



MARINE MAMMAL COMMISSION

22 December 2011

Mr. P. Michael Payne, Chief
Permits, Conservation, and Education Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Mr. Payne:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the application submitted by the Lamont-Doherty Earth Observatory seeking authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act to take small numbers of marine mammals by harassment. The taking would be incidental to a marine geophysical survey to be conducted in the waters of the Commonwealth of the Northern Mariana Islands from February through March 2012. The Commission also has reviewed the National Marine Fisheries Service's 14 December 2011 *Federal Register* notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (76 Fed. Reg. 77782).

RECOMMENDATIONS

The Marine Mammal Commission recommends that, before issuing the requested incidental harassment authorization, the National Marine Fisheries Service—

- require the Observatory to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific information—if the exclusion and buffer zones and numbers of takes are not re-estimated, require the Observatory to provide a detailed justification (1) for basing the exclusion and buffer zones for the proposed survey in the Northern Mariana Islands on empirical data collected in the Gulf of Mexico or on modeling that relies on measurements from the Gulf of Mexico and (2) that explains why simple ratios were used to adjust for tow depth;
- use species-specific maximum densities estimated by multiplying the existing density estimates by a precautionary correction factor (i.e. 1.5), and then re-estimate the anticipated number of takes;
- condition the authorization to prohibit the use of a shortened pause before ramping up after a power-down or shut-down of the airguns based on the presence of a marine mammal in the exclusion zone and the R/V *Langseth's* movement (speed and direction);
- extend the 30-minute period following a marine mammal sighting in the exclusion zone to cover the maximum dive times of all species likely to be encountered;
- provide additional justification for its preliminary determination that the proposed monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion and buffer zones, including (1) identifying those species that it believes can be detected with a high degree of confidence

- using visual monitoring only, (2) describing detection probability as a function of distance from the vessel, (3) describing changes in detection probability under various sea state and weather conditions and light levels, and (4) explaining how close to the vessel marine mammals must be for observers to achieve high nighttime detection rates;
- consult with the funding agency (i.e., the National Science Foundation) and individual applicants (e.g., Lamont-Doherty Earth Observatory and the U.S. Geological Survey) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal taking and the number of marine mammals taken;
 - require the applicant to (1) report the number of marine mammals that were detected acoustically and for which a power-down or shut-down of the airguns was initiated, (2) specify if such animals also were detected visually, (3) compare the results from the two monitoring methods (visual versus acoustic) to help identify their respective strengths and weaknesses, and (4) use that information to improve mitigation and monitoring methods; and
 - work with the National Science Foundation to analyze those data to help determine the effectiveness of ramp-up procedures as a mitigation measure for geophysical surveys after the data are compiled and quality control measures have been completed.

RATIONALE

The National Science Foundation is funding the Lamont-Doherty Earth Observatory to conduct a geophysical survey in waters of the Northern Mariana Islands in the area 16.5 to 19° N latitude and 146.5 to 150.5° E longitude. The Observatory initially planned the survey for 2010. It then delayed the survey due to mechanical issues and the Foundation temporarily withdrew its application.

The purpose of the proposed survey is to investigate the water cycle within subduction zone systems, which is thought to control arc-crust generation and megathrust seismicity. The survey would be conducted in waters from 2,000 to greater than 8,000 m in depth, with approximately 2,800 km of tracklines and turns. The Observatory would use the R/V *Marcus G. Langseth* to tow a 36-airgun array (nominal source levels 236 to 265 dB re 1 μ Pa (peak-to-peak) with a maximum discharge volume of 6,600 in³) at 9 m depth. The R/V *Langseth* would tow one 6-km hydrophone streamer and would use up to 85 ocean-bottom seismometers (i.e., 5 tethered and 80 bottom-mounted) during the survey. The Observatory also would operate a 10.5–13 kHz multibeam echosounder and a 3.5 kHz sub-bottom profiler continuously throughout the survey. After the survey has been completed, the Observatory would recover 60 seismometers. The remaining 5 tethered and 20 bottom-mounted seismometers would be left in place for one year until recovered during a subsequent survey.

The Service preliminarily has determined that, at most, the proposed activities would result in a temporary modification in the behavior of small numbers of up to 22 species of marine mammals and that any impact on the affected species would be negligible. The Service does not

anticipate any take of marine mammals by death or serious injury. It also believes that the potential for temporary or permanent hearing impairment will be at the least practicable level because of the proposed mitigation and monitoring measures. Those measures include monitoring exclusion and buffer zones and using power-down, shut-down, and ramp-up procedures. In addition, the Observatory would shut-down the airguns immediately when a North Pacific right whale is sighted, regardless of the distance from the *Langseth*. Ramp-up procedures would not be initiated until the right whale has not been seen at any distance for 30 minutes. Although the Commission considers the probability of sighting a right whale to be extremely low, it appreciates the extra caution that would be taken by the Observatory to ensure it is not taken by the geophysical survey.

The Commission continues to be concerned about certain aspects of this and similar authorizations for geophysical surveys. These concerns have been raised in past Commission letters (e.g., see the enclosed letter from 19 October 2011) regarding geophysical surveys funded by the National Science Foundation.

Uncertainty in exclusion and buffer zones

Exclusion zones define the area in which marine mammals are close enough to a sound source to be injured (i.e., Level A harassment) or killed by exposure to the sound. Buffer zones delineate the area in which marine mammals are close enough to a sound source to be disturbed to the extent that they change their natural behavior patterns (i.e., Level B harassment). Both zones are established based on the generation and propagation of sound from the source and general assumptions about the responses of marine mammals to sounds at specific sound pressure levels, the latter being based on limited observations of marine mammal responses under known conditions.

In 2007–2008, the Lamont-Doherty Earth Observatory conducted sound propagation studies using airgun arrays from the R/V *Langseth* (Tolstoy et al. 2009) and used results from those studies to create a model of sound propagation for estimating exclusion and buffer zones. However, that model was based on a particular set of environmental conditions, and variation in such conditions is known to affect the manner in which sound propagates through the ocean. Indeed, Tolstoy et al. (2009) not only noted that results vary with environmental conditions but also used that variation as justification for measuring sound propagation at multiple locations. The National Science Foundation subsequently followed that example in its preparation of a programmatic environmental impact statement for geophysical surveys by modeling sound propagation under various environmental conditions. Furthermore, Tolstoy et al. (2009) acknowledged that sound propagation is not only variable, but also dependent on water depth and bathymetry. Specifically, for the Observatory's model, the applicant has stated that it overestimates actual received sound levels in deep water (> 1,000 m) and underestimates actual received sound levels in shallow water (< 50 m). Such deviations raise questions regarding the efficacy of the model for estimating received sound levels at certain distances and for establishing exclusion and buffer zones.

In preparation for the Northern Mariana Islands' survey, the Observatory used that model to estimate exclusion and buffer zones for the single mitigation airgun. However, it used empirically

measured sound pressure levels from the Gulf of Mexico to establish the exclusion and buffer zones for the 36-airgun array to be used in the Northern Mariana Islands. The Observatory stated that “it would be prudent to use” empirical measurements from the Gulf of Mexico but did not provide justification for that statement. It also cited Appendix A of the environmental assessment as providing the basis for its modeling approach, but Appendix A did not discuss modeling of the mitigation airgun. In addition, the Observatory used exclusion and buffer zones for the 36-airgun array that were obtained at a tow depth of 6 m to estimate zones at a tow depth of 9 m using the ratios of the applicable Level A and B harassment zones and depths (i.e., 1.338 and 1.285, respectively). However, such an adjustment may not be valid because, as the Observatory itself notes, the relationship between tow depth and sound exposure level is not linear (see Figure 6 in Appendix A).

Consequently, the buffer and exclusion zones were based on (1) a model with known biases as a function of water depth, (2) environmental conditions that are inconsistent with those in the Northern Mariana Islands, and (3) sound sources that are different from those that are to be used (i.e., the 36-airgun array vs. the single mitigation airgun). These problems might be less significant if mitigation and monitoring measures for this type of activity were known to be highly effective, but as is well known, and as is described later in this letter, that is not the case.

On numerous occasions the Commission has recommended that the Service or the Observatory estimate exclusion and buffer zones using either empirical measurements from the particular survey site or a model that takes into account the conditions in the proposed survey area. The model should incorporate operational parameters (e.g., tow depth, source level, and number of active airguns) and site-specific environmental parameters (e.g., sound speed profiles, surface ducts, bathymetry, water depth, and wind speed). To address these shortcomings, the Marine Mammal Commission recommends that the National Marine Fisheries Service require the Observatory to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific information. If the exclusion and buffer zones and numbers of takes are not re-estimated, the Marine Mammal Commission recommends that the Service require the Observatory to provide a detailed justification (1) for basing the exclusion and buffer zones for the proposed survey in the Northern Mariana Islands on empirical data collected in the Gulf of Mexico or on modeling that relies on measurements from the Gulf of Mexico and (2) that explains why simple ratios were used to adjust for tow depth.

Uncertainty in take estimates

The Observatory estimated the number of takes expected to result from the proposed survey using the size of the buffer zones and associated ensonified areas, coupled with estimates of marine mammal densities from a previous marine mammal survey. To be precautionary, it increased by 25 percent the size of the area it expects to be ensonified to a level sufficient to result in harassment. The Observatory’s application and Service’s *Federal Register* notice indicated some uncertainty in the representativeness of the density data and the assumptions used to calculate takes. That uncertainty pertained to spatial and temporal differences, but it almost certainly reflected substantial underestimates of cryptic species (e.g., beaked whales and *Kogia* spp.) because 88 percent of the

Mariana survey used to estimate densities was conducted in Beaufort sea states of 4 to 6. The combination of rough sea state and cryptic behavior means that the results of this survey are highly questionable. In previous incidental harassment authorizations (e.g., the U.S. Geological Survey's proposed geophysical survey in the central Gulf of Alaska; 76 Fed. Reg. 18187), the Service used maximum densities to estimate the number of takes because of similar uncertainties regarding the density data with respect to space and time. The Service calculated maximum densities for marine mammals where only one density estimate was available, which is the case for this proposed incidental harassment authorization, by multiplying the best density estimate by 1.5 (e.g., 76 Fed. Reg. 18185, 76 Fed. Reg. 26276). Given the similar nature and considerable amount of uncertainty and the need to ensure adequate protection, the Marine Mammal Commission recommends that the National Marine Fisheries Service use species-specific maximum densities estimated by multiplying the existing density estimates by a precautionary correction factor (i.e. 1.5), and then re-estimate the anticipated number of takes.

Mitigation and monitoring measures

The *Federal Register* notice states that the Observatory would monitor the area near the survey vessel for at least 30 minutes prior to the initiation of airgun operations. The notice also states that when airguns have been powered down or shut down because a marine mammal has been detected near or within a proposed exclusion zone, airgun activity would not resume until (1) the marine mammal is observed to have left the exclusion zone, (2) the marine mammal has not been seen or otherwise detected within the exclusion zone for 15 minutes in the case of small odontocetes and 30 minutes in the case of mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, killer, and beaked whales, or (3) the vessel has moved outside the exclusion zone. For this survey, the Observatory assumes that it would take the vessel only 8 minutes to "leave the vicinity of the marine mammal" based on an animal being sighted close to the vessel and a vessel speed of 7.4 km/hour. In addition, the *Federal Register* notice states that ramp-up procedures would occur after only 8 minutes based on the use of a comparable period in previous incidental harassment authorizations. The Commission believes that the proposed use of this limit is inappropriate because, although it takes into account the direction and speed of the vessel, it fails to account for the position, swim speed, and heading of the observed marine mammal. If a marine mammal is sighted in the exclusion zone and is moving in the same direction as the R/V *Langseth*, or if it is moving in a different direction but changes its heading as the vessel or airgun array approaches, it may remain in the exclusion zone for periods far exceeding 8 minutes. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service condition the authorization to prohibit the use of a shortened pause before ramping up after a power-down or shut-down of the airguns based on the presence of a marine mammal in the exclusion zone and the R/V *Langseth's* movement (speed and direction).

The Commission also continues to believe that a 30-minute pause in airgun activity following a marine mammal sighting is not a sufficient amount of time to assume that the marine mammal has left the area or will not be exposed to sound levels that could result in injury or death. Certain marine mammal species that occur in the proposed action area dive for longer periods and, although not visible to the observers, may still be within the exclusion zone. Sperm whales and

beaked whales, in particular, may stay submerged for periods far exceeding 30 minutes. Blainville's beaked whales dive to considerable depths (> 1,400 m) and can remain submerged for nearly an hour (Baird et al. 2006, Tyack et al. 2006). In addition, observers may not detect marine mammals each time they return to the surface, especially cryptic species such as beaked whales, which are difficult to detect even under ideal conditions. Barlow (1999) found that "[a]ccounting for both submerged animals and animals that are otherwise missed by the observers in excellent survey conditions, only 23 percent of Cuvier's beaked whales and 45 percent of *Mesoplodon* beaked whales are estimated to be seen on ship surveys if they are located directly on the survey trackline." Thus, at least for certain species, visual monitoring alone is not adequate to detect all marine mammals within the exclusion and buffer zone. Therefore, the Marine Mammal Commission again recommends that the National Marine Fisheries Service extend the 30-minute period following a marine mammal sighting in the exclusion zone to cover the maximum dive times of all species likely to be encountered.

Furthermore, as discussed in the Commission's previous letters commenting on similar activities by this and other applicants, visual monitoring is not effective during periods of bad weather or at night. The Observatory and Service also state that during the 2007 survey Beaufort sea states of 4 to 6 occurred 88 percent of the time from January through April, which includes the months the survey would be conducted. Therefore, the Marine Mammal Commission recommends that, prior to granting the requested authorization, the National Marine Fisheries Service provide additional justification for its preliminary determination that the proposed monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion and buffer zones. At a minimum, such justification should (1) identify those species that it believes can be detected with a high degree of confidence using visual monitoring only under the expected environmental conditions, (2) describe detection probability as a function of distance from the vessel, (3) describe changes in detection probability under various sea state and weather conditions and light levels, and (4) explain how close to the vessel marine mammals must be for observers to achieve high nighttime detection rates. If such information is not available, the Service and the applicant should conduct the studies needed to describe the efficacy of existing monitoring methods and develop alternative or supplemental methods to address current shortcomings.

In addition, the applicant indicates that it will be able to assess possible impacts by comparing estimated marine mammal abundance during periods when the airguns are not firing (i.e., baseline conditions) with periods when they are. The efficacy of this approach depends, in part, on the length of the periods when the airguns are silent. If firing of the airguns causes marine mammals to depart an area and/or alter their behavior, a comparison after the airguns are silenced would be meaningful only if it involved sufficient time for the disturbed marine mammals to return to their normal distribution and/or behavior. If the time for such a return to normalcy exceeds the period that the airguns are silent, then any comparison would be largely meaningless as an indicator of the impact of seismic disturbance. Put frankly, the Commission does not believe that the proposed monitoring method is a scientifically sound way of assessing impacts on behavior or distribution. The Marine Mammal Protection Act requires that the National Marine Fisheries Service (for the Secretary of Commerce) put forth "requirements pertaining to the monitoring and reporting of such

taking.” Although the Act is not explicit on this point, the Commission believes that Congress’s intent was that those monitoring and reporting methods be scientifically sound and yield sufficient information to confirm that the authorized taking is having only negligible impacts on the affected species and stocks. That is, the monitoring and reporting requirements should provide a reasonably accurate assessment of the types of taking and the number of animals taken by the proposed activity. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service consult with the funding agency (i.e., the National Science Foundation) and individual applicants (e.g., Lamont-Doherty Earth Observatory and the U.S. Geological Survey) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal taking and the number of marine mammals taken. Without such a system in place, the Commission does not see how the Service can continue to assume that this type of survey is having no more than a negligible impact on marine mammal populations.

The *Federal Register* notice states that the applicant also will conduct vessel-based passive acoustic monitoring to augment visual monitoring during daytime operations and at night to help detect, locate, and identify marine mammals that may be present. The Commission supports the use of passive acoustic monitoring for this purpose but also considers it important to keep in mind the limitations of such monitoring. As the Commission has noted in previous correspondence, and as the Service acknowledges, passive acoustic monitoring is effective only when marine mammals vocalize. In addition, the effectiveness of passive acoustic monitoring will depend on the operator’s ability to locate a vocalizing cetacean and determine whether it is within the power-down or shut-down radius or in a position such that the ship’s movement will place it within the power-down or shut-down radius. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service require the applicant to (1) report the number of marine mammals that were detected acoustically and for which a power-down or shut-down of the airguns was initiated, (2) specify if such animals also were detected visually, (3) compare the results from the two monitoring methods (visual versus acoustic) to help identify their respective strengths and weaknesses, and (4) use that information to improve mitigation and monitoring methods.

Effectiveness of ramp-up procedures

Although the effectiveness of ramp-up procedures has yet to be verified empirically, the Service would continue to require the Observatory to monitor, document, and report observations during all ramp-up procedures. Such data will provide a stronger scientific basis for determining the effectiveness of, and deciding when to implement, this particular mitigation measure. Further, the National Science Foundation has indicated that monitoring data from past surveys are being compiled into a single database. The Commission supports that effort by the Foundation. After the data are compiled and quality control measures have been completed, the Marine Mammal Commission recommends that the National Marine Fisheries Service work with the National Science Foundation to analyze those data to help determine the effectiveness of ramp-up procedures as a mitigation measure for geophysical surveys. International researchers also are trying to determine the impacts of seismic airguns and the effectiveness of ramp-up procedures, primarily on humpback whales, during specific life history stages. However, the results of those studies are not

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expected for three to five years and even then, their applicability to other species may be limited. In the interim, the Commission continues to believe that the Service should continue to require data collection and analysis to assess the effectiveness of ramp-up procedures, given that those procedures are considered a substantial component of the mitigation measures.

Reporting requirements

Marine mammals taken or observed during such surveys often are reported to the Service as “unidentified” species due to poor environmental conditions, the distance of the animal(s) relative to the vessel, the brevity of the animal’s presence at the surface, the animal’s avoidance behaviors, and/or lack of expertise of observers that monitor for marine mammals. For these reasons, the Service finds it necessary to authorize takes of groups of animals (i.e., unidentified large whales, unidentified beaked whales, unidentified *Kogia* spp., unidentified blackfish, and unidentified small dolphins) as well as species-specific takes for this incidental harassment authorization. The Service has authorized takes for some of these groups of animals routinely in other incidental harassment authorizations. In this case, as a precautionary measure, the Service based its negligible impact determination on the assumption that even if all animals sighted within a designated group belonged to a particular species, the total number of takes would be less than 2 percent of the abundance of that species. The Commission appreciates the difficulty of identifying marine mammals to the species level at sea. However, it does not believe that the proposed solution should be used indefinitely. Better means of identifying marine mammals at sea are needed, and improvements may be made through analysis of vocalizations or better training/practices for visual observers (including using Big-Eye binoculars). The Commission would welcome an opportunity to discuss this issue with the Service and relevant applicants. Until that time, the Commission encourages the Service to continue requiring Service-approved observers and to work with all applicants to ensure the best possible implementation of all mitigation and monitoring measures.

Please contact me if you have questions about the Commission’s recommendations or comments.

Sincerely,

A handwritten signature in blue ink that reads "Timothy J. Ragen". The signature is written in a cursive, flowing style.

Timothy J. Ragen, Ph.D.
Executive Director

Enclosure

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