



MARINE MAMMAL COMMISSION

8 July 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 U.S. Geological Survey 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-western Bering Sea in August 2011. The Commission also has reviewed the National Marine Fisheries Service's 8 June 2011 *Federal Register* notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (76 Fed. Reg. 33246).

RECOMMENDATIONS

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

- require the U.S. Geological Survey 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 U.S. Geological Survey to provide a detailed justification (1) for basing the exclusion and buffer zones for the proposed survey in the Bering Sea 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 best densities and re-estimate the anticipated number of takes;
- if the Service is planning to allow the applicant to resume full power after 8 minutes under certain circumstances, specify in the authorization all conditions under which an 8-minute period could be followed by a full-power resumption of the airguns;
- 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., the U.S. Geological Survey and Lamont-Doherty Earth Observatory) 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 U.S. Geological Survey to monitor, document, and report observations during all ramp-up procedures;
- work with the National Science Foundation to analyze monitoring 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; and
- condition the incidental harassment authorization to require the Survey to (1) report immediately all injured or dead marine mammals to the Service and (2) suspend the geophysical survey if a marine mammal is seriously injured or killed and the injury or death could have been caused by the survey (e.g., a fresh dead carcass); if additional measures are not likely to reduce the risk of additional serious injuries or deaths to a very low level, require the Survey to obtain the necessary authorization for such takings under section 101(a)(5)(A) of the Marine Mammal Protection Act before allowing it to continue this survey or initiate additional surveys.

RATIONALE

The National Science Foundation is funding the U.S. Geological Survey (Survey), with the Lamont-Doherty Earth Observatory as the operator, to conduct a geophysical survey in the central-western Bering Sea from 350–800 km offshore in the area 55 to 58.5° N latitude and 177° W to 175° E longitude. The purpose of the proposed survey is to collect seismic reflection and refraction profiles to delineate the U.S. Extended Continental Shelf in the Bering Sea. The survey would be conducted in water depths greater than 3,000 m, with approximately 2,420 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 μ Pa (peak-to-peak) with a maximum discharge volume of 6,600 in³). The *Langseth* also would tow one hydrophone streamer, 8 km in length, coupled with up to 18 ocean-bottom seismometers. The Survey also 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 12 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 6 June 2011) regarding geophysical surveys funded by the National Science Foundation. In addition, the Commission sent a letter to the Service on 21 June 2011 (see enclosure) regarding incorrect and inconsistent information in the *Federal Register* notice and between the notice and the revised application submitted by the Survey. The Service has acknowledged that the correct information regarding marine mammal occurrence and density is contained in the revised application. However, the Service corrected and republished only a portion of that information in a subsequent *Federal Register* notice. The Commission continues to believe that the significant errors contained in the original *Federal Register* notice can be amended only through the publication of a revised notice that includes all of the corrected information.

Uncertainty in Modeling Exclusion and Buffer Zones

Exclusion zones are intended to protect marine mammals that are close enough to a sound source to be injured (i.e., Level A harassment) or killed by exposure to the sound. Buffer zones are used to delineate the area in which Level B harassment may occur and to estimate the number of marine mammals that may be taken. 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 *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, which the National Science Foundation subsequently followed 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 Bering Sea survey, the Survey used that model to estimate exclusion and buffer zones for the mitigation airgun. In contrast, the Survey 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 Alaska. It cited Appendix A as providing the basis for doing so, but Appendix A only discussed deviations of the model from empirical measurements for the 36-airgun array in deep and intermediate depths. In addition, the Survey adjusted the exclusion and buffer zones for the 36-airgun array that were obtained at a tow depth of 6 m to zones based on a tow depth of 9 m using the ratios of the applicable zones and depths. However, such an adjustment may not be valid because, as the Survey itself notes, the relationship between tow depth and sound exposure level is not linear (see Appendix A of the environmental assessment for the proposed survey).

Thus, in the end, 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 Bering Sea, and (3) sound sources that are different than what are to be used (i.e., the 36-airgun array vs. the single mitigation airgun). These problems might be less significant if monitoring and mitigation measures for this type of activity were known to be highly effective, but as is well known, and as is described below, that also is not the case.

On numerous occasions the Commission has recommended that the Service or the Survey estimate exclusion and buffer zones using either empirical measurements relevant to 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). Indeed, the National Science Foundation's draft programmatic environmental impact statement concerning geophysical surveys reported modeling results for five "exemplary areas," all based on site-specific information. One of those exemplary areas is in the Gulf of Alaska, near where the proposed survey is planned. The draft programmatic environmental impact statement indicated that "[t]he summer sound speed profile in the W Gulf of Alaska has a strong sound channel at 70 m depth (Figure B-7). This shallow sound channel is expected to trap much of the acoustic energy from an airgun array at the surface, resulting in ducted propagation and lower transmission loss at this site." The presence of the sound channel and its effect on sound propagation is a case-in-point and raises questions regarding the validity of using information collected in the Gulf of Mexico as the basis for predicting sound propagation in the Bering Sea.

To address these shortcomings, the Marine Mammal Commission recommends that the National Marine Fisheries Service require the U.S. Geological Survey 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 U.S. Geological Survey to provide a detailed justification (1) for basing the exclusion and buffer zones for the proposed survey in the Bering Sea

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 Survey 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 the size of the areas it expects to be ensonified to a level sufficient to result in harassment by 25 percent. The revised application submitted by the Survey indicated some uncertainty in the representativeness of the marine mammal density data it was using because of seasonal and habitat-related considerations. Specifically, the surveys from which cetacean densities were derived were conducted in June–July, whereas, the proposed seismic survey would occur in August. In addition, those surveys were conducted in shelf and slope waters less than 500 m in depth, whereas the proposed survey would occur in waters greater than 3,000 m in depth. In the revised application, the Survey used best density estimates (i.e., effort-weighted mean densities) to estimate the number of marine mammal takes rather than maximum densities derived from an individual survey. The problem here is not with that method per se, but with the data being used, which likely are not representative of the abundance or distribution of marine mammals in the proposed survey area. 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 has used maximum densities to estimate the number of takes because of similar uncertainties regarding the density data. For the proposed geophysical survey, the sources of uncertainty regarding the abundance and distribution of marine mammals likely are greater for pelagic species such as sperm and beaked whales, but the Service is using a less cautious approach. Given the nature of the uncertainty and the need to ensure adequate protection, the Marine Mammal Commission recommends that the National Marine Fisheries Service use the species-specific maximum densities rather than the best densities and re-estimate the anticipated number of takes.

Mitigation and Monitoring Measures

The *Federal Register* notice states that the Survey will monitor the area near the seismic 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 will not resume until the marine mammal is outside the exclusion zone (i.e., the animal 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, the *Federal Register* notice also indicates that ramp-up procedures could begin only 8 minutes after a marine mammal sighting based on the theory that the movement of the *Langseth* would result in sufficient separation during that timeframe. The Survey has clarified that the 8-minute period would be used only in specific circumstances (i.e., an equipment failure that is fixed quickly when no marine mammals have been observed within the exclusion zone before or during the failure, or when a marine mammal is seen within the exclusion

zone but is observed leaving the exclusion zone). The Survey further explains that, in such instances, it would not complete a full ramp-up cycle (i.e., a 6-dB increase every five minutes) but would restart the airguns at full power. Resumption of the full array after the abbreviated timeframe may be reasonable in those specific circumstances, but may pose an unacceptable level of risk in others. If the Service is planning to allow the Survey to resume full power after 8 minutes under certain circumstances, then the Marine Mammal Commission recommends that the National Marine Fisheries Service specify in the authorization all conditions under which an 8-minute period could be followed by a full-power resumption of the airguns.

The Commission also continues to believe that a 30-minute pause in airgun activity following a marine mammal sighting is insufficient 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. For these reasons, monitoring for 30 minutes prior to the initiation or resumption of airgun operations likely is not sufficient to detect all marine mammal species within the exclusion zone. The National Marine Fisheries Service has stated that observers would be monitoring the exclusion zones for nearly one hour before airguns are at their maximum output, because 30 minutes would be devoted to monitoring before the airguns are ramped up and it would take nearly 30 minutes for the airguns to ramp up to full power. The Service also believes that it is likely that any marine mammal would be seen during the time it would take to ramp-up the airguns based on the dive times and associated surface intervals of those species. However, the Service does not provide any quantitative data to support this contention and it is not consistent with data collected from marine mammal surveys for 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 zones – particularly when those zones extend as far as 3,850 m from the vessel. The environmental conditions likely to be encountered in the Bering Sea can be expected to make detection even more difficult. It also is not clear that the Service's explanation considers any movement of the vessel. 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., the U.S. Geological Survey and Lamont-Doherty Earth Observatory) 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 U.S. Geological Survey 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.

Level A Harassment and Mortality

The Survey is not seeking authorization to take marine mammals by serious injury or mortality. The *Federal Register* notice indicates that the Survey would report all injured or dead marine mammals to the Service, but the notice does not stipulate who would be responsible for judging if an observed injury or death resulted from the proposed activities. The Commission believes that the National Marine Fisheries Service should make such a determination after consultation with the Survey. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service condition the incidental harassment authorization to require the Survey to (1) immediately report all injured or dead marine mammals to the Service and (2) suspend the

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geophysical survey if a marine mammal is seriously injured or killed and the injury or death could have been caused by the survey (e.g., a fresh dead carcass). The Service should investigate the incident to assess the cause and full impact (e.g., the types of injuries, the number of animals involved) and to determine what modifications in survey procedures are needed to avoid additional injuries or deaths. Full investigation of such incidents is essential to provide information regarding the potential impact of geophysical surveys on marine mammals. If additional measures are not likely to reduce the risk of additional serious injuries or deaths to a very low level, the Service should require the Survey to obtain the necessary authorization for such takings under section 101(a)(5)(A) of the Marine Mammal Protection Act before allowing it to continue this survey or initiate additional surveys.

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

Sincerely,

A handwritten signature in blue ink that reads "Peter O Thomas, Sr".

Timothy J. Ragen, Ph.D.
Executive Director

Enclosures

References

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