



# MARINE MAMMAL COMMISSION

13 December 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. Navy 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 seismic oceanographic survey to be conducted in the southwestern Indian Ocean for 14 days between 23 January and 7 March 2012. The Commission also has reviewed the National Marine Fisheries Service's 21 November 2011 *Federal Register* notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (76 Fed. Reg. 71940).

## RECOMMENDATIONS

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

- require the Navy 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 the Navy to provide a detailed justification for basing the exclusion and buffer zones for the proposed survey in the southwestern Indian Ocean on modeling that relies on measurements from the Gulf of Mexico;
- require the Navy to use species-specific mean maximum densities rather than the mean average densities and then re-estimate the anticipated number of takes; and
- extend the pause in airgun activity following a marine mammal sighting in the exclusion zone to cover the full dive times of all species likely to be encountered.

## RATIONALE

The Marine Geosciences and Oceanography Divisions of the U.S. Navy's Naval Research Laboratory plan to conduct a seismic oceanographic survey in the southwestern Indian Ocean in the area 36 to 43° S latitude and 19 to 30° E longitude—an area including international waters and waters of the South African exclusive economic zone. The purpose of the proposed survey is to obtain high resolution images of ocean mixing dynamics at the juncture of the Agulhas Return Current and Antarctic Circumpolar Current. The survey would be conducted in waters 1,000–5,000 m in depth with about 2,489 km of tracklines. It would use the R/V *Melville* to tow a 2-airgun array (nominal source level of 240 dB re 1 $\mu$ Pa at 1 m (peak-to-peak) with a maximum discharge volume of

210 in<sup>3</sup>) at 2–9 m in depth. The *Melville* also would tow one hydrophone streamer, 1,200 m in length. The Navy also would operate a 12-kHz multibeam echo sounder, a 3.5-kHz sub-bottom profiler, and four moored 75-kHz long-range acoustic Doppler current profilers (ADCPs) continuously during the survey. Those instruments would be used to verify seafloor conditions, collect seafloor bathymetric data, and map the distribution of water currents. In addition, the Navy would use a 38-kHz hull-mounted ADCP, a 300-kHz lowered ADCP, a conductivity-temperature-depth gauge, a vertical microstructure profiler, and 250 expendable bathythermographs/expendable conductivity-temperature-depth gauges to collect hydrographic and suspended material data intermittently throughout the 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 29 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 surveys that collect geophysical and seismic oceanographic data. These concerns have been raised in past Commission letters (e.g., see the enclosed letter from 19 October 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 Navy and the National Science Foundation have incorporated such variation in numerous environmental impact statements 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, the Navy 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. The Navy has 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 for other activities. In addition, the Navy noted that the radii from the Observatory's model were consistent with recent modeling of sound propagation in the Southern Ocean (Breitzke and Bohlen, 2010). However, the radii from the Observatory's model are less than those modeled for an airgun with the same source level in a comparable environment. The Commission is unsure why the Navy did not use either operational and site-specific environmental parameters to model the exclusion and buffer zones or use radii from Breitzke and Bohlen (2010). Rather, it appears that the Navy's approach was based on (1) a model with known biases as a function of water depth, (2) environmental conditions that are inconsistent with those in the southwestern Indian 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 the Navy 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 Commission further recommends that the Service require the Navy to provide a detailed justification for basing the exclusion and buffer zones for the proposed survey in the southwestern Indian 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**

The Navy estimated the number of takes from the proposed survey using the size of the buffer zones and associated ensonified areas, coupled with estimates of marine mammal densities. It used the mean average density to account for uncertainty in (1) the survey location based on the natural meander of the frontal system and unpredictable weather conditions and (2) marine mammal density estimates. However, 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 required the use of maximum densities to estimate the number of takes because of similar uncertainties regarding density data. In this case, the Commission again considers the information regarding marine mammal densities to be limited, at best. For example, although the

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Commission appreciates the approach taken by Kaschner et al. (2006), that approach provides questionable estimates in some areas where densities are relatively well known. Thus, a considerable amount of caution is warranted when basing a mitigation strategy on those estimates. Given the similar nature of the uncertainty regarding conditions in the survey area and in density estimates, and the need to ensure adequate protection, the Marine Mammal Commission recommends that the National Marine Fisheries Service require the Navy to use species-specific mean maximum densities rather than the mean average densities and then re-estimate the anticipated number of takes.

### **Mitigation and monitoring measures**

The *Federal Register* notice states that the Navy 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). The Commission 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 pause in airgun operation following a marine mammal sighting in the exclusion zone to cover the full dive times of all species likely to be encountered.

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

Sincerely,



Timothy J. Ragen, Ph.D.  
Executive Director

## Enclosure

## References

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