29 August 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 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 western tropical Pacific Ocean in November and December 2011. The Commission also has reviewed the National Marine Fisheries Service's 29 July 2011 *Federal Register* notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (76 Fed. Reg. 45518).

RECOMMENDATIONS

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

- require Scripps to re-estimate the proposed exclusion and buffer zones for the two-airgun array and associated numbers of marine mammal takes using operational and site-specific environmental parameters—if the exclusion and buffer zones are not re-estimated for the two-airgun array, require Scripps to provide a detailed justification for basing the exclusion and buffer zones for the proposed survey in the western tropical Pacific Ocean on modeling that relies on measurements from the Gulf of Mexico;
- require Scripps to use operational and site-specific environmental parameters to estimate the exclusion zone, buffer zone, and number of marine mammal takes associated with use of the sub-bottom profiler and to incorporate those exclusion and buffer zones into the same type of mitigation and monitoring measures for the sub-bottom profiler as are proposed for the two-airgun array;
- condition the authorization to prohibit a 15-minute pause and require a longer pause before ramping up after a power-down or shut-down of the airguns, based on the presence of a mysticete or large odontocete in the exclusion zone and the *Thompson's* movement (speed and direction);
- extend the 30-minute period following a marine mammal sighting in the exclusion zone to cover the full dive times of all species likely to be encountered;
- condition the authorization to require Scripps to monitor, document, and report observations during all ramp-up procedures; and

- work with the National Science Foundation to analyze those data to help determine the effectiveness of ramp-up procedures as a mitigation measure for geophysical surveys after the data are compiled and quality control measures have been completed.

RATIONALE

The National Science Foundation is funding the Scripps Institution of Oceanography to conduct a geophysical survey in the western tropical Pacific Ocean in the area 13 to 23º N latitude and 158 to 172º E longitude. Scripps would conduct the survey in international waters, in waters of the U.S. exclusive economic zone around Wake Island, and possibly in waters of the exclusive economic zone around the Republic of the Marshall Islands. The purpose of the proposed survey is to collect seismic reflection and refraction data from the Hawaiian Jurassic crust to define the global nature and significance of variations in the intensity and direction of the Earth's magnetic field. The survey would be conducted in waters 2,000–6,000 m in depth with about 1,600 km of tracklines. It would use the R/V *Thomas G. Thompson* to tow a two-airgun array (nominal source level of 239.8 dB re 1μPa at 1 m (peak-to-peak) with a maximum discharge volume of 210 in^3) at 3 m depth. The *Thompson* also would tow one hydrophone streamer, 800 m in length, coupled with up to 50 sonobuoys and a magnetometer to locate the sites to be surveyed. Scripps also would operate a 30 kHz multibeam echo sounder during airgun operations and a 3-kHz sub-bottom profiler continuously throughout the survey. Scripps would acquire seismic and magnetic data on alternating days.

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 use of 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 10 August 2011) 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, the model was based on environmental conditions in the Gulf of Mexico, and variation in such conditions is known to affect sound propagation 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 then incorporated such variation in its programmatic environmental impact statement for geophysical surveys by modeling sound propagation under different environmental conditions. Tolstoy et al. (2009) also noted that sound propagation depends 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 western tropical Pacific Ocean, and (3) sound sources (i.e., 6-, 10-, 12-, and 20-airgun arrays) that are different from the array to be used (i.e., a 2-airgun array).

On numerous occasions the Commission has recommended that the Service or the applicant estimate exclusion and buffer zones using either empirical measurements from the proposed survey area or a model that takes into account the conditions in that area. To address these shortcomings, the Marine Mammal Commission recommends that the National Marine Fisheries Service require Scripps to re-estimate the proposed exclusion and buffer zones for the two-airgun array and associated numbers of marine mammal takes using operational and site-specific environmental parameters. If the exclusion and buffer zones are not re-estimated for the two-airgun array, 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 western tropical 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.

Sub-bottom profiler

In incidental harassment authorizations for other Foundation-funded surveys, the Service has stated that the exclusion and buffer zones for airgun arrays would subsume the zones for the sub-bottom profiler because the array would operate at a greater source level than the profiler within the mid-frequency range. For that reason, the estimated numbers of marine mammal takes and mitigation and monitoring measures normally are based on sound propagation from the airgun array only. However, Scripps would be operating the sub-bottom profiler continuously during the proposed survey and would be operating the airguns every other day, rather than daily. Accordingly, Scripps should have estimated the harassment zones associated with the sub-bottom profiler to account for incidental harassment of marine mammals and for mitigation and monitoring purposes during the timeframes the airgun array would not be operating. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service require Scripps to use operational and site-specific environmental parameters to estimate the exclusion zone, buffer zone, and number of marine mammal takes associated with use of the sub-bottom profiler. The Commission further recommends that the Service require Scripps to incorporate those exclusion and buffer zones into the same type of mitigation and monitoring measures for the sub-bottom profiler as are proposed for the two-airgun array.

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 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 states that ramp-up procedures would occur after only 15 minutes based on the use of a comparable period in previous incidental harassment authorizations. 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 mysticete or large odontocete is sighted in the safety zone and is moving in the same direction as the *Thompson*, 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 exceeding fifteen minutes. Therefore, the Marine Mammal Commission recommends that the National Marine Fisheries Service condition the authorization to prohibit a 15-minute pause and require a longer pause before ramping up after a power-down or shut-down of the airguns, based on the presence of a mysticete or large odontocete in the exclusion zone and the *Thompson's* movement (speed and direction).

The Commission also continues to believe that a 30-minute pause in airgun activity following a marine mammal sighting is not a sufficient basis for assuming that the marine mammal has left the area or will not be exposed to sound levels that could result in injury or death. Certain marine mammal species that occur in the proposed action area dive for longer periods and, although not visible to the observers, may still be within the exclusion zone. Sperm whales and beaked whales, in particular, may stay submerged for periods far exceeding 30 minutes. Blainville's beaked whales dive to considerable depths (> 1,400 m) and can remain submerged for nearly an hour (Baird et al. 2006, Tyack et al. 2006). In addition, observers may not detect marine mammals each time they return to the surface, especially cryptic species such as beaked whales, which are difficult to detect even under ideal conditions. Barlow (1999) found that "[a]ccounting for both submerged animals and animals that are otherwise missed by the observers in excellent survey conditions, only 23 percent of Cuvier's beaked whales and 45 percent of *Mesoplodon* beaked whales are estimated to be seen on ship surveys if they are located directly on the survey trackline." Thus, at least for certain species, visual monitoring alone is not adequate to detect all marine mammals within the exclusion and buffer zone. Therefore, the Marine Mammal Commission again recommends that the National Marine Fisheries Service extend the 30-minute period following a marine mammal sighting in the exclusion zone to cover the full dive times of all species likely to be encountered.

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 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. The National Science Foundation has indicated that monitoring data from past surveys are being compiled into a single database. The Commission supports that effort by the Foundation. After the data are compiled and quality control measures have been completed, the Marine Mammal Commission recommends that the National Marine Fisheries Service work with the National Science Foundation to analyze those data to help determine the effectiveness of ramp-up procedures as a mitigation measure for geophysical surveys. International researchers also are trying to determine the impacts of seismic airguns and the effectiveness of ramp-up procedures, primarily on humpback whales, during specific life history stages. However, the results of those studies are not expected for three to five years. In the interim, the Commission continues to believe that the Service should be requiring data collection and analysis to assess the effectiveness of ramp-up procedures, given that those procedures are considered a substantial component of the mitigation measures.

Serious injury and mortality

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

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

Sincerely,

Timothy J. Ragen, Ph.D.
Executive Director

Enclosure

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