



# MARINE MAMMAL COMMISSION

19 October 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 central Pacific Ocean from November 2011 through January 2012. The Commission also has reviewed the National Marine Fisheries Service's 19 September 2011 *Federal Register* notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (76 Fed. Reg. 57959).

## RECOMMENDATIONS

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, require the Observatory to provide a detailed justification (1) for basing the exclusion and buffer zones for the proposed survey in the central Pacific Ocean 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 rather than the effort-weighted mean densities and re-estimate the anticipated number of takes;
- condition the authorization to prohibit an 8-minute pause and require a longer 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 full dive times of all species likely to be encountered;
- prior to granting the requested authorization, 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;
  - condition the authorization to require the Observatory to monitor, document, and report observations during all ramp-up procedures; 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 the central Pacific Ocean 1,300 km south of Hawaii in the area 5 to 10° N latitude and 150 to 156° W longitude. The purpose of the proposed survey is to define the detailed structure of the oceanic lithosphere and to develop a comprehensive history of its formation and evolution. The survey would be conducted in water depths greater than 5,000 m, with approximately 2,120 km of tracklines and turns. It would use the R/V *Marcus G. Langseth* towing a 36-airgun array (nominal source levels 236 to 265 dB re 1 $\mu$ Pa (peak-to-peak) with a maximum discharge volume of 6,600 in<sup>3</sup>). The R/V *Langseth* would tow one 6-km hydrophone streamer for a portion of the survey and would use up to 34 short-period ocean-bottom seismometers for another portion of the survey. The Observatory also would operate a 10.5–13 kHz multibeam echo sounder during airgun operations and a 3.5 kHz sub-bottom profiler continuously throughout the survey. After the survey has been completed, the Observatory would recover the short-period seismometers and deploy 27 broad-band seismometers and 5 magneto-telluric instruments. Those devices would remain on the seafloor 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 20 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 exclusion and buffer zones and power-down, shut-down, and ramp-up procedures.

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 29 August 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 central Pacific Ocean survey, the Observatory used that model to estimate exclusion and buffer zones for the single mitigation airgun. In contrast, the Observatory applied empirically measured sound levels from the Gulf of Mexico to establish the exclusion and buffer zones for use of the 36-airgun array in the Pacific Ocean. It cited Appendix A as providing the basis for doing so, 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., 1.285 and 1.3381, 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 of the environmental assessment for the proposed survey).

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 central Pacific Ocean, 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 below, 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, number of active airguns) and site-specific environmental parameters (e.g., sound speed profiles, surface ducts, wind speed, bathymetry, and water depth). 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 central Pacific Ocean 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. 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 revised application submitted by the Observatory indicated some uncertainty in the representativeness of the effort-weighted marine mammal density data and the assumptions used to calculate takes. 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. Given the similar nature of the uncertainty and the need to ensure adequate protection, the Marine Mammal Commission recommends that the National Marine Fisheries Service use species-specific maximum densities rather than the effort-weighted mean densities and re-estimate the anticipated number of takes. Otherwise, the estimated number of takes has a 50 percent chance of being too low.

## 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, 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 8.5 km/hour. In addition, the *Federal Register* notice also 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 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 exceeding 8 minutes. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service condition the authorization to prohibit an 8-minute pause and require a longer 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 basis for assuming 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 full 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. 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, (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 scientifically sound. 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 radii or in a position such that the ship's movement will place it within the power-down or shut-down radii. Cetaceans that are directly on the trackline can be particularly hard to detect and, because of their position and proximity to the sound source, are at elevated risk from sound exposure. 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**

As the Commission has noted in previous correspondence, the effectiveness of ramp-up procedures has yet to be verified empirically. In October 2010 representatives from the Service, Commission, National Science Foundation, U.S. Geological Survey, Lamont-Doherty Earth Observatory, and Scripps Institution of Oceanography met to discuss mitigation and monitoring measures. Among other things, the participants discussed the need to verify the utility of ramp-up procedures. The Commission continues to believe that such verification is important and should be pursued whenever possible. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service condition the authorization 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. 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 expected for three to five years. In the interim, the Commission continues to believe that the Service should be requiring 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.

### **Serious injury and mortality**

The Observatory is not seeking authorization to take marine mammals by serious injury or mortality. However, it has included a phased approach for suspending activities and reporting injuries and deaths. The *Federal Register* notice indicates that the Observatory would immediately

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cease activities if its activities clearly caused an injury or death. The Service then would notify the Observatory when it could resume its activities. The notice also indicates that injuries and deaths clearly caused by the Observatory and injuries and deaths that the lead protected species observer deems recent (i.e., fresh carcasses), but from an unknown cause, would be reported immediately to the Service and local stranding network. If an injured or dead marine mammal was discovered and the lead protected species observer determines that the injury or death was not associated with the Observatory's activities (i.e., previously wounded animal, carcass with moderate or advanced decomposition, or scavenged carcasses), then it would report the injury or death to the Service and local stranding network within 24 hours. The Observatory would provide photographs, video footage (if available), and other relevant data to the Service and local stranding network. The Commission believes that the phased approach is a much needed improvement to the standard monitoring and reporting measures for injuries and deaths and commends the Service and the Observatory for including such an approach.

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

Sincerely,



Timothy J. Ragen, Ph.D.  
Executive Director

Enclosure

#### References

- Baird, R.W., D.L. Webster, D.J. McSweeney, A.D. Ligon, G.S. Schorr, and J. Barlow. 2006. Diving behavior and ecology of Cuvier's (*Ziphius cavirostris*) and Blainville's (*Mesoplodon densirostris*) beaked whales in Hawaii. *Canadian Journal of Zoology* 84(8):1120–1128.
- Barlow, J. 1999. Trackline detection probability for long-diving whales. Pages 209–221 in G.W. Garner, S.C. Amstrup, J.L. Laake, B.F.J. Manly, L.L. McDonald, and D.G. Robertson (eds.), *Marine Mammal Survey and Assessment Methods*. Balkema, Rotterdam, The Netherlands.
- Tolstoy, M., J. Diebold, L. Doermann, S. Nooner, S.C. Webb, D.R. Bohnstiehl, T.J. Crone, and R.C. Holmes. 2009. Broadband calibration of R/V *Marcus G. Langseth* four-string seismic sources. *Geochemistry, Geophysics, Geosystems* 10, Q08011, doi:10.1029/2009GC002451.
- Tyack, P.L., M. Johnson, N. Aguilar Soto, A. Sturlese, and P.T. Madsen. 2006. Extreme diving of beaked whales. *Journal of Experimental Biology* 209(21):4238–4253.