National Marine Fisheries Service

Endangered Species Act Section 7 Consultation

Biological Opinion

Agency:	**Permits and Conservation Division of the Office of Protected Resources, National Marine Fisheries Service**
Proposed Action:	**Proposal to issue permit No. 16919 to Eye of the Whale, which would conduct scientific research on humpback whales in Prince William Sound and adjacent waters of Alaska, pursuant to Section 10(a)(1)(A) of the Endangered Species Act of 1973**
Prepared by:	**Endangered Species Act Interagency Cooperation Division of the Office of Protected Resources, National Marine Fisheries Service**
Approved by:	
Date:	~~OCT 0 8 2012~~ OCT 0 8 2012

Section 7(a)(2) of the Endangered Species Act (ESA; 16 U.S.C. 1536(a)(2)) requires each Federal agency to insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a Federal agency's action "may affect" listed species or designated critical habitat, that agency is required to consult with the National Marine Fisheries Service (NMFS) or U.S. Fish and Wildlife Service, depending on the species that may be affected.

In this instance, the Permits and Conservation Division of NMFS ("Permits Division," the action agency) consulted with the Endangered Species Act Interagency Cooperation Division of NMFS (the consulting agency) on the former's issuance of a scientific research permit (the action) to the Eye of the Whale (the applicant or researchers). This Biological Opinion ("Opinion") is the result of our interagency consultation and describes how the Permits Division has insured that their issuance of scientific research permit No. 16919 is not likely to jeopardize the continued existence of the endangered humpback whale (*Megaptera novaeangliae*).

We, the Endangered Species Act Interagency Cooperation Division, prepared this Opinion in accordance with Section 7 of the ESA and its regulations (50 CFR Part 402). We based our Opinion on information provided in the research permit application, the draft permit, and the environmental assessment. We also reviewed published and unpublished scientific data, recovery plans, and other sources of information.

The format of this Opinion is as follows. After a brief history of the consultation, we describe the proposed action and the area in which it will occur (i.e., *Action Area*). In the *Status of the Species* section, we document which listed species occur in the action area. We identify which, if any, listed species are not likely to be adversely affected and can be eliminated from further consideration. For species that are likely to be adversely affected by the action, we provide the background information required to assess the action's impact on their continued survival. In the *Environmental Baseline* section, we review past and present activities that have affected these species, specifically in the action area. These summaries serve as

the context for the *Effects of the Proposed Action* section, in which we consider the species' exposure and responses to stressors caused by the action. In the *Risk Analyses* section, we determine whether activities that adversely affect listed individuals are likely to reduce their fitness and, in turn, diminish the viability of the population(s) and species they represent. In addition, we consider the *Cumulative Effects* of future state or private activities that are reasonably certain to occur in the action area. We integrate all information in a final synthesis and use this to arrive at our conclusion: whether the Federal agency has insured that their action is not likely to jeopardize listed species or destroy/adversely modify critical habitat. We end with the following sections: *Incidental Take Statement*, *Conservation Recommendations* and *Reinitiation Statement*.

CONSULTATION HISTORY

On August 3, 2007, the Permits Division issued scientific research Permit No. 1120-1898 to the Eye of the Whale, to perform research on humpback whales in Prince William Sound and adjacent waters of Alaska. Section 7 consultation determined that this action was not likely to jeopardize ESA listed species or adversely modify their critical habitat. The permit was amended on July 24, 2012 to extend the duration of the permit. On June 13, 2012, the Permits Division requested consultation on the new scientific research permit, No. 16919. We initiated consultation on June 13, 2012.

DESCRIPTION OF THE PROPOSED ACTION

The Permits Division proposes to authorize a 5 year, scientific research permit (Permit No. 16919, pursuant to Section 10(a)(1)(A) of the ESA and Section 104(a) of the Marine Mammal Protection Act (MMPA, 16 U.S.C. 1361). Permit No. 16919 would authorize Eye of the Whale to annually take 200 humpback whales (*Megaptera novaeangliae*) via photo-identification and/or behavioral observation in Prince William Sound and adjacent waters of Alaska (Table 1). From June to September annually, researchers would conduct four to five whale surveys each lasting six to eight days. They would approach humpback whales in a 20 or 26 foot vessel at a speed of 5-10 mph. Once within ~50 meters of the whale, they would slow the vessel (to 3 mph maximum). They would photograph the fluke, dorsal fin, and any unique markings. They would observe behaviors and record dive times. The objective of the research is continuation of a long-term population census of humpback whales to determine population numbers, distribution, reoccurrence, feeding habits, vital rates, intraspecific associations, and gender of individual whales.

Table 1. Permitted activities and maximum annual takes under Permit No. 16919.

Species	No. Takes	Observation Method	Procedures
Humpback whale	200	Vessel survey	Photo-identification, behavioral observation

The permit would exempt the applicant from ESA prohibitions against take, defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. The ESA does not define harassment nor has NMFS defined the term pursuant to the ESA through regulation. The permit would also exempt the applicant from MMPA prohibitions against take, defined as to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill. The MMPA defines harassment as any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal population in the wild or has the potential to disturb a marine mammal or marine mammal population in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [16 U.S.C. 1362(18)(A)]. This is similar to the U.S. Fish and Wildlife Service's regulatory definition of "harass" pursuant to the ESA (50 CFR 17.3). Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

PERMIT TERMS AND CONDITIONS

The Permits Division requires the following conditions to minimize harassment to humpback whales:

1. No individual animal may be taken more than 3 times in one day.
2. When approaching females with calves, the researchers must:
   a. Immediately terminate efforts if there is any evidence that the activity may be interfering with pair-bonding or other vital functions;
   b. Avoid positioning the research vessel between the mother and calf;
   c. Approach gradually to minimize or avoid any startle response; and
   d. Avoid approaching while the calf is actively nursing
3. To avoid taking Steller sea lions, the researchers must:
   a. Maintain a distance of at least 92 m of a Steller sea lion in the water or hauled out on land.
   b. Maintain a vessel distance of at least 5.5 km of a Steller sea lion rookery site listed in 50 CFR 223.202.
   c. On land, maintain a distance of at least 0.8 km of a Steller sea lion rookery site listed in 50 CFR 223.202 and at least 2.4 km of the eastern shore of Marmot Island

APPROACH TO THE ASSESSMENT

The National Marine Fisheries Service approaches its Section 7 analyses through a series of steps. The first step identifies those aspects of proposed actions that are likely to have direct and indirect physical, chemical, and biotic effects on listed species or on the physical, chemical, and biotic environment of an action area. As part of this step, we identify the spatial extent of these effects (i.e., the *Action Area*).

The second step of our analyses identifies the listed resources that are likely to co-occur with these effects in space and time. We then perform our *Effects Analyses*. The first of these are our *Exposure Analyses*, in which we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent. We evaluate which aspects of the proposed actions could be considered stressors on listed species (i.e., *Potential Stressors*). We then examine available scientific and commercial data to determine whether and how listed individuals are likely to respond to each stressor (i.e., *Response Analyses*).

The final steps of our analyses include assessing the risks those responses pose to listed species and the impacts to their designated critical habitat (i.e., *Risk Analyses*). Our jeopardy determinations must be based on an action's impact on the continued existence of threatened or endangered species as those "species" have been listed, which can include true biological species, subspecies, as well as distinct populations segments (DPSs) and evolutionarily significant units (ESUs) of vertebrate species. The continued existence of species depends on the fate of the populations that comprise them. Similarly, the continued existence of populations is determined by the fate of the individuals that comprise them. Populations grow or decline as the individuals that comprise the population live, die, grow, mature, migrate, and reproduce (or fail to do so).

Our *Risk Analyses* reflect these relationships between listed species, the populations that comprise the species, and the individuals that comprise those populations. They begin by identifying the probable risks that actions pose to listed individuals. Our analyses then integrate those individual risks to identify consequences to the populations those individuals represent. Our analyses conclude by determining the consequences of those population level risks to the species.

We measure risks to listed individuals in terms of "fitness," i.e., their growth, survival, annual reproductive success, and lifetime reproductive success. In particular, we examine the scientific and commercial data available to determine if an individual's probable lethal, sub-lethal, or behavioral responses to an action's effect on the environment (which we identified during our response analyses) are likely to have

consequences for its fitness. When individual listed plants or animals are expected to experience reductions in fitness in response to an action, those fitness reductions are likely to reduce the abundance, reproduction, or growth rates (or increase the variance in these measures) of the populations those individuals represent (Stearns 1992; Mills & Beatty 1979; Anderson 2000). Reductions in at least one of these variables (or one of the variables we derive from them) is a necessary condition for reductions in a population's viability, which is itself a necessary condition for reductions in a species' viability. Alternatively, when listed plants or animals exposed to an action's effects are not expected to experience reductions in fitness, we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise. As a result, if we conclude that listed plants or animals are not likely to experience reductions in their fitness, we would conclude our assessment.

Although reductions in fitness of individuals are a necessary condition for reductions in a population's viability, reducing the fitness of individuals in a population is not always sufficient to reduce the viability of the population(s) those individuals represent. Therefore, if we conclude that listed plants or animals are likely to experience reductions in their fitness, we must next consider whether those fitness reductions are likely to reduce the viability of the population(s) the individuals represent (measured using changes in the populations' abundance, reproduction, spatial structure and connectivity, growth rates, variance in these measures, or measures of extinction risk). In this step of our analyses, we use the population's base condition (established in the *Environmental Baseline* and *Status of the Species* sections of this Opinion) as our point of reference. If we conclude that reductions in individual fitness are not likely to reduce the viability of the populations those individuals represent, we would conclude our assessment.

Reducing the viability of a population is not always sufficient to reduce the viability of the species those populations comprise. Therefore, in the final step of our analyses, we determine if reductions in a population's viability are likely to reduce the viability of the species those populations comprise using changes in a species' reproduction, numbers, distribution, estimates of extinction risk, or probability of being conserved. In this step of our analyses, we use the species' status (established in the *Status of the Species* section of this Opinion) as our point of reference. Our final determinations are based on whether threatened or endangered species are likely to experience reductions in their viability and whether such reductions are likely to be appreciable.

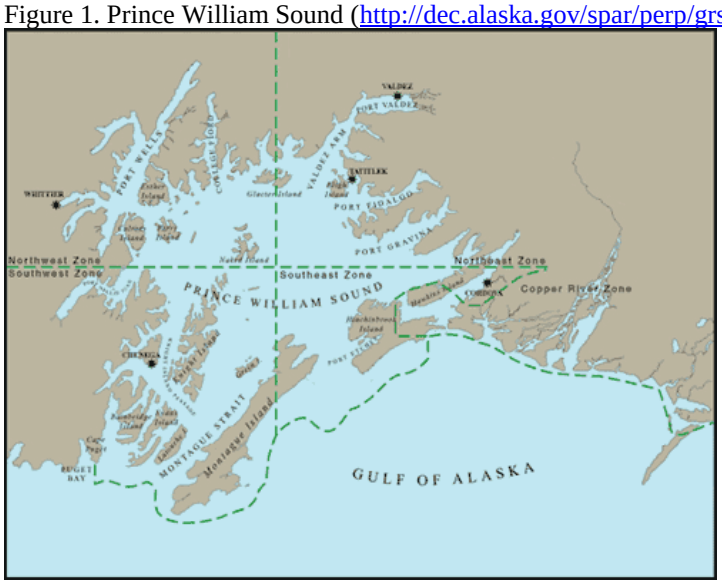
To conduct these analyses, we rely on all of the evidence available to us. This evidence might consist of: monitoring reports submitted by past and present permit holders; reports from NMFS Science Centers; reports prepared by natural resource agencies in states and other countries; reports from domestic and foreign non-governmental organizations involved in marine conservation issues; the information provided by the Permits Division when it initiates formal consultation; and published scientific literature. To find this information, we review peer reviewed scientific literature, master's theses, doctoral dissertations, government reports, and commercial studies. We use literature search engines such as *Science Direct*, *BioOne*, *JSTOR*, and *Google Scholar* as well as the use of NOAA and university libraries. We focus on identifying recent information on the biology, ecology, distribution, status, and trends of the threatened and endangered species considered in this opinion.

We evaluate all evidence based on the quality of the study design, sample sizes, and study results. When data are equivocal, or in the face of substantial uncertainty, our decisions are designed to avoid the risks of incorrectly concluding that an action would not have an adverse effect on listed species when, in fact, such adverse effects are likely. In those cases, in keeping with the direction from the U.S. Congress to provide the "benefit of the doubt" to threatened and endangered species [House of Representatives Conference Report No. 697, 96th Congress, Second Session, 12 (1979)], we generally make determinations which provide the most conservative outcome for listed species.

ACTION AREA

The action would occur in Prince William Sound and adjacent waters of Alaska (Fig. 1).

Figure 1. Prince William Sound (http://dec.alaska.gov/spar/perp/grs/pws/home.htm)



STATUS OF THE SPECIES

The following endangered and threatened species may occur in the action area:

Common Name	Scientific Name	Listing Status
Marine Mammals		
North Pacific right whale	*Eubalaena japonica*	Endangered
Blue whale	*Balaenoptera musculus*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
Humpback whale	*Megaptera novaeangliae*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Steller sea lion	*Eumetopias jubatus*	
Western DPS		Endangered
Sea Turtles		
Leatherback turtle	*Dermochelys coriacea*	Endangered
Marine and anadromous fish		
Sockeye salmon	*Oncorhynchus nerka*	
Snake River DPS		Endangered
Chinook salmon	*Oncorhynchus tschawytscha*	
Snake River Fall Run		Threatened
Snake River Summer/Spring Run		Threatened
Puget Sound		Threatened
Lower Columbia River		Threatened
Upper Columbia River Spring Run		Endangered
Upper Willamette River		Threatened
Steelhead trout	*Oncorhynchus mykiss*	
Snake River Basin		Threatened
Lower Columbia River		Threatened
Middle Columbia River		Threatened
Upper Willamette River		Threatened

Species and Critical Habitat Not Likely to Be Affected by the Action
The purpose of this action is to photograph and observe humpback whales, discussed in a later section. Non-target species may be affected by general risks associated with operating watercraft (i.e., vessel noise, visual disturbance, and collision with the vessel).

The researchers' vessel would maintain safe operating speeds and abide by safe boat-operating guidelines. In addition to the captain or boat driver, there would be observers aboard to watch out for marine animals. The researchers would not intentionally approach non-target species in their vessel. They would avoid all non-target whales, sea turtles, and anadromous fish. Vessel collision is thus discountable, i.e., extremely unlikely to occur, and not likely to adversely affect the above listed non-target whales, sea turtles, and fish. The noise and visual disturbance caused by the whale observation vessel or tagging vessel would be similar to that of other vessels in the area. The presence of one additional vessel in the action area (which has considerable vessel traffic) is unlikely to have a significant impact on listed species. Therefore, non-target whales, leatherback sea turtles, and fish species are unlikely to be adversely affected by the operation of watercraft for the purposes of this action.

In 1993, critical habitat was designated for all major Steller sea lion rookeries, major haulouts, and associated terrestrial, air, and aquatic zones in Alaska (50 CFR 223.202). The designated critical habitat prohibits: vessel approach within 5.5 km of rookeries, terrestrial approach within 0.8 km of rookeries, and terrestrial approach of the eastern shore of Marmot Island.

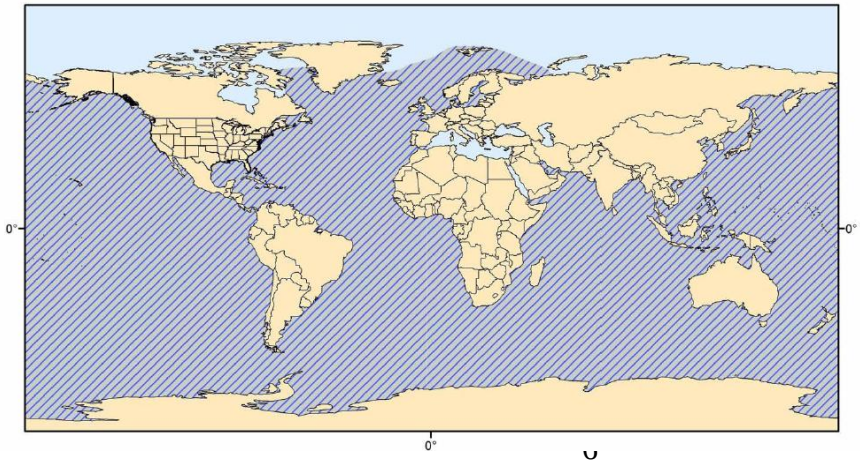
The researchers would maintain a distance of at least 92 m from Steller sea lions in the water or hauled out on land. In their vessel, they would maintain a distance of at least 5.5 km from designated rookery sites. On land, they would maintain a distance of at least 0.8 km of designated rookery sites and 2.4 km of Marmot Island. The researchers' activities would not occur in Steller sea lion critical habitat. They would not affect individuals, rookeries, or food abundance. Therefore, their actions are not likely to destroy or adversely modify Steller sea lion critical habitat.

In conclusion, the following non-target species and their critical habitats are not likely to be adversely affected by the actions of the researchers, and therefore, are not considered further in this opinion: North Pacific right whale; blue whale, fin whale, sperm whale, sei whale, Steller sea lion (Western DPS); and leatherback turtle.

Species Likely to be Adversely Affected by the Action: Humpback Whale

Species Description and Distribution
The humpback whale is a cosmopolitan species that occurs in the Pacific, Atlantic, Indian, and Southern Oceans (Fig. 2). Most populations migrate between breeding areas in tropical waters, usually near continental coastlines or island groups, and productive colder waters in temperate and high latitudes (Reilly et al. 2008).

Figure 2. Range of the humpback whale (map courtesy of NMFS OPR).

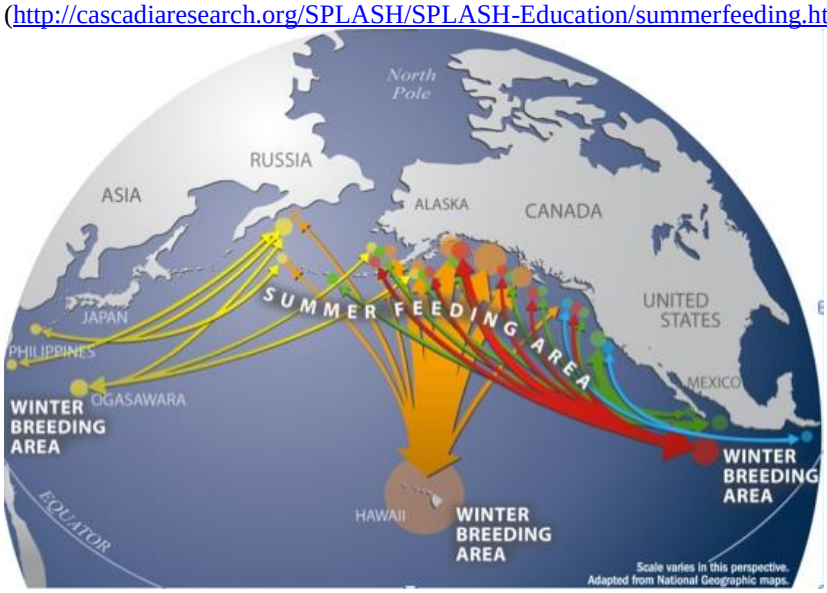


Listing Status
The humpback whale was listed as endangered under the ESA in 1973. It is considered depleted by the MMPA. In 2008, the IUCN Red List of Threatened Species downgraded the species from Vulnerable to Least Concern, reflecting its low risk of extinction; however, the Arabian Sea and Oceania populations remain listed as Endangered (Reilly et al. 2008). It is also protected by the International Whaling Commission (IWC) and the Convention on International Trade in Endangered Species of wild flora and fauna (CITES). Critical habitat has not been designated for the species.

Population Designations, Abundance and Trends
Prior to commercial whaling, hundreds of thousands of humpback whales existed worldwide (Roman & Palumbi 2003; Winn & Reichley. 1985). Global abundance declined to the low thousands by 1968, the last year of substantial catches (Reilly et al. 2008). Since then, the total population size has grown to over 60,000 individuals and continues to increase (Reilly et al. 2008). Humpback whales are broadly divided into four broad geographic regions based on tagging and genetic data (Baker et al. 1990; Palsboll et al. 1995): North Pacific, North Atlantic, Arabian Sea, and Southern Hemisphere.

North Pacific. In the winter, humpback whales breed and calf in the coastal waters of Southeast Asia, Hawaii, Mexico, and Central America. In the summer, they move to foraging areas in the Bering Sea, the Gulf of Alaska, and the temperate eastern Pacific (Fig. 3; Calambokidis 2010). All breeding areas and most foraging areas are genetically differentiated, as indicated by maternally inherited genetic markers (i.e., mitochondrial haplotypes; Baker 2008). In addition, most breeding and foraging areas exhibit significantly different haplotype frequencies, indicating that there is not a simple one-to-one relationship among feeding and breeding areas (Baker 2008). An estimated 15,000 humpback whales resided in the North Pacific in 1905 (Rice 1978). Commercial whaling depleted the population to the low thousands by 1965 (Perry et al. 1999). Current estimates indicate approximately 20,000 humpback whales in the North Pacific, with an annual growth rate of 4.9 percent (Calambokidis 2010).

Figure 3. Humpback whale migrations between wintering and foraging areas in the North Pacific (http://cascadiaresearch.org/SPLASH/SPLASH-Education/summerfeeding.html).



North Atlantic. In the summer, North Atlantic humpback whales range from the Gulf of Maine in the west and Ireland in the east. The northern extent of their range includes the Barents Sea, Greenland Sea, and Davis Strait. In the winter, the majority migrate to breeding grounds in the West Indies, though a small number migrate to the Cape Verde Islands (Reilly et al. 2008). Limited genetic exchange among summer feeding areas but mixing in the winter breeding areas is indicative of a single panmictic (i.e., interbreeding) population in the North Atlantic (Palsboll et al. 1997). Whaling nearly extirpated humpback whales from

the eastern North Atlantic by 1910 and the Canadian Atlantic by 1920 (Stevick et al. 2003). Protection against whaling began in 1955, and the population has since rebounded. As of 1993, there was an estimated 11,570 humpback whales in the North Atlantic, growing at a rate of three percent annually (Stevick et al. 2003).

Southern Hemisphere. Humpback whales are abundant throughout the Antarctic during the summer; they occur south to the ice edge but not within the pack ice zone (Reilly et al. 2008). In the winter, Southern Hemisphere whales migrate to coastal areas within the South Pacific, South Atlantic, and Indian Oceans. There is genetic differentiation within and among all southern ocean basins (Baker et al. 1998; Rosenbaum et al. 2009). Over 200,000 humpback whales were killed in the Southern Hemisphere during the early 20th century. The area now supports more than 36,000 humpback whales and is growing at a minimum annual rate of 4.6 percent (Reilly et al. 2008)

Arabian Sea. A small, genetically and demographically distinct population of humpback whales resides year-round in the Arabian Sea (Mikhalev 1997; Reilly et al. 2008). Though historical estimates are not available, 242 whales were killed in 1965 and 1966 (Reilly et al. 2008). The minimum population size, based on photo-identification data, is 56 whales (Mikhalev 1997); the maximum estimate is 400 (Reilly et al. 2008).

Threats

Three human activities are known to threaten humpback whales: directed harvest, fisheries interactions, and vessel collisions. Historically, whaling represented the greatest threat to every population of humpback whales. It was ultimately responsible for the global decline in humpback whales prior to their listing as an endangered species. Hundreds of thousands of whales were removed from the world's oceans prior to bans on commercial whaling in the mid-20th century (Reilly et al. 2008). Humpback whales are often killed or injured during interactions with commercial fishing gear. They are vulnerable to ship strikes, which are often fatal. Their natural predators my include orcas, false killer whales, and sharks.

Life History Information

Humpback whale reproductive activities occur primarily in winter. Gestation takes about 11 months (Winn & Reichley. 1985), followed by a nursing period of up to one year (Baraff & Weinrich 1993). Calving occurs in the shallow coastal waters of continental shelves and some oceanic islands (Perry et al. 1999). The calving interval is likely two to three years (Clapham & Mayo 1987), although some evidence exists of calving in consecutive years (Clapham & Mayo 1987; 1990; Glockner-Ferrari & Ferrari 1985; Weinrich et al. 1993). Mother/calf groups are found in relatively stable pairs (Ersts & Rosenbaum 2003). Sexual maturity in humpback whales is reached between five and 11 years of age (Clapham 1992; Gabriele et al. 2007). During the breeding season, humpback whales form small unstable groups (Clapham 1996). Males sing long, complex songs, compete for mates, and are polygamous (Clapham 1996).

Humpback whales migrate long distances from breeding areas to foraging areas. Although largely solitary, humpback whales often cooperate during feeding activities (Elena et al. 2002). Feeding groups are sometimes stable for long periods of times, and there is good evidence of some territoriality on both feeding (Clapham 1996) and wintering grounds (Tyack 1981). Humpbacks exhibit a wide range of foraging behaviors and feed on a range of prey types, including: small schooling fishes, euphausiids, and other large zooplankton (Krieger & Wing. 1984; Krieger & Wing. 1986; Nemoto 1957; Nemoto 1959; Nemoto 1970). Because most humpback prey are likely found above 300 m depths, most dives are probably relatively shallow, with typical diving depths of approximately 60-170 m (Hamilton et al. 1997). Dives usually range between two and five minutes but can last to around 20 minutes (Dolphin 1987).

ENVIRONMENTAL BASELINE

By regulation, environmental baselines for biological opinions include: the past and present impacts of all state, Federal, or private actions; other human activities in the action area; the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7

consultation; and the impact of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). A number of human activities have contributed to the current status of Pacific humpback whales. Some of those activities, most notably commercial whaling, occurred extensively in the past, ended, and no longer appear to affect this population, although the effects of the reduction likely persist today. Other human activities are ongoing and may continue to affect this population. The following discussion summarizes the principal phenomena that are known to affect the likelihood that this population will survive and recover in the wild.

Natural Sources of Stress and Mortality

Humpback whales are preyed upon by killer whales and parasitized by the nematode, *Crassicauda boopis* (Dolphin 1987; Lambertsen 1986). Lethal strandings attributed to harmful algal blooms (Geraci et al. 1989) and lethal entrapment in ice have also been observed (Mitchell 1979).

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

Anthropogenic Stressors

Commercial Harvest

Prior to 1900, aboriginal hunting and early commercial whaling on the high seas, using hand harpoons, took an unknown number of humpback whales (Johnson & Wolman 1984). Modern commercial whaling began in 1889 in the western Pacific and 1905 in the eastern Pacific; by 1960 approximately 23,000 humpback whales had been killed (Johnson & Wolman 1984). From 1960 until 1965, over 5,000 humpbacks were killed, reducing the North Pacific population to approximately 1,000 whales (Rice 1978). In 1965, the IWC banned the commercial hunting of humpback whales in the Pacific. Although commercial harvesting no longer targets humpback whales in the proposed action area, prior exploitation may have altered the population structure and social cohesion of the species such that effects on abundance and recruitment can continue for years after harvesting has ceased.

Fishing Activities

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

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

Ship Strikes and Other Vessel Interactions

Ships have the potential to affect humpback whales through strikes, noise, and disturbance by their physical presence. Responses to vessel interactions include interruption of vital behaviors and social groups, separation of mothers and young, and abandonment of resting areas (Bejder et al. 1999; Boren et al. 2001;

Colburn 1999; Constantine 2001; Cope et al. 1999; Kovacs & Innes. 1990; Kruse 1991; Mann et al. 2000; Nowacek et al. 2001; Samuels et al. 2000; Samuels & Gifford. 1998; Wells & Scott 1997). Whale watching, a profitable and rapidly growing business with more than 9 million participants in 80 countries and territories, may increase these types of disturbance and negatively affect the species (Hoyt 2001).

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

Humpback whales are vulnerable to ship strikes, which are often fatal. On the Pacific coast, a humpback whale is killed about every other year by ship strikes (Barlow et al. 1997). Ship strikes killed at least two humpback whales in 1993, one in 1995, one in 2000, and two from 2004 to 2008 (Carretta et al. 2010). From 2004 to 2008, the average number of humpback whale deaths by ship strikes was at least 0.4 per year, up from 0.2 per year for 1999-2003 (Carretta et al. 2010). This number is almost certainly an underestimate, as ship strikes often go unreported.

Noise

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

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

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

US Navy Activities

The U.S. Navy has conducted training and other activities in the Gulf of Alaska since 1973. From 2011 to 2016, they plan to conduct anti-submarine, anti-air, anti-surface warfare activities and two 21-day training exercises in this area. In 2011, we issued a Biological Opinion on the US Navy's proposed training activities in the Gulf of Alaska Temporary Maritime Training Area. We anticipated 6,975 instances of

anthropogenic disturbances as a result of the Navy action; however these disturbances are not likely to disrupt the behavior patterns of humpbacks to a degree that is likely to jeopardize the species.

Pollution

Marine Debris. Types of marine debris include plastics, glass, metal, polystyrene foam, rubber, and derelict fishing gear from human marine activities or transported into the marine environment from land. The sources of this debris include littering, dumping and industrial loss and discharge from land. Whales become entangled in marine debris, or ingest it, which may lead to injury or death. Given the limited knowledge about the impacts of marine debris on baleen whales, it is difficult to determine the extent of the threats that marine debris poses to humpback whales.

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

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

Hydrocarbons. Exposure to hydrocarbons released into the environment via oil spills and other discharges pose risks to marine species. Marine mammals are generally able to metabolize and excrete limited amounts of hydrocarbons, but exposure to large amounts of hydrocarbons and chronic exposure over time pose greater risks (Grant & Ross 2002). Acute exposure of marine mammals to petroleum products causes changes in behavior and may directly injure animals (Geraci 1990). Cetaceans have a thickened epidermis that greatly reduces the likelihood of petroleum toxicity from skin contact with oils (Geraci 1990), but they may inhale these compounds at the water's surface and ingest them while feeding (Matkin & Saulitis 1997). Hydrocarbons also have the potential to impact prey populations, and therefore may affect listed species indirectly by reducing food availability.

Scientific Research

Humpback whales that occur in the action area have been the subject of scientific research activities, as authorized by NMFS permits. Research includes vessel and aircraft surveys, biopsy sampling, collection of sloughed skin, tagging, and active acoustic experiments. No mortalities are authorized for any animal of any age. The Permits Division has authorized 16 scientific research permits (Table 2), including the applicant's current permit, No. 1120-1898, and a total of 49,330 takes of the humpback whales that may be exposed to the proposed research.

Table 2. Scientific research permits authorized by NMFS.

Permit Number	Activity	No. Takes Authorized
1120-1898 (Current)	Photograph	1350
369-1757-01	Tag	200
781-1824	Photograph, sample, tag, track	405
14610	Photograph, sample, tag, track	140
14097	Photograph, sample, tag, track	1760
14599	Photograph, sample, tag, track, acoustic playback	2170
13846	Photograph, sample, tag, track	5960
14122	Photograph, sample, tag, track, acoustic playback	1500
14451	Photograph	5335
14296	Photograph, sample, tag, track	970
14585	Photograph, sample, tag, track	2930
14245	Photograph, sample, tag, track	15925
15330	Photograph, sample, tag, track	1060
15274	Photograph	3000
15844	Photograph, sample	6350
14118	Photograph, sample, tag, track	275

Conservation and Management Efforts

In 1946, the International Convention for the Regulation of Whaling began regulating commercial whaling of humpback whales. In 1966, the International Whaling Commission prohibited commercial whaling of humpbacks. The species was designated "endangered" under the Endangered Species Conservation Act in 1970 and under the Endangered Species Act in 1973. In 1972, it was listed as depleted under the Marine Mammal Protection Act (MMPA), which mitigates threats to humpback whales in the Pacific Offshore Cetacean Reduction Plan.

Several conservation and management efforts have been undertaken for humpback whales in the action area. The humpback whale recovery plan guides the protection and conservation of the species (NMFS 1991). NMFS implements conservation and management activities for the species through its Regional Offices and Fishery Science Centers in cooperation with states, conservation groups, the public, and other federal agencies. They have placed observers aboard driftnet fishing vessels and vessels engaged in seismic activities to record and monitor takes. The Pacific Offshore Cetacean Reduction Plan requires acoustic pingers to help repel marine mammals from fishing operations. NMFS mitigates ship strikes and responds to humpback whales in distress. Together with their partners, they educate the crew of whale watch vessels and other boat operators on safe boating practices.

The 1991 humpback whale recovery plan set a goal of doubling extant populations within 20 years (NMFS 1991). The 2004-2006 SPLASH data indicate that the North Pacific population has doubled in size since 1991 (Calambokidis 2010). Because we do not have baseline abundance data, prior to commercial whaling, it is impossible to know whether the population has fully recovered. We conclude that the North Pacific population has made a substantial recovery and continues to grow, in spite of the threats listed above.

EFFECTS OF THE PROPOSED ACTION

Pursuant to Section 7(a)(2) of the ESA, Federal agencies are directed to insure that their activities are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. For this consultation, we are particularly concerned about behavioral disruptions that may result in animals that fail to feed or breed successfully or fail to complete their life history because these responses are likely to have population-level consequences.

Exposure Analyses

In accordance with Section 10(a)(1)(A) of the Endangered Species Act, the Permits Division determines the maximum number of exempted annual takes allowed (Table 1), should the permit be issued. It is important

to emphasize that the take table defines the maximum level of take that would be permitted; it does not necessarily reflect the number of whales that *are likely* to be exposed to such activities. To determine the number of humpbacks that are likely to be exposed to such activities, we consider past efforts of the researchers (Table 3).

Table 3. Actual annual take of humpback whales under the researchers' previous permit No. 1120-1898

Year	No. approaches	No. individuals	No. females with calves
2007	28	24	2
2008	44	37	8
2009	53	42	0
2010	49	41	3
2011	63	47	5

In 2007, the researchers approached six individuals twice, two individuals three times, and two individuals four times. In 2008, the researchers approached nine individuals twice, six individuals three times, and one individual five times. In 2009, the researchers approached seven individuals twice and one individual four times. In 2010, the researchers approached seven whales twice, two whales three times, and one whale four times. In 2011, the researchers approached eight individuals twice and four individuals three times.

Given the previous exposure, we would expect the researchers to conduct 99 approaches (four standard deviations of the mean) of 73 individuals. Of these, 16 would be likely to be females with calves.

The permit would authorize the take of 200 humpback whales for photography and behavioral observation. Though more than twice our expectations based on previous effort, the estimate is not unreasonable. The researchers may increase their effort in the next 5 years, or they may encounter new individuals. There are at least 2,000 humpback whales in the Gulf of Alaska summer foraging ecostock. The population appears to be growing in size, and there is an increasing trend in individual identification. The authorized take of 200 individuals represents approximately 10% of the total North Pacific population. As described above, it is also likely that some individuals may be encountered more than once. To give the benefit of the doubt to the species (by over-estimating expected take), we anticipate up to 200 instances of exposure (e.g., 200 individuals once, 50 individuals four times, etc.) to vessel approach, photography, and behavioral observation annually.

Duration of Exposure

The investigators would approach the humpback whales in their vessel tagging boat. The close approach would last only as long as necessary for photo-identification and behavioral observation. They would conduct four to five whale surveys between June and September annually; each survey would last 6 – 8 days. The researchers would not approach any individual more than three times in one day.

Stocks Exposed

There are approximately 20,000 humpback whales in the North Pacific (Calambokidis 2010). The Gulf of Alaska is one of seven genetically distinct ecostocks that hosts more than 2,000 individuals. Genetic analyses indicate that humpback whales foraging in this area belong primarily to the Central North Pacific and Western North Pacific breeding stocks (Calambokidis 2010). There are approximately 6,500 whales in these two breeding stocks. While the Central North Pacific breeding stock is increasing by at least 5% annually, population trends for the Western North Pacific breeding stock remain unknown. Males and females, juveniles and adults would be exposed to the activities. We do not expect any neonates to be exposed to any activities because neonates are not likely to be observed in the summer foraging areas.

Potential Stressors and Response Analyses
For each activity listed below, we first identify potential physical, chemical, or biotic stressors (presented in a bulleted list). We then describe likely responses to such stressors. Animal responses to human disturbance are similar to their responses to potential predators (Beale & Monaghan 2004; Frid & Dill 2002; Gill & Sutherland 2001; Lima 1998; Romero 2004). These responses include interruptions of essential behavior and physiological processes such as feeding, mating, resting, digestion, etc. Each of these can result in stress, injury, and increased susceptibility to disease and predation (Frid & Dill 2002; Romero 2004).

For the purposes of consultation, our assessments try to detect potential lethal, sub-lethal (or physiological), or behavioral responses that might reduce the fitness of individuals. Ideally, response analyses would consider and weigh evidence of adverse consequences as well as evidence suggesting the absence of such consequences. When possible, we base the likelihood of a response on previously collected data describing humpback whale responses to similar stressors; however, when that data is not available, we use information from other species to proximate a humpback whale's response.

Vessel approach

- Vessel noise
- Visual disturbance
- Potential for vessel strike

Ships are a major source of anthropogenic noise in the ocean (NRC 2003). The researchers' vessels would emit predominantly low frequency sound, similar to the amount and frequency of noise as other vessels in the area. As previously stated, humpback whales generate and rely on sound to navigate, hunt, and communicate with other individuals. Vessel noise in general has the potential to interfere with these important activities; however, it is unlikely that the use of a single vessel, in addition to the hundreds of ships operating in the action area, would have a significant effect on humpback whales. Ship noise, which has increased steadily in recent decades, has not prevented the species from doubling in size since the early 1990s. Therefore, we conclude vessel noise is unlikely adversely affect individuals, and is thus unlikely to reduce the fitness of humpback whales in the action area.

The mere sight of a ship also has the potential to disturb humpback whales as they feed and rest in the action area. Marine mammals often display great tolerance to boat traffic (Richardson et al. 1995). Under the researchers' previous permit, seven of 237 individuals responded to boat approaches. In 2007, the researchers made 28 approaches; none of the animals responded. In 2008, the researchers made 44 approaches; none of the animals responded. In 2009, the researchers made 53 approaches; two whales responded to the approach: one dove and the other slapped its tail twice. In 2010, the researchers approached 49 whales; three individuals responded to the approach: the researchers reported that the whales behaved "shyly." In 2011, the researchers made 63 approaches. They encountered five mothers with calves; two of these mothers responded to approaches. One blew loudly and the other moved away from the vessel. Of all whales approached, 3.0% (95% CI = 0.00 – 0.06) responded. Of those that responded, most moved away from the vessel (N = 4). This avoidance behavior may interrupt feeding, nursing, or resting; however, because the researchers do not pursue the whales, the response is likely of short duration and low energetic cost. Diving is another avoidance behavior, but one that requires more time and energy than moving away from the vessel at the surface. Repetitive disturbances resulting in dive responses have the potential to reduce foraging and resting time; however the researchers are not allowed to approach a whale more than three times in a day. Furthermore, only one approach of 237 resulted in diving behavior, such that this response appears to be rare (0.4 percent). We conclude that an occasional dive response would have little effect on foraging or resting time and no effect on survival and fitness. Two whales displayed "aggressive" behaviors: a tail slap and loud blow (Silber 1986b). Though neither are considered highly aggressive (the tail slap was not directed at the vessel or another whale), they may be indicative of agitation. Such behavior may interrupt feeding, resting, and nursing; however, the response is of short duration and rare occurrence. It is unlikely to reduce these behaviors at a magnitude which could

impact survival or reproduction. As described in the *Exposure Analyses* above, up to 200 whales would be approached annually. Of these, we would expect six (95% C.I.: 0.0 – 12) to respond to the vessel. The magnitude of these responses would likely range from avoidance to low levels of aggression. Because all responses are likely to be transient and of short duration, none are likely to result in the reduction of survival or reproduction of any whale. While disturbances caused by the researchers' vessel are likely to adversely affect humpback whales, they are unlikely to reduce the fitness of any individual in the action area.

As previously described, ship strikes cause several whale deaths each year. To mitigate this risk, the investigators would conduct all vessel activities at safe operating speeds. They would slow the vessel as they approach a whale. They would have spotters to search for and monitor the whales. Given these precautions, we conclude that a ship strike would be highly unlikely and therefore would not reduce the fitness of humpback whales.

In conclusion, noise and visual disturbances to listed marine mammals that would result from the proposed activities are expected to be minor and short-lived. The chance of a ship strike is unlikely. Therefore, vessel approach activities are not likely to diminish the fitness of any humpback whales.

Photography

- No stressors identified, other than those associated with vessel approach

Behavioral Observation

- No stressors identified, other than those associated with vessel approach

Risk Analyses

None of the activities above are likely to reduce the fitness of any humpback whale. Therefore, we do not expect the action to lower population viability or to threaten the continued survival of the species. Critical habitat has not been designated for the humpback whale.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions, including research authorized under ESA Section 10(a)1(A), that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. After reviewing available information, NMFS is not aware of effects from any additional future non-federal activities in the action area that would not require federal authorization or funding and are reasonably certain to occur during the foreseeable future.

NMFS expects the natural phenomena in the action area (e.g., oceanographic features, storms, and natural mortality) will continue to influence listed whales as described in the *Environmental Baseline*. We also expect current anthropogenic effects will also continue, including the introduction of sound sources into marine mammal habitat, changes in prey availability, vessel traffic and scientific research. Potential future effects from climate change on marine mammals in the action area are not definitively known. However, climatic variability has the potential to affect these species in the future, including indirectly by affecting prey availability.

As the size of human communities increase, there is an accompanying increase in habitat alterations resulting from an increase in housing, roads, commercial facilities and other infrastructure. This results in increased discharge of sediments and pollution into the marine environment. These activities are expected to continue to degrade the habitat of marine mammals as well as that of the prey on which they depend.

INTEGRATION AND SYNTHESIS OF EFFECTS

The following text integrates and synthesizes the *Status of the Species*, the *Environmental Baseline* and the *Effects of the Action* sections of this Opinion. This information, in addition to the known cumulative effects, is used to assess the risk the proposed activities pose to endangered humpback whales in the action area. The Permits Division proposes to issue Permit No. 16919, which would authorize direct take of 200 humpback whales in Prince William Sound and the adjacent waters of Alaska. The proposed activities under this permit include vessel approaches, photography, and behavioral observation. The permit would be valid for 5 years.

The current and historic stressors to humpback whales include natural mortality, depletion of populations due to overharvesting, fishing interactions, ship strikes, vessel interactions, noise, and scientific research. Commercial whaling depleted humpback whales worldwide, but populations have increased substantially since whaling was banned in 1965 (Reilly 2008). Ship strikes and entanglement in fishing gear now pose the largest threats to the species. Humpback whales are also exposed to anthropogenic noise, including US Navy exercises and directed research. The Permits Division has previously authorized 49,330 non-lethal takes for the purpose of directed research. Though these takes are not expected to injure or kill humpback whales, the magnitude is so great that each individual is likely to be harassed more than once per year.

During the course of this consultation, we have identified potential stressors associated with the activities to be authorized under the proposed permit: potential boat strikes; vessel noise; and visual disturbances. For this consultation, we are particularly concerned about behavioral disruptions that may result in animals that fail to feed or breed successfully or fail to complete their life history because these responses are likely to have population-level consequences.

As explained in the *Response Analyses* section of this Opinion, because of the slow speed and safe operating procedures of the researchers' vessels, boat strikes are extremely unlikely and therefore discountable. Vessel noise is expected to be minor and transitory and is therefore discountable. Visual disturbances that would result from vessel operation may adversely affect individuals, which would likely respond with avoidance behavior; however, these responses are expected to be brief and would not have any long-term consequences to individuals. Because the fitness of individuals would not be reduced, the viability of the populations they comprise would not be reduced.

There is no designated critical habitat for the humpback whale. The activities described above would not destroy or adversely modify the critical habitat of the Steller sea lion.

CONCLUSION

After reviewing the current status of species, the environmental baseline for the action area, the anticipated effects of the proposed activities, and the cumulative effects, we conclude that the activities authorized by the proposed issuance of scientific research permit No. 16919 are not likely to jeopardize the continued existence of endangered humpback whales.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the "take" of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Sections 7(b)(4) and 7(o)(2), taking that is incidental and not intended as part of the agency action is not considered to be prohibited taking under the

ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement. However, as discussed in the accompanying Opinion, only the species permitted in the proposed research activities will be significantly harassed as part of the intended purpose of the proposed action. Therefore, the NMFS does not expect the proposed action will incidentally take additional threatened or endangered species.

CONSERVATION RECOMMENDATIONS

Section 7(a) (1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans or to develop information.

We recommend the following conservation recommendations, which would provide information for future consultations involving the issuance of marine mammal permits that may affect endangered whales as well as reduce harassment related to authorized activities:

1. *Calculation of Authorized Take.* For this proposed permit, the Permits Division reduced the authorized annual take from 1350 to 200 humpback whales, a more realistic estimate given the researchers actual annual take over the past 5 years (N = 28 – 63). The reduction is commendable, and we encourage the Permits Division to continue to use previous levels of actual take to calculate future authorized take in their proposed permits.

2. Reporting of Actual Levels of Take. For this consultation, the Permits Division provided five annual reports as required of the researchers' previous permit. We encourage the Permits Division to continue to require and provide these annual reports, as they are a valuable resource for our response analyses. It would be helpful if these reports were available online, preferably in tabular format or as attachments on the Permit Division's APPS website (https://apps.nmfs.noaa.gov/).

In an effort for us to remain informed of actions minimizing or avoiding adverse effects on, or benefiting, listed species or their habitats, the Permits Division should notify the Endangered Species Act Interagency Cooperation Division of any conservation recommendations they implement in their final action.

REINITIATION NOTICE

This concludes formal consultation on the proposal to issue scientific research permit No. 14534-02. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (2) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (3) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of authorized take is exceeded, The Permits Division must immediately request reinitiation of section 7 consultation.

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