



# MARINE MAMMAL COMMISSION

12 March 2013

Mr. P. Michael Payne, Chief  
Permits and Conservation 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 Gulf of Mexico in April and May 2013. The Commission also has reviewed the National Marine Fisheries Service's 20 February 2013 notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (78 Fed. Reg. 11821).

## 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 Survey to provide a detailed justification for (1) basing the exclusion and buffer zones for the proposed survey on modeling that does not incorporate site-specific environmental parameters and has been documented to underestimate the size of those zones and (2) how tow depth was incorporated into the model;
- require the U.S. Geological Survey to re-estimate the numbers of takes by including those takes that would occur if the survey repeats a subset of the tracklines using the single airgun, which would be in addition to takes that occur during turns and equipment testing or that occur because of equipment failure/poor data;
- prohibit the use of only a 15-minute pause following the sighting of a mysticete or large odontocete in the exclusion zone and extend that pause to cover the maximum dive times of the species likely to be encountered prior to initiating ramp-up procedures after a shutdown;
- consult with the U.S. Geological Survey and other relevant entities (e.g., the National Science Foundation 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 numbers of marine mammals taken—the assessment should account for availability biases and the detection biases of the geophysical survey observers; and

- work with the National Science Foundation to analyze monitoring data to assess the effectiveness of ramp-up procedures as a mitigation measure for geophysical surveys.

## RATIONALE

The U.S. Geological Survey proposes to conduct a geophysical survey in two lease blocks off Louisiana in the area 26 to 28° N latitude and 90 to 92° W longitude. The purpose of the proposed survey is to develop technology and collect data to characterize marine gas hydrates to understand their impact on seafloor stability, their role in climate change, and their potential as an energy source. The survey would be conducted in waters 1,500 to 2,000 m in depth with approximately 1,480 km of tracklines. It would use the R/V *Pelican* to tow a two-airgun array (nominal source level of 239.8 dB re 1 $\mu$ Pa at 1 m (peak-to-peak) with a maximum discharge volume of 210 in<sup>3</sup>) at 3 m depth. The Survey would use a single 35-in<sup>3</sup> airgun (2,000 psi) to resurvey a subset of the tracklines. The *Pelican* also would tow one hydrophone streamer, 450 m in length, during the survey. In addition, the Survey would operate a 3.5-kHz sub-bottom profiler and would use up to 46 bottom-mounted seismometers.

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

The Commission continues to be concerned about certain aspects of this and similar authorizations for geophysical surveys. These concerns have been raised in past Commission letters (e.g., see the enclosed letter from 14 May 2012) regarding geophysical surveys.

## Uncertainty in modeling 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.

The Lamont-Doherty Earth Observatory conducts acoustic modeling primarily for National Science Foundation-funded geophysical research, but also for some research funded and/or conducted by the Survey. For at least six years, the Observatory has estimated exclusion and buffer zones using a simple ray trace-based modeling approach that assumes a constant sound speed with no bottom interactions (Diebold et al. 2010). That model does not incorporate environmental characteristics of the specific study area including sound speed profiles, bathymetry/water depth, sediment properties/bottom loss, or absorption coefficients. However, the Observatory believes that its model generally is conservative when compared to in-situ sound propagation measurements of the R/V *Maurice Ewing*'s arrays (i.e., 6-, 10-, 12-, and 20-airgun arrays) and the R/V *Marcus G. Langseth*'s 36-airgun array from the Gulf of Mexico (Tolstoy et al., 2004; Tolstoy et al. 2009; Diebold et al. 2010). Tolstoy et al. 2004 did not measure sound propagation from the 2-airgun array in deep water (i.e., 3,200 m), but the Survey has assumed that the model likely yields conservative exclusion and buffer zones based on measurements from the *Ewing*'s other airgun array configurations. Tolstoy et al. (2004) indicated that the model underestimates the distances to the exclusion and buffer zones in shallow water for all airgun arrays, including the 2-airgun array. In addition, Diebold et al. (2010) demonstrated that the Observatory's model underestimates the near-field sound levels in waters of intermediate depth (600–1,100 m) and in far-field sound levels in waters of deep depth (1,600–1,700 m). They also attributed the bias for intermediate depths to a change in the sound speed profiles—an input that the Observatory's model does not take into account. In fact, Diebold et al. (2010) noted the limited applicability of the Observatory's model when sound propagation is dependent on water depth, bathymetry, and bottom-loss parameters, all of which may be of concern for a survey in water depths of 1,500–2,000 m.

The Commission's concerns are reinforced by the findings of Tolstoy et al. (2009). That paper acknowledged that sound propagation depends on water depth, bathymetry, and tow depth of the array. It not only stated that sound propagation varies with environmental conditions but also used that variation as justification for measuring sound propagation at multiple locations. The Survey and National Science Foundation subsequently followed that example, by modeling sound propagation under various environmental conditions when they prepared their recent programmatic environmental impact statement for geophysical surveys worldwide. The Observatory and Foundation also used a similar modeling approach in the recent incidental harassment authorization application and associated environmental assessment for a geophysical survey of Diablo Canyon in California (77 Fed. Reg. 58256). All of these issues raise questions regarding the efficacy of the Observatory's model for estimating received sound levels at various distances and for establishing exclusion and buffer zones.

In preparation for the Gulf of Mexico survey, the Survey used the Observatory's model to estimate exclusion and buffer zones for the 2-airgun array. However, it did not stipulate how it accounted for a tow depth of 3 m. In previous authorizations, the Observatory made the adjustment using the ratios of the applicable Level A and B harassment zones and tow depths (see Table 1 of 77 Fed. Reg. 58256). However, such adjustments do not appear to be valid because, as the Observatory itself noted, the relationship between tow depth and sound exposure level is not linear (see Figure 6 in Appendix H of the programmatic environmental impact statement).

On numerous occasions the Commission has recommended that the Service or the Survey estimate exclusion and buffer zones using either empirical measurements from the particular survey

site or use a model that takes into account the conditions in the proposed survey area. In this instance empirical measurements were taken from the 2-airgun array in the Gulf of Mexico, but only in shallow water, which is not necessarily applicable to the deep water of the proposed survey area. Therefore, the Commission believes that the Survey should use a model that incorporates operational parameters (e.g., tow depth, source level, number/spacing of active airguns) and site-specific environmental parameters (e.g., sound speed profiles, bathymetry/water depth, sediment properties/bottom loss, and wind speed). To address these shortcomings, the Marine Mammal Commission again 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 Commission recommends that the Service require the Survey to provide (1) a detailed justification for basing the exclusion and buffer zones for the proposed survey along the mid-Atlantic Ridge on modeling that does not incorporate site-specific environmental parameters and underestimates the size of those zones and (2) a detailed explanation of how it accounted for tow depth into its estimation process.

### **Underestimating the numbers of takes**

The Survey estimated the numbers of takes expected during the proposed surveys using estimates of marine mammal densities and the sizes of the buffer zones and associated ensonified areas. To be precautionary, it also increased the sizes of the ensonified areas by 25 percent to account for turns, equipment testing, and repeating tracklines due to equipment failure or poor data. The Survey indicated that it would repeat a subset of the tracklines using the single airgun but did not provide specific information regarding the number of lines to be repeated or the timeframe in which those lines would be surveyed. Presumably, a day or more would occur between repeat passes of those lines. However, the Survey appears to assume that a marine mammal taken during the first pass and then again during the second pass need only be counted once. And, although it indicated that an animal could be taken up to seven times, it has requested authorization for only a few individuals of some species (i.e., two beaked whales). The Commission does not agree with this rationale for several reasons. First, marine mammals that remain in the survey area and are harassed during both passes are taken twice; the second harassment, or take, is not a continuation of the first. On both survey passes those animals may be startled, may abandon habitat, or may even be injured. Second, the marine mammals present in the survey area may change if the affected species are migrating or altering their distribution for other reasons. The available information is not sufficient to make the case that the individual marine mammals taken during the second pass will be the same individuals that were taken during the first pass. Marine mammals are highly mobile animals that often move into and out of an area quickly. The Commission believes that a better way to estimate takes could be to determine the estimated numbers of takes on a daily basis and then account for the number of days the survey would occur, much like is done for military and construction activities. Although cost-prohibitive, the Commission further believes that using animat dosimeters, as were used for the PEIS and currently are used for Navy activities, is a more accurate way to assess the number of takes per species/stock and the number of takes of each individual of that species/stock. For these reasons, the Marine Mammal Commission recommends that the National Marine Fisheries Service require the U.S. Geological Survey to re-estimate the numbers of takes by including those takes that would occur if the survey repeats a subset of the tracklines using the single airgun, which would be in addition to takes that occur during turns and equipment testing or that occur

because of equipment failure/poor data. The Commission would welcome a meeting with the Service, Survey, Foundation, and relevant research entities (e.g., the Observatory and Scripps Institution of Oceanography) to discuss enumeration of takes at the population and individual levels.

### **Mitigation and monitoring measures**

The *Federal Register* notice stated that the Survey would monitor the area near the survey vessel for at least 30 minutes prior to the initiation of airgun operations. The notice also stated that when airguns have been 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 pinnipeds and 30 minutes in the case of mysticetes and large odontocetes, including sperm, killer, and beaked whales). However, the *Federal Register* notice also states that ramp-up procedures would occur after only 15 minutes based on the use of a comparable period in previous incidental harassment authorizations.

In short, the Commission believes that the Service's rationale is incorrect on both biological and physical grounds. The Service's approach appears to require a 15- or 30-minute pause in activity if an animal enters an exclusion zone but, in effect, that pause is not implemented based on the notion that the sound source is moving. That approach does not make sense if the position of the marine mammal is not known. That is, the key considerations driving this measure are the relative positions of the animal and the sound source. Their relative positions over time are best estimated as a function of their positions when the marine mammal was first sighted plus the speed and heading of the vessel and the speed and heading of the marine mammal. If the vessel and marine mammal are moving in opposite directions, then the marine mammal may leave the exclusion zone relatively quickly. However, if they are moving in the same direction, then the marine mammal may remain in the exclusion zone for a prolonged period. In fact, Miller et al. (2009) determined that sperm whales continued on their course of travel during exposure to airgun sounds. None of those sperm whales diverted to avoid seismic activity at distances of 1–13 km from the vessel, and most whales traveled on a parallel course. Unless a sighted marine mammal is seen leaving or outside the exclusion zone, it does not make sense to allow the survey to resume after a shorter period of time because (1) the animal spends much of its time underwater where it is not visible, (2) it may change its heading and speed in response to the vessel, and (3) it is not possible to determine the animal's position relative to the vessel or sound source after the initial sighting unless it surfaces again and is observed.

Indeed, the efficacy of this measure depends largely on observations of the marine mammal at the surface. That being the case, the dive time of the possibly affected marine mammals is a central consideration. For small cetaceans, the Commission has recommended a pause time of at least 15 minutes because their dive times are shorter and generally fall within that limit. For some mysticetes and large cetaceans, the proposed 30-minute pause may be inadequate, sometimes markedly so. Sperm whales and beaked whales, in particular, may remain 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 zones, especially when passive acoustic monitoring is not implemented, which is the case for the proposed authorization. Therefore, the Marine Mammal Commission again recommends that the National Marine Fisheries Service prohibit the use of only a 15-minute pause following the sighting of a mysticete or large odontocete in the exclusion zone and extend that pause to cover the maximum dive times of the species likely to be encountered prior to initiating ramp-up procedures after a shutdown.

In addition, the Survey indicated that it will be able to assess possible impacts partly by comparing estimated marine mammal abundance during periods when the airguns are not firing (i.e., baseline conditions) with periods when they are. However, the efficacy of this approach depends, in part, on the length of the periods when the airguns are silent. If firing of the airguns causes marine mammals to depart an area and/or alter their behavior, a comparison after the airguns are silenced would be meaningful only if it involved sufficient time for the disturbed marine mammals to return to their normal distribution and/or behavior. If the time for such a return to normalcy exceeds the period that the airguns are silent, then any comparison would be largely meaningless as an indicator of the impact of seismic disturbance. Put frankly, the Commission does not believe that the proposed monitoring method is a scientifically sound way of assessing impacts on behavior or distribution. The Marine Mammal Protection Act requires that the National Marine Fisheries Service (for the Secretary of Commerce) put forth “requirements pertaining to the monitoring and reporting of such taking.” Although the Act is not explicit on this point, the Commission believes that Congress’s intent was that those monitoring and reporting methods be scientifically sound and yield sufficient information to confirm that the authorized taking is having only negligible impacts on the affected species and stocks. That is, the monitoring and reporting requirements should provide a reasonably accurate assessment of the types of taking and the numbers of animals taken by the proposed activity. The assessments also should account for animals present but under the water’s surface and not available for sighting (i.e., availability bias) and animals at the surface but not detected (i.e., detection bias). Those adjustments are essential for determining accurate estimates of the numbers of marine mammals taken during surveys. To be useful, the corrections should be based on the ability of the protected species observers to detect marine mammals rather than a hypothetical optimum derived from scientific studies (e.g., from the Service’s shipboard surveys). Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service consult with the U.S. Geological Survey and other relevant entities (e.g., the National Science Foundation 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 numbers of marine mammals taken—the assessment should account for availability biases and the detection biases of the geophysical survey observers. Until the Service can provide assurances that take estimates are reasonably accurate, the Commission does not see how it can continue to assume that this type of survey is having no more than a negligible impact on marine mammal populations.

### **Effectiveness of ramp-up procedures**

Although the effectiveness of ramp-up procedures has yet to be verified empirically, the Service would continue to require the 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 geophysical 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 assess the effectiveness of ramp-up procedures as a mitigation measure for geophysical surveys. The Commission continues to believe that the Service should continue to require data collection and analysis to assess the effectiveness of ramp-up procedures, given that those procedures are considered a substantial component of mitigation measures.

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

Sincerely,



Timothy J. Ragen, Ph.D.  
Executive Director

Cc: Holly Smith, National Science Foundation

Enclosure

### **Literature cited**

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