



MARINE MAMMAL COMMISSION

31 March 2014

Ms. Jolie Harrison, Supervisor
Incidental Take Program
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Ms. Harrison:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the application submitted by Lamont-Doherty Earth Observatory (LDEO), in collaboration with the National Science Foundation (NSF), seeking authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act (the MMPA) to take small numbers of marine mammals by harassment. The taking would be incidental to a marine geophysical survey to be conducted off New Jersey from June–July 2014. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 17 March 2014 notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (79 Fed. Reg. 14780).

Some issues raised in previous letters regarding geophysical surveys reflect Commission concerns that apply more broadly to incidental take authorization applications beyond LDEO's proposed application. The Commission has recommended numerous times that NMFS adjust density estimates using some measure of uncertainty when available density data originate from different geographical and temporal scales and formulate policy or guidance regarding a consistent approach for how applicants should incorporate uncertainty in density estimates. NMFS has indicated that it is currently evaluating available density information and is working on guidance that would outline a consistent approach for addressing uncertainty in specific situations where certain types of data are or are not available (78 Fed. Reg. 57354). Further, the Commission has recommended that NMFS follow a consistent approach of requiring the assessment of Level B harassment takes for specific types of sound sources (e.g., sub-bottom profilers, echosounders, side-scan sonar, and fish-finding sonar) by all applicants who propose to use them. NMFS has indicated that it is evaluating the broader use of those types of sources to determine under what specific circumstances requests for incidental taking would be advisable (or not) and also is working on guidance that would outline a consistent approach for addressing potential impacts from those types of sources (78 Fed. Reg. 57354). The Commission is unsure of the status of the guidance documents but would welcome an opportunity to meet with NMFS to review the higher-level recommendations, as well as those specific to LDEO's application.

RECOMMENDATIONS

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

- require LDEO to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific parameters (including at least sound speed profiles, bathymetry, and sediment characteristics) for the proposed incidental harassment authorizations—NMFS should impose the same requirement for all future incidental harassment authorizations submitted by LDEO, NSF, Antarctic Support Contract (ASC), U.S. Geological Survey (USGS), Scripps Institution of Oceanography (Scripps), or any other related entity;
- require LDEO to estimate the numbers of marine mammals that could be taken based on the total ensonified area in any given day multiplied by 30 and the applicable densities; and
- consult with the funding agency (i.e., NSF) and individual applicants (e.g., LDEO, ASC, Scripps, and USGS) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and the actual numbers of marine mammals taken—the assessment should account for applicable $g(0)$ and $f(0)$ values.

BACKGROUND

LDEO proposes to conduct a high-energy, 3D geophysical survey 25 km offshore of New Jersey from 39.3 to 39.7° N and 73.2 to 73.8° W. The purpose of the proposed survey is to collect and analyze data on the arrangement of sediments deposited during times of changing global sea level from roughly 60 million years ago to present. The survey would be conducted in waters estimated to be 30 to 75 m in depth with approximately 4,900 km of tracklines. LDEO would use the R/V *Marcus G. Langseth* to operate a four- and eight-airgun array (nominal source level of up to 253 dB re 1 μ Pa at 1 m (peak-to-peak) with a maximum discharge volume of 700 or 1,400 in³, respectively) at 4.5 or 6 m depth, respectively. The arrays would be used in an alternating (flip-flopping) firing sequence. The *Langseth* also would tow four hydrophone streamers, 3,000 m in length, during the survey. In addition, LDEO would operate a 10.5- to 13-kHz multibeam echosounder, a 3.5-kHz sub-bottom profiler, and a 75-kHz Acoustic Doppler Current Profiler (ADCP) continuously throughout the survey. The survey is expected to last for 30 days.

NMFS preliminarily has determined that, at most, the proposed activities would result in a temporary modification in the behavior of small numbers of up to 26 species of marine mammals and that any impact on the affected species would be negligible. NMFS 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. In addition, the Observatory would shutdown the airguns immediately if and when a North Atlantic right whale is sighted, regardless of the distance from the *Langseth*. Ramp-up procedures would not be initiated until the right whale has not been seen at any distance for 30 minutes.

Staff members from the NSF, NMFS, USGS, LDEO, and the Commission met in March 2013 to discuss some of the Commission's ongoing concerns regarding the potential effects of geophysical surveys. Although a number of concerns were discussed and several resolved, the following paragraphs highlight areas that, in the Commission's view, warrant further attention.

RATIONALE

Uncertainty in estimating exclusion and buffer zones

The Commission continues to have concerns regarding the method used to estimate exclusion and buffer zones and the numbers of takes for NSF-funded geophysical research. These concerns date back to 2010 (please refer to the Commission's 12 March, 19 April, and 24 June 2013 and 30 January 2014 letters for detailed rationale). Briefly, LDEO conducts acoustic modeling for NSF-funded geophysical research. For at least 6 years (and likely more than the last 10 years), LDEO has estimated exclusion and buffer zones (based on Level A and B harassment, respectively) using a simple ray trace-based modeling approach that assumes spherical spreading, a constant sound speed, and no bottom interactions (Diebold et al. 2010). That model does not incorporate environmental characteristics of the specific study area including sound speed profiles and refraction within the water column, bathymetry/water depth, sediment properties/bottom loss, or absorption coefficients. However, LDEO 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 *Langseth's* 36-airgun array from the Gulf of Mexico (Tolstoy et al. 2004, Tolstoy et al. 2009, Diebold et al. 2010¹). LDEO also notes the model is most directly applicable to deep water (> 1,000 m). Diebold et al. (2010) noted the limited applicability of LDEO's model when sound propagation is dependent on water temperature, water depth, bathymetry, and bottom-loss parameters, all of which are of concern for a survey in water depths as shallow as 30 m. They further indicated that modeling could be improved by including realistic sound speed profiles within the water column. In addition, Tolstoy et al. (2009) acknowledged that sound propagation depends on water depth, bathymetry, and tow depth of the array and that sound propagation varies with environmental conditions and should be measured at multiple locations.

LDEO has stated that empirical data for shallow water (< 100 m) indicated that the model underestimated actual received levels. For previous applications, LDEO has applied correction factors to the distances reported by Tolstoy et al. (2009) for shallow-water depths (76 Fed. Reg. 6430, 61463). Those factors ranged from 1.7 to 5.2 times greater than the distances in deep water, which have been applied to derive appropriate shallow-water zones from the modeled radii for the *Langseth's* 18-airgun array (Tolstoy et al. 2009). Rather than adjust the modeled distances using that same method for the proposed incidental harassment authorization, LDEO applied correction factors (or a scaling approach) to empirical shallow-water zones² based on modeled deep-water zones for the various arrays³. The Commission is unsure why LDEO would assume that the ratio of modeled zones in deep water would equate to empirical zones in shallow water, as those two quantities are not comparable and LDEO itself indicated that the model underestimated received levels in shallow water. Nevertheless, the new approach effectively reduced the zones for the

¹ Diebold et al. (2010) also presented data on the 18-airgun array from the Gulf of Mexico.

² LDEO used the empirical values from an 18-airgun array in shallow water and also assumed that the sound pressure level (rms; SPL_{rms}) values were 10 dB greater than sound exposure level (SEL) values. However, Tolstoy et al. (2009) indicated that the difference between SPL_{rms} and SEL values were highly dependent on water depth, specifically the difference in shallow water was approximately 8 dB. Therefore, the exclusion and buffer zones likely were underestimated because of inaccurate received levels as well as methodological deficiencies.

³ LDEO compared the deep-water modeled values of the 4- and 8-airgun array to the 18-airgun array using accuracy out to the ten-thousandths, which is not appropriate for LDEO's simplistic model in two entirely different environments.

mitigation airgun from 150 to 21 m for the 190-dB re 1 μ Pa threshold, 296 to 100 m for the 180-dB re 1 μ Pa threshold, and 1,050 to 995 m for the 160-dB re 1 μ Pa threshold (see Table 2 in 77 Fed. Reg. 25966, Table 1 in 76 Fed. Reg. 41463, Table 1 in 76 Fed. Reg. 26255, and Table 1 in 76 Fed. Reg. 6430). The new approach would likely reduce the applicable zones for the other airgun arrays proposed for use as well. Tolstoy et al. (2009) verified that in shallow water, sound is expected to reverberate in the water column and upper seafloor, therefore, sound propagation in shallow water would be highly dependent on local seafloor geology⁴—not scaling factors based on modeled results in deep water. Further, although calibration experiments for both the *Ewing* and *Langseth* occurred in the Gulf of Mexico, Tolstoy et al. (2009) also indicated that data differences between the two studies at shallow-water depths may have been attributed to site-specific differences. All these shortcomings reinforce the Commission's ongoing concerns regarding the estimation of exclusion and buffer zones for NSF-funded geophysical surveys.

Those concerns are based primarily on the failure to test and verify the use of LDEO's model under the specific environmental conditions that would be encountered with each survey. For that reason, the Commission has recommended that NMFS or the relevant entity estimate exclusion and buffer zones using either empirical measurements from the particular survey site or a model that accounts for the conditions in the proposed survey area. The model should incorporate operational parameters (e.g., tow depth, source level, number/spacing of active airguns) and site-specific environmental parameters (e.g., sound speed profiles, refraction in the water column, bathymetry/water depth, sediment properties/bottom loss, and wind speed). In March 2013, LDEO indicated that it might be able to compare its model to hydrophone data collected during previous surveys in environmental conditions other than those in the Gulf of Mexico⁵ (i.e., deep and intermediate waters in cold water environments that may have surface ducting conditions, shallow-water environments, etc.). The Commission understands that LDEO has been analyzing hydrophone data from waters off Washington to compare to the estimated exclusion and buffer zones, but LDEO does not seem to use that method for the current proposed authorization. The Commission encourages LDEO to make such comparisons using those methods to estimate its zones at various sites, not just in waters off Washington. The Commission recommended in its 24 June 2013 letter that those comparisons be made prior to the submittal of applications for geophysical surveys to be conducted in 2014. The Commission further recommended that if LDEO and NSF either do not have enough data to compare LDEO's model to other environments or do not assess the accuracy of the model, then they should re-estimate the exclusion and buffer zones and associated takes of marine mammals using site-specific parameters (including sound speed profiles, bathymetry, and bottom characteristics) for all future applications that use LDEO's model. Neither approach was used for the proposed incidental harassment authorization.

NMFS has indicated that NSF, LDEO, and other relevant entities (USGS, Scripps) are providing sufficient scientific justification for their take estimates. The Commission disagrees with this conclusion, given that the estimates are based on LDEO's model or empirical measurements in

⁴ Tolstoy et al. (2009) further indicated that empirical data confirm significantly different propagation loss rates in shallow and deep water as previously observed for the R/V *Ewing* (Tolstoy et al., 2004), with lesser propagation loss rates in shallow water.

⁵ Diebold et al. (2010) supported such an approach, stating that streamer data can provide an accurate assessment of SELs at the relevant ranges for mitigation in shallow-water environments (≤ 100 m). They further indicated it seems logical and advantageous that those data be monitored in real time to fine tune a priori mitigation zones in shallow-water environments.

the Gulf of Mexico, while recent activities would occur in other areas such as the North Atlantic and the Antarctic. Environmental conditions in waters of the continental shelf off New Jersey indicate a surface duct at 50 m, in-water refraction, and bathymetry and sediment characteristics that reflect sound⁶. None of these site-specific parameters are accounted for in LDEO's model.

In a recent sound exposure modeling workshop that was attended by numerous entities (NMFS, NSF, LDEO, USGS, and the Commission), experts confirmed that sound speed profiles and bathymetry/sediment characteristics were the most important factors affecting underwater sound propagation and should be included in related modeling. While LDEO presented various aspects of its model during the workshop and indicated that the model was fast, inexpensive, and simple to use, none of those attributes support its applicability or accuracy. Further, LDEO indicated that the model is more closely related to a source model that compares airgun arrays and that it is not representative of modeling in the actual environment. Therefore, the Commission remains concerned that the LDEO model is not based on best available science and does not support its continued use. For all of these reasons, the Commission recommends that NMFS require LDEO to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific parameters (including at least sound speed profiles, bathymetry, and sediment characteristics) for the proposed incidental harassment authorizations—NMFS should impose the same requirement for all future incidental harassment authorizations submitted by LDEO, NSF, ASC, USGS, Scripps, or any other related entity.

A few years ago, NSF and USGS modeled sound propagation under various environmental conditions in their programmatic environmental impact statement for geophysical surveys worldwide. LDEO and NSF (in cooperation with Pacific Gas and Electric Company) 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). These recent examples indicate that LDEO, NSF, and related entities are able to implement the recommended modeling approach, if required to do so by NMFS. The Commission understands the constraints imposed by the current budgetary environment, but notes that other agencies that contend with similar funding constraints incorporate modeling based on site-specific parameters. LDEO, NSF, and related entities (ASC, USGS, Scripps) should be held to that same standard.

Enumerating takes for surveys in a small area

To determine the numbers of marine mammals that could be taken incidental to the proposed geophysical survey, LDEO multiplied the total ensonified area of 2,502 km² (which includes a 25 percent contingency) by the applicable densities. However, LDEO would be conducting the survey, consisting of 4,900 km of tracklines (spaced 150 m apart), in an area of 12 by 50 km. The survey would occur in that small area for approximately 30 days, 24 hours per day. At the March 2013 meeting, the Commission discussed with NMFS and the other relevant entities the fact that a simple area*density method is not appropriate in such circumstances. Rather, the applicant should be determining the total ensonified area in a given day, which then should be multiplied by the number of survey days (30) and the applicable densities. Otherwise, the method

⁶ NSF and USGS's programmatic environmental impact statement for geophysical surveys included environmental data from the continental shelf close to the proposed survey.

LDEO used in the current request (and has used in the past) very likely underestimated the numbers of marine mammals that could be taken. Therefore, the Commission recommends that NMFS require LDEO to estimate the numbers of marine mammals that could be taken based on the total ensonified area in any given day multiplied by 30 and the applicable densities.

Monitoring measures

In previous letters, the Commission has indicated that 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. Those assessments also should account for animals at the surface but not detected and for animals present but underwater and not available for sighting, which are accounted for by $g(0)$ and $f(0)$ values. Those adjustments are essential for making 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 NMFS's shipboard surveys). Therefore, the Commission again recommends that NMFS consult with the funding agency (i.e., NSF) and individual applicants (e.g., LDEO, ASC, Scripps, USGS) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and the actual numbers of marine mammals taken—the assessment should account for applicable $g(0)$ and $f(0)$ values. NMFS indicated that it was working to develop recommendations for how applicants can correct marine mammal detections appropriately to better estimate the number of animals likely taken during specified activities, considering those that are not detected (79 Fed. Reg. 14219, 78 Fed. Reg. 57354). The Commission encourages NMFS to consult with the Commission and NMFS scientists before finalizing such recommendations.

The Commission is grateful for the opportunity to provide comments on the application submitted by LDEO. Please contact me if you have questions concerning the Commission's recommendation.

Sincerely,



Rebecca J. Lent, Ph.D.
Executive Director

References

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