



MARINE MAMMAL COMMISSION

7 March 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 seismic survey in the eastern tropical Pacific Ocean from April through May 2011. The Commission also has reviewed the National Marine Fisheries Service's 4 February 2011 *Federal Register* notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (76 Fed. Reg. 6430).

RECOMMENDATIONS

The Marine Mammal Commission recommends that the National Marine Fisheries Service—

- require Lamont-Doherty Earth Observatory to (1) provide a full description of the Lamont-Doherty Earth Observatory model as it is used to estimate safety and buffer zones and (2) rerun the model using site-specific information to determine safety and buffer zones and associated takes;
- prior to granting the requested authorization, provide additional justification for its preliminary determination that the planned monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified safety zones;
- propose to the Lamont-Doherty Earth Observatory that it revise its survey design to add pre- and post-seismic survey assessments as a way of obtaining more realistic baseline abundance estimates of marine mammals;
- require the applicant (1) to report on the number of marine mammals that were acoustically detected for which a power-down or shutdown of the airguns was initiated, (2) specify if the animals also were visually detected, and (3) compare the results from the two methods (visual versus acoustic) to help identify their respective weaknesses;
- condition the authorization to prohibit an eight-minute pause before ramping up after either a power-down or shutdown of the airguns, based on the presence of a marine mammal in the safety zone and the *Langseth's* movement (speed and direction);

- extend the monitoring period to at least one hour before initiation of seismic activities and at least one hour before the resumption of airgun activities after a power-down or shutdown and before ramp-up because of a marine mammal sighting within a safety zone; and
- condition the authorization to require Lamont-Doherty Earth Observatory to monitor, document, and report observations during all ramp-up procedures.

RATIONALE

The National Science Foundation is funding Lamont-Doherty Earth Observatory to survey a major plate boundary in Costa Rica's exclusive economic zone. The purpose of the survey is to determine the fault structure and the properties of underlying rocks along the plate boundary. The survey would occur in water depths from less than 100 m to greater than 2,500 m and would consist of approximately 2,510 km of transect lines and turns. The applicant would conduct the survey using the R/V *Marcus G. Langseth*, which would deploy a 36-airgun array as an energy source (nominal source levels of the airgun arrays are 236 to 265 dB re 1 μ Pa (peak-to-peak)). The airgun array would have no more than 18 airguns firing at any given time with a maximum discharge volume of 3,300 in³. The *Langseth* also would tow a receiving system consisting of four hydrophone streamers each 6 km in length. In addition, the applicant would operate a 10.5–13 kHz multibeam echo sounder during airgun operations and a sub-bottom profiler continuously throughout the cruise.

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 19 species of marine mammals and that any impact on the affected species would be negligible. The Service also 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. The measures include safety zones and power-down, shutdown, and ramp-up procedures.

The Commission's concerns regarding the proposed authorization are, for the most part, the same as those raised in its previous letters concerning the applicant's request to conduct similar activities in the North Pacific Ocean. The most recent letter dated 21 June 2010 is enclosed.

Uncertainty in Modeling Safety and Buffer Zones

Safety zones are intended to prevent Level A harassment, and buffer zones are used to monitor Level B harassment. Both are established based on the propagation of sound from the sound source. In 2003 and again in 2007–2008, Lamont-Doherty Earth Observatory conducted sound propagation studies using airgun arrays from the R/V *Maurice Ewing* and the *Langseth*, respectively. As noted in Tolstoy et al. (2009), "The seismic source used on the R/V *Langseth* is significantly different from that used on the R/V *Ewing* requiring an updated calibration effort to ensure marine mammal protection." Lamont-Doherty Earth Observatory used the results of the 2007–2008 study to create a model of sound propagation for estimating safety and buffer zones. However, the details of the model are uncertain. The *Federal Register* notice and the application refer

the reader to the associated environmental assessment for model details. The assessment then refers the reader to its Appendix A, but the model information included in Appendix A pertains to studies based on the older information using the *Ewing* and not the *Langseth*. Thus, the details of the model used to support this proposed survey were not available for review.

The modeling details are particularly important in this case because in the 2007–2008 study the model (1) overestimated the measured received sound levels in deep water (>1,000 m), and (2) underestimated (by a factor of 1.7 to 5.2) the measured received sound levels in shallow water (<100). Received sound levels were not evaluated for intermediate depths, so Lamont-Doherty Earth Observatory estimated those levels to be 1.5 times those that would occur (at the same distance from the source) in deep water. Given such uncertainty, it would be helpful to be able to review the details of the model to determine its usefulness.

Preparations for a previous survey off Costa Rica also suggested that the model may provide inconsistent results. That earlier survey used site-specific sound speed profiles and bathymetry in the shallow waters of Drake Bay, which is part of the currently proposed survey area, and in nearby waters of intermediate depth. The modeled site-specific safety radii (safety zone and buffer zone) were 288 and 2,121 m for shallow waters and 295 and 4,511 m for intermediate waters. In contrast, the application and the *Federal Register* notice propose radii of 1,030 and 19,500 m for shallow water and 675 and 5,700 for intermediate waters based on Gulf of Mexico data. The applicant suggests that these radii demonstrate that their safety and buffer zones are precautionary, which may be the case. However, it raises questions regarding the efficacy of the model used to estimate safety and buffer zones for the proposed survey.

In preceding letters, the Commission has argued that estimating safety and buffer zones via a model should be based on conditions where the survey is to occur. 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, wind speed, bathymetry, and water depth). Indeed, the National Science Foundation's draft programmatic environmental impact statement reported modeling results for five "exemplary areas," all based on site-specific information. Unfortunately, none of those exemplary areas included the eastern tropical Pacific Ocean where the proposed survey is planned. For that reason, the Commission noted in its 24 November 2010 letter (copy enclosed) that the Foundation should be prepared to conduct supplemental environmental analyses under the National Environmental Policy Act when the details of specific studies become clear.

To address all those shortcomings, the Marine Mammal Commission recommends that the National Marine Fisheries require Lamont-Doherty Earth Observatory to (1) provide a full description of the Lamont-Doherty Earth Observatory model as it is used to estimate safety and buffer zones and (2) rerun the model using site-specific information to determine safety and buffer zones and associated takes.

Monitoring Measures

The Service's preliminary determination is based, in part, on the presumed efficacy of the monitoring measures. Those measures depend, in large part, on visual monitoring. However, 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. Even with good visibility, observers are unable to detect marine mammals when they are below the surface or beyond visual range. 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 safety zones—particularly when those zones extend as far as 19.5 km from the vessel. 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 planned monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified safety 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 undertake 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 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 on the length of the periods that 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 effects of seismic disturbance. A more meaningful approach would be to assess abundance in an area before, during, and after the seismic survey to determine how those numbers differ. With that in mind, the Marine Mammal Commission recommends that the National Marine Fisheries Service propose to the Lamont-Doherty Earth Observatory that it revise its survey design to add pre- and post-seismic survey assessments as a way of obtaining more realistic baseline abundance estimates of marine mammals.

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 the

limitations of such monitoring in mind. 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, its effectiveness will depend on the operator's ability to locate a vocalizing cetacean and determine whether it is within the shutdown radius or in a position such that the ship's movement will place it within the shutdown radius. Cetaceans that are on the trackline may be particularly hard to detect but are of relatively greater concern. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service require the applicant (1) to report on the number of marine mammals that were acoustically detected for which a power-down or shutdown of the airguns was initiated, (2) specify if the animals also were visually detected, and (3) compare the results from the two methods (visual versus acoustic) to help identify their respective weaknesses.

The Service's *Federal Register* notice states that the applicant will monitor the area for at least 30 minutes prior to the planned initiation of airgun operations. The notice also states that when airguns have been powered or shut down because a marine mammal has been detected near or within a proposed safety zone, airgun activity will not resume until the marine mammal is outside the safety zone (i.e., the animal visually is observed to have left the safety zone or has not been seen or otherwise detected within the safety 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). However, the *Federal Register* notice also states that ramp-up procedures would occur after only eight minutes based on the notion that the movement of the *Langseth* would lead to increasing the distance from the marine mammal. The Commission believes that this limit is inappropriate because it fails to account for the position, swim speed, and heading of the observed marine mammal. If a marine mammal sighted in the safety zone is moving in the same direction as the *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 safety zone for periods far longer than eight minutes. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service condition the authorization to prohibit an eight-minute pause before ramping up after a power-down or shutdown of the airguns, based on the presence of a marine mammal in the safety zone and the *Langseth's* movement (speed and direction).

The Commission also continues to believe that the 30-minute pause in activity is insufficient because certain marine mammals in the action area dive for longer periods and may be within the safety zone but not visible to the observers at the end of those periods. 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 these animals each time they return to the surface. Accordingly, monitoring for 30 minutes prior to the planned start or resumption of airgun operations likely is not sufficient to detect those species even if they remain within the safety zone. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service extend the monitoring period to at least one hour before initiation of seismic activities and at least one hour before the resumption of airgun activities after a power-down or shutdown and before ramp-up because of a marine mammal sighting within a safety zone.

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Mitigation Effectiveness

As the Commission has noted in previous correspondence, the effectiveness of ramp-up procedures has yet to be verified empirically. In October 2010 the Service, the Commission, and representatives from the 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 whenever possible. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service condition the authorization to require Lamont-Doherty Earth Observatory to monitor, document, and report observations during all ramp-up procedures. Such data will provide a stronger scientific basis for determining when to implement this particular monitoring measure.

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

Sincerely,



Timothy J. Ragen, Ph.D.
Executive Director

Enclosures

Literature Cited

- 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.



MARINE MAMMAL COMMISSION

21 June 2010

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 seismic survey in the northwest Pacific Ocean during approximately 17 days between late July and early September 2010. The Commission also has reviewed the National Marine Fisheries Service's 21 May 2010 *Federal Register* notice (75 Fed. Reg. 28568) announcing receipt of the application and proposing to issue the authorization, subject to certain conditions.

The National Science Foundation is funding the planned survey to investigate the crustal structure of the Shatsky Rise, which is located at 30–37° N latitude, 154–161° E longitude in international waters of the western North Pacific. The survey would occur in water depths greater than 1,000 m (3,280 ft) and consist of approximately 3,160 km (1,963.5 mi) of transect lines. The applicant would conduct the survey using the R/V *Marcus G. Langseth*, which would deploy a 36-airgun array (6,600 in³) as an energy source (nominal source levels of the airgun arrays are 236 to 265 dB re 1μPa at 1 m (peak-to-peak)). The *Langseth* would tow a receiving system consisting of a 6-km-long hydrophone streamer and approximately 28 ocean bottom seismometers. In addition, the applicant would operate a 10.5–13 kHz multi-beam echo sounder during airgun operations and a sub-bottom profiler continuously throughout the cruise.

RECOMMENDATIONS

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

- require the applicant to use location-specific environmental parameters to re-estimate exclusion zones and verify the estimates with field measurements prior to or at the beginning of the study;
- require the applicant to re-estimate exposures based upon location-specific environmental parameters and associated ensonified areas;
- provide additional justification for its preliminary determination that the planned monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion zones;
- clarify the qualifiers “when practical,” “if practical,” and “when feasible” with respect to (1) using two marine mammal observers to monitor the exclusion zone for marine mammals during daytime operations and nighttime start-ups of the airguns, (2) using crew members to

- assist observers in detecting marine mammals and implementing mitigation requirements, and (3) using marine mammal observers during daytime periods to compare sighting rates and animal behavior during times when seismic airguns are and are not operating;
- propose to the Lamont-Doherty Earth Observatory that it revise its study design to add pre- and post-seismic survey assessments as a way of obtaining more realistic baseline sighting rates for marine mammals, as well as better assessment of impacts and recovery from those impacts;
- clarify the qualifier “ideally,” including the conditions under which the towed hydrophones would not be monitored, and clarify and describe the conditions that it assumes would render the use of passive acoustic monitoring impracticable for supplementing the visual monitoring program;
- extend the monitoring period to at least one hour before initiation of seismic activities and at least one hour before the resumption of airgun activities after a shutdown because of a marine mammal sighting within an exclusion zone;
- require that observations be made during all ramp-up procedures to gather the data needed to analyze and report on their effectiveness as mitigation;
- work with the applicant to correct discrepancies within the application and between the application and the Service’s *Federal Register* notice; and
- advise the applicant of the need to use the 160-dB re 1 μ Pa (rms) threshold for all cetaceans as currently used by the Service or to explain the basis for using some other sound level as the appropriate threshold.

RATIONALE

The Service preliminarily has determined that the proposed activities would result, at most, in a temporary modification in the behavior of small numbers of up to 34 species of marine mammals and that any impact on the affected species is expected to be negligible. The Service also preliminarily has determined that no take of marine mammals by death or serious injury is anticipated and that the potential for temporary or permanent hearing impairment will be avoided through the incorporation of the proposed mitigation measures. The Service provides the following justification for its determinations:

- (1)...marine mammals are expected to move away from a noise source that is annoying before it becomes potentially injurious;
- (2)...cetaceans would have to be closer than 940 m (0.6 mi) in deep water when the full array is in use at a 9 m (29.5 ft) tow depth from the vessel to be exposed to levels of sound (180 dB) believed to have a minimal chance of causing permanent threshold shift;
- (3)...marine mammals would have to be closer than 3,850 m (2.4 mi) in deep water when the full array is in use at a 9 m (29.5 ft) tow depth from the vessel to be exposed to levels of sound (160 dB) believed to have a minimal chance at causing temporary threshold shift; and
- (4) [t]he likelihood that marine mammal detection ability by trained observers is high at that short distance from the vessel.

As described in the following paragraphs, the Commission's concerns regarding the proposed authorization are, for the most part, the same as those raised in its 8 June 2009 letter (enclosed) regarding the applicant's request to conduct similar activities in the northeast Pacific Ocean in 2009.

Modeling Exclusion Zones

The application uses corrected empirical measurements of propagation loss from the Gulf of Mexico in 2007–2008 (Tolstoy et al. 2009) as the basis for the estimated exposures and exclusion (safety) zones in the North Pacific. However, propagation of sound is dependent upon various location-specific environmental parameters including sound speed profiles, surface ducts, wind speed, bathymetry, water depth, and tow depth. The Marine Mammal Commission therefore recommends that the National Marine Fisheries Service require the applicant to use location-specific environmental parameters to re-estimate exclusion zones and verify the estimates with field measurements prior to or at the beginning of the study. Similarly, the Marine Mammal Commission recommends that the National Marine Fisheries Service require the applicant to re-estimate exposures based upon location-specific environmental parameters and associated ensonified areas.

Monitoring

Visual monitoring. The Service's preliminary determination is based, in part, on the presumed efficacy of the monitoring measures. However, as discussed in the Commission's previous letters commenting on similar activities by this and other applicants, and as recognized by the Service in its previous *Federal Register* notices on similar requests, visual monitoring typically is not effective during periods of bad weather or at night and, even with good visibility, observers are unable to detect marine mammals when they are below the surface or beyond visual range. In fact, one of the Service's own scientists (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 zones—particularly when those zones include all areas within 940 m (0.6 mi) and 3,850 m (2.4 mi) of the vessel. 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 planned monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified exclusion 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 at night, and (4) explain how close to the vessel marine mammals must be for observers to achieve the anticipated high nighttime detection rate. If such information is not available, the Service and the applicant should undertake the studies needed to verify that the proposed monitoring program is likely to detect all or nearly all marine mammals in or near exclusion zones and/or to encourage development of alternative means of detecting marine mammals in or near those zones.

The *Federal Register* notice states that five observers will be based aboard the *Langseth*, and at least one observer and “when practical, two observers” will monitor marine mammals near the seismic vessel during ongoing daytime operations and nighttime start-ups of the airguns (noting that the use of two observers simultaneously will increase the effectiveness of detecting animals near the source vessel). It further notes that the applicant also will instruct other crew to assist in detecting marine mammals and implementing mitigation requirements if practical. The terms “when practical” and “if practical” are not clear in this instance. Similarly, the notice states that, “when feasible,” marine mammal observers will make observations during daytime periods when the seismic system is not operating to compare sighting rates and animal behavior when airguns are operating versus when they are not. Here again, the term “when feasible” is not clear. The Marine Mammal Commission recommends that before issuing the requested authorization, the Service clarify the qualifiers “when practical,” “if practical,” and “when feasible” with respect to (1) using two marine mammal observers to monitor the exclusion zone for marine mammals during daytime operations and nighttime start-ups of the airguns, (2) using crew members to assist observers in detecting marine mammals and implementing mitigation requirements, and (3) using marine mammal observers during daytime periods to compare sighting rates and animal behavior during times when seismic airguns are and are not operating. In light of the number of similar surveys previously conducted by the applicant, it may be possible for the applicant to estimate how frequently it expects such expansion of observer effort to be implemented.

In addition, the notion that informative comparisons can be made of marine mammal observations when airguns are and are not firing depends on the periods of time that the airguns are silent. If firing of the airguns causes marine mammals to depart an area or alter their behavior, a comparison after the airguns are silenced would be meaningful only if it involved sufficient time for the marine mammals in the area to return to their normal distribution and behavior. If the time taken for the animals to return to their normal distribution and behavior exceeds the period that the airguns are silent, then any comparison would be largely meaningless as an indicator of the effects of seismic disturbance. A more meaningful approach would be to assess sighting rates in an area before the seismic study to evaluate baseline conditions and then again during and after the survey to assess immediate impacts and recovery from those impacts. With that in mind, the Marine Mammal Commission recommends that the National Marine Fisheries Service propose to the Lamont-Doherty Earth Observatory that it revise its study design to add pre- and post-seismic survey assessments as a way of obtaining more realistic baseline sighting rates for marine mammals, as well as better assessment of impacts and recovery from those impacts.

With regard to passive acoustic monitoring, the *Federal Register* notice states that the applicant 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, and its value is limited by water depth and other environmental factors as well as by the characteristics of the vocal repertoires of the species in the area. The effectiveness of such monitoring will depend on the ability of the acoustic system and its operators to locate vocalizing cetaceans and determine whether an acoustically detected cetacean is

within the shutdown radius or in a position such that the ship's movement will place the animal within the shutdown radius. Cetaceans that are on the trackline may be particularly hard to detect but are of relatively greater concern.

In this regard, the *Federal Register* notice states that “the towed hydrophones will *ideally* be monitored 24 hr/d while at the seismic survey area during airgun operations, and during most periods when the *Langseth* is underway while the airguns are not operating” (emphasis added). The notice further states that passive acoustic monitoring will complement the visual monitoring program “if practicable.” The notice does not describe the conditions that would render the use of passive acoustic monitoring impracticable. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service clarify the qualifier “ideally,” including the conditions under which the towed hydrophones would not be monitored, and clarify and describe the conditions that it assumes would render the use of passive acoustic monitoring impracticable for supplementing the visual monitoring program.

Monitoring prior to start-up and resumption of airgun activity. The Service's *Federal Register* notice states that the applicant will monitor the area for at least 30 minutes prior to the planned initiation of airgun operations. The notice also states that when airguns have been powered down or completely shut down because a marine mammal has been detected near or within a proposed exclusion zone, airgun activity will not resume until the marine mammal is outside the exclusion zone (i.e., the animal visually is observed to have left the exclusion zone or 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). However, several species of cetaceans for which the applicant is seeking incidental take authority remain submerged on most dives for more than 30 minutes. 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 [4,592 ft]) and can remain submerged for nearly an hour (Tyack et al. 2006, Baird et al. 2006). In addition, observers may not detect these animals each time they return to the surface. Accordingly, monitoring for 30 minutes prior to the planned start or resumption of airgun operations is not sufficient to allow detection of those species. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service extend the monitoring period to at least one hour before initiation of seismic activities and at least one hour before the resumption of airgun activities after a shutdown because of a marine mammal sighting within an exclusion zone.

Mitigation

Ramp-up procedures. As the Commission has noted in previous correspondence, the effectiveness of ramp-up has yet to be empirically verified. The Service should not continue to assume that ramp-up constitutes effective mitigation without empirical verification. Such verification may require not only collecting opportunistic data but also designing and conducting studies to test specific hypotheses regarding the utility of ramp-up and analysis of responses of the various species encountered. For those reasons, the Marine Mammal Commission recommends that the National Marine Fisheries Service require that observations be made during all ramp-up procedures to gather the data needed to analyze and report on their effectiveness as mitigation. Such analyses would

provide a stronger scientific basis for this particular monitoring measure. As it has noted in past correspondence, the Commission would be pleased to discuss with the Service the collection and analysis of such data and the design of such experiments to promote a better understanding of the utility and shortcomings of ramp-up as a mitigation measure.

Discrepancies To Be Addressed

Descriptions of the proposed action include discrepancies within the application and between the application and the Service's *Federal Register* notice. The Marine Mammal Commission recommends that the National Marine Fisheries Service and the applicant correct these discrepancies before the Service issues the authorization. Examples are as follows.

The last paragraph on page 8 of the application states that “[t]hirty-three cetacean species, including 26 odontocete (dolphins and small- and large-toothed whales) species and seven mysticetes (baleen whales) may occur in the Shatsky Rise study area...” but then goes on to state that “[i]nformation on the occurrence, distribution, population size, and conservation status for each of the 34 marine mammal species that may occur in the proposed study area is presented in Table 2.” The text of the *Federal Register* notice refers to 34 species of marine mammals that could be taken by harassment, but Table 3 in the notice (Estimates of the Possible Numbers of Marine Mammals Exposed to Different Sound Levels during L-DEO's Proposed Seismic Survey at Shatsky Rise during July–September, 2010) lists only 32 species.

In addition, the application (page 43, paragraph 4) states that “[t]here is some uncertainty about the representativeness of the density data and the assumptions used in the calculations...” and “...there is uncertainty with respect to the expected marine mammal densities during this time.” However, the application on page 45 (paragraph 3) states that “[t]he *Requested Take Authorization*, ..., is based on the best estimates rather than the maximum estimates of the numbers exposed, because there was little uncertainty associated with the method of estimating densities.” This latter statement is both contradictory with the statement on page 43 and incorrect, inasmuch as the Service's *Federal Register* notice clearly states that “[t]he requested take authorization, given in the far right column of Table 4 of L-DEO's application, is based on the maximum estimates rather than the best estimates of the numbers of individuals exposed, because of uncertainties associated with applying density data from one area to another.”

Also, the application states that the estimated numbers of individual marine mammals potentially exposed to sound from the airgun operations are based on the 160-dB re 1 μ Pa (rms) threshold for all cetaceans, but then also states that a 170-dB re 1 μ Pa (rms) threshold will be used for delphinids, Dall's porpoises, and pinnipeds. It is not clear why the applicant is using 170-dB 1 μ Pa (rms) as a threshold for these latter species. In fact, the *Federal Register* notice states that “[t]he estimated numbers of individuals potentially exposed are based on the 160-dB re 1 μ Pa (rms) criterion for all cetaceans.... It is assumed that marine mammals exposed to airgun sounds that strong might change their behavior sufficiently to be considered ‘taken by harassment.’” The Marine Mammal Commission recommends that the National Marine Fisheries Service advise the applicant of the need to use the 160-dB re 1 μ Pa (rms) threshold for all cetaceans as currently used by the Service or to explain the basis for using some other sound level as the appropriate threshold.

Mr. P. Michael Payne
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Meeting Request

As discussed in previous correspondence to the Service, seismic studies introduce a large amount of acoustic energy into the marine environment, and existing data are not sufficient for describing effects on cetacean species (with the possible exception of the sperm whale). The Commission believes that the action agency and contractor (i.e., National Science Foundation and Lamont-Doherty) bear primary responsibility for carrying out the studies needed to reduce the uncertainty and that the authorizing and oversight agencies (i.e., National Marine Fisheries Service and Marine Mammal Commission) also have a degree of responsibility. Indeed, the Commission believes that these issues can best be addressed jointly. Therefore, the Commission requests a meeting with the National Marine Fisheries Service, National Science Foundation, and Lamont-Doherty Earth Observatory to discuss (1) existing research plans and (2) needs regarding monitoring and mitigation measures. The Commission will take the initiative to arrange such a meeting.

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

Sincerely,



Timothy J. Ragen, Ph.D.
Executive Director

Enclosure

Literature Cited

- 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.



MARINE MAMMAL COMMISSION

November 24, 2010

Ms. Holly Smith
National Science Foundation
Division of Ocean Sciences, Room 725
4201 Wilson Boulevard
Arlington, VA 22230

Dear Ms. Smith:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the Draft Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research funded by the National Science Foundation or conducted by the U.S. Geological Survey. The Commission also has reviewed the Foundation's 8 October 2010 *Federal Register* notice (75 Fed. Reg. 62433) requesting comments. When appropriate, the Commission will comment in more detail on site-specific research activities associated with this program. For now, the Commission offers the following recommendations and rationale.

RECOMMENDATIONS

The Marine Mammal Commission recommends that the National Science Foundation and the U.S. Geological Survey—

- be prepared to conduct supplemental environmental analyses under the National Environmental Policy Act once the details pertaining to specific proposed seismic studies become available;
- redefine the alternatives considered in the programmatic analysis to encompass the broad technological, monitoring, and mitigation issues that pertain to all marine seismic research and provide a clear basis for choosing among options by decision-makers and the public;
- require for each proposed project specific mitigation and monitoring requirements tailored to such things as the species present in the research area, their natural history and status (e.g., endangered, threatened), pertinent oceanographic and bathymetric features, and the proposed operations;
- develop guidelines for cruise research design and planning that would minimize the potential impacts of seismic research on marine mammals and other protected species;
- work with their observers, observer service providers, the National Marine Fisheries Service, the Fish and Wildlife Service, and other stakeholders to establish and implement standards for protected species observers to improve the quality and usefulness of information collected during marine seismic surveys;
- establish requirements for analysis of data collected by the observers to ensure that those data are used both to estimate potential effects on marine mammals and to inform the continuing development of mitigation and monitoring measures;

- provide additional justification for their preliminary determination that the mitigation and monitoring measures that depend on visual observations would be sufficient to detect, with a high level of confidence, all marine mammals within or entering identified mitigation zones; and
- provide, to the extent possible, a comprehensive analysis of the cumulative impacts expected from seismic surveys themselves, but then be prepared to conduct additional cumulative impact analyses for future specific seismic studies in the context of all the other factors in the pertinent human environment; that is, the human environment where seismic studies have been proposed.

RATIONALE

Programmatic Approach and Site-Specific Analyses

Federal agencies are required to comply with the National Environmental Policy Act before they make final decisions about proposed federal actions that could impact the human environment. The National Science Foundation has identified proposed marine seismic research that it will fund or that the U.S. Geological Survey will conduct as federal actions requiring such environmental review. In the past, the Foundation has prepared environmental assessments to analyze the environmental impact of individual cruises or surveys and posted the assessments on the Foundation's website for public review and comment¹. The Marine Mammal Commission concurs with the Foundation and the Survey that a programmatic analysis such as the one under consideration here may help streamline environmental reviews needed for marine seismic research.

However, a programmatic approach also has its limitations. The Foundation and the Survey state that they cannot anticipate fully the actual types of research activities that they will fund or conduct during the next several years and therefore have limited their programmatic analyses to "exemplary areas" based on past activities. Although a focus on such areas may be useful for the purpose of completing a programmatic analysis, such a focus does not provide assurance that all area-specific considerations are adequately described in the analysis. In addition, other factors such as season, protected resources at risk, environmental conditions, and the precise nature of future studies may not be adequately described using a programmatic approach based on exemplary areas. The Foundation's *Federal Register* notice acknowledges such limitations and states that subsequent project- and cruise-specific analyses will be needed to evaluate specific research projects. The Marine Mammal Commission concurs with this assessment and recommends that the National Science Foundation and the U.S. Geological Survey be prepared to conduct supplemental environmental analyses under the National Environmental Policy Act once the details pertaining to specific proposed seismic studies become available. The Marine Mammal Commission requests that the National Science Foundation and the U.S. Geological Survey provide the Commission with copies of these supplemental environmental analyses as they are made available for public review and comment.

¹ <http://www.nsf.gov/geo/oce/envcomp/index.jsp>

Action Alternatives

Past environmental assessments have generally discussed only two alternatives; the No Action Alternative (i.e., research is not conducted) and the Preferred Alternative (a single statement of proposed mitigation measures for a specific research program). This narrow range of alternatives is contrary to guidance provided by the Council on Environmental Quality in regulations implementing the National Environmental Policy Act. This guidance states that environmental documents “should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public.”

The draft programmatic environmental impact statement identifies two action alternatives. Alternative A would require cruise-specific mitigation measures for all energy sources, whereas Alternative B (the preferred alternative) would require cruise-specific mitigation measures except for low-energy acoustic sources, which would require only generic mitigation measures. The Commission does not consider these proposed alternatives to be sufficient to define sharply the issues and provide a clear basis for choice among alternatives. Indeed, both of these alternatives would be carried out in identical fashion for all but low-energy sources. Undoubtedly, the programmatic analysis will be limited because the specifics of future seismic studies are not known. However, in developing the analysis, the Foundation and the Survey should be able to provide a full description of the various types of technology that are involved, their utility for various purposes and in various locations, their characteristics (in addition the amount of energy involved), and the types and severities of the risks involved. By including such information in the analysis the agencies will inform the public and decision-makers regarding the various technologies and research approaches that are available and the tradeoffs in terms of information gained versus risks presented. In addition, the agencies should be able to provide a full description of the kinds of mitigation measures that might be used, and their utility and shortcomings under different circumstances. Also, the Commission understands that the Foundation helps researchers design their proposed actions in ways that minimize effects on marine mammal populations. The Commission gratefully acknowledges such efforts, and believes that the guidance given to researchers should be described in the programmatic analysis and may provide a basis for additional alternatives to be considered.

The alternatives in the programmatic analysis will determine whether and to what extent it provides an adequate foundation from which to tier future project-specific analyses. To that end, the Marine Mammal Commission recommends that the National Science Foundation and the U.S. Geological Survey redefine the alternatives considered in the programmatic analysis to encompass the broad technological, monitoring, and mitigation issues that pertain to all marine seismic research and provide a clear basis for choosing among options by decision-makers and the public. Doing so should then allow the agencies to focus their attention on specific matters when particular studies are analyzed.

Site- and Species-Specific Mitigation and Monitoring Measures

The National Marine Fisheries Service has indicated that cruise-specific analyses of impacts will be required for the issuance of incidental take authorizations under the Marine Mammal Protection Act and/or incidental take statements under the Endangered Species Act. These authorizations likely will have cruise-specific mitigation and monitoring requirements based on potential impacts on the marine mammal species expected to be in the study area. The Marine Mammal Commission agrees with the need for such specificity and recommends that the National Science Foundation and the U.S. Geological Survey require for each proposed project specific mitigation and monitoring requirements tailored to such things as the species present in the research area, their natural history and status (e.g., endangered, threatened), pertinent oceanographic and bathymetric features, and the proposed operations.

Guidance for Applicants

The draft programmatic environmental impact statement indicates that the design of any specific survey requires consideration of the trade-off among the range and resolution of different sound sources, the timing of the survey and seasonal sea conditions, research vessel transit times, and the availability of properly outfitted vessels. Whether and to what extent researchers consider potential impacts on marine mammals and other protected species is not clear. If staff from the Foundation and/or Survey spend considerable time and effort helping researchers redesign their studies to minimize impacts on marine mammals, then it may be useful for the agencies to provide guidelines for research that scientists could incorporate into their original research design and planning efforts. For that reason, the Marine Mammal Commission recommends that the National Science Foundation and the U.S. Geological Survey develop guidelines for cruise research design and planning that would minimize the potential impacts of seismic research on marine mammals and other protected species. The Commission would be pleased to assist in developing such guidelines.

Collection of Information by Protected Species Observers

The Foundation and the Survey propose to deploy protected species observers aboard seismic survey vessels, whether the research is funded by the Foundation or conducted by the Survey. The agencies would consult with the Office of Protected Resources at the National Marine Fisheries Service regarding the observers' qualifications. The National Marine Fisheries Service has developed standards for the selection and training of fisheries observers, and it has made preliminary recommendations to improve protected species observer programs generally, including recommendations for program management, data reporting, training and eligibility, standards of conduct and conflict of interest, and safety. Those recommendations have not yet been implemented in the training of observers for seismic studies and the qualifications and training of observers on seismic vessels varies considerably. The lack of uniform standards undermines the quality (e.g., accuracy, reliability) of information available to assess the impact of seismic activities on marine mammals. To address this concern, the Marine Mammal Commission recommends that the National Science Foundation and the U.S. Geological Survey work with their observers, observer service providers, the National Marine Fisheries Service, the Fish and Wildlife Service, and other

stakeholders to establish and implement standards for protected species observers to improve the quality and usefulness of information collected during marine seismic surveys. In addition, the Commission recommends that the Foundation and Survey establish requirements for analysis of data collected by the observers to ensure that those data are used both to estimate potential effects on marine mammals and to inform the continuing development of mitigation and monitoring measures.

Visual Mitigation and Monitoring Measures

The Foundation's analysis of impact on marine mammals is based, in part, on the presumed efficacy of the proposed visual mitigation and monitoring measures. The effectiveness of visual monitoring is limited and varies considerably depending on conditions, as has been determined from extensive data and experience in the field of marine mammal assessment. For example, visual monitoring typically is not effective at night or during periods of bad weather and, even with good visibility, observers are unable to detect marine mammals when they are below the surface or beyond visual range. Determining the efficacy of mitigation and monitoring measures may require not only collecting opportunistic data but also designing and conducting studies to test specific hypotheses regarding the utility of visual observations and to evaluate responses of the various species encountered. Because the efficacy of visual observation can vary markedly depending on circumstances, the Marine Mammal Commission recommends that the National Science Foundation and the U.S. Geological Survey provide additional justification for their preliminary determination that the mitigation and monitoring measures that depend on visual observations would be sufficient to detect, with a high level of confidence, all marine mammals within or entering identified mitigation zones. At a minimum, such justification should describe (1) detection probability as a function of distance from the vessel and (2) changes in detection probability under various sea state and weather conditions. If such information is not available, the Foundation and the Survey should undertake the studies needed to verify that the proposed mitigation and monitoring measures are likely to detect all or nearly all marine mammals in or near mitigation zones and, if necessary, to develop alternative means of detecting marine mammals in or near those zones. The Commission would be pleased to continue discussions with the Foundation and the Survey regarding the design of such experiments to promote a better understanding of the utility and shortcomings of visual observations for monitoring and mitigation purposes.

Analysis of Cumulative Impacts

The Council on Environmental Quality's regulations implementing the National Environmental Policy Act require that an analysis of cumulative impacts include not only the impacts of the proposed action, but also the "incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR § 1508.7). Therefore, the Foundation and the Survey must not limit their analysis of cumulative effects only to the expected impact of research funded by the Foundation or conducted by the Survey.

Contrary to the Council's regulations, that appears to be exactly what the Foundation and Survey have done in the draft impact statement. The statement lists other activities, such as oil and

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gas exploration and production, recreation, tourism and commercial vessel traffic, military exercises and operations, fishing operations, hunting and/or incidental mortality, and pollution, but provides few details regarding the impact of these activities on marine mammals. It also does not mention other potentially important natural and human-related impacts, such as disease, natural toxins, predation, weather and climatic influences, or ingestion of debris. More importantly, the impact statement provides little analysis or discussion of how the proposed action, together with the total effects of all of these factors, might affect marine mammals. Instead, the draft impact statement mentions only the impacts of proposed marine seismic research funded by the Foundation or conducted by the Survey when it concludes there would not be any significant cumulative impacts to marine resources.

Furthermore, the Foundation justifies this conclusion simply by stating that pre-cruise planning and coordination with other ongoing and planned activities, as well as mitigation and monitoring during proposed seismic operations, would minimize cumulative impacts to an insignificant level. The Commission does not agree that such a blanket statement can be made without a reasoned analysis to support it. First, it is not possible to do a cumulative effects analysis that encompasses all future seismic projects. Such an analysis must take into account not only the effects of a specific project, but also the effects of all other human impacts in the area and at the time of the proposed study. Because the Foundation and the Survey have recognized already that they cannot predict exactly where and when they will fund or conduct such studies, the Commission does not see how the agencies can describe in advance the other factors that must be considered in a cumulative effects analysis. Second, the added effects of a specific project cannot be dismissed based simply on an expectation or promise of future remedies. To do so would be contrary to the whole purpose of an environmental impact statement. To address this shortcoming, the Marine Mammal Commission recommends that the National Science Foundation and the U.S. Geological Survey provide, to the extent possible, a comprehensive analysis of the cumulative impacts expected from seismic surveys themselves, but then be prepared to conduct additional cumulative impact analyses for future specific seismic studies in the context of all the other factors in the pertinent human environment; that is, the human environment where seismic studies have been proposed.

The Commission hopes that these recommendations and comments are helpful. Please contact me if you have any questions about them.

Sincerely,



Timothy J. Ragen, Ph.D.
Executive Director

cc: Jon Childs, U.S. Geological Survey