



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

DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE

Incidental Harassment Authorization

Amended on February 9, 2009

Lamont-Doherty Earth Observatory, Columbia University, P.O. Box 1000, 61 Route 9W, Palisades, New York 10964-8000, is hereby authorized under section 101(a)(5)(D) of the Marine Mammal Protection Act (16 U.S.C. 1371(a)(5)(D)) and 50 CFR 216.107, to harass small numbers of marine mammals incidental to a marine seismic survey conducted by the R/V *Marcus G. Langseth* in the southwest Pacific Ocean, January – **March**, 2009:

1. This Authorization is valid from January 14 through **March 15, 2009**.
2. This Authorization is valid only for activities associated with the R/V *Marcus G. Langseth's* (*Langseth*) seismic operations in the following area:
 - (a) The Eastern Lau Spreading Center (ELSC) in the southwest Pacific Ocean west of the island of Tonga. The overall area for the marine geophysical survey is between 19°40'–21°30'S, 175°30'–176°50'W which is in the Exclusive Economic Zone of Tonga. Water depths in the survey area range from 1000 meters (m) (3280 feet (ft)) to 2600 m (8530 ft), and the survey will not approach land closer than 42 kilometers.
3. Species Impacted and Level of Takes
 - (a) The incidental taking of marine mammals, by Level B behavioral harassment only, is limited to the species listed under condition 3(b)(i-ii) of this Authorization.
 - (b) The species authorized for takings by incidental harassment are:
 - (i) Mysticetes – blue whale (*Balaenoptera musculus*), Bryde's whale (*Balaenoptera edeni*), dwarf minke whale (*Balaenoptera acutorostrata*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), minke whale (*Balaenoptera acutorostrata*), pygmy right whale (*Caperea marginata*), and sei whale (*Balaenoptera borealis*).
 - (ii) Odontocetes – Blainville's beaked whale (*Mesoplodon densirostris*), Cuvier's beaked whale (*Ziphius cavirostris*), dwarf sperm whale (*Kogia sima*), ginkgo-toothed beaked whale (*Mesoplodon ginkgodens*), Longman's beaked whale

(*Indopacetus pacificus*), pygmy sperm whale (*Kogia breviceps*), southern bottlenose whale (*Hyperoodon planifrons*), sperm whale (*Physeter macrocephalus*), bottlenose dolphin (*Tursiops truncatus*), short-beaked common dolphin (*Delphinus delphis*), Fraser's dolphin (*Lagenodelphis hosei*), Pantropical spotted dolphin (*Stenella attenuata*), Risso's dolphin (*Grampus griseus*), Rough-toothed dolphin (*Steno bredanensis*), Spinner dolphin (*Stenella longirostris*), Striped dolphin (*Stenella coeruleoalba*), false killer whale (*Pseudorca crassidens*), killer whale (*Orcinus orca*), melon-headed whale (*Peponocephala electra*), pygmy killer whale (*Feresa attenuata*), and short-finned pilot whale (*Globicephala macrorhynchus*).

(iii) See Table 1 for authorized take numbers.

(c) The taking by Level A harassment, serious injury, or death of any of the species listed in 3(b)(i and ii) or the taking of any kind of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this Authorization.

(d) The authorization for taking by Level B harassment is limited to the following acoustic sources without an amendment to this Authorization:

- (i) a 36-Bolt airgun array that may range in size from 40 to 360 cubic inches (in³) a total volume of approximately 6,600 in³ as an energy source;
- (ii) a multi-beam echosounder;
- (iii) a sub-bottom profiler; and
- (iv) the acoustic release transponder used to communicate with the Ocean Bottom Seismometers (OBS).

4. The taking of any marine mammal in a manner prohibited under this Authorization must be reported within 48 hours (hr) to the Director, Office of Protected Resources, NMFS at (301) 713-2289.
5. The holder of this Authorization is required to cooperate with NMFS and any other Federal, state or local agency monitoring the impacts of the activity on marine mammals.
6. NMFS encourages NSF and L-DEO to coordinate with Tongan government regarding the proposed seismic activity.
7. Mitigation Requirements

L-DEO must suspend the seismic survey if a dead or injured marine mammal is found in the vicinity of the project area and the serious injury or mortality, and are judged to result from these activities.

L-DEO must schedule seismic operations and ocean bottom seismometer (OBS) operations in deep waters during daylight hours, whenever possible.

In addition, the holder of this Authorization must follow the conditions listed below when conducting the seismic survey:

(a) Safety Zones

- (i) L-DEO will establish a 180-dB, 1,120 m (3,674 ft) radius safety zone for marine mammals before the 4-string airgun array (6,600 in³) is in operation; and a 180-dB 40 m (131 ft) radius safety zone before a single air gun (40 in³) is in operation, respectively. See Table 2 for distances and safety radii.
- (ii) NMFS-qualified marine mammal visual observers (MMVO) will visually observe the entire extent of the safety radius (180 dB for cetaceans) for at least 30 minutes prior to starting the airgun (day or night) to ensure that no marine mammals are seen within the safety zone before a seismic survey commences.
- (iii) If the MMVO finds a marine mammal within the safety zone, L-DEO must delay the seismic survey until the marine mammal has left the area. If the MMVO sees a marine mammal that surfaces, then dives below the surface, the observer shall wait 30 minutes. If the MMVO sees no marine mammals during that time, they should assume that the animal has moved beyond the safety zone.
- (iv) If for any reason the MMVO cannot see the entire radius for the entire 30 minutes (i.e., rough seas, fog, darkness), or if marine mammals are near, approaching, or in the safety radius, L-DEO may not start up the airguns. If one airgun is already running at a source level of at least 180 dB, L-DEO may start the second gun without observing the entire safety radius for 30 minutes prior, provided that no marine mammals are known to be near the safety radius.

(b) Direction, Speed, and Course Alteration:

- (i) To the maximum extent possible, L-DEO will conduct inshore seismic surveys starting from upstream (inshore) and proceeding towards the sea (offshore) in order to avoid trapping marine mammals in shallow water.
- (ii) Alter speed or course during seismic operations if a marine mammal, based on its position and relative motion, appears likely to enter the relevant safety zone. If speed or course alteration is not safe or practical, or if after alteration the marine mammal still appears likely to enter the safety zone, further mitigation measures, such as power-down or shutdown, will be taken.
- (iii) If concentrations of beaked whales are observed (by MMVOs or passive acoustic detection) at a continental slope site just prior to or during the airgun operations, L-DEO will move those operations to another location along the slope based on recommendations by the on-duty MMVO aboard the *Langseth*.

- (iv) If concentrations of blue, humpback, fin, Sei or sperm whales are observed (by MMVOs or passive acoustic detection) prior to or during the airgun operations, L-DEO will power-down/shut down and/or move the operations to another location based on recommendations by the on-duty MMVO aboard the *Langseth*.

(c) Power-down and Shut-down Procedures:

- (i) Shutdown or power-down the airguns if a marine mammal is detected within, approaches, or enters the relevant safety radius (as defined in Table 2, attached). A shutdown means all operating airguns are shut down. A power-down means shutting down one or more airguns and reducing the safety radius to the degree that the animal is outside of it.
- (ii) Following a power-down, if the marine mammal approaches the smaller designated safety radius, L-DEO must completely shut down the airguns. L-DEO will not resume the airgun activity until the marine mammal has cleared the safety radius. That is: the MMVO visually observed the marine mammal exiting the safety radius or the MMVO sees no marine mammals within the radius for 15 minutes (small odontocetes) or 30 minutes (mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, killer, and beaked whales).
- (iii) Following a power-down or shut-down and subsequent animal departure, L-DEO may resume airgun operations following ramp-up procedures described below in 6(d).

(d) Ramp-up Procedures:

- (i) Implement a “ramp-up” procedure when starting up at the beginning of seismic operations or anytime after the entire array has been shutdown for more than 7 minutes, which means start the smallest gun in the array first and add airguns in a sequence such that the source level of the array (40 in³) will increase in steps not exceeding approximately 6 dB per a 5-minute period.
- (ii) During ramp-up, the MMVO will monitor the safety radius. If a MMVO sights a marine mammal, he/she will implement decisions about course/speed alteration, power-down, or shutdown as though the full array were operational. Therefore, initiation of ramp-up procedures from shutdown requires that the MMVO can view full safety zone as described in 6(a)(iv).

(e) Night-time and Low-light Hour Operations

- (i) L-DEO may continue marine geophysical surveys into night and low-light hours if such segment of the survey is initiated when the entire relevant safety zones are visible and can be monitored.
- (ii) No initiation of airgun array operation is permitted from a shut-down position at night or during low-light hours (such as in dense fog) when the full safety zone cannot be monitored by the MMOs.
- (iii) If L-DEO wishes to conduct marine geophysical surveys at night or during low-light hours, a small airgun with the source level of at least 180 dB re μPa (rms) shall be initiated during the day-time with good visibility when no marine mammal is in the safety zone, and be kept on and monitored before ramping up for the survey.

8. Monitoring Requirements

(a) Vessel-Based Monitoring

The Holder of this Authorization is required to:

- (i) Utilize at least one, and two (when practical), NMFS-qualified, vessel-based MMVOs to watch for and monitor marine mammals near the seismic source vessel during daytime airgun operations and before and during start-ups of airguns day or night. Observers will have access to reticle binoculars (7 X 50 Fujinon), big-eye binoculars (25 X 150), and night vision devices to scan the area around the vessel. MMVO shifts will last no longer than 4 hr at a time. MMVOs will also make observations during daytime periods when the seismic system is not operating for comparison of animal abundance and behavior, when feasible.
- (ii) The *Langseth's* vessel crew will also assist in detecting marine mammals, when practical.
- (iii) MMVOs will also conduct monitoring onboard the *Langseth* while the seismic array is being deployed or being pulled from the water.
- (iv) L-DEO and the MMVOs will record the following information when a marine mammal is sighted:
 - 1. species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from seismic vessel, sighting cue, apparent reaction to the airguns or vessel (e.g., none, avoidance, approach, paralleling, etc., and including responses to ramp-up), and behavioral pace; and

2. time, location, heading, speed, activity of the vessel (including number of airguns operating and whether in state of ramp-up or power-down), sea state, visibility, cloud cover, and sun glare; and
3. the data listed under 7(a)(iii)(2) at the start and end of each observation watch and during a watch whenever there is a change in one or more of the variables.

(b) Passive Acoustic Monitoring (PAM)

- (i) L-DEO will utilize the passive acoustic monitoring (PAM) system, to the maximum extent practicable, to detect and allow some localization of marine mammals around the *Langseth* during all airgun operations and during most periods when airguns are not operating.
- (ii) One NMFS-qualified MMVO and/or bioacoustician will monitor the PAM at all times in shifts of 1-6 hr. A bioacoustician shall design and set up the PAM system and be present to operate or oversee PAM, and available when technical issues occur during the survey.
- (iii) Do and record the following when an animal is detected by the PAM:
 1. notify the MMVO immediately of a vocalizing marine mammal so a power-down or shutdown can be initiated, if required;
 2. enter the information regarding the vocalization into a database. The data to be entered include an acoustic encounter identification number, whether it was linked with a visual sighting, date, time when first and last heard and whenever any additional information was recorded, position, and water depth when first detected, bearing if determinable, species or species group (e.g., unidentified dolphin, sperm whale), types and nature of sounds heard (e.g., clicks, continuous, sporadic, whistles, creaks, burst pulses, strength of signal, etc.), and any other notable information.

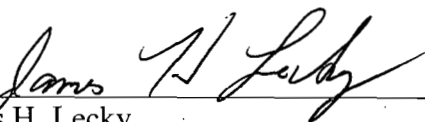
9. Reporting

The Holder of this Authorization is required to:

- (a) submit a draft report on all activities and monitoring results to the Office of Protected Resources, NMFS, within 90 days after the expiration of the IHA. This report must contain and summarize the following information:
 - (i) Dates, times, locations, heading, speed, weather, and associated activities during all seismic operations and marine mammal sightings;

- (ii) Species, number, location, distance from the vessel, and behavior of any marine mammals, as well as associated seismic activity (number of power-downs and shutdowns), observed throughout all monitoring activities.
 - (iii) An estimate of the number (by species) of marine mammals that: (i) are known to have been exposed to the seismic activity (visual observation) at received levels greater than or equal to 160 dB re 1 microPa (rms) and/or 180 dB re 1 microPa (rms) with a discussion of any specific behaviors those individuals exhibited and (ii) may have been exposed (modeling results) to the seismic activity at received levels greater than or equal to 160 dB re 1 microPa (rms) and/or 180 dB re 1 microPa (rms) with a discussion of the nature of the probable consequences of that exposure on the individuals that have been exposed.
 - (iv) A description of the implementation and effectiveness of the: (a) terms and conditions of the Biological Opinion's Incidental Take Statement (attached), and (b) mitigation measures of the IHA. For the biological opinion, the report will confirm the implementation of each term and condition, as well as any conservation recommendations, and describe their effectiveness, for minimizing the adverse effects of the action on listed marine mammals.
- (b) submit a final report to the Chief, Permits, Conservation, and Education Division, Office of Protected Resources, Headquarters, NMFS within 30 days after receiving comments from NMFS on the draft report. If NMFS decides that the draft report needs no comments, the draft report will be considered to be the final report.
10. In the unanticipated event that any taking of a marine mammal in a manner prohibited by this Authorization occurs, such as an injury, serious injury or mortality, and is judged to result from these activities, L-DEO will immediately cease operating all authorized sound sources and report the incident to the Chief of the Permits, Conservation, and Education Division, Office of Protected Resources, NMFS, at 301-713-2289. L-DEO will postpone the research activities until NMFS is able to review the circumstances of the take. NMFS will work with L-DEO to determine whether modifications in the activities are appropriate and necessary, and notify L-DEO that they may resume the seismic survey operations.
11. In the event that L-DEO discovers an injured or dead marine mammal that is judged to not result from these activities, L-DEO will contact and report the incident to the Chief of the Permits, Conservation, and Education Division, Office of Protected Resources, NMFS, at 301-713-2289 within 24 hours of the discovery.
12. L-DEO is required to comply with the Terms and Conditions of the Biological Opinion's Incidental Take Statement issued to both the National Science Foundation and NMFS' Office of Protected Resources (attached).

13. A copy of this Authorization and the Incidental Take Statement must be in the possession of all contractors and marine mammal monitors operating under the authority of this Incidental Harassment Authorization.



James H. Lecky
Director
Office of Protected Resources
National Marine Fisheries Service

FEB 09 2009

Date

Attachments

Attachment

Table 1. Authorized Take Numbers for Each Species in the Southwest Pacific Ocean.

Mysticetes	
Pygmy right whale	3
Humpback whale	1
Minke whale	3
Dwarf Minke whale	3
Bryde's whale	14
Sei whale	1
Fin whale	1
Blue whale	1
Odontocetes	
Sperm whale	50
Pygmy sperm whale	353
Dwarf sperm whale	353
Cuvier's beaked whale	40
Southern bottlenose whale	0
Longman's beaked whale	16
Blainville's beaked whale	40
Gingko-toothed beaked whale	16
Rough-toothed dolphin	1649
Bottlenose dolphin	330
Pantropical spotted dolphin	1649
Spinner dolphin	3298
Striped dolphin	330
Fraser's dolphin	989
Short-Beaked Common dolphin	330
Risso's dolphin	330
Melon-headed whale	152
Pygmy killer whale	30
False killer whale	91
Killer whale	61
Short-finned pilot whale	61

Table 2. Safety Radii for Triggering Mitigation.

Source and Volume	Tow Depth (m)	Predicted RMS Distances (m)		
		190 dB	180 dB	160 dB
Single Bolt airgun 40 in ³	9-12	12	40	385
4 strings 36 airguns 6600 in ³	9	300	950	6000
	12	340	1120	6850

Table 2. Predicted distances to which sound levels ≥ 190 , 180, and 160 dB re 1 μ Pa might be received in deep (>1000 m; 3280 ft) water from the 36-airgun array during the seismic survey, January – March, 2009.

of whom the green, loggerhead, and olive ridley are threatened and the hawksbill and leatherback are endangered. The *Status of listed resources* section found that all sea turtle stocks have undergone severe reduction by human harvesting of both eggs and turtles, as well as severe bycatch pressure in worldwide fishing industries. Legislative actions are slowly becoming more widespread and human harvesting pressure is slacking, but bycatch pressure remains in many areas of the world. Additional pressures facing these listed species both locally and worldwide include

- beach modification, both naturally from erosion and anthropogenically from construction
- loss of nesting habitat and modified hatchling sex ratios from climate change
- chemical and trash pollution
- invasive species
- entanglement in abandoned fishing gear

As a result of these pressures, recovery of sea turtle populations is tenuous, with many increasing, but significant decreases or no growth in many more. As previously mentioned, the *Cumulative effects* section describes fishing effort in the southwest Pacific is likely to increase in future years, as is the input of pollution by humans. This may in part be mitigated by movements to strengthen environmental controls.

From the *Effects analysis*, it is expected that 1,314 sea turtles will be exposed 4,928 times to airgun sounds at a level just below that which is expected to induce a temporary effect in swimming patterns and movement out of the action area. These exposures are divided unequally between the five species, with green and hawksbills expected to receive the greatest exposure (1,642 exposures to 438 individuals of each species) and loggerhead and olive ridleys the least (274 exposures to 73 individuals of each species). Population sizes are not available to calculate the subset of each population affected. However, responses are expected to be transient and not affect the fitness of any one individual. Although local nesting is expected to occur, it is not expected to be impaired by the proposed survey. As no sea turtle is expected to be capable of hearing signals produced by the MBES and SBP systems, no direct effects are expected from these systems on sea turtle fitness. No indirect effects from the proposed actions are known that will influence sea turtles. Overall, no individual sea turtle is expected to undergo a fitness reduction and thus, no sea turtle population or species is expected to be jeopardized.

Conclusion

After reviewing the current status of blue, fin, sei, humpback, and sperm whales, and green, hawksbill, leatherback, loggerhead, and olive ridley sea turtles; the *Environmental baseline* for the action area; the anticipated effects of the proposed activities; and the *Cumulative effects*, it is the NMFS' Opinion that the proposed action is not likely to jeopardize the continued existence of these species. Similarly, it is the NMFS' Opinion that the issuance of an amended IHA by the NMFS' Permits Division for harassment that would occur incidental to the proposed action is not likely to jeopardize the continued existence of these species. No critical habitat has been designated within the action area and thus the proposed action would have no effect on critical habitat.

Incidental take statement

Section 9 of the ESA and federal regulation pursuant to Section 4(d) of the ESA prohibit the “take” of endangered and threatened species, respectively, without special exemption. “Take” is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct (16 U.S.C. §1532(19)). Harm includes significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Sections 7(b)(4) and 7(o)(2), taking that is incidental and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are nondiscretionary, and must be undertaken by the NSF and the Permits Division so that they become binding conditions for L-DEO for the exemption in Section 7(o)(2) to apply. Section 7(b)(4) of the ESA requires that when a proposed agency action is found to be consistent with Section 7(a)(2) of the ESA and the proposed action may incidentally take individuals of listed species, the NMFS will issue a statement that specifies the impact of any incidental taking of endangered or threatened species. To minimize such impacts, reasonable and prudent measures and term and conditions to implement the measures, must be provided. Only incidental take resulting from the agency actions and any specified reasonable and prudent measures and terms and conditions identified in the incidental take statement are exempt from the taking prohibition of Section 9(a), pursuant to Section 7(o) of the ESA.

Section 7(b)(4)(C) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under Section 101(a)(5) of the MMPA. One of the federal actions considered in this Opinion is the Permits Division’s proposed authorization of the incidental taking of blue, fin, sei, humpback, and sperm whales pursuant to Section 101(a)(5)(D) of the MMPA. With this authorization, the incidental take of listed whales is exempt from the taking prohibition of Section 9(a), pursuant to Section 7(o) of the ESA.

The NMFS anticipates the incidental harassment of the blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), sei whale (*Balaenoptera borealis*), humpback whale (*Megaptera novaeangliae*), and sperm whale (*Physeter macrocephalus*), as well as the green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), and olive ridley sea turtle (*Lepidochelys olivacea*) during the proposed seismic activities.

Amount or extent of take

The NMFS anticipates the proposed seismic survey in the Pacific Ocean off Tonga might result in the incidental take of listed species. The proposed action might take 1 blue whale, 1 fin whale, 1 sei whale, 1 humpback whale, and 50 sperm whales by exposing individuals to received seismic sound levels greater than 160 dB re 1 μ Pa. These estimates are based on the best available information of whale densities in the area to be ensounded above 160 dB re 1 μ Pa during the proposed activities. This incidental take would result from exposure to acoustic energy during seismic operations, would be in the form of harassment, and is not expected to result in the death or injury of any individuals that are exposed.

We expect the proposed action might also take individual sea turtles as a result of exposure to

acoustic energy during seismic studies, and we expect this take would also be in the form of harassment, with no death or injury expected for individuals exposed. Harassment of sea turtles is expected to occur at received levels above 166 dB re 1 μ Pa. The proposed action might take 1,314 sea turtles, comprised of 438 greens, 438 hawksbills, 292 leatherbacks, 73 loggerheads, and 73 olive ridleys. These estimates are based on the best available information on sea turtle abundance expected in the area to be ensounded above 160 dB re 1 μ Pa during the proposed activities.

Harassment of blue, fin, sei, humpback, and sperm whales exposed to seismic studies at levels less than 160 dB re 1 μ Pa, or of sea turtles at levels less than 166 dB re 1 μ Pa, is not expected. We expect some sperm whales and possibly one humpback whale to be taken by operation of the sonars. However, if overt adverse reactions (for example, startle responses, dive reactions, or rapid departures from the area) by listed whales or sea turtles are observed outside of the 160 dB or 166 dB re 1 μ Pa isopleths, respectively, while airguns are operating, incidental take may be exceeded. If such reactions by listed species are observed while sonars are in operation, this may constitute take that is not covered in this amended Incidental Take Statement. The NSF and the Permits Division must contact the Endangered Species Division to determine whether reinitiation of consultation is required because of such operations.

Any incidental take of blue whales, fin whales, sei whales, humpback whales, sperm whales, green sea turtles, hawksbill sea turtles, leatherback sea turtles, loggerhead sea turtles, and olive ridley sea turtles is restricted to the permitted action as proposed. If the actual incidental take meets or exceeds the predicted level, the NSF and Permits Division must reinitiate consultation. All anticipated takes would be "takes by harassment", as described previously, involving temporary changes in behavior.

Reasonable and prudent measures

The NMFS believes the reasonable and prudent measures described below are necessary and appropriate to minimize the amount of incidental take of listed whales and sea turtles resulting from the proposed action. These measures are non-discretionary and must be binding conditions of the NSF funding of the proposed seismic studies and the NMFS' authorization for the exemption in Section 7(o)(2) to apply. If the NSF or the NMFS fail to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse.

1. All activities must comply with the reasonable and prudent measures for sea turtles and whales listed in this biological opinion. For listed sea turtle and marine mammal species these measures include the following: vessel-based visual monitoring by marine mammal and sea turtle observers; real-time passive acoustic monitoring by marine mammal and sea turtle observers; speed or course alteration as practicable; implementation of a marine mammal and sea turtle exclusion zone within the 180 dB re 1 μ Pa_{rms} isopleth for power-down and shut-down procedures; emergency shutdown procedures in the event of an injury or mortality of a listed marine mammal or sea turtle; and ramp-up procedures when starting up the array. The measures for marine mammals are required to be implemented through the terms of the IHA issued under section 101(a)(5)(D) and 50 CFR 216.107.
2. The implementation and effectiveness of mitigation measures incorporated as part of the Reasonable and Prudent Measure mentioned above and the associated Terms and Conditions must be monitored.

Terms and conditions

In order to be exempt from the prohibitions of Section 9 of the ESA, the NSF, Permits Division, and L-DEO must comply with the following terms and conditions, which implement the Reasonable and Prudent Measures described above. These terms and conditions are non-discretionary.

To implement the Reasonable and Prudent Measures, the NSF and the NMFS shall ensure that

1. L-DEO implements the mitigation, monitoring, and reporting conditions contained in the amended IHA and this Opinion.
2. The Chief of the Endangered Species Division is immediately informed of any changes or deletions to any portions of the monitoring plan or amended IHA.
3. L-DEO immediately reports all sightings and locations of injured or dead endangered and threatened species (e.g., sea turtles and blue, fin, sei, humpback, and sperm whales) to the Permits Division and NSF.
4. the NSF and the Permits Division provide a summary of the implementation and effectiveness of the terms of the amended IHA to the Chief of the Endangered Species Division. This report shall confirm the implementation of each term and summarize the effectiveness of the terms for minimizing the adverse effects of the project on listed whales and sea turtles.

Conservation recommendations

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

We recommend the following conservation recommendations, which would provide information for future consultations involving seismic surveys and the issuance of incidental harassment authorizations that may affect endangered large whales and endangered or threatened sea turtles

1. *Improve estimates of levels and forms of "take" and responses to seismic sounds.* The Permits Division should review reports submitted for this and other prior geophysical research surveys funded by the NSF and compile and analyze information to improve agency estimates of the number of the different species of marine mammals and sea turtles that are likely to be exposed to sounds from seismic surveys, the response of those species to this exposure, and the probable consequences of those responses on the life history of individual animals. The results should be provided to the Endangered Species Division as part of requests for consultation on future proposals to authorize incidental harassment.
2. *Effects of seismic noise on sea turtles.* The NSF should promote and fund research examining the potential effects of seismic surveys on listed sea turtle species.

In order for the Endangered Species Division to be kept informed of actions minimizing or avoiding adverse effects on, or benefiting ESA-listed species or their habitats, the Permits Division should notify the Endangered Species Division of any conservation recommendations they implement in their final action.

Reinitiation notice

This concludes formal consultation on the proposed seismic source survey to be funded by the NSF and conducted by the L-DEO on board the *R/V Langseth* in the Pacific Ocean off Tonga, and the issuance of an amended incidental harassment authorization for the proposed studies pursuant to Section 101(a)(5)(D) of the Marine Mammal Protection Act (MMPA). As provided in 50 CFR §402.16, control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of authorized take is exceeded, Section 7 consultation must be reinitiated immediately.

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