U.S.C. 1361 *et seq.*), the Regulations Governing the Taking and Importing of Marine Mammals (50 CFR part 216).

In compliance with the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*), a determination was made that the permitted activity is categorically excluded from the requirement to prepare an environmental assessment or environmental impact statement.

Dated: January 30, 2006.

Stephen L. Leathery,

Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service.

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[I.D. 080905A]

Small Takes of Marine Mammals Incidental to Specified Activities; Low-Energy Seismic Survey on the Louisville Ridge, Southwest Pacific Ocean

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of issuance of an incidental harassment authorization.

SUMMARY: In accordance with provisions of the Marine Mammal Protection Act (MMPA) as amended, notification is hereby given that an Incidental Harassment Authorization (IHA) to take small numbers of marine mammals, by harassment, incidental to conducting an oceanographic survey in the southwestern Pacific Ocean (SWPO) has been issued to the Scripps Institution of Oceanography (Scripps).

DATES: Effective from January 20, 2006, through January 19, 2007.

ADDRESSES: The authorization and application containing a list of the references used in this document may be obtained by writing to this address or by telephoning the contact listed here. The application is also available at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm.*

FOR FURTHER INFORMATION CONTACT: Kenneth Hollingshead, Office of Protected Resources, NMFS, (301) 713–2289, ext 128.

SUPPLEMENTARY INFORMATION:

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

An authorization may be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses and that the permissible methods of taking and requirements pertaining to the monitoring and reporting of such takings are set forth. NMFS has defined ''negligible impact'' in 50 CFR 216.103 as '' * * * an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.''

Section 101(a)(5)(D) of the MMPA established an expedited process by which citizens of the United States can apply for an authorization to incidentally take small numbers of marine mammals by harassment. Except with respect to certain activities not pertinent here, the MMPA defines ''harassment'' as:

> any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Section 101(a)(5)(D) establishes a 45-day time limit for NMFS review of an application followed by a 30-day public notice and comment period on any proposed authorizations for the incidental harassment of marine mammals. Within 45 days of the close of the comment period, NMFS must either issue or deny issuance of the authorization.

Summary of Request

On June 29, 2005, NMFS received an application from Scripps for the taking, by harassment, of several species of marine mammals incidental to conducting a low-energy marine seismic survey program during early 2006 in the SWPO. Scripps plans to conduct a seismic survey of several seamounts on the Louisville Ridge in the SWPO as part of the Integrated Ocean Drilling Program (IODP). As presently scheduled, the seismic survey will occur from about January 21 to February 26, 2006.

The purpose of the research program is to conduct a planned scientific rock-dredging, magnetic, and seismic survey program of six seamounts of the Louisville seamount chain. The results will be used to: (1) Test hypotheses about the eruptive history of the submarine volcanoes, the subsequent formation (by subaerial erosion and submergence) of its many guyots, and motion of the hotspot plume; and (2) design an effective IODP cruise (not currently scheduled) to drill on carefully-selected seamounts. Included in the research planned for 2006 is scientific rock dredging, extensive total-field and three-component magnetic surveys, the use of multi-beam and Chirp techniques to map the seafloor, and high-resolution seismic methods to image the subsea floor. Following the cruise, chemical and geochronologic analyses will be conducted on rocks from 25 sites.

Description of the Activity

The seismic surveys will involve one vessel. The source vessel, the *R/V Roger Revelle*, will deploy a pair of low-energy Generator-Injector (GI) airguns as an energy source (each with a discharge volume of 45 in^3), plus a 450-m (1476-ft) long, 48-channel, towed hydrophone streamer. As the airguns are towed along the survey lines, the receiving system will receive the returning acoustic signals.

The program will consist of approximately 1840 km (994 nm) of surveys, including turns. Water depths within the seismic survey areas are 800–2300 m (2625–7456 ft). The GI guns will be operated on a small grid (see inset in Figure 1 in Scripps (2006)) for about 28 hours at each of 6 seamounts between approximately January 28 to February 19, 2006. There will be additional seismic operations associated with equipment testing, start-up, and repeat coverage of any areas where initial data quality is sub-standard.

The *Revelle* is scheduled to depart from Papeete, French Polynesia, on or about January 21, 2006, and to arrive at Wellington, New Zealand, on or about February 26, 2006. The GI guns will be used for about 28 hours on each of 6 seamounts between about January 28th to February 19th. The exact dates of the activities may vary by a few days because of weather conditions, repositioning, streamer operations and adjustments, airgun deployment, or the need to repeat some lines if data quality is substandard. The overall area within which the seismic surveys will occur is located between approximately 25° and 45° S., and between 155° and 175° W. The surveys will be conducted entirely in International Waters.

In addition to the operations of the GI guns, a 3.5-kHz sub-bottom profiler and passive geophysical sensors to conduct total-field and three-component magnetic surveys will be operated during seismic surveys. A Kongsberg-Simrad EM–120 multi-beam sonar will be used continuously throughout the cruise.

The energy to the airguns is compressed air supplied by compressors on board the source vessel. Seismic pulses will be emitted at intervals of 6–10 seconds. At a speed of 7 knots (13 km/h), the 6–10 sec spacing corresponds to a shot interval of approximately 21.5–36 m (71–118 ft).

The generator chamber of each GI gun, the one responsible for introducing the sound pulse into the ocean, is 45 in^3. The larger (105 in^3) injector chamber injects air into the previously-generated bubble to maintain its shape, and does not introduce more sound into the water. The two 45/105 in^3 GI guns will be towed 8 m (26.2 ft) apart side by side, 21 m (68.9 ft) behind the *Revelle*, at a depth of 2 m (6.6 ft).

General-Injector Airguns

Two GI-airguns will be used from the *Revelle* during the proposed program. These 2 GI-airguns have a zero to peak (peak) source output of 230.7 dB re 1 microPascal-m (3.4 bar-m) and a peak-to-peak (pk-pk) level of 235.9B (6.2 bar-m). However, these downward-directed source levels do not represent actual sound levels that can be measured at any location in the water. Rather, they represent the level that would be found 1 m (3.3 ft) from a hypothetical point source emitting the same total amount of sound as is emitted by the combined airguns in the airgun array. The actual received level at any location in the water near the airguns will not exceed the source level of the strongest individual source and actual levels experienced by any organism more than 1 m (3.3 ft) from any GI gun will be significantly lower.

Further, the root mean square (rms) received levels that are used as impact criteria for marine mammals (see Richardson *et al.*, 1995) are not directly comparable to these peak or pk-pk values that are normally used to characterize source levels of airgun arrays. The measurement units used to describe airgun sources, peak or pk-pk decibels, are always higher than the rms decibels referred to in biological literature. For example, a measured received level of 160 dB rms in the far field would typically correspond to a peak measurement of about 170 to 172 dB, and to a pk-pk measurement of about 176 to 178 decibels, as measured for the same pulse received at the same location (Greene, 1997; McCauley *et al.*, 1998, 2000). The precise difference between rms and peak or pk-pk values depends on the frequency content and duration of the pulse, among other factors. However, the rms level is always lower than the peak or pk-pk level for an airgun-type source.

The depth at which the sources are towed has a major impact on the maximum near-field output, because the energy output is constrained by ambient pressure. The normal tow depth of the sources to be used in this project is 2.0 m (6.6 ft), where the ambient pressure is approximately 3 decibars. This also limits output, as the 3 decibars of confining pressure cannot fully constrain the source output, with the result that there is loss of energy at the sea surface. Additional discussion of the characteristics of airgun pulses is provided in Scripps application and in previous **Federal Register** documents (see 69 FR 31792 (June 7, 2004) or 69 FR 34996 (June 23, 2004)).

Received sound levels have been modeled by Lamont-Doherty Earth Observatory (L-DEO) for a number of airgun configurations, including two 45-in^3 Nucleus G-guns (G guns), in relation to distance and direction from the airguns. The L-DEO model does not allow for bottom interactions, and is therefore most directly applicable to deep water. Based on the modeling, estimates of the maximum distances from the GI guns where sound levels of 190, 180, 170, and 160 dB microPascal-m (rms) are predicted to be received are shown in Table 1. Because the model results are for the G guns, which have more energy than GI guns of the same size, those distances are overestimates of the distances for the 45 in^3 GI guns.

TABLE 1.—DISTANCES TO WHICH SOUND LEVELS ≥190, 180, 170, AND 160 DB RE 1 μPA (RMS) MIGHT BE RECEIVED FROM TWO 45-IN^3 G GUNS, SIMILAR TO THE TWO 45-IN^3 GI GUNS THAT WILL BE USED DURING THE SEISMIC SURVEY IN THE SW PACIFIC OCEAN DURING JANUARY–FEBRUARY 2006. DISTANCES ARE BASED ON MODEL RESULTS PROVIDED BY L–DEO.

Water depth	Estimated distances at received levels (m)			
	190 dB	180 dB	170 dB	160 dB
100–1000 m	15	60	188	525
>1000 m	10	40	125	350

Some empirical data concerning the 180- and 160-dB distances have been acquired based on measurements during an acoustic verification study conducted by L–DEO in the northern Gulf of Mexico between May 27 and June 3, 2003 (Tolstoy *et al.*, 2004). Although the results are limited, the data showed that water depth affected the radii around the airguns where the received level would be 180 dB re 1 microPa (rms), NMFS' current injury threshold safety criterion applicable to cetaceans (NMFS, 2000). Similar depth-related variation is likely in the 190–dB distances applicable to pinnipeds. Correction factors were developed for water depths 100–1000 m (328–3281 ft) and less than 100 m (328 ft). The proposed survey will occur in depths 800–2300 m (2625–7456 ft), so only the correction factor for intermediate water depths is relevant here.

The empirical data indicate that for deep water (>1000 m (3281 ft)), the L–DEO model tends to overestimate the received sound levels at a given distance (Tolstoy *et al.*, 2004). However, to be precautionary pending acquisition of additional empirical data, it is proposed that safety radii during airgun operations in deep water will be the values predicted by L–DEO's model (Table 1). Therefore, the assumed 180- and 190-dB radii are 40 m (131 ft) and 10 m (33 ft), respectively.

Bathymetric Sonar and Sub-bottom Profiler

The Kongsberg-Simrad EM120 multi-beam sonar operates at 11.25–12.6 kHz, and is mounted in the hull of the *Revelle.* It operates in several modes, depending on water depth. In the proposed survey, it will be used in deep (>800-m) water, and will operate in ''deep'' mode. The beamwidth is 1° or 2° fore-aft and a total of 150° athwartship. Estimated maximum source levels are 239 and 233 dB at 1° and 2° beam widths, respectively. Each ''ping'' consists of nine successive fan-shaped transmissions, each ensonifying a sector that extends 1° or 2° fore-aft. In the ''deep'' mode, the total duration of the transmission into each sector is 15 ms. The nine successive transmissions span an overall cross-track angular extent of about 150°, with 16-ms gaps between the pulses for successive sectors. A receiver in the overlap area between two sectors would receive two 15-ms pulses separated by a 16-ms gap. The ''ping'' interval varies with water depth, from approximately 5 sec at 1000 m (3281 ft) to 20 sec at 4000 m (13123 ft/2.2 nm).

Sub-bottom Profiler—The sub-bottom profiler is normally operated to provide information about the sedimentary features and the bottom topography that is simultaneously being mapped by the multi-beam sonar. The energy from the sub-bottom profiler is directed downward by a 3.5-kHz transducer mounted in the hull of the *Revelle*. The output varies with water depth from 50 watts in shallow water to 800 watts in deep water. Pulse interval is 1 second (sec) but a common mode of operation is to broadcast five pulses at 1-s intervals followed by a 5-sec pause. The beamwidth is approximately 30° and is directed downward. Maximum source output is 204 dB re 1 microPa (800 watts) while normal source output is 200 dB re 1 microPa (500 watts). Pulse duration will be 4, 2, or 1 ms, and the bandwith of pulses will be 1.0 kHz, 0.5 kHz, or 0.25 kHz, respectively.

Although the sound levels have not been measured directly for the sub-bottom profiler used by the *Revelle*, Burgess and Lawson (2000) measured sounds propagating more or less horizontally from a sub-bottom profiler similar to the Scripps unit with similar source output (i.e., 205 dB re 1 microPa m). For that profiler, the 160- and 180-dB re 1 microPa (rms) radii in the horizontal direction were estimated to be, respectively, near 20 m (66 ft) and 8 m (26 ft) from the source, as measured in 13 m (43 ft) water depth. The corresponding distances for an animal in the beam below the transducer would be greater, on the order of 180 m (591 ft) and 18 m (59 ft) respectively, assuming spherical spreading. Thus the received level for the Scripps sub-bottom profiler would be expected to decrease to 160 and 180 dB about 160 m (525 ft) and 16 m (52 ft) below the transducer, respectively, assuming spherical spreading. Corresponding distances in the horizontal plane would be lower, given the directionality of this source (30° beamwidth) and the measurements of Burgess and Lawson (2000).

Characteristics of Airgun Pulses

Discussion of the characteristics of airgun pulses was provided in several previous **Federal Register** documents (see 69 FR 31792 (June 7, 2004) or 69 FR 34996 (June 23, 2004)) and is not repeated here. Reviewers are encouraged to read these earlier documents for additional information.

Comments and Responses

A notice of receipt and request for 30-day public comment on the application and proposed authorization was published on October 17, 2005 (70 FR 60287). During the 30-day public comment period, NMFS received comments only from the Marine Mammal Commission (Commission). It is the Commission's view that

(1) Considerable uncertainty exists regarding the effects of sound on marine mammals;

(2) Better understanding of those effects will require carefully designed studies, the results of which may not be available for years;

(3) Important activities should not be postponed or delayed until such results become available; and

(4) Until the results of needed studies become available and uncertainties are resolved or clarified, it is essential that agencies take a precautionary approach (as defined in the previous statements and publications) in authorizing and conducting activities.

Comment 1: The Commission believes that NMFS' preliminary determinations are reasonable provided NMFS is satisfied that the proposed mitigation and monitoring activities are adequate to detect marine mammals in the vicinity of the proposed operations and to ensure that marine mammals are not being taken in unanticipated ways or numbers.

Response: For this activity, the radius of the zone of potential impact ranges from 10 to 60 m (33 to 216.5 ft) depending upon water depth and whether the sighted mammal is a pinniped, a small cetacean, or a large cetacean (see Table 1). Considering the very small size of the conservative shutdown zones, the speed of the vessel when towing the airgun (7 kts), the length of daylight at this time of the year, and the marine mammal avoidance measures that are implemented by the vessel for animals on the vessel's track, it is very unlikely that any marine mammals would enter the safety zone undetected. If a marine mammal enters the small safety zone, operational shutdown will be implemented until the animal leaves the safety zone.

Comment 2: The Commission notes that its April 2004 Beaked Whale Conference explored issues related to the vulnerability of beaked whales to anthropogenic sound. Discussions at the workshop appear to lend support to the hypothesis that beaked whales have unique characteristics that make them particularly vulnerable to certain anthropogenic sound sources (e.g., sonars). Preliminary research findings presented at the workshop suggest that at least some beaked whales exhibit a unique dive behavior that raises the possibility that they may live in a physiologic condition of chronic supersaturation that would increase their susceptibility to received sound levels less than 180 dB. Workshop participants theorized that the animals' behavioral response to anthropogenic sound, coupled with their susceptibility to gas bubble formation may lead to strandings (which in many cases are lethal). The Commission recognizes that the evidence with respect to this scenario is preliminary and that other explanations and scenarios exist. However, the uncertainties concerning the effects of sound on these species underscore the need for caution.

Response: NMFS notes that the MMC's workshop summary report is available for reading or downloading at: *http://www.mmc.gov/sound/beakedwhalewrkshp/pdf/bwhale_wrkshpsummary.pdf*.

Comment 3: The Commission notes that although the proposed study is not expected to result in injuries or deaths to beaked whales or other species of marine mammals, observers will conduct monitoring for injured or dead animals along some recently run transect lines as the source vessel returns along parallel and perpendicular transect tracks. In this regard, the Commission would be interested in learning from NMFS and/or Scripps what the probability is that an injured or dead beaked whale, other small cetacean, or elephant seal would be sighted from a ship running transects through an area or retracing recently run transect lines.

Response: NMFS is unaware of any scientific studies to demonstrate efficacy of conducting marine mammal sightings from a moving vessel for incapacitated or dead marine mammals. However, Scripps notes that the *Revelle* will spend approximately 28 hours at each of the 6 seamounts. As the inset to Figure 1 in the Scripp's application shows, parallel seismic lines are approximately 2.5 km (1.35 nm) apart, and the ''perpendicular'' lines about twice that distance. Using big-eye binoculars, injured or dead mammals that are floating should be readily visible during daytime hours.

Comment 4: The Commission notes that to obtain the best possible observations prior to initiating full-scale operations, NMFS should require Scripps not initiate ramp-up after dark and/or to maintain a low-level output from the airguns if full-scale operations may take place after dark.

Response: The IHA to Scripps, similar to other seismic IHAs, requires that ramp-up not commence if the complete safety radii are not visible for at least 30 minutes prior to ramp-up in either daylight (rain/fog) or nighttime.

Comment 5: The Commission notes that NMFS' discussion of Scripps' proposed shut-down procedures in the proposed IHA **Federal Register** notice states: ''The mammal has cleared the safety radius if it is visually observed to have left the safety radius, or if it has not been seen within the zone for 15 min. (small odontocetes and pinnipeds) or 30 min. (mysticetes and large odontocetes)* * * .'' The Commission notes that elephant seals can dive for much longer than 15 minutes and, thus, could be directly below the sound source when it is reactivated.

Response: For elephant seals and other pinnipeds, the safety radius around the 2–GI airgun seismic source (not the vessel itself) is 10–15 m (33–49 ft) depending upon water depth. When towing seismic airguns, the *Revelle*'s speed is about 7 knots (nm/hr or 13 km/hr). As a result, the likelihood of an elephant seal (or any other marine mammal) making a deep dive and returning to the immediate area of the vessel and its safety zone, which after 15 minutes of travel will be about 1.75 nm (3.2 km) away from the elephant seal sighting location, is considered remote.

Comment 6: The Commission believes NMFS should require that operations be suspended immediately if a dead or seriously injured marine mammal is found in the vicinity of the operations, pending authorization to proceed or issuance of regulations authorizing such takes under section 101(a)(5)(A) of the MMPA.

Response: A standard condition in all seismic IHAs is for an emergency shut-down. The IHA states that ''If observations are made or credible reports are received that one or more marine mammals or sea turtles are within the area of this activity in an injured or mortal state, or are indicating acute distress, the seismic airguns will be immediately shut down and the Chief of the Permits, Conservation and Education Division, Office of Protected Resources or a staff member contacted. The airgun array will not be restarted until review and approval has been given by the Director, Office of Protected Resources or his designee.'' However, this requirement pertains only to recently deceased marine mammals, not long-dead ''floaters.''

Description of Habitat and Marine Mammals Affected by the Activity

Forty species of cetacean, including 31 odontocete (dolphin and small- and large-toothed whale) species and nine mysticete (baleen whales) species, are believed by scientists to occur in the southwest Pacific in the proposed seismic survey area. More detailed information on these species is contained in the Scripps application and the National Science Foundation (NSF) EA which are available at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm.* Table 2 in both the Scripps application and NSF EA summarizes the habitat, occurrence, and regional population estimate for these species. The following species may be affected by this low-intensity seismic survey: Sperm whale, pygmy and dwarf sperm whales, southern bottlenose whale, Arnoux's beaked whale, Cuvier's beaked whale, Shepherd's beaked whale, mesoplodont beaked whales (Andrew's beaked whale, Blainville's beaked whale, gingko-toothed whale, Gray's beaked whale, Hector's beaked whale, spade-toothed whale, strap-toothed whale), melon-headed whale, pygmy killer whale, false killer whale, killer whale, long-finned pilot whale, short-finned pilot whale, rough-toothed dolphin, bottlenose dolphin, pantropical spotted dolphin, spinner dolphin, striped dolphin, short-beaked common dolphin, hourglass dolphin, Fraser's dolphin , Risso's dolphin, southern right whale dolphin, spectacled porpoise, humpback whale, southern right whale, pygmy right whale, common minke whale, Antarctic minke whale, Bryde's whale, sei whale, fin whale and blue whale. Because the proposed survey area spans a wide range of latitudes (25–45° S), tropical, temperate, and possibly polar species are all likely to be found there. The survey area is all in deep-water habitat but is close to oceanic island (Kermadec Islands) habitats, so both coastal and oceanic species might be encountered. However, abundance and density estimates of cetaceans found there are provided for reference only, and are not necessarily the same as those that likely occur in the survey area.

Five species of pinnipeds could potentially occur in the proposed seismic survey area: Southern elephant seal, leopard seal, crabeater seal, Antarctic fur seal, and the sub-Antarctic fur seal. All are likely to be rare, if they occur at all, as their normal distributions are south of the Scripps survey area. Outside the breeding season, however, they disperse widely in the open ocean (Boyd, 2002; King, 1982; Rogers, 2002). Only three species of pinniped are known to wander regularly into the area (Reeves *et al.*, 1999): the Antarctic fur seal, the sub-Antarctic fur seal, and the leopard seal. Leopard seals are seen as far north as the Cook Islands (Rogers, 2002).

Potential Effects on Marine Mammals

As outlined in several previous NMFS documents, the effects of noise on marine mammals are highly variable, and can be categorized as follows (based on Richardson *et al.*, 1995):

(1) The noise may be too weak to be heard at the location of the animal (i.e., lower than the prevailing ambient noise level, the hearing threshold of the animal at relevant frequencies, or both);

(2) The noise may be audible but not strong enough to elicit any overt behavioral response;

(3) The noise may elicit reactions of variable conspicuousness and variable relevance to the well being of the marine mammal; these can range from temporary alert responses to active avoidance reactions such as vacating an area at least until the noise event ceases;

(4) Upon repeated exposure, a marine mammal may exhibit diminishing responsiveness (habituation), or disturbance effects may persist; the latter is most likely with sounds that are highly variable in characteristics, infrequent and unpredictable in occurrence, and associated with situations that a marine mammal perceives as a threat;

(5) Any anthropogenic noise that is strong enough to be heard has the potential to reduce (mask) the ability of a marine mammal to hear natural sounds at similar frequencies, including calls from conspecifics, and underwater environmental sounds such as surf noise;

(6) If mammals remain in an area because it is important for feeding, breeding or some other biologically important purpose even though there is chronic exposure to noise, it is possible that there could be noise-induced physiological stress; this might in turn have negative effects on the well-being or reproduction of the animals involved; and

(7) Very strong sounds have the potential to cause temporary or permanent reduction in hearing sensitivity. In terrestrial mammals, and presumably marine mammals, received sound levels must far exceed the animal's hearing threshold for there to be any temporary threshold shift (TTS) in its hearing ability. For transient sounds, the sound level necessary to cause TTS is inversely related to the duration of the sound. Received sound levels must be even higher for there to be risk of permanent hearing impairment. In addition, intense acoustic or explosive events may cause trauma to tissues associated with organs vital for hearing, sound production, respiration and other functions. This trauma may include minor to severe hemorrhage.

Effects of Seismic Surveys on Marine Mammals

The Scripps' application provides the following information on what is known about the effects on marine mammals of the types of seismic operations planned by Scripps. The types of effects considered here are (1) tolerance, (2) masking of natural sounds, (2) behavioral disturbance, and (3) potential hearing impairment and other non-auditory physical effects (Richardson *et al.*, 1995). Given the relatively small size of the airguns planned for the present project, its effects are anticipated to be considerably less than would be the case with a large array of airguns. Scripps and NMFS believe it is very unlikely that there would be any cases of temporary or especially permanent hearing impairment, or non-auditory physical effects. Also, behavioral disturbance is expected to be limited to distances less than 525 m (1722 ft) from the source, the zone calculated for 160 dB or the onset of Level B harassment. Additional discussion on species-specific effects can be found in the Scripps application.

Tolerance

Numerous studies (referenced in Scripps, 2005) have shown that pulsed sounds from airguns are often readily detectable in the water at distances of many kilometers, but that marine mammals at distances more than a few kilometers from operating seismic vessels often show no apparent response. That is often true even in cases when the pulsed sounds must be readily audible to the animals based on measured received levels and the hearing sensitivity of that mammal group. However, most measurements of airgun sounds that have been reported concerned sounds from larger arrays of airguns, whose sounds would be detectable farther away than that planned for use in the proposed survey. Although various baleen whales, toothed whales, and pinnipeds have been shown to react behaviorally to airgun pulses under some conditions, at other times mammals of all three types have shown no overt reactions. In general, pinnipeds and small odontocetes seem to be more tolerant of exposure to airgun pulses than are baleen whales. Given the relatively small, low-energy airgun source planned for use in this project, mammals are expected to tolerate being closer to this source than would be the case for a larger airgun source typical of most seismic surveys.

Masking

Masking effects of pulsed sounds (even from large arrays of airguns) on marine mammal calls and other natural sounds are expected to be limited (due in part to the small size of the GI airguns), although there are very few specific data on this. Given the small acoustic source planned for use in the SWPO, there is even less potential for masking of baleen or sperm whale calls during the present research than in most seismic surveys (Scripps, 2005). GI-airgun seismic sounds are short pulses generally occurring for less than 1 sec every 6–10 seconds or so. The 6–10 sec spacing corresponds to a shot interval of approximately 21.5–36 m (71–118 ft). Sounds from the multi-beam sonar are very short pulses, occurring for 15 msec once every 5 to 20 sec, depending on water depth.

Some whales are known to continue calling in the presence of seismic pulses. Their calls can be heard between the seismic pulses (Richardson *et al.*, 1986; McDonald *et al.*, 1995, Greene *et al.*, 1999). Although there has been one report that sperm whales cease calling when exposed to pulses from a very distant seismic ship (Bowles *et al.*, 1994), a recent study reports that sperm whales continued calling in the presence of seismic pulses (Madsen *et al.*, 2002). Given the relatively small source planned for use during this survey, there is even less potential for masking of sperm whale calls during the present study than in most seismic surveys. Masking effects of seismic pulses are expected to be negligible in the case of the smaller odontocete cetaceans, given the intermittent nature of seismic pulses and the relatively low source level of the airguns to be used in the SWPO. Also, the sounds important to small odontocetes are predominantly at much higher frequencies than are airgun sounds.

Most of the energy in the sound pulses emitted by airgun arrays is at low frequencies, with strongest spectrum levels below 200 Hz and considerably lower spectrum levels above 1000 Hz. Among marine mammals, these low frequencies are mainly used by mysticetes, but generally not by odontocetes or pinnipeds. An industrial sound source will reduce the effective communication or echolocation distance only if its frequency is close to that of the marine mammal signal. If little or no overlap occurs between the industrial noise and the frequencies used, as in the case of many marine mammals relative to airgun sounds, communication and echolocation are not expected to be disrupted. Furthermore, the discontinuous nature of seismic pulses makes significant masking effects unlikely even for mysticetes.

A few cetaceans are known to increase the source levels of their calls in the presence of elevated sound levels, or possibly to shift their peak frequencies in response to strong sound signals (Dahlheim, 1987; Au, 1993; Lesage *et al.*, 1999; Terhune, 1999; as reviewed in Richardson *et al.*, 1995). These studies involved exposure to other types of anthropogenic sounds, not seismic pulses, and it is not known whether these types of responses ever occur upon exposure to seismic sounds. If so, these adaptations, along with directional hearing, pre-adaptation to tolerate some masking by natural sounds (Richardson *et al.*, 1995), and the relatively low-power acoustic sources being used in this survey, would all reduce the importance of masking marine mammal vocalizations.

Disturbance by Seismic Surveys

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous dramatic changes in behavioral activities, and displacement. However, there are difficulties in defining which marine mammals should be counted as ''taken by harassment''. For many species and situations, scientists do not have detailed information about their reactions to noise, including reactions to seismic (and sonar) pulses. Behavioral reactions of marine mammals to sound are difficult to predict. Reactions to sound, if any, depend on species, state of maturity, experience, current activity, reproductive state, time of day, and many other factors. If a marine mammal does react to an underwater sound by changing its behavior or moving a small distance, the impacts of the change may not rise to the level of a disruption of a behavioral pattern. However, if a sound source would displace marine mammals from an important feeding or breeding area, such a disturbance would likely constitute Level B harassment under the MMPA. Given the many uncertainties in predicting the quantity and types of impacts of noise on marine mammals, scientists often resort to estimating how many mammals may be present within a particular distance of industrial activities or exposed to a particular level of industrial sound. With the possible exception of beaked whales, NMFS believes that this is a conservative approach and likely overestimates the numbers of marine mammals that are affected in some biologically important manner.

The sound exposure criteria used to estimate how many marine mammals might be harassed behaviorally by the seismic survey are based on behavioral observations during studies of several species. However, information is lacking for many species. Detailed information on potential disturbance effects on baleen whales, toothed whales, and pinnipeds can be found on pages 33–37 and Appendix A in Scripps's SWPO application.

Hearing Impairment and Other Physical Effects

Temporary or permanent hearing impairment is a possibility when marine mammals are exposed to very strong sounds, but there has been no specific documentation of these effects for marine mammals exposed to airgun pulses. Current NMFS policy precautionarily sets impulsive sounds equal to or greater than 180 and 190 dB re 1 microPa (rms) as the exposure thresholds for onset of Level A harassment for cetaceans and pinnipeds, respectively (NMFS, 2000). Those criteria have been used in defining the safety (shut-down) radii for seismic surveys. However, those criteria were established before there were any data on the minimum received levels of sounds necessary to cause auditory impairment in marine mammals. As discussed in the Scripps application and summarized here,

1. The 180-dB criterion for cetaceans is probably quite precautionary, i.e., lower than necessary to avoid TTS let alone permanent auditory injury, at least for delphinids.

2. The minimum sound level necessary to cause permanent hearing impairment is higher, by a variable and generally unknown amount, than the level that induces barely-detectable TTS.

3. The level associated with the onset of TTS is often considered to be a level below which there is no danger of permanent damage.

Given the small size of the two 45 in ^{3} GI-airguns, along with the proposed monitoring and mitigation measures, there is little likelihood that any marine mammals will be exposed to sounds sufficiently strong to cause even the mildest (and reversible) form of hearing impairment. Several aspects of the planned monitoring and mitigation measures for this project are designed to detect marine mammals occurring near the 2 GI-airguns (and bathymetric sonar), and to avoid exposing them to sound pulses that might (at least in theory) cause hearing impairment. In addition, research and monitoring studies on gray whales, bowhead whales and other cetacean species indicate that many cetaceans are likely to show some avoidance of the area with ongoing seismic operations. In these cases, the avoidance responses of the animals themselves will reduce or avoid the possibility of hearing impairment.

Non-auditory physical effects may also occur in marine mammals exposed to strong underwater pulsed sound. Possible types of non-auditory physiological effects or injuries that theoretically might occur in mammals close to a strong sound source include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage. It is possible that some marine mammal species (i.e., beaked whales) may be especially susceptible to injury and/or stranding when exposed to strong pulsed sounds. However, Scripps and NMFS believe that it is especially unlikely that any of these non-auditory effects would occur during the survey given the small size of the acoustic sources, the brief duration of exposure of any given mammal, and the mitigation and monitoring measures. The following paragraphs discuss the possibility of TTS, permanent threshold shift (PTS), and non-auditory physical effects.

TTS

TTS is the mildest form of hearing impairment that can occur during exposure to a strong sound (Kryter, 1985). When an animal experiences TTS, its hearing threshold rises and a sound must be stronger in order to be heard. TTS can last from minutes or hours to (in cases of strong TTS) days. Richardson *et al.* (1995) note that the magnitude of TTS depends on the level and duration of noise exposure, among other considerations. For sound exposures at or somewhat above the TTS threshold, hearing sensitivity recovers rapidly after exposure to the noise ends. Little data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals.

For toothed whales exposed to single short pulses, the TTS threshold appears to be, to a first approximation, a function of the energy content of the pulse (Finneran *et al.*, 2002). Given the available data, the received level of a single seismic pulse might need to be on the order of 210 dB re 1 microPa rms (approx. 221–226 dB pk-pk) in order to produce brief, mild TTS. Exposure to several seismic pulses at received levels near 200–205 dB (rms) might result in slight TTS in a small odontocete, assuming the TTS threshold is (to a first approximation) a function of the total received pulse energy (Finneran *et al.*, 2002). Seismic pulses with received levels of 200–205 dB or more are usually restricted to a zone of no more than 100 m (328 ft) around a seismic vessel operating a large array of airguns. Because of the small airgun source planned for use during this project, such sound levels would be limited to distances within a few meters directly astern of the *Revelle.*

There are no data, direct or indirect, on levels or properties of sound that are required to induce TTS in any baleen whale. However, TTS is not expected to occur during this survey given the small size of the source limiting these sound pressure levels to the immediate proximity of the vessel, and the strong likelihood that baleen whales would avoid the approaching airguns (or vessel) before being exposed to levels high enough for there to be any possibility of TTS.

TTS thresholds for pinnipeds exposed to brief pulses (single or multiple) have not been measured, although exposures up to 183 dB re 1 microPa (rms) have been shown to be insufficient to induce TTS in California sea lions (Finneran *et al.*, 2003). However, prolonged exposures show that some pinnipeds may incur TTS at somewhat lower received levels than do small odontocetes exposed for similar durations (Kastak *et al.*, 1999; Ketten *et al.*, 2001; Au *et al.*, 2000). For this research cruise therefore, TTS is unlikely for pinnipeds.

A marine mammal within a zone with a radius of ≤100 m (≤328 ft) around a typical large array of operating airguns might be exposed to a few seismic pulses with levels of ≥205 dB, and possibly more pulses if the mammal moved with the seismic vessel. Also, around smaller arrays, such as the 2 GI-airgun array proposed for use during this survey, a marine mammal would need to be even closer to the source to be exposed to levels greater than or equal to 205 dB. However, as noted previously, most cetacean species tend to avoid operating airguns, although not all individuals do so. In addition, ramping up airgun arrays, which is now standard operational protocol for many U.S. and some foreign seismic operations, should allow cetaceans to move away from the seismic source and avoid being exposed to the full acoustic output of the airgun array. Even with a large airgun array, it is unlikely that these cetaceans would be exposed to airgun pulses at a sufficiently high level for a sufficiently long period to cause more than mild TTS, given the relative movement of the vessel and the marine mammal. However, with a large airgun array, TTS would be possible in odontocetes that bow-ride or otherwise linger near the airguns. Bow-riding odontocetes mostly would be at or above the surface, and thus not exposed to strong sound pulses given the pressure-release effect at the surface. However, bow-riding animals generally dive below the surface intermittently. If they did so while bow-riding near airguns, they would be exposed to strong sound pulses, possibly repeatedly. During this project, the anticipated 180-dB radius is less than 60 m (197 ft), the array is towed about 21 m (69 ft) behind the *Revelle,* the bow of the *Revelle* will be about 104 m (341 ft) ahead of the airguns, and the 205-dB radius would be less than 50 m (165 ft). Thus, TTS would not be expected in the case of odontocetes bow riding during airgun operations, and if some cetaceans did incur TTS through exposure to airgun sounds, it would very likely be a temporary and reversible phenomenon.

NMFS believes that, to avoid Level A harassment, cetaceans should not be exposed to pulsed underwater noise at received levels exceeding 180 dB re 1 microPa (rms). The corresponding limit for pinnipeds has been set at 190 dB. The predicted 180- and 190-dB distances for the airgun arrays operated by Scripps during this activity are summarized in Table 1 in this document. These sound levels are not considered to be the levels at or above which TTS might occur. Rather, they are the received levels above which, in the view of a panel of bioacoustics specialists convened by NMFS (at a time before TTS measurements for marine mammals started to become available), one could not be certain that there would be no injurious effects, auditory or otherwise, to marine mammals. As noted here, TTS data that are now available imply that, at least for dolphins, TTS is unlikely to occur unless the dolphins are exposed to airgun pulses substantially stronger than 180 dB re 1 microPa (rms).

It has also been shown that most whales tend to avoid ships and associated seismic operations. Thus, whales will likely not be exposed to such high levels of airgun sounds. Because of the relatively slow ship speed, any whales close to the trackline could move away before the sounds become sufficiently strong for there to be any potential for hearing impairment. Therefore, there is little potential for whales being close enough to an array to experience TTS. In addition, ramping up the airgun array should allow cetaceans to move away from the seismic source and avoid being exposed to the full acoustic output of the GI airguns.

Permanent Threshold Shift (PTS)

When PTS occurs there is physical damage to the sound receptors in the ear. In some cases there can be total or partial deafness, while in other cases the animal has an impaired ability to hear sounds in specific frequency ranges. Although there is no specific evidence that exposure to pulses of airgun sounds can cause PTS in any marine mammals, even with the largest airgun arrays, physical damage to a mammal's hearing apparatus can potentially occur if it is exposed to sound impulses that have very high peak pressures, especially if they have very short rise times (time required for sound pulse to reach peak pressure from the baseline pressure). Such damage can result in a permanent decrease in functional sensitivity of the hearing system at some or all frequencies.

Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage in terrestrial mammals. However, very prolonged exposure to sound strong enough to elicit TTS, or shorter-term exposure to sound levels well above the TTS threshold, can cause PTS, at least in terrestrial mammals (Kryter, 1985). Relationships between TTS and PTS thresholds have not been studied in marine mammals but are assumed to be similar to those in humans and other terrestrial mammals. The low-to-moderate levels of TTS that have been induced in captive odontocetes and pinnipeds during recent controlled studies of TTS have been confirmed to be temporary, with no measurable residual PTS (Kastak *et al.*, 1999; Schlundt *et al.*, 2000; Finneran *et al.*, 2002; Nachtigall *et al.*, 2003). In terrestrial mammals, the received sound level from a single non-impulsive sound exposure must be far above the TTS threshold for any risk of permanent hearing damage (Kryter, 1994; Richardson *et al.*, 1995). For impulse sounds with very rapid rise times (e.g., those associated with explosions or gunfire), a received level not greatly in excess of the TTS threshold may start to elicit PTS. Rise times for airgun pulses are rapid, but less rapid than for explosions.

Some factors that contribute to onset of PTS are as follows: (1) Exposure to single very intense noises, (2) repetitive exposure to intense sounds that individually cause TTS but not PTS, and (3) recurrent ear infections or (in captive animals) exposure to certain drugs.

Cavanagh (2000) reviewed the thresholds used to define TTS and PTS. Based on his review and SACLANT (1998), it is reasonable to assume that PTS might occur at a received sound level 20 dB or more above that which induces mild TTS. However, for PTS to occur at a received level only 20 dB above the TTS threshold, it is probable that the animal would have to be exposed to the strong sound for an extended period.

Sound impulse duration, peak amplitude, rise time, and number of pulses are the main factors thought to determine the onset and extent of PTS. Ketten (1994) noted that the criteria for differentiating the sound pressure levels that result in PTS (or TTS) are location and species-specific. PTS effects may also be influenced strongly by the health of the receiver's ear.

Given that marine mammals are unlikely to be exposed to received levels of seismic pulses that could cause TTS, it is highly unlikely that they would sustain permanent hearing impairment. If we assume that the TTS threshold for odontocetes for exposure to a series of seismic pulses may be on the order of 220 dB re 1 microPa (pk-pk) (approximately 204 dB re 1 microPa rms), then the PTS threshold might be about 240 dB re 1 microPa (pk-pk). In the units used by geophysicists, this is 10 bar-m. Such levels are found only in the immediate vicinity of the largest airguns (Richardson *et al.*, 1995; Caldwell and Dragoset, 2000). However, sea Gentryit is very unlikely that an odontocete would remain within a few meters of a large airgun for sufficiently long to incur PTS. The TTS (and thus PTS) thresholds of baleen whales and pinnipeds may be lower, and thus may extend to a somewhat greater distance from the source. However, baleen whales generally avoid the immediate area around operating seismic vessels, so it is unlikely that a baleen whale could incur PTS from exposure to airgun pulses. Some pinnipeds do not show strong avoidance of operating airguns. In summary, it is highly unlikely that marine mammals could receive sounds strong enough (and over a sufficient period of time) to cause permanent hearing impairment during this project. In this project marine mammals are unlikely to be exposed to received levels of seismic pulses strong enough to cause TTS, and because of the higher level of sound necessary to cause PTS, it is even less likely that PTS could occur. This is due to the fact that even levels immediately adjacent to the 2 GI-airguns may not be sufficient to induce PTS because the mammal would not be exposed to more than one strong pulse unless it swam alongside an airgun for a period of time.

Strandings and Mortality

Marine mammals close to underwater detonations of high explosives can be killed or severely injured, and the auditory organs are especially susceptible to injury (Ketten *et al.*, 1993; Ketten, 1995). Airgun pulses are less energetic and have slower rise times. While there is no documented evidence that airgun arrays can cause serious injury, death, or stranding, the association of mass strandings of beaked whales with naval exercises and an L-DEO seismic survey in 2002 have raised the possibility that beaked whales may be especially susceptible to injury and/or stranding when exposed to strong pulsed sounds. Information on recent beaked whale strandings may be found in Appendix A of the Scripps application and in several previous **Federal Register** documents (see 69 FR 31792 (June 7, 2004) or 69 FR 34996 (June 23, 2004)). Reviewers are encouraged to read these documents for additional information.

It is important to note that seismic pulses and mid-frequency sonar pulses are quite different. Sounds produced by the types of airgun arrays used to profile sub-sea geological structures are broadband with most of the energy below 1 kHz. Typical military mid-frequency sonars operate at frequencies of 2 to 10 kHz, generally with a relatively narrow bandwidth at any one time (though the center frequency may change over time). Because seismic and sonar sounds have considerably different characteristics and duty cycles, it is not appropriate to assume that there is a direct connection between the effects of military sonar and seismic surveys on marine mammals. However, evidence that sonar pulses can, in special circumstances, lead to physical damage and, indirectly, mortality suggests that caution is warranted when dealing with exposure of marine mammals to any high-intensity pulsed sound.

In addition to the sonar-related strandings, there was a September 2002 stranding of two Cuvier's beaked whales in the Gulf of California (Mexico) when a seismic survey by the *R/V Maurice Ewing* was underway in the general area (Malakoff, 2002). The airgun array in use during that project was the Ewing's 20-gun 8490-in^3 array. This might be a first indication that seismic surveys can have effects, at least on beaked whales, similar to the suspected effects of naval sonars. However, the evidence linking the Gulf of California strandings to the seismic surveys is inconclusive, and to date, is not based on any physical evidence (Hogarth, 2002; Yoder, 2002). The ship was also operating its multi-beam bathymetric sonar at the same time but this sonar had much less potential than these naval sonars to affect beaked whales. Although the link between the Gulf of California strandings and the seismic (plus multi-beam sonar) survey is inconclusive, this event plus the various incidents involving beaked whale strandings associated with naval exercises suggests a need for caution in conducting seismic surveys in areas occupied by beaked whales. However, the present project will involve a much smaller sound source than used in typical seismic surveys. That, along with the monitoring and mitigation measures planned for this cruise are expected to eliminate any possibility for strandings and mortality.

Non-Auditory Physiological Effects

Possible types of non-auditory physiological effects or injuries that might theoretically occur in marine mammals exposed to strong underwater sound might include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage. There is no evidence that any of these effects occur in marine mammals exposed to sound from airgun arrays (even large ones). However, there have been no direct studies of the potential for airgun pulses to elicit any of these effects. If any such effects do occur, they would probably be limited to unusual situations when animals might be exposed at close range for unusually long periods.

It is doubtful that any single marine mammal would be exposed to strong seismic sounds for sufficiently long that significant physiological stress would develop. That is especially so in the case of the present project where the airguns are small, the ship's speed is relatively fast (6 knots or approximately 11 km/h), and, except while on a seismic station, the survey lines are widely spaced with little or no overlap.

Gas-filled structures in marine animals have an inherent fundamental resonance frequency. If stimulated at that frequency, the ensuing resonance could cause damage to the animal. There may also be a possibility that high sound levels could cause bubble formation in the blood of diving mammals that in turn could cause an air embolism, tissue separation, and high, localized pressure in nervous tissue (Gisner (ed), 1999; Houser *et al.*, 2001).

In April 2002, a workshop (Gentry [ed.] 2002) was held to discuss whether the stranding of beaked whales in the Bahamas in 2000 (Balcomb and Claridge, 2001; NOAA and USN, 2001) might have been related to air cavity resonance or bubble formation in tissues caused by exposure to noise from naval sonar. A panel of experts concluded that resonance in air-filled structures was not likely to have caused this stranding. Among other reasons, the air spaces in marine mammals are too large to be susceptible to resonant frequencies emitted by mid-or low-frequency sonar; lung tissue damage has not been observed in any mass, multi-species stranding of beaked whales; and the duration of sonar pings is likely too short to induce vibrations that could damage tissues (Gentry [ed.], 2002). Opinions were less conclusive about the possible role of gas (nitrogen) bubble formation/growth in the Bahamas stranding of beaked whales.

Until recently, it was assumed that diving marine mammals are not subject to decompression injury (the bends) or air embolism. However, a short paper concerning beaked whales stranded in the Canary Islands in 2002 suggests that cetaceans might be subject to decompression injury in some situations (Jepson *et al.*, 2003). If so, that might occur if they ascend unusually quickly when exposed to aversive sounds. However, the interpretation that strandings are related to decompression injury is unproven (Piantadosi and Thalmann, 2004; Fernández *et al.*, 2004). Even if that effect can occur during exposure to mid-frequency sonar, there is no evidence that this type of effect occurs in response to low-frequency airgun sounds. It is especially unlikely in the case of this project involving only two small, low-intensity GI-airguns.

In summary, little is known about the potential for seismic survey sounds to cause either auditory impairment or other non-auditory physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would be limited to short distances from the sound source. However, the available data do not allow for meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in these ways. Marine mammals that show behavioral avoidance of seismic vessels, including most baleen whales, some odontocetes, and some pinnipeds, are unlikely to incur auditory impairment or other physical effects. Also, the planned mitigation and monitoring measures are expected to minimize any possibility of serious injury, mortality or strandings.

Possible Effects of Mid-frequency Sonar Signals

A multi-beam bathymetric sonar (Simrad EM120, 11.25–12.6 kHz) and a sub-bottom profiler will be operated from the source vessel essentially continuously during much of the planned survey. Details about these sonars were provided previously in this document.

Navy sonars that have been linked to avoidance reactions and stranding of cetaceans generally: (1) Are more powerful than the Simrad EM120 sonar; (2) have a longer pulse duration; and (3) are directed close to horizontally (vs. downward for the Simrad EM120). The area of possible influence of the Simrad EM120 is much smaller—a narrow band oriented in the cross-track direction below the source vessel. Marine mammals that encounter the Simrad EM120 at close range are unlikely to be subjected to repeated pulses because of the narrow fore-aft width of the beam, and will receive only limited amounts of pulse energy because of the short pulses and vessel speed. Therefore, as harassment or injury from pulsed sound is a function of total energy received, the actual harassment or injury threshold for the bathymetric sonar signals would be at a much higher dB level than that for longer duration pulses such as seismic signals. As a result, NMFS believes that marine mammals are unlikely to be harassed or injured from the multibeam sonar.

Masking by Mid-Frequency Sonar Signals

Marine mammal communications will not be masked appreciably by the multibeam sonar signals or the sub-bottom profiler given the low duty cycle and directionality of the sonars and the brief period when an individual mammal is likely to be within its beam. Furthermore, in the case of baleen whales, the sonar signals from the Simrad EM120 do not overlap with the predominant frequencies of their calls, which would avoid significant masking.

For the sub-bottom profiler, marine mammal communications will not be masked appreciably because of their relatively low power output, low duty cycle, directionality (for the profiler), and the brief period when an individual mammal may be within the sonar's beam. In the case of most odonotocetes, the sonar signals from the profiler do not overlap with the predominant frequencies in their calls. In the case of mysticetes, the pulses from the pinger do not overlap with their predominant frequencies.

Behavioral Responses Resulting From Mid-Frequency Sonar Signals

Behavioral reactions of free-ranging marine mammals to military and other sonars appear to vary by species and circumstance. Observed reactions have included silencing and dispersal by sperm whales (Watkins *et al.*, 1985), increased vocalizations and no dispersal by pilot whales (Rendell and Gordon, 1999), and the previously-mentioned strandings by beaked whales. Also, Navy personnel have described observations of dolphins bow-riding adjacent to bow-mounted mid-frequency sonars during sonar transmissions. However, all of these observations are of limited relevance to the present situation. Pulse durations from these military tactical sonars were much longer than those of the Scripps multibeam sonar, and a given mammal would have received many pulses from the naval sonars. During Scripps' operations, the individual pulses will be very short, and a given mammal would not receive many of the downward-directed pulses as the vessel passes by.

Captive bottlenose dolphins and a white whale exhibited changes in behavior when exposed to 1-sec pulsed sounds at frequencies similar to those that will be emitted by the multi-beam sonar used by Scripps and to shorter broadband pulsed signals. Behavioral changes typically involved what appeared to be deliberate attempts to avoid the sound exposure (Schlundt *et al.*, 2000; Finneran *et al.*, 2002). The relevance of these data to free-ranging odontocetes is uncertain and in any case the test sounds were quite different in either duration or bandwidth as compared to those from a bathymetric sonar.

Scripps and NMFS are not aware of any data on the reactions of pinnipeds to sonar sounds at frequencies similar to those of the 12.0 kHz frequency of the *Revelle*'s multibeam sonar. Based on observed pinniped responses to other types of pulsed sounds, and the likely short duration of exposure to the bathymetric sonar sounds, pinniped reactions are expected to be limited to startle or otherwise brief responses of no lasting consequences to the individual animals. The pulsed signals from the sub-bottom profiler are much weaker than those from the multibeam sonar and somewhat weaker than those from the 2 GI-airgun array. Therefore, significant behavioral responses are not expected.

Hearing Impairment and Other Physical Effects

Given stranding events that have been associated with the operation of naval sonar, there is much concern that sonar noise can cause serious impacts to marine mammals (for discussion see Effects of Seismic Surveys on Marine Mammals). However, the multi-beam sonars proposed for use by Scripps are quite different than tactical sonars used for navy operations. Pulse duration of the bathymetric sonars is very short relative to the naval sonars. Also, at any given location, an individual marine mammal would be in the beam of the multi-beam sonar for much less time given the generally downward orientation of the beam and its narrow fore-aft beam-width. (Navy sonars often use near-horizontally directed sound.) These factors would all reduce the sound energy received from the multi-beam sonar rather drastically relative to that from the sonars used by the Navy. Therefore, hearing impairment by multi-beam bathymetric sonar is unlikely.

Source levels of the sub-bottom profiler are much lower than those of the airguns and the multi-beam sonar. Sound levels from a sub-bottom profiler similar to the one on the *Revelle* were estimated to decrease to 180 dB re 1 microPa (rms) at 8 m (26 ft) horizontally from the source (Burgess and Lawson, 2000), and at approximately 18 m (59 ft) downward from the source. Furthermore, received levels of pulsed sounds that are necessary to cause temporary or especially permanent hearing impairment in marine mammals appear to be higher than 180 dB (see earlier discussion). Thus, it is unlikely that the sub-bottom profiler produces pulse levels strong enough to cause hearing impairment or other physical injuries even in an animal that is (briefly) in a position near the source.

The sub-bottom profiler is usually operated simultaneously with other higher-power acoustic sources. Many marine mammals will move away in response to the approaching higher-power sources or the vessel itself before the mammals would be close enough for there to be any possibility of effects from the less intense sounds from the sub-bottom profiler. In the case of mammals that do not avoid the approaching vessel and its various sound sources, mitigation measures that would be applied to minimize effects of the higher-power sources would further reduce or eliminate any minor effects of the sub-bottom profiler.

Estimates of Take by Harassment for the SWPO Seismic Survey

Although information contained in this document indicates that injury to marine mammals from seismic sounds potentially occurs at sound pressure levels significantly higher than 180 and 190 dB, NMFS' current criteria for where onset of Level A harassment of cetaceans and pinnipeds from impulse sound might occur are, respectively, 180 and 190 re 1 microPa rms. The rms level of a seismic pulse is typically about 10 dB less than its peak level and about 16 dB less than its pk-pk level (Greene, 1997; McCauley *et al.*, 1998; 2000a). The criterion for where onset of Level B behavioral harassment occurs is 160 dB.

Given the mitigation (see Mitigation later in this document), all anticipated effects involve a temporary change in behavior that may constitute Level B harassment. The mitigation measures will minimize or eliminate the possibility of Level A harassment or mortality. Scripps has calculated the ''best estimates'' for the numbers of animals that could be taken by level B harassment during the proposed SWPO seismic survey using data on marine mammal density (numbers per unit area) and estimates of the size of the affected area, as shown in the predicted RMS radii table (see Table 1).

These estimates are based on a consideration of the number of marine mammals that might be exposed to sound levels greater than 160 dB by operations with the 2 GI-gun array planned to be used for this project. The anticipated zones of influence of the multi-beam sonar and sub-bottom profiler are less than that for the airguns, so it is assumed that during simultaneous operations of these instruments that any marine mammals close enough to be affected by the multi-beam and sub-bottom profiler sonars would already be affected by the airguns. Therefore, no additional incidental takings are included for animals that might be affected by the multi-beam sonar. Given their characteristics (described previously), Level B harassment takings are considered unlikely when the multibeam and sub-bottom profiler are operating but the airguns are silent.

Table 2 provides the best estimate of the numbers of each species that would be exposed to seismic sounds greater than 160 dB and the number of marine mammals requested to be taken by Level B harassment. A detailed description on the methodology used by Scripps to arrive at the estimates of Level B harassment takes that are provided in Table 2 can be found in Scripps's IHA application for the SWPO survey.

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TABLE 2. Estimates of the possible numbers of marine mammal exposures to the different sound levels, and the numbers of different individuals that might be exposed, during the proposed SIO seismic surveys the Louisville Ridge in the SW Pacific Ocean during January-February 2006. (Specific Geographic Regions--SPSG = South Pacific Subtropical Gyre; SSTC = South Subtropical Convergence Province (Longhurst (1998)).

Species	Number of Exposures to Sound Levels ≥160 dB (rms)						Number of Individuals Exposed to Sound Levels ≥160 dB (rms)						
	Best Estimate			Maximum Estimate			Best Estimate			Pop'	Maximum		
	SPSG	SSTC	Total	SPSG	SSTC	Total	SPSG	SSTC	Total	n %	SPSG	SSTC	Total
Delphinidae													
Rough-toothed dolphin	19	30	49	36	47	83	18	29	47	0.02	35	45	80
Bottlenose dolphin	38	149	186	72	233	305	36	144	180	0.04	70	225	295
Pantropical spotted dolphin	19	30	49	36	47	83	18	29	47	0.00	35	45	80
Spinner dolphin	4	15	19	7	23	31	4	14	18	0.00	7	22	29
Striped dolphin	4	15	19	7	23	31	4	14	18	0.00	7	22	29
Common dolphin	38	149	186	72	233	305	36	144	180	0.01	70	225	295
Hourglass dolphin	4	15	19	7	23	31	4	14	18	0.01	7	22	29
Fraser's dolphin	11	15	26	22	23	45	11	14	25	0.01	21	22	43
S'n right-whale dolphin	4	45	48	7	70	77	4	43	47	NA	7	67	74
Risso's dolphin	19	74	93	36	117	153	18	72	90	0.05	35	112	147
Melon-headed whale	0	0	0	1	0	1	0	0	0	0.00	1	0	1
Pygmy killer whale	0	0	0	1	0	2	0	0	0	0.00	1	0	1
False killer whale	0	0	1	2	1	3	0	0	1	0.00	2	1	3
Killer whale	1	0	1	3	1	4	1	0	1	0.00	3	1	4
Short-finned pilot whale	1	0	1	5	0	6	1	0	1	0.00	5	0	6
Long-finned pilot whale	0	1	1	1	2	2	0	1	1	0.00	1	2	2
Odontocetes													
Physeteridae													
Sperm whale	0	1	1	1	2	3	0	1	1	0.00	1	2	3
Pygmy sperm whale	2	1	4	12	4	16	2	1	4	NA	11	4	15
Dwarf sperm whale	0	0	0	0	0	0	0	0	0	0	0	0	0
												0	
Ziphiidae												0	
Southern bottlenose whale	0	1	1	0	2	2	0	1	1	0.00	0	2	2
Arnoux's beaked whale	0	0	0	0	1	1	0	0	0	0	0	1	1
Cuvier's beaked whale	0	0	1	1	1	2	0	0	1	0.00	1	1	2
Shepard's beaked whale	0	0	0	0	0	1	0	0	0	0	0	0	1
Andrew's beaked whale	0	0	0	0	0	1	0	0	0	0	0	0	1
Blainville's beaked whale	0	0	1	1	1	2	0	0	1	NA	1	1	2

Ginkgo-t'ed beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray's beaked whale	0	0	1	1	1	2	0	0	1	NA	1	1	2
Hector's beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0
Spade-t'hed beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0
Strap-t'hed beaked whale	0	0	1	1	1	2	0	0	1	NA	1	1	2
Phocoenidae													
Spectacled porpoise	0	13	13	0	136	136	0	13	13	NA	0	132	132
Mysticetes													
Southern right whale	0	1	1	0	1	1	0	1	1	NA	0	1	1
Pygmy right whale	0	1	1	0	1	1	0	1	1	NA	0	1	1
Humpback whale	0	0	0	0	1	1	0	0	0	0	0	1	1
Minke whale	0	0	0	0	1	1	0	0	0	0	0	1	1
Dwarf minke whale	0	0	0	0	1	1	0	0	0	0	0	1	1
Bryde's whale	0	0	1	0	2	2	0	0	1	0.00	0	2	2
Sei whale	0	1	1	0	2	2	0	1	1	0.01	0	2	2
Fin whale	0	1	1	0	1	1	0	1	1	0.00	0	1	1
Blue whale	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinnipeds													
Southern elephant seal	0	3	3	NA	NA	NA	0	3	3	0.00	0	0	0
Leopard seal	0	5	6	NA	NA	NA	0	5	5	0.00	0	0	0
Crabeater seal	0	3	3	NA	NA	NA	0	3	3	0.00	0	0	0
Antarctic fur seal	0	5	6	NA	NA	NA	0	5	5	0.00	0	0	0
Sub-antarctic fur seal	0	5	6	NA	NA	NA	0	5	5	NA	0	0	0

Conclusions

Effects on Cetaceans

Strong avoidance reactions by several species of mysticetes to seismic vessels have been observed at ranges up to 6–8 km (3.2–4.3 nm) and occasionally as far as 20–30 km (10.8–16.2 nm) from the source vessel. However, reactions at the longer distances appear to be atypical of most species and situations, particularly when feeding whales are involved. Few mysticetes are expected to be encountered during the proposed survey in the SWPO (Table 2) and disturbance effects would be confined to shorter distances given the low-energy acoustic source to be used during this project. In addition, the estimated numbers presented in Table 2 are considered overestimates of actual numbers that may be harassed.

Odontocete reactions to seismic pulses, or at least the reactions of dolphins, are expected to extend to lesser distances than are those of mysticetes. Odontocete low-frequency hearing is less sensitive than that of mysticetes, and dolphins are often seen from seismic vessels. In fact, there are documented instances of dolphins approaching active seismic vessels. However, dolphins as well as some other types of odontocetes sometimes show avoidance responses and/or other changes in behavior when near operating seismic vessels.

Taking into account the small size and the relatively low sound output of the 2 GI-gun array to be used, and the mitigation measures that are planned, effects on cetaceans are generally expected to be limited to avoidance of a small area around the seismic operation and short-term changes in behavior. Furthermore, the estimated numbers of animals potentially exposed to sound levels sufficient to cause appreciable disturbance are very low percentages of the affected populations.

Based on the 160-dB criterion, the best estimates of the numbers of individual cetaceans that may be exposed to sounds ≥ 160 dB re 1 microPa (rms) represent from 0 to approximately 0.04 percent of the regional SWPO species populations (Table 2). In the case of endangered balaenopterids, it is most likely that no more than 1 humpback, sei, or fin whale will be exposed to seismic sounds ≥ 160 dB re 1 microPa (rms), based on estimated densities of those species in the survey region. Therefore, Scripps has requested an authorization to expose up to 1 individual of each of those species to seismic sounds of ≥ 160 dB during the proposed survey. Best estimates of blue whales are that no individuals would be potentially exposed to seismic pulses with received levels ≥ 160 dB re 1 microPa (rms) (Table 2).

Higher numbers of delphinids may be affected by the proposed seismic surveys, but the population sizes of species likely to occur in the survey area are large, and the numbers potentially affected are small relative to population sizes (Table 2).

Mitigation measures such as controlled speed, course alteration, observers, ramp ups, and shut downs when marine mammals are seen within defined ranges should further reduce short-term reactions, and minimize any effects on hearing. In all cases, the effects are expected to be short-term, with no lasting biological consequence. In light of the type of effects expected and the small percentages of affected stocks of cetaceans, the action is expected to have no more than a negligible impact on the affected species or stocks of cetaceans.

Effects on Pinnipeds

Five pinniped species may be encountered at the survey sites, but their distribution and numbers have not been documented in the proposed survey area. In all likelihood, these species will be in southern feeding areas during the period for this survey. However, to ensure that the Scripps project remains in compliance with the MMPA in the event that a few pinnipeds are encountered, Scripps has requested an authorization to expose up to 3–5 individuals of each of the five pinniped species to seismic sounds with rms levels ≥ 160 dB re 1 μPa. Therefore, the survey would have, at most, a short-term effect on their behavior and no long-term impacts on individual pinnipeds or their populations. Responses of pinnipeds to acoustic disturbance are variable, but usually quite limited. Effects are expected to be limited to short-term and localized behavioral changes falling within the MMPA definition of Level B harassment. As is the case for cetaceans, the short-term exposures to sounds from the two GI-guns are not expected to result in any long-term consequences for the individuals or their populations and the activity is expected to have no more than a negligible impact on the affected species or stocks of pinnipeds.

Potential Effects on Habitat

The proposed seismic survey will not result in any permanent impact on habitats used by marine mammals, or to the food sources they utilize. The main impact issue associated with the proposed activity will be temporarily elevated noise levels and the associated direct effects on marine mammals.

One of the reasons for the adoption of airguns as the standard energy source for marine seismic surveys was that they (unlike the explosives used in the distant past) do not result in any appreciable fish kill. Various experimental studies showed that airgun discharges cause little or no fish kill, and that any injurious effects were generally limited to the water within a meter or so of an airgun. However, it has recently been found that injurious effects on captive fish, especially on fish hearing, may occur at somewhat greater distances than previously thought (McCauley *et al.*, 2000a,b; 2002; 2003). Even so, any injurious effects on fish would be limited to short distances from the source. Also, many of the fish that might otherwise be within the injury-zone are likely to be displaced from this region prior to the approach of the airguns through avoidance reactions to the approaching seismic vessel or to the airgun sounds as received at distances beyond the injury radius.

Fish often react to sounds, especially strong and/or intermittent sounds of low frequency. Sound pulses at received levels of 160 dB re 1 μPa (peak) may cause subtle changes in behavior. Pulses at levels of 180 dB (peak) may cause noticeable changes in behavior (Chapman and Hawkins, 1969; Pearson *et al.*, 1992; Skalski *et al.*, 1992). It also appears that fish often habituate to repeated strong sounds rather rapidly, on time scales of minutes to an hour. However, the habituation does not endure, and resumption of the disturbing activity may again elicit disturbance responses from the same fish.

Fish near the airguns are likely to dive or exhibit some other kind of behavioral response. This might have short-term impacts on the ability of cetaceans to feed near the survey area. However, only a small fraction of the available habitat would be ensonified at any given time, and fish species would return to their pre-disturbance behavior once the seismic activity ceased. Thus, the surveys would have little impact on the abilities of marine mammals to feed in the area where seismic work is planned. Fish that do not avoid the approaching airguns (probably a small number) may be subject to auditory or other injuries.

Zooplankton that are very close to the source may react to the airgun's shock wave. These animals have an exoskeleton and no air sacs; therefore, little or no mortality is expected. Many crustaceans can make sounds and some crustacea and other invertebrates have some type of sound receptor. However, the reactions of zooplankton to sound are not known. Some mysticetes feed on concentrations of zooplankton. A reaction by zooplankton to a seismic impulse would only be relevant to whales if it caused a concentration of zooplankton to scatter. Pressure changes of sufficient magnitude to cause this type of reaction would probably occur only very close to the source, so few zooplankton concentrations would be affected. Impacts on zooplankton behavior are predicted to be negligible, and this would translate into negligible impacts on feeding mysticetes.

Potential Effects on Subsistence Use of Marine Mammals

There is no known legal subsistence hunting for marine mammals in the SWPO, so the proposed Scripps activities will not have any impact on the availability of these species or stocks for subsistence users.

Mitigation

For the proposed seismic survey in the SWPO, Scripps will deploy 2 GI-airguns as an energy source, each with a discharge volume of 45 in^3. The energy from the airguns is directed mostly downward. The directional nature of the airguns to be used in this project is an important mitigating factor. This directionality will result in reduced sound levels at any given horizontal distance as compared with the levels expected at that distance if the source were omnidirectional with the stated nominal source level. Also, the small size of these airguns is an inherent and important mitigation measure that will reduce the potential for effects relative to those that might occur with large airgun arrays. This measure is in conformance with NMFS policy of encouraging seismic operators to use the lowest intensity airguns practical to accomplish research objectives.

The following mitigation measures, as well as marine mammal visual monitoring (discussed later in this document), will be implemented for the subject seismic surveys: (1) Speed and course alteration (provided that they do not compromise operational safety requirements); (2) shut-down procedures; and (3) ramp-up procedures.

Speed and Course Alteration

If a marine mammal is detected outside its respective safety zone (180 dB for cetaceans, 190 dB for pinnipeds) and, based on its position and the relative motion, is likely to enter the safety zone, the vessel's speed and/or direct course may, when practical and safe, be changed to avoid the mammal in a manner that also minimizes the effect to the planned science objectives. The marine mammal activities and movements relative to the seismic vessel will be closely monitored to ensure that the marine mammal does not approach within the safety zone. If the mammal appears likely to enter the safety zone, further mitigative actions will be taken (*i.e.*, either further course alterations or shut down of the airguns).

Shut-down Procedures

Although power-down procedures are often standard operating practice for seismic surveys, power-down will not be used for this activity because powering down from two guns to one gun would make only a small difference in the 180- or 190-dB radius—probably not enough to allow continued one-gun operations if a mammal came within the safety radius for two guns.

If a marine mammal is detected outside the safety radius but is likely to enter the safety radius, and if the vessel's speed and/or course cannot be changed to avoid having the mammal enter the safety radius, the GI-guns will be shut down before the mammal is within the safety radius. Likewise, if a mammal is already within the safety zone when first detected, the airguns will be shut down immediately.

Following a shut-down, airgun activity will not resume until the marine mammal has cleared the safety zone. The animal will be considered to have cleared the safety zone if it: (1) Is visually observed to have left the safety zone, or (2) has not been seen within the zone for 15 min in the case of small odontocetes and pinnipeds, or (3) has not been seen within the zone for 30 minutes in the case of mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, beaked and bottlenose whales.

During airgun operations following a shut-down whose duration has exceeded these specified limits, the airgun array will be ramped-up gradually. Ramp-up is described later in this document.

Ramp-up Procedure

A ramp-up procedure will be followed when the airguns begin operating after a period without airgun operations. The two GI guns will be added in sequence 5 minutes apart. During ramp-up procedures, the safety radius for the two GI guns will be maintained.

During the day, ramp-up cannot begin from a shut-down unless the entire 180-dB safety radius has been visible for at least 30 minutes prior to the ramp up (i.e., no ramp-up can begin in heavy fog or high sea states).

During nighttime operations, if the entire safety radius is visible using vessel lights and night-vision devices (NVDs) (as may be the case in deep and intermediate waters), then start up of the airguns from a shut down may occur, after completion of the 30-minute observation period.

Comments on past IHAs raised the issue of prohibiting nighttime operations as a practical mitigation measure. However, this is not practicable due to cost considerations and ship time schedules. If the *Revelle* was prohibited from operating during nighttime, each trip could require an additional several days to complete.

If a seismic survey vessel is limited to daylight seismic operations, efficiency would also be much reduced. Without commenting specifically on how that limitation would affect the present project, for seismic operators in general, a daylight-only requirement would be expected to result in one or more of the following outcomes: cancellation of potentially valuable seismic surveys; reduction in the total number of seismic cruises annually due to longer cruise durations; a need for additional vessels to conduct the seismic operations; or work conducted by non-U.S. operators or non-U.S. vessels when in waters not subject to U.S. law.

Marine Mammal Monitoring

Scripps must have at least three visual observers on board the *Revelle*, and at least two must be experienced marine mammal observers that NMFS has approved in advance of the start of the SWPO cruise. These observers will be on duty in shifts of no longer than 4 hours.

The visual observers will monitor marine mammals and sea turtles near the seismic source vessel during all daytime airgun operations, during any nighttime start-ups of the airguns, and at night whenever daytime monitoring resulted in one or more shut-down situations due to marine mammal presence. During daylight, vessel-based observers will watch for marine mammals and sea turtles near the seismic vessel during periods with shooting (including ramp-ups), and for 30 minutes prior to the planned start of airgun operations after a shut-down.

Use of multiple observers will increase the likelihood that marine mammals near the source vessel are detected. *Revelle* bridge personnel will also assist in detecting marine mammals and implementing mitigation requirements whenever possible (they will be given instruction on how to do so), especially during ongoing operations at night when the designated observers are on stand-by and not required to be on watch at all times.

The observer(s) will watch for marine mammals from the highest practical vantage point on the vessel, which is either the bridge or the flying bridge. The observer(s) will systematically scan the area around the vessel with Big Eye binoculars, reticle binoculars (e.g., 7 x 50 Fujinon) and with the naked eye during the daytime. Laser range-finding binoculars (Leica L.F. 1200 laser rangefinder or equivalent) will be available to assist with distance estimation. The observers will be used to determine when a marine mammal or sea turtle is in or near the safety radii so that the required mitigation measures, such as course alteration and power-down or shut-down, can be implemented. If the GI-airguns are shut down, observers will maintain watch to determine when the animal is outside the safety radius.

Observers may not be on duty during ongoing seismic operations at night; bridge personnel will watch for marine mammals during this time and will call for the airguns to be powered-down or shut-down if marine mammals are observed in or about to enter the safety radii. However, a biological observer must be on standby at night and available to assist the bridge watch if marine mammals are detected at any distance from the *Revelle*. If the 2 GI-airgun is ramped-up at night (see previous section), two marine mammal observers will monitor for marine mammals for 30 minutes prior to ramp-up and during the ramp-up using either deck lighting or NVDs that will be available (ITT F500 Series Generation 3 binocular image intensifier or equivalent).

Post-Survey Monitoring

In addition, the biological observers will be able to conduct monitoring of most recently-run transect lines as the *Revelle* returns along parallel and perpendicular transect tracks (see inset of Figure 1 in the Scripps application). This will provide the biological observers with opportunities to look for injured or dead marine mammals (although no injuries or mortalities are expected during this research cruise).

Passive Acoustic Monitoring (PAM)

Because of the very small zone for potential Level A harassment, Scripps has not proposed to use the PAM system during this cruise.

Summary

Taking into consideration the additional costs of prohibiting nighttime operations and the likely impact of the activity (including all mitigation and monitoring), NMFS has determined that the mitigation and monitoring measures ensure that the activity will have the least practicable impact on the affected species or stocks. Marine mammals will have sufficient notice of a vessel approaching with operating seismic airguns, thereby giving them an opportunity to avoid the approaching array; if ramp-up is required, two marine mammal observers will be required to monitor the safety radii, in daylight or night-time, using shipboard lighting or NVDs for at least 30 minutes before ramp-up begins and verify that no marine mammals are in or approaching the safety radii; ramp-up may not begin unless the entire safety radii are visible.

Reporting

Scripps will submit a report to NMFS within 90 days after the end of the cruise, which is currently predicted to occur during January and February, 2006. The report will describe the operations that were conducted and the marine mammals that were detected. The report must provide full documentation of methods, results, and interpretation pertaining to all monitoring tasks. The report will summarize the dates and locations of seismic operations, marine mammal sightings (dates, times, locations, activities, associated seismic survey activities), and estimates of the numbers of affected marine mammals and a description of their reactions.

Endangered Species Act (ESA)

NMFS has issued a biological opinion regarding the effects of this action on ESA-listed species and critical habitat under the jurisdiction of NMFS. That biological opinion concluded that this action is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. A copy of the Biological Opinion is available upon request (see **ADDRESSES**).

National Environmental Policy Act (NEPA)

The NSF made a FONSI determination on November 3, 2005 (70 FR 68102, November 9, 2005), based on information contained within its EA (see 70 FR 39346, July 7, 2005 for public availability), that implementation of the subject action is not a major Federal action having significant effects on the environment within the meaning of NEPA. The NSF determined, therefore, that an environmental impact statement would not be prepared.

NMFS noted that the NSF had prepared an EA for the SWPO surveys and made this EA available upon request (October 17, 2005, 70 FR 60287). In accordance with NOAA Administrative Order 216–6 (Environmental Review Procedures for Implementing the National Environmental Policy Act, May 20, 1999), NMFS has reviewed the information contained in NSF's EA and determined that the NSF EA accurately and completely describes the proposed action alternative, and the potential impacts on marine mammals, endangered species, and other marine life that could be impacted by the preferred alternative and the other alternatives. Accordingly, NMFS adopted the NSF EA under 40 CFR 1506.3 and made its own FONSI. The NMFS FONSI also takes into consideration additional mitigation measures required by the IHA that are not in NSF's EA. Therefore, it is not necessary to issue a new EA, supplemental EA or an environmental impact statement for the issuance of an IHA to L-DEO for this activity. A copy of the EA and the NMFS FONSI for this activity is available upon request.

Determinations

NMFS has determined that the impact of conducting the seismic survey on the Louisville Ridge in the SWPO may result, at worst, in a temporary modification in behavior by certain species of marine mammals. This activity is expected to result in no more than a negligible impact on the affected species or stocks.

For reasons stated previously in this document, this determination is supported by: (1) The likelihood that, given advance notice through relatively slow ship speed and ramp-up, marine mammals are expected to move away from a noise source that is annoying before it becomes potentially injurious; (2) recent research that indicates that TTS is unlikely (at least in delphinids) until levels closer to 200–205 dB re 1 microPa are reached rather than 180 dB re 1 microPa; (3) the fact that 200–205 dB isopleths would be well within 100 m (328 ft) of the vessel even in shallow water; and (4) the likelihood that marine mammal detection in the safety zone by trained observers is close to 100 percent during daytime and remains high at night to the short distance from the seismic vessel. As a result, no take by injury or death is anticipated, and the potential for temporary or permanent hearing impairment is very low and would be avoided through the incorporation of the mitigation measures described in this document.

While the number of potential incidental harassment takes will depend on the distribution and abundance of marine mammals in the vicinity of the survey activity, the number of potential harassment takings is estimated to be small. In addition, the proposed seismic program will not interfere with any known legal subsistence hunts, since seismic operations will not take place in subsistence whaling and sealing areas and will not affect marine mammals used for subsistence purposes.

Authorization

On January 20, 2006, NMFS has issued an IHA to Scripps to take marine mammals, by harassment, incidental to conducting seismic surveys in the SWPO for a 1-year period, provided the mitigation, monitoring, and reporting requirements are undertaken.

Dated: January 31, 2006.

James H. Lecky,

Director, Office of Protected Resources, National Marine Fisheries Service.

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