at sea. Regarding the barges, water taken onto ballast barges will occur during loading or unloading alongside the dock. All water used and released dockside will occur from the same water body. No ballast water discharge is expected as the barge ballast tanks are empty during the ocean voyage.

Estimated Frequency of Barge-Tug Trips from Hawaii to the Continental U.S. According to the BA, the State of Hawaii will only allow 300,000 tons of GRG to be exported off-island regardless of what applicants have proposed for transport to landfills. Given that volume, a barge carrying 5,000 tons of GRG results in about 60 barge trips per year, slightly more than 1 per week.

However, APHIS assumes 500,000 tons of GRG or 100 barge trips of GRG from Hawaii per year for transport and disposal to the west coast as a worst case scenario. This translates to under two trips per week. NMFS relies on the 100 barge trips per year (2 trips per week, rounded up estimate) as the frequency for barge movement in its effects analysis.

Interrelated Action. Barges travel to Hawaii containing construction or other materials (i.e., dry goods and commodities). According to the Department of Transportation of Freight Management and Operations report 14 million tons of freight was shipped to, from, and within Hawaii by water in 1998 (USDOT 2002). The report predicts 20 million tons for 2010 and 24 million tons by 2020 (USDOT 2002).

As it is not cost-effective to send empty barges to pick up baled GRG from Hawaii, a subset of these incoming barges may move GRG to the U.S. continent. Ongoing freight movement between the U.S. continent and Hawaii will continue regardless of APHIS' approval of the GRG movement. Thus, no net increase in barge traffic across the Pacific Ocean is expected from GRG transport. Given the limited information on the overall number of barges entering Hawaii and associated manifest of their contents, we are unable to evaluate the effects of accidental loss of transported materials at this time.

Proposed Action Duration. APHIS expects the proposed action will continue for the foreseeable future, provided the landfills maintain required operational permits and have adequate capacity to accept waste. Estimated service life (permitted site capacity) for the Columbia Ridge Landfill in Gilliam County, Oregon and the Roosevelt Regional Landfill in Klickitat County, Washington are 50 and 33 years, respectively.

Compliance Agreement. Prior to any GRG movement, compliance agreements between APHIS, the affected states, and applicants must be mutually agreed upon and signed in accordance with APHIS regulations (7 CFR §330.400). These regulations and §330.402 and §330.403 allow movement of GRG from Hawaii to the continental U.S. if it is compressed, packaged, shipped, and disposed of in a manner that the APHIS Administrator determines is adequate to prevent the introduction or dissemination of plant pests. Additionally, movement of GRG must be in compliance with all applicable laws for environmental protection.

Compliance agreements between APHIS and prospective applicants currently specify protocols for proper collection, preparation and baling of GRG, bale record maintenance, and bale movement to staging area and transport area. These measures ensure bale integrity and elimination of potential pests prior to and during transport. Additionally, clean up and emergency response and notification procedures during a spill are included. These measures further ensure immediate spill recovery and salvage of lost bales in water.

Currently, the State of Hawaii has not signed an agreement with APHIS for GRG transport. Additionally, no applicant has specified a timeframe for the proposed action. However, compliance agreements between APHIS and the waste management companies will be renewed every three years. Any revisions to the compliance agreement are included at that time when agreed upon by both the companies and APHIS.

As part of the proposed action, protective measures for marine protected species are included in compliance agreements with applicants. Proper implementation of these measures may avoid direct in-water interactions with listed species during vessel movement from Hawaii to the continental U.S. They include:

Listed Species Protective Measures In Compliance Agreements

Hawaiian Monk Seal

Vessel operators will be on the lookout for Hawaiian monk seals when transiting to and leaving harbor waters. In the event that a seal is in the harbor, the vessel must be prepared to stand down until the seal leaves on its own volition.

Should a vessel collision occur with a Hawaiian monk seal, the vessel operator will immediately contact the National Oceanic and Atmospheric Administration (NOAA) Fisheries hotline at 1-888-256-9840. This incident should be reported to APHIS and APHIS will re-initiate consultation with NMFS.

Humpback Whales

Within 200 nautical miles of the Hawaiian Islands, barges will not approach or cause an object to approach within 100 yards of any whale species.

Vessel operators will maintain a sharp lookout for whales and other collision hazards. Vessel operators will also look ahead for "blows" (puffs or mists), dorsal fins, tails, etc.

Operators are advised to post at least one person dedicated to lookout for whales from November through May, the peak period for humpback whales in Hawaiian waters.

Tugs and barges will not travel above a speed of 12 knots.

The barges will use appropriate VHF radio protocol or other means to alert other vessels of whales that may be in their path.

Vessel operators will move out of the way of approaching whales.

If possible, vessel operators will attend educational workshops held in Hawaii and sponsored by the State of Hawaii or NOAA Fisheries on whale etiquette.

Vessel operators will call the NOAA Hotline if involved in a collision: (888) 256-9840 or hail the U.S. Coast Guard on VHF channel 16. This incident would also be reported to APHIS and NOAA's Pacific Islands Regional Office. APHIS will re-initiate consultation with NMFS.

Other Listed Whales

Vessel operators will maintain a sharp lookout for whales and other collision hazards. Vessel operators will also look ahead for "blows" (puffs or mists), dorsal fins, tails, etc.

Operators are advised to post at least one person dedicated to lookout for whales while on route to the mouth of the Columbia River.

Tugs and barges will not travel above a speed of 12 knots.

Vessel operators will contact APHIS and NOAA's Northwest Regional Office if involved in a collision: (206) 526-6733. APHIS will re-initiate consultation with NMFS.

Listed Sea Turtles

Vessels will operate at low speeds and have observers look out for sea turtles in Hawaii to avoid direct encounters with them.

Should vessel collisions with sea turtles occur in Hawaii, these incidents will be reported to APHIS and NOAA's Pacific Islands Regional Office at 808-983-5730. APHIS will re-initiate consultation with NMFS.

Southern Resident Killer Whale

Vessel operators will maintain a sharp lookout for whales and other collision hazards. Vessel operators will also look ahead for "blows" (puffs or mists), dorsal fins, tails, etc.

Operators are advised to post at least one person dedicated to lookout for killer whales on route to the Columbia River.

Tugs and barges will not travel above a speed of 12 knots.

Vessel operators will contact APHIS and NOAA's Northwest Regional Office if involved in a collision: (206) 526-6733. APHIS will re-initiate consultation with NMFS.

Steller Sea Lion

Vessel operators will maintain a sharp lookout for Steller sea lions and other collision hazards. Operators are advised to post at least one person dedicated to lookout for sea lions on route to the Columbia River.

Tugs and barges will not travel above a speed of 12 knots.

Vessel operators will contact APHIS and NOAA's Northwest Regional Office if involved in a collision: (206) 526-6733. APHIS will initiate re-initiate consultation with NMFS

No barge will approach within three nautical miles of the Steller sea lion rockeries in Oregon (Rogue Reef: Pyramid Rock and Orford Reef: Long Brown Rock and Seal Rock) and California (Ano Nuevo Island, Southeast Farallon Island, Sugarloaf Island, and Cape Mendocino).

Proposed Action Area

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for this consultation encompasses the ocean route from two harbors (Barbers Point, Oahu and Hilo Harbor, Hawaii Island) in the MHI to the continental U.S., the barge-navigable portion of the Columbia River, and the rail and truck routes in Washington, Oregon, and Idaho. During the ocean travel route, the barge-tug will travel along the Columbia River and out in the Pacific Ocean approximately 25 miles, where it will turn south. Vessels will travel south parallel to the coast until near Eureka, California. The vessels will turn west for Hawaii in a southwesterly line. The full route from the Columbia River to Hawaii is roughly 2,500 miles. NMFS evaluation of the proposed action and action area is restricted to the marine waters for two harbors in the MHI, the ocean route to the U.S. continent, and the navigable portion of the Columbia River.

Species That Maybe Affected

Listed species under NMFS jurisdiction known to occur or reasonably expected to occur in marine and navigable waters of the action area include the humpback whale (*Megaptera novaengliae*), blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), sei whale (*Balaenoptera borealis*), sperm whale (*Physeter macrocephalus*), Southern Resident killer whale (*Orcinus orca*), Hawaiian monk seal (*Monachus schauinslandi*), green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), olive ridley sea turtle (*Lepidochelys oliveacea*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), and Steller sea lion (*Eumetopias jubatus*).

Listed evolutionarily significant units (ESUs) and distinct population segments (DPS) of Pacific salmon (which includes steelhead) also occur in the action area. Chinook Salmon (*Oncorhynchus tshawytscha*) ESUs include the Lower Columbia River Chinook Salmon, Upper Columbia River spring-run Chinook Salmon, Upper Willamette River Chinook Salmon, Snake River fall-run Chinook Salmon, and Columbia River Chinook Salmon. Steelhead (*Oncorhynchus mykiss*) DPSs include the Upper Columbia River Steelhead, Snake River Basin Steelhead, Lower Columbia River Steelhead, and the Middle Columbia River Steelhead. The Chum Salmon (*Oncorhynchus keta*) and Snake River Sockeye Salmon (*Oncorhynchus nerka*) comprise the remaining ESUs in the action area.

Humpback Whale. The humpback whale is listed as endangered throughout its range. There is good evidence for multiple populations in the North Pacific (Baker et al. 1990). Aerial, vessel, and photo-identification surveys, and genetic analysis indicate that within the U.S. Exclusive Economic Zone (EEZ), there are at least three relatively separate populations that migrate between their respective summer/fall feeding areas and winter/spring calving and mating areas (Calambokidis et al. 2001, Baker et al. 1998). They include: 1) winter/spring populations in coastal Central America and Mexico which migrate to the coast of California to southern British Columbia in summer/fall (Steiger et al. 1991, Calambokidis et al. 1996) – referred to as the eastern Northern Pacific stock; 2) winter/spring populations of the Hawaiian Islands which migrate to northern British Columbia/Southeast Alaska and Prince William Sound west to Kodiak (Baker et al. 1990; Perry et al. 1990; Calambokidis et al. 2001) – referred to as the central North Pacific stock; and 3) winter/spring populations of Japan which, based on Discovery Tag information, probably migrate to waters west of the Kodiak Archipelago (the Bering Sea and Aleutian Islands) in summer fall (Berzin and Rovnin 1966; Nishiwaki 1966; Darling 1991) – referred to as the western North Pacific stock. Winter/spring populations of humpback whales also occur in Mexico's offshore islands; the migratory destination of these whales is not well known (Calambokidis et al. 2001). However, Norris et al. (1999) speculate that these whales may travel to the Bering Sea or Aleutian Islands. This stock structure represents the predominant migration patterns. However, there is no perfect correspondence between the breeding and feeding areas that are paired above. For example, some individuals migrate from Mexico to the Gulf of Alaska and others migrate from Japan to British Columbia. In general, interchange occurs (at low levels) between breeding areas. However, fidelity is extremely high among the feeding areas (Calambokidis et al. 2001). Available information suggests that there is considerable overlap between the Western North Pacific and Central North Pacific stocks in the Gulf of Alaska between Kodiak Island and the Shumagin Islands.

The North Pacific stock currently exceeds 6,000 humpback whales. Of these, about 1,000 individuals are from the California Mexico population and about 400 are from the Western North Pacific population (Calambokidis et al. 1996, 2004).

Humpback whales reach sexual maturity between 4 and 6 years of age, and may live up to 80 years old and 56 ft long. Females typically produce a single calf about once every two or three years. Humpback whales generally inhabit waters over continental shelves, often relatively close to shore, and around some oceanic islands. However, humpback whales make pelagic migrations between summer and winter grounds. The species winters in tropical and sub-tropical waters, where they calve and probably mate. Calving areas within the U.S. jurisdiction include the Hawaiian Islands, the Mariana Islands, and American Samoa. Little feeding is thought to occur during the winter. Humpback whales are common around the MHI between October and May. However, their occurrence peaks between November and May. Humpbacks mainly inhabit leeward (western) coasts, in waters shallower than 100 fathoms (183 m). Although humpback whales frequent near-shore waters, they are thought to remain out of waters approaching 25 ft deep or less.

About 6,000 to 10,000 humpback whales visit Hawaiian waters each year to give birth and nurse their calves. This number is increasing by about seven percent each year. The greatest densities of adult humpbacks and calf pods occur on Maui, Molokai, Kahoolawe, Lanai, and the Penguin Bank region. Although humpback whales have occasionally been observed in Hawaiian coastal waters during the late spring-summer months, this number is typically low.

Based on the distribution and numbers of humpback whales, we expect an individual could be exposed to disturbance by vessels associated with the proposed action. Vessel collisions with humpback whales are also possible. From 2004 to 2006, there were 14 confirmed collisions in Hawaii, 6 of which were confirmed to involve calves. During the 2006-2007 whale season, two of the six collision incidents involved serious injuries to calves. Both were apparently hit by boat propellers. This data suggest the youngest whales are the most vulnerable to collisions. In 2005, at least six collisions with humpback whales were reported statewide, with five of those occurring in Maui County waters.

Humpback whales are killed by ship strikes along both coasts of the U.S. On the Pacific coast, a humpback whale is killed about every other year by ship strikes (Barlow et al. 1997). On the Atlantic coast, 6 out of 20 humpback whales stranded along the mid-Atlantic coast showed signs of major ship strike injuries (Wiley et al. 1995). Almost no information is available on the number of humpback whales killed or seriously injured by ship strikes outside of U.S. waters.

Blue Whale. The blue whale is listed as endangered throughout its range. In the North Pacific Ocean, blue whales are found along the coastal shelves of North America and South America (Rice 1974, Donovan 1984). Blue whale feeding aggregations are often found at the continental shelf edge where upwelling produces concentrations of krill. Although the blue whale population has increased off California, they are rare in the Gulf of Alaska and southern Bering Sea where they were once abundant. Nishiwaki (1966) noted the occurrence of blue whales among the Aleutian Islands and in the Gulf of Alaska. However, no blue whales have been sighted in these waters for many years despite several surveys (Leatherwood et al. 1982; Stewart et al. 1987; Forney and Brownell 1996).

The Eastern North Pacific stock feeds in California waters in summer/fall (from June to November) and migrates south to productive areas off Mexico and as far south at the Costa Rica Dome in winter/spring. Blue whales are occasionally seen or heard off Oregon, but sightings are rare. The feeding stock of blue whales in California was recently estimated by both line-transect and mark-recapture methods. Barlow (2003b) estimated 1,736 (CV=0.23) blue whales off California, Oregon, and Washington based on ship line-transect surveys in 1996 and 2002. Calambokidis et al. (2003) used photographic mark-recapture and estimated the average population as 1,760 (CV=0.32), close to the line-transect estimate. There is some indication that blue whales increased in abundance in California coastal waters in the late 1970s and in the 1990s. However, more recent estimates suggest this population has declined slightly (Caretta et al. 2006). Blue whale sightings in the Pacific region are historically rare. The only reliable sighting of a blue whale in the vicinity of the Hawaiian Islands was observed from scientific research vessels about 400 kilometers (km) northeast of Hawaii in January 1964 (NMFS 1998). Blue whales have been recorded off Oahu and Midway (Northrop et al. 1971; Thompson Friedl 1982) within several hundred km of these islands (Barlow et al. 1997). The recordings made off Oahu showed bimodal peaks throughout the year, suggesting the animals were migrating into the area during the summer and winter (Thompson and Friedl 1982). Twelve aerial surveys were flown from 1993-1998 within the 25 nautical square miles of the MHI and no blue whales were sighted in these waters. There are no reports of blue whale strandings in Hawaiian waters, as evidenced by the absence of reliable observations of these whales in vessel and air craft surveys that have been conducted in Hawaiian waters since the mid-1960s. Based on the distribution of blue whales, we expect an individual could be exposure to disturbance by vessels associated with the proposed action.

Fin Whale. The fin whale is listed as endangered throughout its range. Fin whales were reported as occurring immediately offshore throughout the North Pacific from central Baja California to Japan and as far north as the Chukchi Sea (Rice 1974). Recent observations show aggregations of fin whales year-round in southern/central California, year-round in the Gulf of California, in summer in Oregon, and in summer and autumn in the Shelikof Strait and Gulf of Alaska (Dohl et al. 1983; Brueggeman et al. 1990; Green et al. 1992; Tershy et al. 1993; Forney et al. 1995; McDonald 1994; Barlow 1997).

In the Gulf of Alaska, fin whales appear to congregate in the waters around Kodiak Island and south of Prince William Sound. In recent years, small numbers of fin whales have been observed south of the Aleutian Islands (Forney and Brownell 1996), in the Gulf of Alaska (including Shelikof Strait), and in the southeastern Bering Sea (Leatherwood et al. 1982). Fin whale concentrations in the northern areas of the North Pacific and Bering Sea generally form along frontal boundaries or mixing zones between coastal and oceanic waters, which correspond roughly to the 200-m isobath (the shelf edge). Acoustic data collected from 1995 to 1999 from hydrophone arrays show fin whales vocalizing in Alaskan waters during all seasons, with a peak in occurrence in mid-winter.

There is some indication that fin whales have increased in abundance in California coastal waters in the 1990s. Shipboard sighting surveys in the summer and autumn of 1991, 1993, 1996, and 2001 produced estimates of 1,600-3,200 fin whales off California and 280-380 fin whales off Oregon and Washington (Barlow 2003). The minimum estimate for the California-Oregon-Washington stock as defined in the U.S. Pacific Marine Mammal Stock Assessments in 2005, is about 2,500 (Carretta et al. 2006). An increasing trend between 1979-80 and 1993 was suggested by the available survey data, but it was not statistically significant (Barlow et al. 1997).

In the eastern North Pacific the current population size is estimated at between 8,500 and almost 11,000 individuals. About 3,279 individuals are found off California, Oregon, and Washington based on ship surveys in summer and autumn (Barlow and Taylor 2001).

Fin whales have been observed year round off central and southern California, with peak numbers in summer and fall (Dohl et al. 1983; Barlow 1995; Forney et al. 1995), and in summer off Oregon (Green et al. 1992), and in summer and fall in the Gulf of Alaska (including Shelikof Strait) and the southeastern Bering Sea (Leatherwood et al. 1986; Brueggeman et al.1990). Their regular summer occurrence has also been noted in recent years around the Pribilof Islands in the northern Bering Sea (Baretta and Hunt 1994).

Although some fin whales apparently are present in the Gulf of California, Mexico year-round, there is a marked increase in their numbers in the winter and spring (Tershey et al. 1990). Relatively large fin whale concentrations have been observed in the northern Gulf of California (Silber et al. 1994). Their migration into the mid- and lower Gulf is thought to be related to the high seasonal abundance of krill (Tershy 1992).

Fin whales are considered rare in Hawaiian waters. Balcomb (1987) observed 8-12 fin whales in a multi-species feeding assemblage in May 1966 about 250 miles south of Honolulu. Additional sightings were reported north off Oahu in May 1976 and in the Kauai Channel in February 1979 (Shallenberger 1981). A single fin whale was observed north of Kauai in February 1994 (Mobley et al. 1996), and five sightings were made during a 2002 survey of waters within the U.S. EEZ of the Hawaiian Islands (Barlow 2003). A single stranding has been reported on Maui (Shallenberger 1981).
Fin whales may migrate into Hawaiian waters mainly in the fall and winter, based on acoustic recordings off Oahu and Midway (Thompson and Friedl 1982; and Northrop et al. 1968). This species has been observed feeding in Hawaiian waters during mid-May (Balcomb 1987; Shallenberger 1981). McDonald and Fox (1999) reported calling fin whales about 16 km off the north shore of Oahu, based on passive acoustic recordings. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 174 fin whales (Barlow 2003). Based on the distribution of fin whales, we expect an individual could be exposed to disturbance by vessels associated with the proposed action.

Sei Whale. Sei whales are distributed in all of the world's oceans, except the Arctic Ocean. This species does not appear to be associated with coastal features. The International Whale Commission's Scientific Committee groups all of the sei whales in the entire North Pacific Ocean into one population (Donovan 1991). However, some mark-recapture, catch distribution, and morphological research indicated that more than one population exists; one between 175°W and 155°W longitude, and another east of 155° W longitude (Masaki 1976, 1977). During the winter, sei whales are found from 20° to 23° N and during the summer from 35° to 50° N (Masaki 1976, 1977). Horwood (1987) reported that 7.5 to 85 percent of the total North Pacific population of sei whales resides east of 180° longitude. In the North Pacific Ocean, sei whales have been reported primarily south of the Aleutian Islands, in Shelikof Strait and waters surrounding Kodiak Island, in the Gulf of Alaska, inside waters of southeast Alaska, and off the coasts of

California, Washington, and Oregon (Nasu 1974; Leatherwood et al. 1982; Caretta et al. 2006). Sei whales have been occasionally reported from the Bering Sea and in low numbers on the central Bering Sea shelf (Hill and DeMaster 1998). Masaki (1977) reported sei whales concentrating in the northern and western Bering Sea from July through September. However, other researchers question these observations because no other surveys have ever reported sei whales in the northern and western Bering Sea. Horwood (1987) evaluated the Japanese sighting data and concluded that sei whales rarely occur in the Bering Sea.

Sei whale abundance prior to commercial whaling in the North Pacific has been estimated at 42,000 individuals (Tillman 1977). Japanese and Soviet catches of sei whales in the North Pacific and Bering Sea increased from 260 whales in 1962 to over 4,500 in 1968 and 1969. Afterwards, the sei whale population declined rapidly (Mizroch et al. 1984). When commercial whaling for sei whales ended in 1974, the population of sei whales in the North Pacific had been reduced to between 7,260 and 12,620 animals (Tillman 1977). Current abundance or trends are not known for sei whales in the North Pacific (Best 1993 in Carretta et al. 2006).

Only two confirmed sightings of sei whales and five possible sightings were made in California, Oregon, and Washington waters during extensive ship and aerial surveys in 1991-1993, 1996, and 2001 (Hill and Barlow 1992; Carretta and Forney 1993; Mangels and Gerrodette 1994; Barlow 2003). Green et al. (1992) did not report any sightings of sei whales in aerial surveys of Oregon and Washington. The abundance estimate for California, Oregon, and Washington waters out to 300 nautical miles is 56 sei whales (Barlow 2003).

Four sightings of sei whales were made during a summer/fall 2002 shipboard survey of waters within the U.S. EEZ of the Hawaiian Islands. A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in a summer/fall abundance estimate of 77 sei whales (Barlow 2003). This is currently the best available abundance estimate for this stock. However, the majority of sei whales are expected to be at higher latitudes in their feeding grounds at this time of year. The log-normal 20th percentile of the 2002 abundance estimate is 37 sei whales. No data are available on current population trend. Based on the distribution of sei whales, we expect an individual could be exposed to disturbance by vessels associated with the proposed action.

Sperm Whale. Sperm whales are distributed in all of the world's oceans. There are three discrete population "centers" of sperm whales within the action area: (1) North Pacific stock, which includes Alaska, and the (2) California, Oregon, and Washington stock (Carretta et al. 2006; Angliss and Outlaw 2007). In California, sperm whales occur year round with peak abundance from April through mid-June and from the end of August through mid-November (Rice 1974). Sperm whales were seen in every season except winter (December through February) in Washington and Oregon (Green et al. 1992). Recent estimates, based on survey data, indicate there are about 1,200 sperm whales along the coasts of California, Oregon, and Washington (Carretta et al. 2006).

In the North Pacific, sperm whales are distributed widely, with the northernmost boundary extending from Cape Navarin to the Pribilof Islands (Omura 1955). Females and young sperm whales usually remain in tropical and temperate waters year-round, while males are thought to move north into the Aleutian Islands, Gulf of Alaska, and the Bering Sea to feed. Sperm whales are rarely found in waters less than 300 m in depth. They are often concentrated around oceanic islands in areas of upwelling, and along the outer continental shelf and mid-ocean waters. Because they inhabit deeper pelagic waters, their distribution does not include the broad continental shelf of the Eastern Bering Sea and these whales generally remain offshore in the eastern Aleutian Islands, Gulf of Alaska, and the Bering Sea. Reliable estimates of the North Pacific (Alaskan) population size are not currently available (Angliss and Outlaw 2007).

The majority of sperm whales are thought to be south of 40°N in winter (Rice 1974, 1989; Gosho et al. 1984; Miyashita et al. 1995). The Hawaiian Islands marked the center of a major 19th century whaling ground for sperm whales (Gilmore 1959; Townsend 1935). Since 1936, at least 18 strandings of sperm whales have been reported from Oahu, Kauai, and Kure Atoll (Woodward 1972; Nitta 1991; Maldini 2005). Sperm whales have also been sighted around several of the Northwestern Hawaiian Islands (NWHI) (Rice 1960; Barlow 2003), off Hawaii Island (Lee 1993; Mobley et al. 2000), in the Kauai Channel and in the Alenuihaha Channel between Maui and Hawaii Island (Shallenberger 1981). Sounds of sperm whales have been recorded throughout the year off Oahu (Thompson and Friedl 1982). This species is known to spend a large proportion of time diving.

A summer/fall 2002 shipboard line-transect survey of waters within the U.S. EEZ of the Hawaiian Islands resulted in 43 sperm whale sightings throughout the study area (Barlow 2003). The best available abundance estimate for the Hawaii stock of sperm whales is 7,082 animals. Based on the distribution and number of sperm whales, we expect an individual could be exposed to disturbance by vessels associated with the proposed action.

Southern Resident Killer Whale. The distinct population segment of Southern Resident killer whales is listed as endangered. Designated critical habitat for Southern Resident killer whales encompasses parts of Haro Strait and the U.S. waters around the San Juan Islands, the Strait of Juan de Fuca, and all of Puget Sound. These areas total over 2,500 square miles.

In general, killer whales are one of the most widely distributed cetaceans in the action area. In the North Pacific Ocean, killer whales are often sighted from the eastern Bering Sea to the Aleutian Islands, in the waters of southeastern Alaska and the intercoastal waterways of British Columbia and Washington State, along the coasts of Washington, Oregon, and California, along the Russian coast in the Bering Sea and the Sea of Okhotsk; and on the eastern side of Sakhalin and the Kuril Islands, and the Sea of Japan.

Southern Resident killer whales are fish eaters and live in stable matrilineal pods: the "J" pod, "K" pod, and "L" pod. Their range in the spring, summer, and fall includes the inland waterways of Puget Sound, Strait of Juan de Fuca, and Southern Georgia Strait. Southern Resident killer whales have also been documented in coastal waters off British Columbia, Washington, Oregon, and central California (Krahn et al. 2004a). Southern Resident killer whales may have numbered more than 200 whales until perhaps the mid- to late-1800s (Krahn et al. 2004a). This DPS has fluctuated between 71 and 97 individuals in the last 30 years and in 2003 numbered about 80 individuals.

While in the inshore waters of southern British Columbia and Washington, this species spends 95 percent of its time underwater, nearly all of which is between the surface and a depth of 30 m (Baird 2000; Baird et al. 2003, 2005). As top level predators, killer whales feed on a variety of organisms ranging from fish to squid to other marine mammal species. Cooperative hunting, food sharing, and innovative learning are notable foraging traits in killer whales (Smith et al. 1981, Lopez and Lopez 1985, Felleman et al. 1991, Boran and Heimlich 1999, Guinet et al. 2000, Pitman et al. 2003, and Ford and Ellis 2006). Cooperative hunting presumably increases hunting efficiency and prey capture success of group members, and may also enhance group bonds. Additionally, group living facilitates knowledge of specialized hunting skills and productive foraging areas to be passed traditionally from generation to generation (Lopez and Lopez 1985, Guinet 1991, Guinet and Bouvier 1995, Ford et al. 1998).

Available feeding records for Southern Residents suggest a strong dietary preference for Chinook salmon (78 percent of identified prey) during late spring to fall (Hanson et al. 2005, Ford and Ellis 2006). Chum salmon (11 percent) are also taken in significant amounts, especially in autumn. Other species eaten include coho (5 percent), Steelhead (*O. mykiss*, 2 percent), sockeye (*O. nerka*, 1 percent), and non-salmonids (e.g., Pacific herring and quillback rockfish [*Sebastes maliger* (3 percent) combined]. Whales appear to feed on salmon rather than other fish species (Krahn et al. 2002). Based on the distribution of Southern Resident killer whales, we expect an individual could be exposed to disturbance by vessels associated with the proposed action.

Hawaiian Monk Seal. Hawaiian monk seals are the most primitive genus of seals and are one of the most endangered marine mammals in the U.S. This species is endemic to the Hawaiian Archipelago, and its entire range lies within the U.S. Designated critical habitat for the Hawaiian monk seal occurs out from shore to 20 fathoms in 10 areas of the Northwestern Hawaiian Islands (NWHI). Critical habitat for this species includes all beach areas, sand spits and islets, including all beach crest vegetation to its deepest extent inland, lagoon waters, inner reef waters, and ocean waters out to a depth of 20 fathoms, around Kure Atoll, Midway Islands (except Sand Island and its harbor), Pearl and Hermes Reef (PHR), Maro Reef, Lisianski Island, Laysan Island, Gardner Pinnacles, French Frigate Shoals (FFS), Necker Island, and Nihoa Island (55 CFR 226.201).

Hawaiian monk seals may live up to 30 years. Females reach sexual maturity at about five to 10 years of age and pup a maximum of once a year. The species may have extensive home ranges and monk seals spend about two thirds of their lives out in the water. Inter-island movement is common. Hawaiian monk seals are capable of dives of about 1,500 ft while foraging, and appear to be opportunistic feeders feeding on fish, eels, mollusks, and crustaceans. Available food in the marine habitat seems to be a limiting factor to population growth in the NWHI, with the greatest impact of food limitation on the survival of juvenile and yearling seals, age of sexual maturity, and fecundity.

Spatial dispersal of foraging seals indicates they forage extensively within the atoll lagoons at Midway Island. Seals forage extensively within the fringing reefs at FFS, PHR, Midway Atoll, Kure Atoll, and on the outer slopes of those atolls and seaward of Laysan and Lisianski Island. Seals also ranged to and evidently foraged along the submarine ridges between those atolls and islands and at virtually all nearby seamounts. Generalized foraging ranges varied to various extents by age and sex of seals and also among colonies.

Although monk seal puppings within the MHI is increasing, they remain uncommon there. The population's six main breeding sites occur in the NWHI and include: Kure Atoll, Midway Islands, PHR, Lisianski Island, Laysan Island, and FFS. Smaller breeding subpopulations also occur at Necker Island and Nihoa Island and monk seals have been observed at Gardner Pinnacles and Maro Reef. Monk seals are also found throughout the MHI, where births have been documented on most of the major islands (Baker and Johanos 2004). The best estimate of the total population size is 1,247. The main terrestrial habitat requirements include haul-out areas for pupping, nursing, molting, and resting. These are primarily sandy beaches, but virtually all substrates are used at various islands (NMFS 2007). Based on the distribution of Hawaiian monk seals, we expect individuals could be exposed to disturbance by vessels associated with the proposed action.

Green Sea Turtle. The green sea turtle is listed as threatened and endangered (endangered populations are the breeding populations in Florida and Mexico). Green turtles are a circumglobal and highly migratory species that nest mainly in tropical and subtropical regions. The primary green turtle nesting grounds in the eastern Pacific are located in Michoacán, Mexico, and the Galapagos Islands, Ecuador (NMFS and USFWS 1998a). Their non-breeding range is generally tropical, and can extend approximately 500-800 miles from shore in certain regions (Eckert 1998). They appear to prefer waters that usually remain around 20° C in the coldest month; for example, during warm spells (e.g., El Nino), green turtles may be found considerably north of their normal distribution. Stinson (1984) found green turtles to appear most frequently in U.S. coastal waters with temperatures exceeding 18° C. Waters in this temperature range are generally found in the southern portion of the action area (i.e., Central California and south [NOAA 2002]).

Tag returns of eastern Pacific green turtles establish that these turtles travel long distances between foraging and nesting grounds. In fact, 75 percent of tag recoveries from 1982-90 were from turtles that had traveled more than 1,000 km from Michoacán, Mexico. These turtles are found in coastal waters and offshore areas. In a review of sea turtle sighting records from northern Baja California to Alaska, Stinson (1984) determined that the green turtle was the most commonly observed sea turtle on the U.S. Pacific Coast, with 62 percent reported in a band from southern California and southward

Post-hatchling and juvenile green sea turtles are believed to drift along major current systems for several years. We assume that green sea turtles forage at or near the water surface where currents converge. Green sea turtle diet appears carnivorous and includes invertebrates and fish eggs. Juveniles recruit to near-shore habitats and switch to a nearly exclusive herbivorous diet of seagrasses and marine algae upon reaching a carapace length of about 35 centimeters (cm). Every few years after reaching sexual maturity, green sea turtles may migrate thousands of km between their resident foraging grounds and their natal nesting areas.

Green sea turtles occur in waters around the NWHI and all MHI. They spend their juvenile and adult life near coral reef environments. The green sea turtle nests in large numbers in the archipelago and represents a distinct population. Green sea turtles are known to nest mostly at FFS and over 90 percent of the species' nesting and breeding activity also occurs there. The species has a nearly exclusive herbivorous diet consisting of selected macroalgae and sea grasses. At certain near-shore habitats of the MHI, green turtles feed on benthic algae. Based on the distribution of green sea turtles and their numbers in Hawaii, we expect an individual could be exposed to disturbance by vessels associated with the proposed action.

Hawksbill Sea Turtle. The hawksbill sea turtle is listed as endangered throughout its range. Critical habitat for this species has been designated in Puerto Rico.

The hawksbill sea turtle is circumtropical in distribution, generally occurring in waters between 30° North and 30° South latitude within the Atlantic, Pacific, and Indian Oceans and associated bodies of water. Along the eastern Pacific rim, hawksbills were apparently common to abundant as recently as 50 years ago in the nearshore waters from Mexico to Ecuador, particularly in the east coast of Baja California Sur in the vicinity of Concepcion Bay and Paz Bay, Mexico (Cliffton et al. 1982). Today, the hawksbill is rare to nonexistent in most localities; there are known nesting beaches remaining on the Pacific coast of Mexico (Cliffton et al. 1982). Hawksbills may still represent a rare nesting species along Pacific Central America, but there has been no documented nesting in recent years (Cornelius 1982).

Within the Central Pacific, nesting is widely distributed but scattered and in very low numbers. Foraging hawksbills have been reported from virtually all of the island groups of Oceania, from the Galapagos Islands in the eastern Pacific to the Republic of Palau in the western Pacific (Witzell 1983; Pritchard 1982 a,b). Along the far western and southwestern Pacific, hawksbills nest on the islands and mainland of southeast Asia , from China and Japan, through the Philippines, Malaysia, and Indonesia, to Papua New Guinea, the Solomon Islands (McKeown 1977), and Australia (Limpus 1982)

Hawksbills are highly migratory, use different habitats at different stages of their life cycle, and are most commonly associated with healthy coral reefs. Post-hatchlings and oceanic stage juveniles may occupy the pelagic environment for several years. They probably drift along major current systems and feed primarily at the surface. At about 35 cm carapace length, juveniles recruit to near-shore foraging grounds and feed on benthic organisms including sponges, other invertebrates, and algae. Every few years after reaching sexual maturity, adult hawksbill sea turtles may migrate thousands of km between their foraging grounds and nesting areas.

Hawksbill sea turtles occur occasionally in waters around the MHI. This species is considered rare to nonexistent in most localities, but are known to nest primarily on several small sand beaches on Maui, Oahu, Molokai and Hawaii Island. The species inhabits coral reefs and uses its long narrow beak to probe for sponges and other bottom-dwelling invertebrates. Hawksbill sea turtles feed opportunistically on a wide variety of marine invertebrates and algae. Based on hawksbill distribution and nesting in Hawaii, we expect an individual could be exposed to disturbance by vessels associated with the proposed action.

Olive Ridley Sea Turtle. Olive ridley populations in the Pacific are listed as threatened, except the Mexican nesting population, which is listed as endangered under the ESA. This latter designation was based on the extensive over-harvesting of olive ridleys in Mexico, which caused a severe population decline, although turtle harvests have since been banned in Mexico. Regarded as one of the most abundant sea turtles, olive ridleys were once "superabundant" in the eastern Pacific Ocean, and may have outnumbered all other sea turtles species combined (NMFS & USFWS 1998d). Historically, an estimated 10 million olive ridleys inhabited the waters in the eastern Pacific off Mexico (NMFS and USFWS 1998d). However, human-induced mortality led to declines in this population. Within U.S. territorial waters, however, numbers are considered quite low.

Olive ridleys are the smallest living sea turtle, with an adult carapace length between 60 and 70 cm, and rarely weigh over 50 kg. Most olive ridley turtles lead a primarily pelagic existence (Plotkin et al. 1993), migrating throughout the Pacific, from their nesting grounds in Mexico and Central America to the north Pacific. While olive ridleys generally have a tropical range with a distribution from Baja California, Mexico, to Chile (Silva-Batiz et al. 1996), individuals do occasionally venture north, some as far as the Gulf of Alaska (Hodge and Wing 2000). Washington State has only a single record whereby the turtle was found dead in Grays Harbor County. Oregon has two records.

The Olive ridley is essentially rare throughout the islands in the Pacific, and even scarcer in the western Pacific. This species is rarely seen in Hawaiian waters. Nesting has only been recorded once on Maui in 1985. Nevertheless, available information suggests that the olive ridley turtle regularly uses the Hawaiian pelagic region for foraging and/or developmental migrations. Juvenile and subadult olive ridleys are among the life stages known to be present in Hawaiian waters. Olive ridleys found in Hawaiian waters are probably derived from the eastern Pacific breeding aggregation of Mexico. Based on the distribution of olive ridleys, we expect an individual could be exposed to disturbance by vessels associated with the proposed action.

Leatherback Sea Turtle. The leatherback turtle is listed as endangered under the ESA throughout its global range. Leatherback turtles are the largest of the marine turtles and can reach 6.5 ft long and 2000 pounds (NMFS and USFWS 1998b). Leatherback sea turtles are widely distributed throughout the oceans of the world. In the Pacific Ocean, they range as far north as Alaska and the Bering Sea and as far south as Chile and New Zealand. In Alaska, leatherback turtles are found as far north as 60°.34 N, 145°.38W and as far west as the Aleutian Islands (Hodge 1979, Stinson 1984). Leatherback turtles have also been found in the Bering Sea along the coast of Russia (Bannikov et al. 1971). Leatherbacks are commonly known as pelagic animals, but also forage in coastal waters. In fact, leatherbacks are the most migratory and wide ranging of sea turtle species, exploiting convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters (Morreale et al. 1994; Eckert 1998; Eckert 1999). In a single year, a leatherback may swim more than 10,000 kilometers (Eckert 1998). To a large extent, the oceanic distribution of leatherback turtles may reflect the distribution and abundance of their macroplanktonic prey, which includes medusae, siphonophores, and salpae in temperate and boreal latitudes (NMFS and USFWS 1998b). Surface feeding has been reported in U.S. waters, especially off the west coast (Eisenberg and Frazier 1983), but foraging may also occur at depth.

Populations of leatherback turtles in the eastern Pacific were estimated to number more than 91,000 adults in 1980 (Spotila 1996). Current estimates number less than 3,000 adult and subadult animals (Spotila 2000).

Leatherback sea turtles occur occasionally in waters around the MHI. This species does not nest or usually come close to Hawaii shores. Leatherback turtles are rarely sighted in near-shore waters. However, this species is regularly seen by fishermen in Hawaiian offshore waters beyond the 100 fathom contour but within sight of land. Sightings often occur off the north coast of Oahu and the west coast of Hawaii. The pelagic zone surrounding the Hawaiian Islands likely constitute foraging habitat and migratory pathways for this species. A high-seas aggregation of leatherbacks is known to occur north of the Hawaiian Islands at latitude 35 ° – 45 ° N, longitude 175 ° – 180 ° W (Skillman and Balazs 1992).

This species probably migrates occasionally through deep, pelagic waters. Recent satellite tagging studies show that leatherback sea turtles tagged on the California coast migrated through the Hawaiian archipelago on route to an area just north of Australasia. Based on the distribution of leatherbacks, we expect an individual could be exposed to disturbance by vessels associated with the proposed action.

Loggerhead Sea Turtle. The loggerhead turtle is listed as threatened under the ESA throughout its range, primarily due to direct take, incidental capture in various fisheries, and the alteration and destruction of its habitat. Loggerhead turtles are a cosmopolitan species, found in temperate and subtropical waters and inhabiting pelagic waters, continental shelves, bays, estuaries and lagoons. The species is divided into five populations: the Atlantic Ocean, Pacific Ocean, Indian Ocean, Caribbean Sea and Mediterranean Sea populations. Loggerhead sea turtles in the action area most likely originate from Japanese nesting area. There are no loggerhead nesting sites on the western seaboard of the United States. However, loggerhead turtles have been reported as far north as Alaska, are occasionally sighted off the coasts of Washington and Oregon. Most records are of juveniles off the coast of California (NMFS & USFWS 1998c).

The population status of the loggerhead nesting colonies in Japan and the surrounding region are not clear. Balazs and Wetherall (1991) speculated that 2,000 to 3,000 female loggerheads may nest annually in all of Japan. However, more recent data suggest that only approximately 1,000 female loggerhead turtles may nest there (Bolten et al. 1996). Nesting beach monitoring at Gamoda (Tokushima Prefecture) has been ongoing since 1954. Surveys at this site showed a marked decline in the number of nests between 1960 and the mid-1970s. Since then, the number of nests has fluctuated, but has been downward since 1985 (Bolten et al. 1996).

Loggerhead sea turtles are found occasionally in waters around the MHI. Loggerhead turtles usually feed among coral reefs and sometimes small bays and far out at sea. The species is found in the Pacific, Indian, and Atlantic oceans but does not nest in Hawaii. The species is encountered at sea only occasionally in the U.S. Pacific, notably off the coast of California. Based on the distribution of loggerheads, an individual could be exposed to disturbance by vessels associated with the proposed action.

Steller Sea Lion. Steller sea lions were listed as threatened on November 26, 1990. In 1997, the species was split into two separate populations based on demographic and genetic differences (Bickham et al. 1996; Loughlin 1997). The western population was reclassified to endangered while the eastern population remained threatened (62 FR 30772). The eastern (threatened) population includes animals east of Cape Suckling, Alaska (144°W), while animals in the western (endangered) population are at Cape Suckling and to the west (Loughlin 1997). Critical habitat has been designated for the species in California, Oregon, and Alaksa (50 CFR 26.202). Steller sea lion critical habitat includes all major rookeries in California, Oregon, and Alaska and major haulouts in Alaska.

Steller sea lions are distributed along the rim of the North Pacific Ocean from San Miguel Island (Channel Islands) off Southern California to northern Hokkaido, Japan (Loughlin *et al.* 1984; Nowak 2003). Their centers of abundance and distribution are in the Gulf of Alaska and the Aleutian Islands, respectively (NMFS 1992). In the Bering Sea, the northernmost major rookery is on Walrus Island in the Pribilof Island group. The northernmost major haul-out is on Hall Island off the northwestern tip of St. Matthew Island. Their distribution also extends northward from the western end of the Aleutian chain to sites along the eastern shore of the Kamchatka Peninsula.

Steller sea lions regularly retreat from the water to land sites, termed haulouts or rookeries. Steller sea lions are also the only otariid that regularly hauls out on sea ice (Rice 1998). Rookeries are used by adult sea lions for pupping, nursing, and mating during the reproductive season (generally from late May to early July). Haulouts are used by all ages and both genders but are generally not where sea lions reproduce. Steller sea lions exhibit a high level of site fidelity. Presumably, the sites were chosen and continue to be used because they protect sea lions from predators, some measure of protection from severe climate or sea surface conditions, and (perhaps most importantly) are in close proximity to prey resources.

Steller sea lions are not known to make regular migrations but they do move considerable distances. Adult males, in particular, may disperse widely after the breeding season; some at notable distances from their natal rookeries where they held a territory (over 1000 km). Animals marked as pups in the Gulf of Alaska have been sighted in Southeast Alaska and British Columbia, and others marked in British Columbia have been seen at Cape Saint Elias, Alaska. Similarly, animals marked in Oregon, were later seen in northern California, Washington, British Columbia, Southeast Alaska, and the northern Gulf of Alaska (Calkins and Pitcher 1982; Calkins 1986; Loughlin 1997). Raum-Suryan et al. (2002) analyzed resightings of more than 8,000 pups that were branded from 1975 to 1995 on rookeries in Alaska and reported that almost all of the resightings of young-of-the-year were within 500 km of the rookery where the pup was born. Older animals (>11 months and juveniles) have been observed at much greater distances from their natal rookery. During the May to July breeding season, Steller sea lions congregate at more than 40 rookeries, where adult males defend territories, pups are born, and mating takes place. Sea lions continue to gather at both rookeries and haul out sites outside of the breeding season.

In Oregon, numbers have remained relatively stable since 1981 at about 2,000 to 3,000 animals. In California, numbers have declined, especially in the southern portion of their range. Breeding colonies occur in Oregon and British Columbia but not in Washington (non-breeding occurrences only). Breeding rookeries extend from the central Kuril Islands and the Okhotsk Sea in the West to Ano Nuevo Island and San Miguel Island, California, in the east. Although the latter rookery is nearly or actually defunct, none have been seen on the Channel Islands since 1984. Based on the distribution of Steller sea lions, we expect an individual could be exposed to disturbance by vessels associated with the proposed action.

Pacific Salmon

Pacific salmon (which includes steelhead) enter estuarine and ocean waters and then migrate northward along the west coast. Many will reach the Gulf of Alaska and the Aleutian Peninsula. The distribution of migrating Pacific salmon smolts is generally influenced by temperature, oceanography, and food availability along the continental shelf. In the late summer and fall, salmon will move to the subarctic Pacific where they are widely distributed (Percy 1992). Return migrations of adult salmon to natal rivers may not be along the same route as they traveled as smolts (Percy 199). Pacific salmon generally exhibit a wide range of swimming depths, sometimes traveling as deep as 100 m, and other times traveling at the water surface (Tanka et al. 2001). Chum salmon fitted with data loggers were recorded making frequent dives from surface waters at depths often between 50 to 100 m (Tanka et al. 2001). Tanka et al. (2001) showed that the descent phase of recorded vertical movements were generally faster than the vertical rate of ascent. Based on the distribution of listed salmonids and their migration along the Columbia River, an individual may be exposed to disturbance by vessels from the proposed action.

Critical Habitat
Designated critical habitat for Hawaiian monk seals, Steller sea lions, Southern Resident killer whales, and hawksbill sea turtles do not occur in the action area. Thus, no effects to critical habitat areas for these four species are expected.

Critical habitat is designated for each ESU of Pacific salmon (see 50 CFR part 226.210-212 for a complete summary). Some ESUs have had designated critical habitat since the 1990s. However, the bulk of the critical habitat was redesignated in 2005. Critical habitat for ESUs of Pacific salmon in Washington, Oregon, and Idaho is described in detail at 50 CFR 226.12. Critical habitat for Chinook Salmon ESUs for this consultation includes freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat, estuarine areas (also free of obstruction), waterway bottoms, and adjacent riparian zones of specified lakes and river reaches in the Columbia River that are or were accessible to listed Snake River salmon, and offshore marine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions, and floodplain connectivity.

Effects of the Proposed Action
Our analysis considers the direct and indirect effects of the proposed action on listed species. Potential effects during the GRG shipment from Hawaii to the continental U.S. include vessel disturbance, in-water collisions, and increased marine debris with listed whales, Hawaiian monk seals, turtles, Southern resident killer whales, and Steller sea lions. Additional effects include an increase in barge-tug traffic and exposure concentrations from fuel, oil, and copper leaking from vessels transporting GRG along the Columbia River. We evaluate the likelihood, frequency, and severity of the above effects with listed species in the action area.

Potential effects from interrelated activities associated with the proposed action include ongoing barge transport of materials not regulated by APHIS from the continental U.S. to Hawaii. Materials may include construction materials or any other products. These barges will depart to Hawaii regardless of APHIS approval of GRG transport from Hawaii for disposal at specified landfills in the U.S. continent. The known effects of these interrelated barge activities are limited and may include vessel disturbance, collisions, and accidental loss of unknown transport materials into the aquatic environment.

Vessel Disturbance and Collisions.

General Whale Behavior and Vessel Speed. It is difficult to determine whether and at what distance whales are able to detect and avoid ships. Some studies indicate that large whales do change behavior and exhibit avoidance responses to vessels, while evidence from other studies shows little or no apparent behavioral changes. Reactions have been observed when boats changed speed or direction, or made fast, erratic approaches.

Generally, it appears that baleen whales often ignore low-level sounds from distant vessels. More often, whales exhibit avoidance behavior when vessel noise or speed changes, particularly when the vessel is heading directly toward them (Richardson et al. 1995). Avoidance reactions may include interrupting normal behavior, diving, or swimming rapidly away from approaching vessels. Some whales attempt to avoid an approaching vessel by outrunning it.

Vessel speed may affect the level of injury or mortality to whales during a collision event. Data from 292 cases in the 2003 NOAA Fisheries database reports vessel speeds that have struck a variety of whale species ranged from 2 to 51 knots with an average speed of 18.1 knots. The average vessel speed that resulted in injury or mortality to the whale was 18.6 knots. Evidence of serious injury or mortality is characterized by blood noted in water; animal observed with cuts; propeller gashes or severed tailstock; animal observed sinking after a strike indicating death; fractured skull, jaw, vertebrae; hemorrhaging, massive bruising or other injuries noted during necropsy of animal. The data (n=58) indicated that most vessels were traveling in the ranges of 13 to 15 knots, followed by speed ranges of 16-18 knots and 22-24 knots.

Information in the Jensen and Silber (2003) database and Laist et al. (2001) indicates that the majority of vessel collisions with whales occurred at speeds between 13 to 15 knots. Overall, most ship strikes of large whale species occurred when ships were traveling at speeds of 14 knots or greater. Only 12.3 percent of the ship strikes in the Jensen and Silber database occurred when vessels were traveling at speeds of 10 knots or less. While vessel speed may not be the only factor in ship/whale collisions, or even the primary factor, data indicate that collisions are more likely to occur when ships are traveling at speeds of 14 knots or greater. Thus, ships going slower than 14 knots are less likely to collide with large whales and may facilitate whale avoidance.

Slow moving ships may allow more time for a whale to detect and possibly avoid the low-frequency sounds of an approaching vessel. Ships operating at reduced speed may be less likely to impose strong hydrodynamic forces on whales which otherwise might pull whales into the path of a ship. Additionally, slower vessel speeds may give a whale more time to detect, react, and avoid a vessel. Finally, collision at slower speed results in less actual impact (physical force) to the whale and to the vessel. Average vessel speed for the proposed action is between 6 to 9 knots, with a maximum towing speed of 11.6 knots.

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

Bauer (1986) and Bauer and Herman (1986) investigated potential consequences of vessel disturbance on humpback whales wintering off Hawaii. Thy include changes in respiration, diving, swimming speed, social exchanges, and other behavior correlated with the number, speed, direction, and proximity of vessels. Depending on the social status of whales observed (single males when compared with cows and calves), humpback whales generally tried to avoid vessels when the vessels were 0.5 to 1 kilometer away from the whale. Smaller pods of whales and pods with calves seemed more responsive to approaching vessels. These stimuli are probably stressful to humpback whales in Hawaiian waters. However, the consequences of this stress on the individual whales remain unknown.

Currently, the proposed action will occur year round, including the peak months for humpback whale migration from Alaska to Hawaiian waters from November through May. Given the upper estimate of two barge-tug departure trips per week, encounters between humpback whales and barge-tug during ocean travel is possible, especially during the seven-month whale migration period in Hawaii.

In order to avoid vessel disturbance and collisions with humpback whales, protective species measures are stipulated in the compliance agreement agreed to and signed by the applicants. Measures include but are not limited to observer monitoring for signs of whales especially during migration periods, keeping a 100 yard distance between the vessel and animal, and maintaining low vessel speed.

Coupled with proper implementation of the species' protective measures, low vessel speed, vessel size, and two barge-tug trip departures from Hawaii per week, we expect a low likelihood of humpback whale exposure to approaching vessels. Nevertheless, if an animal is directly exposed to vessels, we expect the exposure time to be short term and temporary. As low vessel speeds reduce the likelihood of collision with whales, we expect ample time for both vessel operator and the animal to engage in avoidance behavior and prevent a direct strike. We further expect the animal to leave the area without incident. Thus, we expect discountable and insignificant effects to humpback whales from the proposed action.

Nevertheless, should a vessel strike an animal during GRG transport, measures are in place for agency reporting, notification, and re-initiation of ESA section 7 consultation with NMFS.

Fin Whale. Studies have shown that fin whales respond to noise created by approaching vessel traffic in a variety of ways, depending on the behavior of the animal at the time of approach and the speed and direction of the approaching vessel. Fin whales involved in feeding react less rapidly and with less obvious avoidance maneuvers than those not involved in feeding (Richardson et al. 1995). Watkins et al. (1981) found that both fin and humpback whales appeared to react to vessel approach by increasing swim speed, exhibiting a startled reaction, and moving away from the vessel with strong fluke motions.

In the St. Lawrence River, the most marked reactions by fin whales to industrial freight and whale watching vessels occurred when boats made fast, erratic approaches or sudden changes in direction or speed. In the waters off New England, in an area with high level of whale watching and recreational boat activity, fin whales have been reported to reduce the duration of their surfacing and to reduce the number of blows per surfacing when whale-watching and other vessels are nearby. However there is also evidence of habituation to increased vessel traffic by the fin whales in these waters (Watkins 1986). Although these stimuli are probably stressful to fin whales in the action area, the consequences of this stress on the individual whales remain unknown.

It is possible that ship strikes affect all fin whale stocks. However, due to their pelagic nature, they go unreported because injured or killed animals do not strand. In U.S. waters of the North Atlantic, there are nine records of ship collisions, boat strikes, or propeller scars between 1980 and 1994 and four such records between 1991 and 1995 (Waring et al. 1998). In 1996, one anecdotal incident was reported from the southeastern U.S. of a whale being hit at sea by a container ship and carried into harbor on the ship's bow (Krueger 1996).

In order to avoid vessel disturbance and collisions with fin whales, measures are stipulated in compliance agreements for applicants. Measures include vessel operator monitoring for signs of whales and maintaining low vessel speeds. Coupled with proper implementation of species protection measures, vessel size, low vessel speed, and two barge-tug trips from Hawaii per week, we expect a low likelihood of fin whale exposure to approaching vessels. Nevertheless, if an animal is directly exposed to vessels, we expect the time of exposure to be short term and temporary. We expect slow moving vessels are less likely to collide with fin whales and may facilitate whale avoidance. We further expect the animal may have ample time to avoid the vessel and leave the area without incident. Thus, we expect discountable and insignificant effects to fin whales from the proposed action.

Nevertheless, should a vessel strike an animal during GRG transport, measures are in place for agency reporting, notification, and re-initiation of ESA section 7 consultation with NMFS.

Blue Whale. We expect blue whales to respond similarly to approaching vessels as those described above for humpback and fin whales. Additionally, this species is vulnerable to unnatural mortality caused by shipping where vessel traffic is heavy. Deep wounds and scars, which can be attributed to collisions with the propeller or hull of large vessels, have been observed on 16 percent of the blue whales found in the St. Lawrence. Though there is little direct evidence of mortality due to ship strikes, the relatively high numbers of blue whales (58) with scars that can be linked to ship strikes indicate that this is likely a serious problem. Off California between 1980 and 1993, ship strikes caused the deaths of at least four and possibly six blue whales (Barlow et al. 1997). It is possible that whales struck and killed by fast moving vessels may just sink out of sight to the bottom and go unnoticed. High speed container ships, common worldwide, are potentially one of the greatest threats. Large vessels traveling at more than 15 nautical miles per hour (26 km/h) have been found as the principal source of ship strike mortality in whales (Laist et al. 2001).

In order to avoid vessel disturbance and collisions with blue whales, protective measures are stipulated in compliance agreements with applicants. Measures include vessel operator monitoring for signs of whales and maintaining low vessel speed. Coupled with proper implementation of these measures, vessel size, and the low number of departing barge trips from Hawaii, we further expect a low likelihood of exposure between blue whales and vessels.

In the event an individual is exposed to approaching vessels, we expect the time of exposure to be short term and temporary. We expect slow moving vessels are less likely to collide with blue whales and the animal may have ample time to avoid the vessel and leave the area without incident. Thus, we expect the discountable and insignificant effects to blue whales from the proposed action.

However, should a vessel strike an animal during GRG transport, measures are in place for agency reporting, notification, and re-initiation of ESA section 7 consultation with NMFS.

Sei whale. We expect sei whales to respond similarly to noise from and approaching vessels as described for the above whale species. Given the low population number of sei whales, the rarity of sei reports off waters at the affected states, low vessel speeds, and the low frequency of barge-tug departures from Hawaii, we expect a very low probability of an individual exposure to vessel disturbance. Nevertheless, if an animal is exposed to vessels, we expect sei whales may have ample time to avoid a collision and leave the area without incident. Thus, we expect insignificant and discountable effects to sei whales from the proposed action.

Nevertheless, should a vessel strike an animal during GRG transport, measures are in place for agency reporting, notification, and re-initiation of ESA section 7 consultation with NMFS.

Sperm Whale. We expect sperm whales to respond similarly to approaching vessels as described for the above whale species. As sperm whales are deep divers, they are likely to be at depth rather than at the surface during barge-tug transport. No exposure or disturbance is anticipated if the species is at depth. Species protective measures in compliance agreements with applicants further ensure avoidance of direct encounters with the animal. Measures include vessel operator monitoring for signs of whales and maintaining low speed. Coupled with deep diving behavior of sperm whales and proper implementation of species protection measures, we expect a low probability of co-occurrence between the animal and vessels traveling across the ocean.

Nevertheless, if the individual is at the surface for a breath, the surface interval will last only a few seconds before the sperm whale is likely to make another dive. We expect the time of exposure to be short term and temporary and the animal may leave the area without incident. Thus, we expect discountable and insignificant effects to sperm whales from the proposed action.

However, should a vessel strike an animal during GRG transport, measures are in place for agency reporting, notification, and re-initiation of ESA section 7 consultation with NMFS.

Southern Resident KillerWhale. Vessels have the potential to affect whales through the physical presence and the activity of the vessel, the increased underwater sound levels generated by boat engines or a combination of these factors. Vessel strikes are rare but do occur and cause injury.

Killer whales rely on their highly developed acoustic sensory system for navigating, locating prey, and communicating with other individuals. Increased levels of anthropogenic sound have the potential to mask echolocation and other signals used by the species, as well as to temporarily or permanently damage hearing sensitivity. Exposure to sound may therefore be detrimental to survival by impairing foraging and other behavior, resulting in a negative energy balance (Bain and Dahlheim 1994, Gordon and Moscrop 1996, Erbe 2002, Williams et al. 2002a, 2002b). In other cetaceans, hormonal changes indicative of stress have been recorded in response to intense sound exposure (Romano et al. 2003). Chronic stress is known to induce harmful physiological conditions including lowered immune function, in terrestrial mammals and likely does so in cetaceans (Gordon and Moscrop 1996). The threshold levels at which underwater sound become harmful to killer whales remain poorly understood (Krahn et al. 2002).

Several studies have linked vessels with short-termed behavioral changes in Northern and Southern Resident killer whales (Kruse 1991, Kriete 2002, Williams et al. 2002a, 2002b, Foote et al. 2004, Bain et al. 2006). Whether it is the presence and activity of the vessel, the sounds of the vessel or a combination of these factors is not well understood. Individual whale responses to whale watching vessels include swimming faster, adopting less predictable travel paths, making shorter or longer dives, moving into open water, and altering normal patterns of behavior at the surface (Kruse 1991; Williams et al. 2002a, Bain et al. 2006). In some cases, no disturbance to Southern Resident killer whales seems to occur (R. Williams, unpubl data). Avoidance tactics often vary between encounters and the sexes, with the number of vessels present and their proximity, activity, size, and "loudness" affecting the reaction of the whales Williams et al. 2002a, 2002b). Avoidance patterns often become more pronounced as boats approach closer. Bain et al. (2006) found that behavior of Southern Residents in the presence of vessels included inhibition of feeding behavior, horizontal avoidance, and changes in surface active behavior.

In recent decades commercial shipping traffic has become a major source of low frequency (5 to 500 Hz) human-generated sound in the world's oceans (National

Research Council 2003). The low-frequency sound generated by these ships is largely from cargo ships (71 percent), passenger vessels (13 percent), tugs (7 percent), and tankers (5 percent) (Mintz and Feladelfo 2004b). Although large vessels have predominantly low frequency sound, studies have reported broad band sounds from large cargo ships including significant levels of noise above 2 kHz that may interfere with important biological functions (Hildebrand 2006 summarized in Holt 2007). However, boats such as recreational fishing vessels operating at slow speeds or in idle, usually do not appear to disrupt the whales' behavior (Krahn et al. 2004a).
In rare instances, killer whales are injured or killed by collisions with passing ships and powerboats, primarily from being struck by the propeller blades (Visser 1999d, Ford et al. 2000, Visser and Fertl 2000, Baird, 2001, Carretta et al. 2001, 2004). Some animals with severe injuries eventually make full recoveries, such as a female described by Ford et al. (2000) that showed healed wounds extending almost to her backbone. One mortality from a vessel collision was reported for Washington and British Columbia between the 1960s and 1990s (Baird 2002). However, two additional mortalities have occurred since then. In March of 2006, a lone resident killer whale in Nootka Sound was killed by the engine of a tug boat. In July 2006, the death of a stranded Northern Resident female was attributed to blunt trauma, probably from a vessel strike (Gaydos and Raverty 2007). Five additional accidents between vessels and killer whales have been documentated the region since the 1990s (Baird 2001; DFO, unpubl. data, NMFS, unpubl. data).

Despite the above incidences, species protective measures are prescribed in compliance agreements to avoid animals while on route to the Columbia River. Measures include vessel operator monitoring for Southern Resident killer whales and maintaining low vessel speed. Based on the slow vessel speed, we expect any noise generated from these vessels may not mask the animal's ability to communicate with each other or disrupt its normal behavior. We also expect a low probability of exposure between Southern Resident killer whales and vessels given proper implementation of species protection measures, vessel size, low number of departing barge trips from Hawaii, and vessel speed. Nevertheless, if an animal is exposed to slow moving vessels, we expect the time of exposure to be short term and temporary. We further expect the animal may have ample time to avoid the vessel and leave the area without incident. Thus, we expect insignificant effects to Southern Resident killer whales from the proposed action.

However, should a vessel strike an animal during GRG transport, measures are in place for agency reporting, notification, and re-initiation of ESA section 7 consultation with NMFS.

Hawaiian Monk Seal. Hawaiian monk seals are capable of deep dives and can swim long distances when searching for food and haul out sites. Consequently, monk seals at or near the water surface are vulnerable to collisions with motor boats or their propellers. Potential injuries and their severity will depend on the speed of the vessel, the part of the vessel striking the animal, and the body part impacted. Injuries from vessel strikes may include bruising, broken bones, lacerations, and possibly death.

Limited information is available on the behavioral response and stress levels for Hawaiian monk seals and approaching vessels. A few individuals may be curious and approach the vessel while others may ignore the vessel and continue swimming and foraging behaviors. Some individuals may also depart the area without incident. Although an animal's avoidance response to an approaching vessel may affect its respiration, diving, and swimming speed, the consequences of these stressors on the individual are unknown.

Nevertheless, vessel strikes have injured Hawaiian monk seals in the past (NMFS, unpublished data). Although there is no published evidence that monk seals were struck by vessels, one seal was found in 1986 with a broken jaw and presumed propeller cuts on his ventrum.

In order to address vessel disturbance effects to Hawaiian monk seals at Barbers Point and Hilo harbors, vessel operators will travel at low speeds and look out for monk seals when entering or leaving the harbors. These measures ensure a low probability of animal exposure to approaching vessels. Nevertheless, if a seal is encountered, vessels will also halt their activity and allow the animal to leave the area on its own volition. These measures are included into compliance agreements with future applicants. Given proper implementation of these measures, vessel size, slow vessel speed, and a low frequency of barge-tug departure trips per week, we expect insignificant effects of vessel disturbance and discountable effects of vessel collisions with Hawaiian monk seals.

Nevertheless, should a vessel strike an animal during GRG transport, measures are in place for agency reporting, notification, and re-initiation of ESA section 7 consultation with NMFS.

Listed Sea Turtles.

General Sea Turtle Behavior. Sea turtles breathe air and must resurface to breathe. Consequently, turtles at or near the surface are vulnerable to collisions with motor boats or their propellers. Potential injuries and their severity will depend on the speed of the vessel, the part of the vessel striking the animal, and the body part impacted. Injuries from vessel strikes may include bruising, broken bones, or carapaces, and lacerations, and possibly death. When exposed to vessel approaches, sea turtles may dive quickly and depart the area without incident.

However, the opportunity for an animal to respond appropriately to an approaching source of danger is constrained by how soon the animal can detect the danger. Contemporary knowledge of the sensory biology of marine turtles (Moien Bartol and Musik 2003) indicates that sound and light offer potential cues for detect an approaching vessel. The ability of marine turtles to hear underwater sound has been confirmed by measuring their auditory brainstem responses (Ketten and Bartol 2006) and by observations of their behavioral responses to sound (O'Hara and Wilcox 1990, Moein et al. 1993). The relative low frequency range of turtle hearing (Ketten and Bartol 2006) lies well within the broad frequency spectrum of noise produced by vessels (Richardson et al. 1995).

Efficient turtle vision has been confirmed through physiological and behavioral studies in the laboratory and on nesting beaches. This research has established that turtles see with sufficient visual acuity to discern relatively small (prey-sized) objects, differentiate between colors, and rely on vision for return to the sea after nesting (see Moien, Bartol and Musick 2003). Anecdotal field observations also attest the apparent ability of turtles to detect danger by sight while underwater.

Despite these physical abilities, high vessel speed may increase collision risk for sea turtles in water. Collision may occur when turtles fail to flee from an approaching vessel or there is inadequate vertical distance between the vessel and the turtle to allow the vessel to pass safely above the animal. Hazel et al. (2007) suggest that turtle fleeing response may depend on timely visual detection to evade approaching vessels. The proportion of turtles that fled to avoid vessels decreased significantly as vessel speed increased. Also, turtles that fled moderate and fast approaches did so at significantly shorter distances from the vessels than turtles that fled from slow approaches. These findings suggest slow vessel speed may facilitate timely detection and evasion responses by turtles to approaching vessels. Average vessel speed for the proposed action is between 6 to 9 knots, with a maximum towing speed of 11.6 knots.

Green and Hawksbill Sea Turtles. Barge-tug traffic may encounter green and hawksbill sea turtles in Hawaiian harbor waters given these species' abundance and nesting in the MHI. In order to avoid vessel disturbance to listed sea turtles, vessel operators will monitor for sea turtles and avoid direct encounters with the animal in water. Coupled with proper implementation of species protection measures, two barge-tug departure trips per week, vessel size, and low vessel speeds, we expect a low probability of sea turtle exposure to approaching vessels. Nevertheless, in the event of the animal's exposure to such vessels, we expect the time of exposure to be short term and temporary. We further expect the animal may have ample time to detect and avoid the vessel and may leave the area without incident. Thus, we expect insignificant levels of disturbance to green and hawksbill sea turtles from vessels and a discountable probability of vessel collisions and propeller damage to both species.

Olive ridleys, Leatherbacks, and Loggerhead Sea Turtles. These three species may occur throughout the action area. In order to avoid collisions with sea turtles, vessel operators will look out for animals in water and avoid direct encounters with them. Nevertheless, we expect a very low probability of an animal's exposure to vessels based on the rarity of species sightings and their pelagic and highly migratory nature in the action area.

If an individual is exposed to slow moving vessels, we expect the time of exposure to be short term and temporary. We further expect the animal may have ample time to detect and avoid vessels and leave the area without incident. Thus, we expect insignificant and discountable effects to olive ridley, leatherback, and loggerhead sea turtles from the proposed action.

Steller Sea Lions. The behavioral effects of vessel traffic on Steller sea lions were derived from scientific research via vessel surveys. Disturbance effects from this activity may range from no response to initiating the flight response in an aggregation (i.e., a stampede). Studies have shown disturbance from vessel traffic has highly variable effects on Steller sea lions that are hauled out (Calkins and Pitcher 1982). Response may range from no reaction at all to the immediate and complete evacuation of haulouts (Calkins and Pitcher 1982). The flight response in pinnipeds has been described as "unrelenting and reckless" such that animals that are chased before capture (or which flee in response to the presence of researchers or low-flying aircraft) are placed at risk of injury not only from the excessive metabolic heat generated from the flight itself, but also from a variety of potentially dangerous situations encountered in their escape attempts (Sweeney 1990). In the wild, when sea lions are frightened off rookeries during the breeding and pupping season, animals may be injured as they run over each other or slide or crash into cliff facings or underwater rocks in their haste to escape, and pups may be trampled or abandoned.

Frid and Dill (2002) argue that an animal's response to human-caused disturbance is analogous to their response to a predator, such that they will make optimal fleeing decisions that balance the benefit of avoiding capture against the cost of abandoning the resource patch. In review of studies across taxa, Frid and Dill (2002) found that, in general, the probability of fleeing increases when the disturbance approaches more directly and when the cost of fleeing is lower than the perceived cost of staying. Results varied among studies as to whether speed and the size of the disturbance (i.e., size of the perceived predator) influenced flight responses (Frid and Dill 2002). In some instances, sea lions have temporarily abandoned haulouts after repeated disturbance (Thorsteinson and Lensink 1962; Kucey 2005). However, in other situations Steller sea lions have continued using areas after repeated and severe harassment. Kenyon (1962) noted permanent abandonment of areas in the Pribilof Islands that were subjected to repeated disturbance. A major sea lion rookery at Cape Sarichef was abandoned after the construction of a light house at that site. However, the sea lions used the site as a haulout after the light house was no longer inhabited by humans.

Kucey (2005) observed more than 1,000 disturbance events of which slightly more than 40 percent caused animals to leave the site. She found that boat disturbance evoked greater responses than aerial disturbances with more than 15 percent of the animals leaving the haulout in response to watercraft (n=36). Kucey (2005) observed that the nature of the vessel approach (i.e., speed, noise, fumes, combined with other variables like weather) influenced the magnitude of the response.

In order to avoid Steller sea lions, no vessels will approach within three nautical miles of a Steller sea lion rookery site as listed in 50 CFR § 223.202(a)(3). These locations are all within the Aleutian Islands and the Gulf of Alaska, not part of the barge travel route. Vessel operators will travel at slow speeds, monitor for animals, and avoid direct encounters with them.

Although ship strikes are not reported as a threat to this species, vessels will travel at low speeds (6 to 9 knots) on route to the Columbia River. Coupled with vessel size, the low frequency of GRG transport, and avoidance of the species' rookeries, we expect a very low probability of exposure to Steller sea lions from the proposed action.

If an exposure does occur, we expect the time of exposure to be short term and temporary. We further expect the animal may have ample time to avoid the vessel and leave the area without incident. Thus, we expect insignificant and discountable effects to Steller sea lions from the proposed action.

However, should a vessel strike an animal during GRG transport, measures are in place for agency reporting, notification, and re-initiation of ESA section 7 consultation with NMFS.

Marine Debris and Pollution Effects.
Other than a vessel capsizing, which may trigger an emergency consultation with the resource agencies, marine debris and pollution effects may occur from accidental loss of bales and their rupture in the water. Bales of GRG may accidentally fall in the water during their loading and unloading from barges docked portside in Hawaii and along the Columbia River. The Columbia River is a primary migration route for listed salmonids and some ESUs are known to spawn in the Columbia River. Any bales that fall and rupture in the Columbia River may drift into fish spawning areas.

Given the sorting requirements of waste prior to baling and transport of GRG, no hazardous wastes are permitted in the bales. Thus, no chemical pollution is expected from baled GRG. We further expect low incidences of marine debris and pollution exposure from fallen bales as waste management companies must implement measures for bale integrity and their salvage in water to the extent practicable. Measures include the frequent inspection of bales for breaks, training of waste management personnel in proper handling procedures, labeling and identification of all bales, and implementation of spill response plans.

Nevertheless, should bales of GRG fall from the barge, into the ocean or the Columbia River, they will sink to the bottom due to their significant relative density. Bales may remain intact or may break open, depending on conditions. APHIS' analysis for bale-rupturing accidents for barges to Washington and Oregon estimated an annual likelihood of a bale-rupturing accident at 0.37 percent and 0.41 percent, respectively. Mean years to the first bale rupturing accident for barges in both states was 130 and 246, respectively. The Washington and Oregon estimates were based on the proposed transport of 300,000 and 120,000 tons of GRG per year. For both analyses, the risk of catastrophic rupture of bales is less than one percent.

Waste hauling companies will document incidences of lost bales during transport in reports to APHIS. APHIS, in turn, will provide annual reports to the resource agencies (USFWS and NMFS) for the first three years of operation. Reports will contain information on compliance agreement activities, a summary of any incidents documented

on the bale manifests, and any quarantine-specific pest found in bales associated with GRG movement from Hawaii. Resource agencies may formally request continued issuance of these reports after the third year reporting period. Agency monitoring of these activities for the project duration may require future re-analysis of the proposed action as necessary, and refinements for securing bales during future transport.
Given the low probability of exposure from accidents and bale rupture from barges, low frequency of GRG departures from Hawaii, lack of hazardous pollutants in bales, proper implementation of bale integrity and salvage measures, and notification procedures, we expect insignificant effects to the above listed species from marine debris and pollution.

Vessel Traffic Increase Along The Columbia River. As per the BA, the net volume of tonnage for the Columbia Basin was 54,390,000 tons of freight (all commodities), with over 1,113,000 tons moving between Vancouver and The Dalles and 2,231,000 tons moving above The Dalles. APHIS estimated about 10,000 barge trips per year on the Columbia River based on the 5,000 tons per barge load. As the proposed action may add 100 barge trips per year, the anticipated overall increase in barge traffic is about one percent of all barge traffic in the Columbia River. This represents a minimal increase in barge traffic on the river.

As GRG transport occurs along the Columbia River, we expect a low probability of pest escape and its establishment in the river. This is based on proper implementation of baling protocols, duration of bales at staging areas prior to transport, and a low probability of bale rupture. Nevertheless, should a plant pest escape into the Columbia River, we expect insignificant effects to listed fishes as pests from Hawaii already occur in the continental U.S. Based on the above, we expect insignificant effects of a one percent increase in vessel traffic to listed salmonids in the Columbia River.

Fuel, Oil, and Copper Leakage from Vessel Movement Along The Columbia River.

The effects of fuel may directly poison fish species in the Columbia River or indirectly affect them by poisoning invertebrate or prey species. Oil and petroleum products vary considerably in their toxicity and the sensitivity of fish to petroleum varies among species. The sublethal effects of oil on fish include changes in heart and respiratory rates, gill hyperplasia, enlarged liver, reduced growth, fin erosion, impaired endocrine system, a variety of biochemical blood and cellular changes, and behavioral responses (USFWS 2003).

Although no intentional discharge of fuel or oil is expected, routine leakage of small amounts of fuel or oil (sheen) during GRG transport along the Columbia River is possible. APHIS estimated a total of 0.01 gallons per hour would be lost through normal operations during the trip up the river. APHIS further estimated the exposure concentration associated with routine fuel or oil loss flowing downstream in the Columbia River. Parameters considered the duration of lost fuel, evaporation rates of the most toxic fuel fractions, the low frequency of barges from Hawaii, uniform flow rates along the entire length of the Columbia River, and uniform mixing in the water column. The resulting toxicity value of 0.006 mg/L/hr (concentration) was compared to the toxicity value for the 48-hour Daphnia EC_{50} value of 1.43 mg/L/hr, benchmark exposure concentration for unexposed salmonids. Although the calculated exposure value fell below the benchmark concentration, we expect the actual toxicity exposure as being much lower in field conditions. This is based on actual dilution of these inputs from variable flow rates, mixing in the water column, and river water volume. Thus, we expect a very low probability of fish exposure to any lost fuel or oil in the Columbia River. Furthermore, we expect these releases to be short term and rapid evaporation of the most toxic fractions may occur. Based on this, we expect insignificant effects from fuel and oil effects to listed fish or their prey species in the Columbia River.

In the unlikely event that a GRG spill occurs, vessel operators will immediately implement spill and equipment clean up protocols. No disinfectants or detergents will be used during GRG spill clean ups. APHIS will initiate emergency consultation with NMFS should this incident occur.

According to the BA, vessels transporting GRG along the Columbia River use an anti-fouling hull agent, known as Interclene Formula BRA 572. Although data searches for this particular agent yielded limited information, similar Interclene formulas used in the European Union (i.e., Formula 300 and 400 series) are known to contain copper oxide. Although Formula BRA 572 is in a different series for Interclene, similar Interclene products are also developed by the same company, International Paint, for this same brand. Thus, we assumed this agent also contains copper oxide.

Dissolved copper is known to cause olfactory impairments in salmonids. Copper can disrupt and damage the olfactory system of salmonids and cause a decreased capacity to detect important chemical cues in the environment, including but not limited to the location of prey, predator avoidance, and locating natal streams. This sense of smell is critical for salmonids to complete their complex life history behaviors including homing, foraging, and predator avoidance. Potential sublethal impacts on the olfactory function may affect salmon survival and reproduction.

APHIS estimated exposure levels of copper leaching into the Columbia River from GRG transport. Parameters considered copper leaching rates from ships with anti-hull fouling paint, the largest barge surface area, and water volume in a closed system (no contribution of flow or tide as per actual field conditions). The resulting value of 0.52 μg/L was compared with benchmark concentrations for dissolved copper to unexposed salmonids. This benchmark concentration ranged from 0.59 to 2.1 μg/L. Values above this benchmark concentration could be expected to impact fish olfaction and behavior (Hecht et al. 2007).

As the calculated exposure value of copper to salmonids is below the threshold range of 0.59, we expect a low probability of copper exposure to salmonids. We further expect the calculated exposure as being lower than actual copper concentrations in the river. This is based on actual dilution rates in ports and rivers with flowing water and tidal fluctuations along the Columbia River. The assessment also assumed that 100 percent of the copper is bioavailable and in the dissolved phase. These conditions do not occur in natural waters having suspended solids, organic carbon, acid volatile sulfides and other water quality parameters affecting the concentrations of dissolved copper. Based on the above, we expect a very low probability of copper exposure to listed fish in the Columbia River. Thus, we expect insignificant exposure effects from copper to listed salmonids during GRG transport.

Critcal Habitat for Listed Salmonids.
Although some leakage of fuel, oil, and copper from barge-tug transport along the Columbia River, we expect these inputs will be diluted given fluctuating tide and water flow into river tributaries designated as critical habitat for salmonids. The dilution factor of these inputs into the aquatic environment and their very low exposure levels are not expected to modify the overall conservation value of any primary constituent elements for salmonids. This is based on the temporary and short term duration of initial exposure of fuel, oil, and copper from barge-tug transport on overall water quality in the Columbia River. Given the ongoing navigable use of vessels along the Columbia River, we do not expect additional modifications to the natural cover, forage, passage conditions, and floodplain connectivity to salmonids by vessels associated with the proposed action. Thus, we expect the proposed action would have no adverse effect on salmonid critical habitat.

Conclusion of Consultation
NMFS concurs with APHIS' determination that authorization of the proposed movement of GRG from Hawaii for disposal in landfills in Washington, Oregon, and Idaho may affect but is not likely to adversely affect marine protected species or their designated critical habitats. NMFS concurrence is based on the:

1. Proposed action's requirements for low vessel speeds (average towing speed at 6 to 9 knots; maximum towing speed at 11.6 knots);
2. Proper implementation of species protection measures;
3. A low probability of exposure of listed individuals to vessels, including operator and animal avoidance response; and
4. A low probability of exposure of listed species to highly diluted and low exposure concentrations of fuel, oil, and copper in the aquatic environment; and
5. The short term and temporary nature of an exposure with vessels whereby the animal may leave the area without incident.

This concludes your consultation responsibilities under the ESA for species under NMFS' jurisdiction. Consultation must be reinitiated if: 1) a take occurs; 2) new information reveals the effects of the action that may affect listed species or critical habitat n a manner or to an extent no previously considered; 3) the identified action is subsequently modified in a manner causing effects to listed species or critical habitat not previously considered; or 4) a new species is listed or critical habitat designated that may be affected by the identified action.

If you have further questions please contact Arlene Pangelinan on my staff at (301) 713-1401. Thank you for protecting our nation's marine living resources.

Sincerely,

James H. Lecky
Director
Office of Protected Resources

Cc: Pacific Islands Regional Office, Honolulu, HI
Northwest Regional Office, Seattle, WA
USFWS, Region 1, Portland, OR

References

Angliss, R.P., and R.B. Outlaw. 2007. Alaska Marine Mammal Stock Assessments, 2006. U.S. Dep. Comm., NOAA, NMFS, AFSC. NOAA Tech. Memo. NMFS-AFSC-168.

Bain, D.E. and M.E. Dahlheim. 1994. Effects of masking noise on detection thresholds of killer whales. Pages 243-256 *in* T.R. Loughlin, editor. Marine mammals and the Exxon Valdez. Academic Press, San Diego, California.

Bain, D.E., J.C. Smith, R.Willams and D. Lusseau. 2006. Effects of vessels on behavior of southern resident killer whales (*Orcinus* spp.) NMFS Contract Report N. AB133f03SE0959 and AB133f04CN0040.

Baird,R.W. 2000. The killer whale: foraging specializations and group hunting. Pages 127-153 *in* J. Mann, R.C. Connor, P.L. Tyack, and H. Whitehead, editors. Cetacean societies: field studies of dolphins and whales. University of Chicago Press, Chicago, Illinois.

Baird, R.W., M.B. Hanson, E.A. Ashe, R.R. Heithaus, and G.J. Marshall. 2003. Studies of foraging in "southern resident" killer whales during July 2002: dive depths, bursts in speed, and the use of a "Crittercam" system for examining subsurface behavior. National Marine Fisheries Service, National Marine Mammal Laboratory, Seattle, Washington.

Baird, R. W. and L.M. Dill. 1995. Occurrence and behaviour of transient killer whales: seasonal and pod-specific variability, foraging behaviour, and prey handling. Canadian Journal of Zoology 73:1300-1311.

Baird, R.W. 2001. Status of killer whales, *Orcinus orca*, in Canada. Canadian Field-Naturalist 115:676-701.

Baird, R.W. 2002. Killer whales of the world: natural history and conservation. Voyageur Press, Stillwater, Minnesota.

Baird, R.W., M.B. Hanson, and L.M. Dill. 2005. Factors influencing the diving behaviour of fish-eating killer whales: sex differences and diel and inter-annual variation in diving rates. Canadian Journal of Zoology 83: 257-267.

Balcomb, K.C., III. 1987. The Whales of Hawaii. Marine Mammal Fund, 99 pp.

Baker, C.S., L.M. Herman, B.G. Bays, and G.B. Bauer. 1983. The impact of vessel traffic on the behavior of humpback whales in southeast Alaska: 1982 season. Report submitted to the National Marine Mammal Laboratory, Seattle, Washington.

Baker, C.S., L. Medrano-Gonzalez, J. Calambokidis, A. Perry, F. Pichler, H. Rosenbaum, J.M. Straley, J. Urban-Ramirez, M. Yamaguchi, and O. von Ziegesar. 1998. Population structure of nuclear and mitochondrial DNA variation among humpback whales in the North Pacific. Mol. Ecol. 7:695-708.

Baker, C.S., S.R. Palumbi, R.H. Lambertsen, M.T. Weinrich, J. Calambokidis, and S.J. O'Brien. 1990. Influence of seasonal migration on geographic distribution of mitochondrial DNA haplotypes in humpback whales. Nature 344(15):238-240.

Baker, J.D. and T.C. Johanos. 2004. Abundance of the Hawaiian monk seal in the main Hawaiian Islands. Biological Conservation. 116:103-110.

Balazs, G.H. and J.A. Wetherall. 1991. Assessing impacts of North Pacific high-seas driftnet fisheries on marine turtles: progress and problems. Unpublished paper prepared for the North Pacific Driftnet Scientific Review Meeting, Sidney, British Columbia, Canada, 11-14 June 1991.

Bannikov, A.G., I.S. Darevsky, and A.K. Rustamov. 1971. Zemnovodni I presmikaushchienya USSR. Izdatelistovo "Misl", Moscow. 304 p.

Barlow, J. 1995. The abundance of cetaceans in California waters. Part I: ship surveys in summer and fall of 1991. Fish. Bull. U.S. 93:1-14.

Barlow, J., K.A. Forney, P.S. Hill, R.L. Brownell, Jr., J.V. Carretta, D. P. DeMaster, F. Julian, M.S. Lowry, T. Ragen, and R. R. Reeves. 1997. U.S. Pacific marine mammal stock assessment: 1996. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-248. Southwest Fisheries Science Center; La Jolla, California.

Barlow, J. 1997. Preliminary estimates of cetacean abundance off California, Oregon, and Washington based on a 1996 ship survey and comparisons of passing and closing modes. Admin. Rept. LJ-97-11 available from Southwest Fisheries Science Center, P.O. Box 271, La Jolla, CA. 25 pages.

Barlow, J. 2003a. Cetacean abundance in Hawaiian waters during summer/fall 2002. Admin. Rep. LJ-03-13. Southwest Fisheries Science Center, National Marine Fisheries Service, 8604 La Jolla Shores Drive, La Jolla, CA 92038.

Barlow, J. 2003b. Preliminary estimates of the abundance of cetaceans along the U.S. west coast: 1991-2001. Southwest Fisheries Science Center Administrative Report LJ-03-03. Available from SWFSC, 8604 La Jolla Shores Dr., La Jolla CA 92037. 31 p.

Barlow, J. and B.L. Taylor. 2001. Estimates of large whale abundance off California, Oregon, Washington, and Baja California based on 1993 and 1996 ship surveys. Administrative Report LJ-01-03 available from Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038. 12p.

Baretta, L., and G.L. Hunt. 1994. Changes in the numbers of cetaceans near Pribilof Islands Bering Sea between 1975-78 and 1987-89. Arctic 47:399-406.

Bauer, G.B. 1986. The behavior of humpback whales in Hawaii and modification of behavior induced by human interventions. Unpublished doctoral dissertation; University of Hawaii, Honolulu.

Bauer, G.B. and L.M. Herman. 1986. Effects of vessel traffic on the behavior of humpback whales in Hawaii. Report submitted to NMFS Southwest Region, Western Pacific Program Office; Honolulu, Hawaii.

Berzin, A.A. 1972. The sperm whale. Pacific Scientific Research Institute of Fisheries and Oceanography, Moscow. (Transl. from Russian 1971 version by Israel Program for Sci. Transl., Jerusalem).

Berzin, A. A., and A. A. Rovnin. 1966. The distribution and migrations of whales in the northeastern part of the Pacific, Chukchi and Bering Seas. Izvestiya Tikhookeanskogo Nauchno-Issledovatel'skogo Institut Rybnogo Khozyaistva I Okeanografii 58:179-207. (Translated by Bureau of Commercial Fisheries, U. S. Fish and Wildlife Service, Seattle, 1968. Pages 103-136 in K. I. Panin, editor. Soviet Research on Marine Mammals of the Far East).

Best, P.B. 1993. Increase rates in severely depleted stocks of baleen whales ICES. J. Mar. Sci. 50:169-186. *Cited in* Caretta, J.V., K.A. Forney, M.M. Muto, J. Barlow, J. Baker, B. Hanson, and M.S. Lowry. 2006. U.S. Pacific Marine Mammal Stock Assessments: 2005. US Dept. Comm, Southwest Fisheries Science Center. NOAA-TM-NMFS-SWFSC-388.

Bickham, J.W., J.C. Patton, and T.R. Loughlin. 1996. High variability for control-region sequences in a marine mammal: implications for conservation and biogeography of Steller sea lions (*Eumetopia jubatus*). J. Mammal. 77:95-108.

Bolten, A.B., J.A. Wetherall, G.H. Balazs, and S.G. Pooley (compilers). 1996. Status of marine turtles in the Pacific Ocean relevant to incidental take in the Hawaii-based pelagic longline fishery. U.S. Dept. of Commerce, NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-230.

Boran, J.R. and S.L. Heimlich. 1999. Social learning in cetaceans: hunting, hearing and hierarchies. Pages 282-307 *in* H.O. Box and K.R. Gibson, editors. Mammalian social learning: comparative and ecological perspectives. Cambridge University Press, Cambridge, United Kingdom.

Brueggeman, J.J., G.A. Green, K.C. Balcomb, C.E. Bowlby, R.A. Grotefendt, K.T. Briggs, M.L. Bonnell, R.G. Ford, D.H. Varoujean, D. Heinemann, and D.G. Chapman. 1990. Oregon-Washington marine mammal and seabird survey: information synthesis and hypothesis formulation. OCS Study, Minerals Management Survey, Contract 89-0030.

Calambokidis, J., G. H. Steiger, J. R. Evenson, K. R. Flynn, K. C. Balcomb, D. E. Claridge, P. Bloedel, J. M. Straley, C. S. Baker, O. von Ziegesar, M. E. Dahlheim, J. M. Waite, J. D. Darling, G. Ellis, and G. A. Green. 1996. Interchange and isolation of humpback whales in California and other North Pacific feeding grounds. Mar. Mamm. Sci. 12(2):215-226.

Calambokidis, J., G.H. Steiger, J.M. Straley, L.M. Herman, S. Cerchio, D. R. Salden, J. Urbán-R., J. K. Jacobsen, O. von Ziegesar, K. C. Balcomb, C. M. Gabriele, M. E. Dahlheim, S. Uchida, G. Ellis, Y. Miyamura, P. Ladrón de Guevara-P., M. Yamaguchi, F. Sata, S. A. Mizroch, L. Schlender, K. Rasmussen, J. Barlow, and T. J. Quinn II. 2001. Movements and population structure of humpback whales in the North Pacific. Mar. Mamm. Sci. 17(4):769-794.

Calambokidis, J., T. Chandler, E. Falcone, and A. Douglas. 2004. Research on large whales off California, Oregon and Washington in 2003. Contract Report to Southwest Fisheries Science Center, P.O. Box 271, La Jolla, CA 92038. 48p.

Calambokidis, J.,T. Chandler, L. Schlender, G.H. Steiger, and A. Douglas. 2003. Research on humpback and blue whales off California, Oregon and Washington in 2002. Final Contract Report to Southwest Fisheries Science Center, national Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038. 49 pages.

Calkins, D.G. and K.W. Pitcher. 1982. Population assessment, ecology and trophic relationships of Steller sea lions in the Gulf of Alaska. Pages 445-546 *in* Environmental assessment of the Alaskan continental shelf: final reports of principal investigators. U.S. Dept. Comm., NOAA.

Carretta, J.V. and K.A. Forney. 1993. Report on two aerial surveys for marine mammals in California coastal waters utilizing a NOAA DeHavilland Twin Otter Aircraft: March 9-April 7, 1991 and February 8-April 6, 1992. U.S. Department of Commerce. NOAA Technical Memo. NMFS-SWFSC-185. 77 pp.

Carretta, J.V., Barlow, K.A. Forney, M.M. Muto, and J. Baker. 2001. U.S. Pacific marine mammal stock assessments: 2001. NOAA Technical Memorandum NMFS-SWFSC-317, U.S. Department of Commerce, San Diego, California.

Carretta, J.V., K.A. Forney, M.M. Muto, J. Barlow, J. Baker, and M. Lowry. 2004. U.S. Pacific marine mammal stock assessments: 2003. NOAA Technical Memorandum NMFS-SWFSC-358, U.S. Department of Commerce, San Diego, California.

Carretta, J.V., K.A. Forney, M.M. Muto, J. Barlow, J. Baker, B. Hanson, and M.S. Lowry. 2006. U.S. Pacific Marine Mammal Stock Assessments: 2005. U.S. Department of Commerce Technical Memorandum, NOAA-TM-NMFS-SWFSC-388, 317 p.

Carretta, J.V., K.A. Forney, M.M. Muto, J. Barlow, J. Baker, B. Hanson, and M.S. Lowry. 2006. U.S. Pacific Marine Mammal Stock Assessments: 2005. US Dept. Comm, Southwest Fisheries Science Center. NOAA-TM-NMFS-SWFSC-388.

Cliffton, I., D.O. Corneho, and R.S. Felger. 1982. Sea turtles of the Pacific coast of Mexico. Pages 199-209 *in* K.A. Bjorndal (ed.), Biology and Conservation of Sea turtles. Smithsonian Institution Press, Washington, DC. 583 pp.

Cornelius, S.E. 1982. Status of sea turtles along the Pacific Coast of Middle America. Pages 211-220 *in* K.A. Bjorndal (ed.), Biology and conservation of sea turtles. Smithsonian Insititution Press, Washington, DC. 583 pp.

Darling, J. D. 1991. Humpback whales in Japanese waters. Ogasawara and Okinawa. Fluke identification catalog 1987-1990. Final Contract Report, World Wildlife Fund for Nature, Japan. 22 pp.

Department of Commerce, National Oceanic and Atmospheric Administration. 2006. Endangered and threatened species; Designation of critical habitat of the Southern Resident killer whale. Vol. 71, p. 69054-69070, November 29, 2006.

Dohl, T.P., R.C. Guess, D.L. Duman, and R.C. Helm. 1983. Cetaceans of central and northern California, 1980-1983: status, abundance and distribution. OCS Study MMS 84-0045. Minerals Management Service contract 14-12-0001-29090. 284 pp.

Donovan, G.P. 1984. Blue whales off Peru, December 1982, with special reference to pygmy blue whales. Reports of the International Whaling Commission 34: 473-476.

Donovan, G.P. 1991. A review of IWC stock boundaries. Reports of the International Whaling Commission, Special Issue 13:39- 68

Eckert, S.A. 1998. Perspectives on the use of satellite telemetry and other electronic technologies for the study of marine turtles, with reference to the first year long tracking of leatherback sea turtles. Pg. 44 in Proceedings of the Seventeenth Annual Sea Turtle Symposium, 4-8 March 1997.

Eckert, S.A. 1999. Habitats and migratory pathways of the Pacific leatherback sea turtle. Hubbs Sea World Research Institute Technical Report 99-290.

Eckert, K.L. 1993. The biology and population status of marine turtles in the North Pacific Ocean. Final Report to SWFSC, NMFS, NOAA Honolulu, HI.

Eisenberg, J.F. and J. Frazier. 1983. A leatherback turtle (*Dermochelys coriacea*) feeding in the wild. Journal of Herpetology. Vol. 17., No. 1., pp. 81-82.Felleman, F.L., J.R. Heimlich-Boran, and R.W. Osborne. 1991. The feeding ecology of killer whales (*Orcinus orca*) in the Pacific Northwest. Pages 113-147 in K. Pryor and K.S. Norris, editors. Dolphin societies: discoveries and puzzles. University of California Press, Berkeley, California.

Erbe, C. 2002. Underwater noise of whale-watching boats and potential effect on killer whales (*Orcinus orca*), based on an acoustic impact model. Marine Mammal Science 18:394-418.

Ford, J.K. B., G.M. Ellis, L.G. Barrett-Lennard, A.B. Morton, R.S. Palm, and K.C. BalcombIII. 1998. Dietary specialization in two sympatric populations of killer whales (*Orcinus orca*) in coastal British Columbia and adjacent waters. Canadian Journal of Zoology 76:1456-1471.

Ford, J.K. B., G.M. Ellis, and K.C. Balcomb. 2000. Killer whales: the natural history and genealogy of *Orcinus orca* in British Columbia and Washington State. 2nd ed. UBC Press, Vancouver, British Columbia.

Ford, J.K.B. and G.M. Ellis. 2006. Selective foraging by fish-eating killer whales *Orcinus orca* in British Columbia. Marine Ecology Progress Series 316:185-199.

Forney, K.A., and R.L.Brownell, Jr. 1996. Preliminary report of the 1994 Aleutian Island marine mammal survey. Paper SC/48/O11 presented to the International Whaling Commission.

Forney, K.A., J. Barlow, and J. V. Carretta. 1995. The abundance of cetaceans in California waters. Part II: Aerial surveys in winter and spring of 1991 and 1992. Fish. Bull. 93:15-26.

Frid, A. and L.M. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. Conservation Ecology 6(1):1-11.

Gaydos, J.K. and S. Raverty. 2007. Killer Whale Stranding Response, August 2007 Final Report. Report under UC Davis Agreement No. C 05-00581 V, August 2007.

Gordon, J. and A. Moscrop. 1996. Underwater noise pollution and its significance for whales and dolphins. Pages 281-319 *in* M.P. Simmonds and J.D. Hutchinson, editors. The conservation of whales and dolphins: science and practice. John Wiley & Sons, Chichester ,United Kingdom.

Gosho, M.E., D.W. Rice, and J.M. Breiwick. 1984. The sperm whale *Physeter macrocephalus*. Mar. Fish. Rev 46(4):54-64.

Green, G.A., J.J.Brueggeman, R.A. Grotefendt, C.E. Bowlby, M.L. Bonnell, K.C. Balcomb III. 1992. Cetacean distribution and abundance off Oregon and Washington, 1989-1990. Chapter 1 *In:* J.J. Brueggeman (ed). Oregon and Washington Marine Mammal and Seabird Surveys. Minerals Management Service Contract Report 14-12-0001-30426.

Guinet. C. 1119. International stranding apprenticeship and social play in killer whales (*Orcinus orca*). Canadian Journal of Zoology 69:2712-2716.

Guinet, C. and J. Bouvier. 1995. Development of intentional stranding hunting techniques in killer whale (*Orcinus orca*) calves at Crozet Archipelago. Canadian Journal of Zoology 73:27-33.

Guinet, C., L.G. Barrett-Lennard, and B. Loyer. 2000. Co-ordinated attack behaviour and prey sharing by killer whales at Crozet Archipelago: strategies for feeding on negatively-buoyant prey. Marine Mammal Science 16:829-834.

Hanson, B., R.W. Baird, and G. Schorr. 2005. Focal behavioral observations and fish-eating killer whales: improving our understanding of foraging behaviour and prey selection. Abstract at the 16th Biennial Conference on the Biology of Marine Mammals, San Diego, California.

Hazel, J., I.R. Lawler, H. Marsh, and S. Robson. 2007. Vessel speed increases collision risk for the green turtle *Chelonia mydas*. Endangered Species Research Vol (3):105-113.

Hildebrand, J., M.McDonald, J. Calambokidis, and K. Balcomb. 2006. Whale watching vessel ambient noise in the Haro Strait. NMFS Contract Report No. NA17RJ123, 24 pp.

Hill, P.S. and J. Barlow. 1992. Report of a marine mammal survey of the California coast aboard the research vessel McARTHUR July 28-November 5, 1991. U.S. Department of Commerce. NOAA Technical Memo. NMFS-SWFSC-169. 103 pp.

Hill, P.S., and D.P. DeMaster. 1998. Draft Alaska marine mammal stock assessments 1998. National Marine Mammal Laboratory; Seattle, Washington.

Hodge, R.P. 1979. Dermochelys coriacea schlegeli (Pacific leatherback) USA: Alaska. Herp. Rev. 10(3):102.

Hodge R. and B.L. Wing. 2000. Occurrence of marine turtles in Alaska Waters: 1960-1998. Herpetological Review 31, 148-151. Houston, J. J. 1988. Status of green sturgeon, *Acipenser medirostris*, in Canada. Canadian Field-Naturalist 102: 286-290.

Hoelzel, A.R. 1991. Killer whale predation on marine mammals in Punta Norte, Argentina: food sharing, provisioning, and foraging strategy. Behavioral Ecology and Sociobiology 29:297-304.

Hoelzel, A.R. 1993. Foraging behaviour and social group dynamics in Puget Sound killer whales. Animal Behaviour 45:581-591.

Holt, M. In Review 2007. Sound exposure and Southern Resident killer whales (*Orcinus orca*): a review of current knowledge and data gaps. NOAA Northwest Fisheries Science Center, Seattle, WA.

Horwood, J. 1987. The sei whale: population biology, ecology and management. Croom Helm; Beckenham, Kent, United Kingdom.

Jefferson, T.A., P.J. Stacey, and R.W. Baird. 1991. A review of killer whale interactions with other marine mammals: predation to co-existence. Mammal Review 21:151-180.

Jensen, A.S. and G.K. Silber. 2003. Large whale ship strike database. NOAA Technical Memorandum NMFS-OPR-25, 37 pp.

Laist, D.W., A.R. Knowlton, J.G. Mead, A.S. Collet and M. Podesta. 2001. Collisions between ships and whales. Marine Mammal Science, 17(1):35-75.

Kenyon, K.W. 1962. History of the Steller sea lion at the Pribilof Islands, Alaska. Journal of Mammalogy 43(1):68-75.

Ketten, D.R., and S.M. Bartol. 2006. Functional measures of sea turtle hearing. Woods Hole Oceanographic Institution, Woods Hole, MA.

Krahn, M.M., P.R. Wade, S.T. Kalinowski, M.E. Dahlheim, B.L. Taylor, M.B. Hanson, G.M. Ylitalo, R.P. Angliss, J.E. Stein, and R.S. Waples. 2002. Status review of southern resident killer whales (*Orcinus orca*) under the Endangered Species Act.

NOAA Technical Memorandum NMFS-NWFSC-54, U.S. Department of Commerce, Seattle, Washington.

Krahn, M.M., M.J. Ford, W.F. Perrin, P.R. Wade, R.P. Angliss, M.B. Hanson, B.L. Taylor, G.M. Ylitalo, M.E. Dahlheim, J.E. Stein, and R. S. Waples. 2004a. 2004 Status review of Southern resident killer whales (Orcinus orca) under the Endangered Species Act. U.S. Dept. Comm., NOAA Tech. Memo. NMFS-NWFSC-62. 73 pages. December 2004. Available at: http://www.nwr.noaa.gov/

Kucey, L. 2005. Human disturbance and the hauling out behavior of Steller sea lions (*Eumetopias jubatus*). Thesis, UBC. 67 pages.

Leatherwood, S., R.R. Reeves, W.F. Perrin, and W.E. Evans. 1982. Whales, dolphins, and porpoises of the eastern North Pacific and adjacent arctic waters: a guide to their identification. NOAA Technical Report National Marine Fisheries Service Circular 444.

Leatherwood,S., A.E. Bowles and R.R. Reeves. 1986. Aerial surveys of marine mammals in the southeastern Bering Sea. U.S. Dept. of Commerce, NOAA, OSEAP Final report 42(1986):147-490.

Limpus, C.J. 1982. The status of Australian sea turtle populations. Pages 297-303 *in* K.A. Bjorndal (ed.), Biology and conservation of sea turtles. Smithsonian Institution Press, Washington, DC. 583 pp.

Lopez, J.C. and D. Lopez. 1985. Killer whales (*Orcinus orca*) of Patagonia, and their behavior of intentional stranding while hunting nearshore. Journal of Mammalogy 66:181-183.

Loughlin T.R., D.J. Rugh, and C.H. Fiscus. 1984. Northern sea lion distribution and abundance: 1956-1980. Journal of Wildlife Management 48:729-740.

Loughlin, T.R. 1997. Using the phylogeographic method to identify Steller sea lion stocks. Pages 159-171 *in* A.E. Dizon, SJ. Chivers, and W.F. Perrin, editors. Molecular Genetics of Marine Mammals. Society for Marine Mammalogy Spec. Publ. 3

Mangels, K.F. and T.Gerrdette. 1994. Report of cetacean sightings during a marine mammal survey in the eastern Pacific Ocean and the Gulf of California aboard NOAA ships *McArthur* and *David Starr Jordan* July 28-Novembe 6, 1993. U.S. Department of Commerce. NOAA Technical Memo. NMFS-SWFSC-221. 88 pp.

Masaki, Y. 1976. Biological studies on the North Pacific sei whale. Bulletin of the Far Seas Fisheries Research Laboratory (Shimizu) 14:1-104.

Masaki, Y. 1977. The separation of the stock units of sei whales in the North Pacific. Reports of the International Whaling Commission Special Issue No. 1: 71-79.

McDonald, M. A., J. A. Hildebrand, and S. C. Webb. 1994. Blue and fin whales observer on a seafloor array in the Northeast Pacific. (unpubl. ms.).

McKeown, A. 1977. Marine turtles of the Solomon Islands. Honiara, Ministry of Natural Resources, Fisheries Division. 47 pp.

Mintz, J.D. and R.J. Filadelfo. 2004. Vessel traffic and radiated noise in the Pacific Northwest. Report CMED0010607.A1 CNA Corporation, Alexandria, Virginia.

Miyashita, T., H. Kato, and T. Kasuya (Eds.). 1995. Worldwide map of cetacean distribution based on Japanese sighting data. Volume 1. National Research Institute of Far Seas Fisheries, Shizuoka, Japan. 140 pp.

Mobley, J.R., M. Smultea, T. Norris, and D. Weller. 1996. Fin whale sightings north of Kauai, Hawaii. Pacific Science 50:230-233.

Mobley, J. R., Jr., S.S. Spitz, I.A. Forney, R.A. Grotefendt, and P.H. Forestall. 2000. Distribution and abundance of odontocete species in Hawaiian waters: preliminary results of 1993-1998 aerial surveys. Admin. Rep. LJ-00-14C. Southwest Fisheries Science Center.

Moein Bartol, S., and J.A. Musick (2003). Sensory biology of sea turtles. *In*: Lutz, P.L., Musick, J.A, Wyneken J. (eds) Biology of sea turtles, Vol II. CRC Press, Boca Raton, FL, p. 79-102.

Moein, SS, M. Lenhardt, D. Barnard, J.A. Keinath, J. Musick. 1993. Marine turtle auditory behavior. J. Acoust Soc Am 93(3): 2378.

Morreale, S., E. Standora, F. Paladino and J. Spotila. 1994. Leatherback migrations along deepwater bathymetric contours. Pg.109, 13th Ann. Symp. Sea Turtle Biol. and Conserv, Feb. 23-27, 1993, Jekyll Island, Georgia.

Nasu, K. 1974. Movement of baleen whales in relation to hydrographic conditions in the northern part of the North Pacific Ocean and the Bering Sea. Pp. 345-361 in D.W. Hood and E.J. Kelley (editors) Oceanography of the Bering Sea. Institute of Marine Science, University of Alaska, Fairbanks.

National Marine Fisheries Service. 2007. Recovery Plan for the Hawaiian Monk Seal (*Monachus schauinslandi*). National Marine Fisheries Service, Silver Spring, Maryland. 164 pp.

National Marine Fisheries Service. 2005. Proposed conservation plan for Southern Resident Killer Whales (*Orcinus orca*). National Marine Fisheries Service Northwest Region, Seattle Washington. 183 pp.

National Research Council. 1996. Upstream: salmon and society in the Pacific Northwest. National Academy Press, Washington, D.C.

Nishiwaki, M. 1966. Distribution and migration of the larger cetaceans in the North Pacific as shown by Japanese whaling results. Pp. 171-191 in Norris, K.S., (ed.), Whales, Dolphins and Porpoises. University of California Press, Berkeley.

Nitta, E. 1991. The marine mammal stranding network for Hawaii: an overview. *In*: J.E. Reynolds III, D.K. Odell (eds.), Marine Mammal Strandings in the United States, pp. 56-62. NOAA Tech. Rep. NMFS 98, 157 pp.

NMFS & USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 1998a. Recovery Plan for U.S. Pacific Populations of the Green Turtle. Prepared by the Pacific Sea Turtle Recovery Team.

NMFS & USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 1998b. Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle. Prepared by the Pacific Sea Turtle Recovery Team.

NMFS & USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 1998c. Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle. Prepared by the Pacific Sea Turtle Recovery Team.

NMFS & USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 1998d. Recovery Plan for U.S. Pacific Populations of the Olive Ridley Turtle. Prepared by the Pacific Sea Turtle Recovery Team.

NMFS [National Marine Fisheries Service]. 1992. Recovery plan for the Steller sea lion (*Eumetopias jubatus*). Prepared by the Steller seal lion recovery team for the National Marine Fisheries Service, Silver Spring, MD, 92 p.

NOAA (National Oceanographic Atmospheric Administration). 2002. National Oceanographic Data Center Coastal Water Temperature Water Temperature Guide. Accessed Northern and Central Pacific Coast data on 4 Apr 2007. Available online at: http://www.nodc.noaa.gov/dsdt/cwtg.

Norris, T. F., M. McDonald, and J. Barlow. 1999. Acoustic detections of singing humpback whales (*Megaptera novaeangliae*) in the eastern North Pacific during their northbound migration. J. Acoust. Soc. Am. 106(1):506-514.

Northrop, J., W.C. Cummings, and P. O. Thompson. 1968. 20-Hz signals observed in the central Pacific. J. Acoust. Soc. Am. 43:383-384.

Nowak, R.M. 2003. Walker's Marine Mammals of the World. The John Hopkins University Press, Baltimore, MD. 284 pages.

O'hara J, and J.R. Wilcox (1990). Avoidance responses of loggerhead turtles, *Caretta caretta*, to low frequency sound. Copeia 1990(2):564-567.

Omura, H. 1958. North Pacific right whales. Scientific Reports of the Whales Research Institute 13:1-52.

Perry, A., C. S. Baker, L. M. Herman. 1990. Population characteristics of individually identified humpback whales in the central and eastern North Pacific: a summary and critique. Rep. Int. Whal. Commn. (Special Issue 12):307-317.

Pittman, R.L., S.O'Sullivan, and B. Mase. 2003. Killer whales (*Orcinus orca*) attack of a school of pantropical spotted dolphins (*Stenella attenuata*) in the Gulf of Mexico. Aquatic Mammals 29:321-324.

Plotkin, P.T., R.A. Bales, and D.C. Owens. 1993. Migratory and reproductive behavior of *Lepidochelys olivacea* in the eastern Pacific Ocean. Schroeder, B.A. and B.E. Witherington (Compilers). Proc. of the Thirteenth Annual Symp. on Sea Turtle Biology and Conservation. NOAA, Natl. Mar. Fish. Serv., Southeast Fish. Sci. Cent. NOAA Tech. Mem. NMFS-SEFSC-31.

Pritchard, P.C.H. 1982a. Marine turtles of the South Pacific. Pages 253-262 *in* K.A. Bjorndal (ed.) Biology and Conservation of sea turtles. Smithsonian Institution Press, Washington, DC. 583 pp.

Pritchard, P.C.H. 1982a. Marine turtles of Micronesia. Pages 263-274 *in* K.A. Bjorndal (ed.) Biology and Conservation of sea turtles. Smithsonian Institution Press, Washington, DC. 583 pp.

Raum-Suryan, K.L., K.W. Pitcher, D.G. Calkins, J.L. Sease, and T.R. Loughlin. 2002. Dispersal, rookery fidelity and metapopulation structure of Steller sea lions (Eumetopias jubatus) in an increasing and decreasing population in Alaska. Marine Mammal Science 18: 746-764.

Rice, D.W. 1960. Distribution of bottle-nosed dolphin in the leeward Hawaiian Islands. J. Mamm. 41:407-408.

Rice, D.W. 1974. Whales and whale research in the eastern North Pacific. pp. 170-195 In: W.E. Schevill (ed.). The Whale Problem: A Status Report. Harvard Press, Cambridge, MA.

Rice, D.W. 1989. Sperm whale *Physeter macrocephalus*. Linneaus, 1758. In: S.H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals, Vol. 4: The

River Dolphins and Larger Toothed Whales, pp. 177-233. Academic Press, 442 pp.

Richardson, W.J., C.R. Green, Jr., C.I. Malme, and D.H. Thompson. 1995. Marine mammals and noise. Academic Press, San Diego, California.

Romano, T.A., M.J. Keogh, C. Kelly, P. Feng, L. Berk, C.E. Schlundt, D.A. Carder, and J.J. Finneran. 2003. Anthropogenic sound and marine mammal health: measures of the nervous and immune systems before and after intense sound exposure. Canadian Journal of Fisheries and Aquatic Sciences 61:11124-1134.

Shallenberger, E.W. 1981. The status of Hawaiian cetaceans. Final report to U.S. Marine Mammal Commission. MMC-77/23, 79 pp.

Silber, G.K., M.W. Newcomer, P.C. Silber, H. Perez-Cortes M., and G.M. Ells. 1994. Cetaceans of the Northern Gulf of California: Distribution, occurrence, and relative abundance. Mar. Mamm. Sci. 10(3):283-298.

Silva-Batiz, F.A., E. Godinez-Dominguez, J.A. Trejo-Robles. 1996. Status of the olive ridley nesting population in Playon de Mismaloya, Mexico: 13 years of data. Pg.302, 15th Annual Symposium, Sea Turtle Biology and Conservation, Feb. 20-25, 1995, Hilton Head, South Carolina.

Simila, T. and F. Ugarte. 1993. Surface and underwater observations of cooperatively feeding killer whales in northern Norway. Canadian Journal of Zoology 71:1494-1499.

Spotila, J.R., A.E. Dunham, A.J. Leslie, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 1996. Worldwide population decline of *Dermochelys coriacea*: Are leatherback turtles going extinct? Chelonian Cons. and Biol. 2(2):209-222.

Spotila, J.R., R.D. Reina, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 2000. Pacific leatherback turtles face extinction. Nature. Vol. 45. June 1, 2000.

Steiger, G. H., J. Calambokidis, R. Sears, K. C. Balcomb, and J. C. Cubbage. 1991. Movement of humpback whales between California and Costa Rica. Mar. Mamm. Sci. 7:306-310.

Stewart, B.S., S.A. Karl, P.K. Yochem, S. Leatherwood, and J.L. Laake. 1987. Aerial surveys for cetaceans in the former Akutan, Alaska, whaling grounds. Arctic 40(1): 33-42.

Stinson, M. 1984. Biology of sea turtles in San Diego Bay, California and the Northeastern Pacific Ocean. Master's Thesis, San Diego State University.

Sweeney, J.C. 1990. Marine Mammal Behavioral Diagnostics. Pages 53-72 in In L.A. Dierauf, editor. Handbook of Marine Mammal Medicine: Health, Disease, and Rehabilitation. CRC Press, Inc. Boca Raton, FL

Tanka, H. Y. Takagi, Y.Naito. 2001. Swimming speeds and buoyancy compensation of migrating adult chum salmon *Oncorhynchus keta* revealed by speed/depth/acceleration data logger. The Journal of Experimental Biology 204:3895-3904.

Tershy, B.R., D.Breese, and C.S. Strong. 1990. Abundance seasonal distribution and population composition of balaenopterid whales in the Canal de Ballenas, Gulf of California, Mexico. Re. Int. Whl.Comn (Spec. Iss. 12): 369-375.

Tershy, B.R. 1992. Body size, diet, habitat use, and social behavior of Balenoptera whales in the Gulf of California. J. Mamm. 73:477-486.

Thompson, P.O. and W.A. Friedl. 1982. A long term study of low frequency sound from several species of whales off Oahu, Hawaii. Cetology 45:1-19.

Thorsteinson, F.V. and C.J. Lensink. 1962. Biological observations of Steller sea lions taken during an experimental harvest. The Journal of Wildlife Management 26(4):353-359.

Tillman, M.F. 1977. Estimates of population size for the North Pacific sei whale. Reports of the International Whaling Commission Special Issue No. 1:98-106.

U.S. Department of Transportation, Federal Highway Administration. 2002. State Profile – Hawaii: 1998, 2010, 2020. 6 pp.

U.S. Fish and Wildlife Service. 2003. Biological Opinion

Visser, I.N. 1999. Propeller scars on and known home range of two orca (*Orcinus orca*) in New Zealand waters. Marine Mammal Science 15:222-227.

Visser, I.N. and D. Fertl. 2000. Stranding, resighting, and boat strike of a killer whale (*Orcinus orca*) off New Zealand. Aquatic Mammals 26:232-240.

Waring, G.T., J.M. Quintal, S.L. Swartz, (eds). 2001. U:.S. Atlantic and Gulf of Mexico marine mammal stock assessments. NOAA Technical Memorandum, NMFS-NE-168, 310 pp.

Watkins, W.A. 1981. Activities and underwater sounds of fin whales. Scientific Reports of the International Whaling Commission 33:83-117.

Williams, R., A.W. Trites, and D.E. Bain. 2002a. Behavioral responses of killer whales (*Orcinus orca*) to whale-watching boats: opportunistic observations and experimental approaches. Journal of Zoology (London) 256:255-270.

Williams, R., D.E. Bain, J.K. B. Ford, and A.W. Trites. 2002b. Behavioural responses of male killer whales to a "leapfrogging' vessel. Journal of Cetacean Research and Management 4:305-310.

Witzell, W.N. 1983. Synopsis of biological data on the hawksbill sea turtle, *Eretmochelys imbricata* (Linnaeus 1766). FAO Fisheries Synopsis No. 137, FAO, Rome, 78 pp.