



MARINE MAMMAL COMMISSION

27 March 2012

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 Scripps Institution of Oceanography 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 southeastern Pacific Ocean in May 2012. The Commission also has reviewed the National Marine Fisheries Service's 13 March 2012 *Federal Register* notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (77 Fed. Reg. 14744).

RECOMMENDATIONS

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

- require Scripps Institution of Oceanography to re-estimate exclusion and buffer zones for the two-airgun array and associated number of marine mammal takes using operational and site-specific environmental parameters—if the exclusion and buffer zones and number of takes are not re-estimated, require Scripps to provide a detailed justification for basing the exclusion and buffer zones for the proposed survey in the southeastern Pacific Ocean on modeling that relies on measurements from the Gulf of Mexico;
- (1) use species-specific maximum densities derived by multiplying the best density estimates by a precautionary correction factor and (2) re-estimate the anticipated number of takes using that precautionary approach;
- prohibit 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; and
- work with the National Science Foundation to analyze the data collected during ramp-up procedures to help determine the effectiveness of those procedures as a mitigation measure for geophysical surveys.

RATIONALE

The National Science Foundation is funding the Scripps Institution of Oceanography to conduct a geophysical survey in the southeastern Pacific Ocean in the area 34 to 36° S latitude and 72 to 74° W longitude. Scripps would conduct the survey in waters of the Chilean exclusive economic zone. The purpose of the proposed survey is to collect seismic reflection and refraction data to monitor the post-seismic response of the outer accretionary prism of the coast of Chile. The survey would be conducted in waters 1,000–5,300 m in depth with about 1,145 km of tracklines. It would use the R/V *Melville* to tow a 2-airgun array (nominal source level of 239.8 dB re 1µPa at 1 m (peak-to-peak) with a maximum discharge volume of 210 in³) at 2 m depth. The *Melville* also would tow one hydrophone streamer, 200–800 m in length, during the survey. In addition, Scripps would operate a 10.5- to 13-kHz multibeam echosounder and a 3.5-kHz sub-bottom profiler continuously throughout the survey. Finally, Scripps would deploy approximately 10 broadband ocean bottom seismometers. Those seismometers would be left in place for one year until recovered during a subsequent survey.

The Service preliminarily has determined that, at most, the proposed activities would result in a temporary modification in the behavior of small numbers of up to 20 species of marine mammals and that any impact on the affected species would be negligible. The Service does not anticipate any take of marine mammals by death or serious injury. It also believes that the potential for temporary or permanent hearing impairment will be at the least practicable level because of the proposed mitigation and monitoring measures. Those measures include monitoring exclusion and buffer zones and using 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 27 February 2012) regarding geophysical surveys funded by the National Science Foundation.

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.

In 2003 and 2007–2008, the Lamont-Doherty Earth Observatory conducted sound propagation studies using various configurations of airgun arrays from the R/V *Maurice Ewing*

(Tolstoy et al. 2004) and R/V *Marcus G. Langseth* (Tolstoy et al. 2009). The Observatory used results from those studies to create a model of sound propagation for estimating exclusion and buffer zones. However, that model was based on a particular set of environmental conditions, and variation in such conditions is known to affect the manner in which sound propagates through the ocean. Indeed, Tolstoy et al. (2009) not only noted that results vary with environmental conditions but also used that variation as justification for measuring sound propagation at multiple locations. The National Science Foundation subsequently followed that example in its preparation of a programmatic environmental impact statement for geophysical surveys by modeling sound propagation under various environmental conditions. Furthermore, Tolstoy et al. (2009) acknowledged that sound propagation is not only variable, but also dependent on water depth and bathymetry. In addition, Tolstoy et al. (2004) indicated that the Observatory's model 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 proposed survey, Scripps used the Observatory's model to estimate exclusion and buffer zones for its two-airgun array. It did not provide details regarding the model and estimation of those zones in either its application or environmental assessment. As such, the Commission is unable to review and assess the applicability of the model and its associated exclusion and buffer zones. Other Foundation-funded applicants have used operational and site-specific environmental parameters, the Comprehensive Acoustic System Simulation/Gaussian Ray Bundle model, and the Range-dependent Acoustic Model to estimate the extent of those zones. The Commission is unsure why Scripps did not use the same methods to estimate the exclusion and buffer zones for its study. Thus, it appears that the Scripps approach is based on (1) a model with known biases as a function of water depth, (2) environmental conditions that are inconsistent with those in the southeastern Pacific Ocean, and (3) sound sources (i.e., 6-, 10-, 12-, and 20-airgun arrays) that are different than the array to be used (i.e., a 2-airgun array).

On numerous occasions the Commission has recommended that the Service or Scripps estimate exclusion and buffer zones using either empirical measurements from the particular survey site or a model that takes into account the conditions in the proposed survey area. The model should incorporate operational parameters (e.g., tow depth, source level, and number of active airguns) and site-specific environmental parameters (e.g., sound speed profiles, surface ducts, bathymetry, water depth, and wind speed). To address these shortcomings, the Marine Mammal Commission recommends that the National Marine Fisheries Service require Scripps Institution of Oceanography to re-estimate exclusion and buffer zones for the two-airgun array and associated number of marine mammal takes using operational and site-specific environmental parameters. If the exclusion and buffer zones and number of takes are not re-estimated, the Marine Mammal Commission recommends that the Service require Scripps to provide a detailed justification for basing the exclusion and buffer zones for the proposed survey in the southeastern Pacific Ocean on modeling that relies on measurements from the Gulf of Mexico. The Commission would like an opportunity to evaluate the detailed justification prior to issuance of the authorization.

Uncertainty in take estimates

Scripps estimated the number of takes expected to result from the proposed survey using the size of the buffer zones and associated ensonified areas, coupled with estimates of marine mammal densities from a previous marine mammal survey. To be precautionary, it increased by 25 percent the size of the area it expects to be ensonified to a level sufficient to result in harassment. Scripps' application and the Service's *Federal Register* notice indicated uncertainty in the representativeness of the density data and, thus, the assumptions used to calculate takes. That uncertainty was based on oceanographic conditions, including occasional El Niño and La Niña events, which influence the year-to-year distribution and numbers of marine mammals present in the equatorial tropical and southeastern Pacific Ocean. However, Scripps and the Service did not address the other types of uncertainty inherent in the density data including (1) geographical differences (i.e., the majority of the densities originated from the equatorial tropical Pacific and others originated off Patagonia), (2) temporal differences (i.e., some data were collected in the mid-1980s and the majority of the data were not collected during May when the survey would occur), and (3) accuracy of the data (i.e., some data were corrected by arbitrary percentages to account for geographical differences and arbitrary low densities were assigned to species that lacked data). In previous incidental harassment authorizations (e.g., the U.S. Geological Survey's proposed geophysical survey in the central Gulf of Alaska; 76 Fed. Reg. 18187), the Service used maximum densities to estimate the number of takes because of similar uncertainties regarding density data with respect to space and time. In the cases where only one density estimate was available (as is the case for this proposed incidental harassment authorization), the Service has calculated maximum densities for marine mammals by multiplying the best density estimate by 1.5 (e.g., 76 Fed. Reg. 18185, 76 Fed. Reg. 26276). Given the similar nature and considerable uncertainty in density estimates for marine mammals in the proposed survey area and the need to ensure adequate protection, the Marine Mammal Commission recommends that the National Marine Fisheries Service (1) use species-specific maximum densities derived by multiplying the best density estimates by a precautionary correction factor and (2) re-estimate the anticipated number of takes using that precautionary approach.

Mitigation and monitoring measures

The *Federal Register* notice states that Scripps will monitor the area near the survey vessel for at least 30 minutes prior to the initiation of airgun operations. The notice also states that when airguns have been powered down or shutdown 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.

After further review of the ramp-up measure, the Commission believes that it does not make sense biologically or physically. On its face, the power-down and shut-down mitigation measure has required a 15- or 30-minute pause in activity if an animal enters an exclusion zone. However, the related ramp-up measure has allowed the applicant to resume the survey after a shorter period of

time based on the movement of the vessel and sound source. That approach does not make sense if the position of the marine mammal is not known. That is, the key consideration driving this measure is 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. Unless the marine mammal is sighted 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 in developing mitigation measures. 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. Therefore, the Marine Mammal Commission again recommends that the National Marine Fisheries Service prohibit 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.

Effectiveness of ramp-up procedures

Although the effectiveness of ramp-up procedures has yet to be verified empirically, the Service would continue to require Scripps to monitor, document, and report observations during all ramp-up procedures. Such data will provide a stronger scientific basis for determining the effectiveness of, and deciding when to implement, this particular mitigation measure. Further, the National Science Foundation has indicated that monitoring data from past surveys are being compiled into a single database. The Commission supports that effort by the Foundation. After the data are compiled and quality control measures have been completed, the Marine Mammal Commission recommends that the National Marine Fisheries Service work with the National Science Foundation to analyze the data collected during ramp-up procedures to help determine the effectiveness of those procedures as a mitigation measure for geophysical surveys. International

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

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

Sincerely,

A handwritten signature in blue ink that reads "Timothy J. Ragen". The signature is written in a cursive style with a long horizontal stroke at the beginning.

Timothy J. Ragen, Ph.D.
Executive Director

Enclosure

References

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