



MARINE MAMMAL COMMISSION

28 September 2015

Ms. Jolie Harrison, Chief
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 in the eastern Mediterranean Sea in November–December 2015. The Commission also has reviewed the National Marine Fisheries Service’s (NMFS) 4 September 2015 notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (80 Fed. Reg. 53624).

Background

LDEO proposes to conduct a 2D geophysical survey off Crete and a 3D geophysical survey within the territorial waters¹ and exclusive economic zone of Greece. The purpose of the 2D survey is to investigate the megathrust fault between Peloponnesus and Crete in the Hellenic subduction zone off southwestern Crete and the 3D survey is to collect and analyze seismic refraction data on and around the island of Santorini to examine the crustal magma plumbing of the Santorini volcanic system. The surveys would be conducted in waters estimated to be 20 to 3,000 m in depth along approximately 2,344 km of tracklines. LDEO would use the R/V *Marcus G. Langseth* to operate a 36-airgun array at a tow depth of either 9 or 12 m. The *Langseth* also would (1) tow a hydrophone streamer (8,000 m in length) or (2) use 93 ocean-bottom seismometers to collect data during the survey. In addition, LDEO would operate a 10.5- to 13-kHz multibeam echosounder and a 3.5-kHz sub-bottom profiler continuously during the survey. The survey is expected to last for 30 days.

NMFS preliminarily has determined that, at most, the proposed activities would result in the incidental taking of small numbers of up to 22 species of marine mammals by Level B harassment

¹ NMFS does not authorize the taking of marine mammals within the territorial waters (in this case within 6 nmi) of a foreign country but does consider such taking when determining whether the activity would have a negligible impact on the affected species or stocks.

and 4 species of marine mammals by Level A harassment² 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 measures. Those measures include (1) refraining from operating the multibeam echosounder and sub-bottom profiler in transit to and from the survey area, (2) monitoring the exclusion³ and buffer zones (based on Level A and B harassment, respectively), and (3) using power-down, shut-down, and ramp-up procedures. To reduce impacts on Mediterranean monk seals during the peak pupping season (September through November), LDEO would survey the three tracklines closest to Anafi Island⁴ as late as possible (i.e., late November to early December). LDEO also would shut down the airguns immediately if and when a pinniped is sighted, regardless of the distance from the *Langseth*. Ramp-up procedures would not be initiated until the pinniped has not been seen at any distance for 30 minutes. In addition, LDEO would power down the array, if possible, when concentrations of gray, humpback, sei, fin, and/or sperm whales (six or more individuals that do not appear to be traveling and are feeding, socializing, etc.) are observed within the Level B harassment zone. Further, LDEO would (1) implement speed and course alterations if those alterations do not compromise operational safety and (2) conduct the survey starting from the coast and proceeding offshore to avoid trapping marine mammals in shallow water.

Species-specific densities⁵ or group sizes⁶ were used to estimate the numbers of takes for the majority of marine mammal species. However, NMFS based the number of Mediterranean monk seal takes on the number of individuals in the monk seal subpopulations on Anafi Island and the Kimolos–Polyaigos Island complex⁷ and from stranding data from Santorini Island, which represent the maximum number of seals that could be harassed during the survey rather than the number of takes. The Commission understands that NMFS is increasing the number of total takes based on the extent of the ensonified area and number of days of activities to inform its negligible impact determination for monk seals—the Commission supports that approach. NMFS’s small numbers analysis would not change.

However, the Commission has recommended numerous times that NMFS adjust density estimates used to estimate the numbers of takes by incorporating some measure of uncertainty when available density data originate from other geographical areas and temporal scales⁸. In this instance,

² The Commission understands that NMFS proposed to authorize taking by Level A harassment to account for situations in which marine mammals may enter the Level A harassment zone before the airguns can be either powered or shut down, namely because standard mitigation measures included in incidental take authorizations rely on visual monitoring and implementation may not occur until an animal is observed within the specified zone. This is especially true for seismic surveys that have Level A harassment zones of greater than 2 km.

³ The Commission understands that NMFS plans to require LDEO to use an exclusion zone of 100 m for both pinnipeds and cetaceans for all water depths when the mitigation gun is in use, rather than the proposed 27 and 96 m for pinnipeds and cetaceans, respectively, in shallow water (< 100 m). The exclusion zone for both pinnipeds and cetaceans in both intermediate (100–1,000 m) and deep (> 1,000 m) water was already proposed to be 100 m.

⁴ A known haul-out and pupping area.

⁵ And the total ensonified area in a given day for the two different types of surveys and the numbers of days those surveys would occur.

⁶ Some group sizes were multiplied by the number of days of activities for those species that have a greater likelihood of occurrence and hooded seal takes were based on a single stranding record from the western Mediterranean.

⁷ Which included only the adult females that can travel up to 70 km.

⁸ Including the age of the data.

in the absence of applicable density data off Santorini and Crete, NMFS used various extrapolations⁹ and adjustments based on numerous assumptions. It would be very useful if NMFS had guidance available that would set forth a consistent approach for how applicants should incorporate uncertainty in density estimates. In addition, NMFS has yet to develop a clear policy setting forth more explicit criteria and/or thresholds for making small numbers and negligible impact determinations. The Commission understands that NMFS is in the process of developing policies and guidance to address these concerns and would welcome the opportunity to work with NMFS as it develops them.

Uncertainty in modeling exclusion and buffer zones

For more than five years, the Commission has raised concerns about the method used to estimate exclusion and buffer zones (based on Level A and B harassment, respectively) and the numbers of takes incidental to NSF-funded geophysical research. LDEO performs acoustic modeling for geophysical research funded by NSF¹⁰ to estimate exclusion and buffer zones using a simple ray trace–based modeling approach that assumes spherical spreading, a constant sound speed, and no bottom interactions (Diebold et al. 2010). As noted in several Commission letters, numerous studies¹¹ have emphasized the importance of incorporating site-specific environmental and operational parameters into estimating exclusion and buffer zones. The recent Crone et al. (2014)¹² study indicated that, in shallow and sloped environments, the complexity of local geology and bathymetry and the typical lack of sufficient information regarding this complexity can make it difficult to predict accurately sound levels as a function of distance from the source array.

In keeping with that theme, Crone et al. (2014) used a (1) non-parametric smoothing cubic spline model to estimate the distances to the 180-dB re 1 μPa ¹³ and the 160-dB re 1 $\mu\text{Pa}^2\text{-sec}$ thresholds, (2) spherical spreading model with an attenuation term for the 160-dB re 1 μPa threshold, and (3) high-degree polynomial model for the 180-dB re 1 $\mu\text{Pa}^2\text{-sec}$ threshold for a survey¹⁴ off Washington state. Extrapolation was necessary for both the 160-dB re 1 μPa and 180-dB re 1 $\mu\text{Pa}^2\text{-sec}$ thresholds due to the isopleths being either beyond the range of the hydrophone streamer or closer to the ship than what the streamer could collect. Conversely, Crone (2015) determined that a simple logarithmic spreading loss model¹⁵ without an attenuation term best characterized the distances to the 180- and 160-dB re 1 μPa thresholds for a survey¹⁶ off New Jersey. Extrapolation also was necessary for the 180-dB re 1 μPa thresholds due to the isopleths being closer to the ship than what the streamer could collect. These recent examples highlight the inherent site-specific and near- and far-field differences in deriving both exclusion and buffer zones—attributes that LDEO does not currently incorporate in its estimates of those zones.

⁹ Including data from the Ligurian, Adriatic and Balearic Seas for estimating densities and data from Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, and 2013 for estimating group sizes.

¹⁰ Including NSF's Division of Polar Programs and Antarctic Support Contract (ASC) and projects funded by the U.S. Geological Survey (USGS).

¹¹ Tolstoy et al. (2004), Tolstoy et al. (2009), Diebold et al. (2010), and most recently, Crone et al. (2014).

¹² Crone et al. (2014) used hydrophone data from waters off Washington State to compare empirically derived estimates to model-estimated exclusion and buffer zones for LDEO's 36-airgun array.

¹³ Root mean square.

¹⁴ Using a 36-airgun array towed at 9 m with a total volume of 6,600 in³.

¹⁵ The spreading loss factor/fitting parameters were not specified.

¹⁶ Using a 4-airgun array towed at 4.5 m with a total volume of 700 in³.

To estimate the proposed exclusion and buffer zones for the survey in the Mediterranean, LDEO (1) used its model for the 36-airgun array in deep water and the mitigation airgun in all water depths, (2) applied a correction factor of 1.5 to the deep-water radii for the 36-airgun array in intermediate water depths, and (3) scaled empirically-derived measurements from the calibration study in the Gulf of Mexico for the 36-airgun array in shallow water (Tolstoy et al. 2009) to account for the differences in tow depths between the calibration study (6 m) and the proposed survey (9 or 12 m). The use of LDEO's simple model, both correction and scaling factors, and measurements from the Gulf of Mexico have yet to be substantiated relative to conditions in the Mediterranean Sea. Specifically, Tolstoy et al. (2009) verified that, in shallow water, sound is expected to reverberate in the water column and upper seafloor and, therefore, sound propagation in shallow water would be highly dependent on local seafloor geology¹⁷. Further, although calibration experiments for both the R/V *Maurice Ewing* and *Langseth* occurred in the Gulf of Mexico, Tolstoy et al. (2009) indicated that data differences between the two studies at shallow-water depths may have been due to site-specific differences within the Gulf of Mexico itself.

Although LDEO's model does not incorporate environmental characteristics of the specific survey area (including sound speed profiles and refraction within the water column, bathymetry/water depth, sediment properties/bottom loss, or absorption coefficients), the most widely accepted current modeling approaches normally do. Such approaches are used, and historically have been used, by other action proponents that conduct seismic surveys. In addition to incorporating site-specific parameters, those action proponents generally collect empirical sound source and sound propagation measurements as well. None of those action proponents use exclusion or buffer zones derived from measurements obtained in a specific ocean basin as proxies for another environment, nor do they utilize simple spherical spreading models or numerous correction and scaling factors. If such simple models or various extrapolations and scaling factors were considered best available and more representative, it would follow that other action proponents would use similar methods rather than allocating funds to more sophisticated modeling. It is unclear why NSF, which supports research to advance scientific discoveries on the geological intricacies of the earth, continues to base its own modeling approaches on methods that are significantly outdated. LDEO, NSF, and related entities (ASC, USGS, Scripps Institution of Oceanography (Scripps)) should be held to the same standard as other action proponents (i.e., Bureau of Ocean Energy Management, the oil and gas industry, U.S. Navy, U.S. Air Force).

Because empirical measurements are lacking for the Mediterranean Sea and LDEO has failed to verify the applicability of its exclusion and buffer zones to conditions in the Mediterranean, the Commission believes that LDEO should estimate those zones using a model that accounts for the conditions in the proposed survey area. The model should incorporate site-specific environmental¹⁸ and operational¹⁹ parameters. Until such models are used, the Commission believes LDEO's use of a simplistic model, various extrapolations, and correction and scaling factors cannot be considered the best available science. Therefore, the Commission recommends that NMFS (1) require LDEO to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals

¹⁷ 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 lower propagation loss rates in shallow water.

¹⁸ Such as sound speed profiles, refraction in the water column, bathymetry/water depth, sediment properties/bottom loss, and wind speed.

¹⁹ Such as tow depth, source level, number/spacing of active airguns.

using site-specific environmental (including sound speed profiles, bathymetry, and sediment characteristics at a minimum) and operational (including number/type of airguns, tow depth) parameters for the proposed incidental harassment authorization and (2) impose the same requirements for all future incidental harassment authorizations submitted by LDEO, NSF, ASC, USGS, Scripps, or any other relevant entity.

Monitoring measures

In several previous letters, the Commission has indicated that the monitoring and reporting requirements adopted under section 101(a)(5) of the MMPA need to be sufficient to provide a reasonably accurate assessment of the manner of taking and the numbers of animals taken incidental to the specified activity. A key goal of those requirements should be to verify that the assessments and assumptions underlying the issuance of the authorization were correct and to confirm that only small numbers of marine mammals are being taken and that the impacts are negligible. The Commission continues to believe those assessments need to account for all animals in the survey area, including those animals directly on the trackline that are not detected and how well animals are detected based on the distance from the observer, which are accounted for by $g(0)$ and $f(0)$ values. In the past, NMFS has indicated that those assessments could be qualitative or relative in nature, or they could be more directly quantitative (79 Fed. Reg. 38503). More recently, NMFS indicated that comparing the actual total area ensonified after the survey to the predicted total area ensonified should result in an even more accurate evaluation of exposed animals, which could then be compared to the numbers of animals actually detected to provide some sense of how the estimates compare to real likely exposure (80 Fed. Reg. 4891). The Commission disagrees with both assertions.

First, the Commission is unsure how a qualitative assessment could provide information regarding the numbers of marine mammals taken and whether those are considered small numbers. Second, in regards to comparing ensonified areas, in-situ sound measurements would have to be collected to compare accurately the actual total ensonified area to that which was predicted. However, very few action proponents conduct such measurements and analyses. Rather, NMFS may have been suggesting that the actual total ensonified area be compared to the predicted total ensonified area based on the length of tracklines surveyed and the associated ensonified area. In either instance, NMFS would be assuming that the uniform species-specific densities used to predict the numbers of animals to be taken would equate directly to those animals actually taken during the survey. That assumption is not supported by NMFS's own acknowledgement that marine mammals are distributed patchily—based on species-specific group sizes and behavior states. Furthermore, NMFS indicated that the number of marine mammals detected during geophysical surveys is a small percentage of those predicted to be taken, which is to be expected since marine mammals spend a large portion of their time underwater (80 Fed. Reg. 4891). The Commission has repeatedly recommended that NMFS and LDEO incorporate this latter factor via $g(0)$ and $f(0)$ values into their monitoring efforts.

The Commission continues to believe that $g(0)$ and $f(0)$ values²⁰ should be based on the ability of protected species observers to detect marine mammals rather than on hypothetically

²⁰ These values vary based on platform characteristics, observer skill, environmental conditions, and sightability and detectability of the species.

optimal estimates derived from scientific surveys²¹ (e.g., from NMFS's shipboard abundance surveys). The Commission also understands that LDEO (and relevant entities) collects, and has been collecting for many years, sightings data during periods both when the airguns are active and when they are not. Those data could be pooled amongst similar survey types (e.g., based on geographical location, array configuration, airgun activity status, vessel-specific observational parameters) to determine rudimentary $g(0)$ and $f(0)$ values—an analysis that was discussed with NMFS, LDEO, and relevant entities in 2013. Although NMFS has indicated it is unlikely that the information gathered from those surveys would result in any statistically robust conclusions for any particular species because of the small number of animals typically observed, the Commission believes that pooling the data and adjusting by those rudimentary values would be preferable to assuming that the number of animals detected during the survey equates to the total numbers taken. This approach, which is LDEO's current method, clearly underestimates the numbers of marine mammals taken.

Therefore, the Commission again recommends that NMFS consult with LDEO and other relevant entities (e.g., NSF, ASC, USGS, Scripps) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and reliable estimates of the numbers of marine mammals taken by incorporating appropriate estimates of $g(0)$ and $f(0)$ values derived from protected species observer data collected during geophysical surveys. The Commission believes those values are essential for assessing more accurately the numbers of marine mammals taken during geophysical surveys, especially given the extent of the Level B harassment zones that routinely extend to 10 km and can extend to more than 27 km in some instances, including the proposed survey. The Commission notes that it has made this recommendation in numerous previous letters, but has some concern that NMFS may have misinterpreted it. NMFS recently stated that it does not believe it is appropriate to require NSF to collect information in the field to support the development of survey-specific correction factors (80 Fed. Reg. 4862). The Commission never suggested that separate²² correction factors be developed for every survey. Rather, it is important for LDEO, NSF, and other relevant entities to continue to collect appropriate sightings data in the field to be pooled to determine $g(0)$ and $f(0)$ values relevant to the various geophysical survey types and platforms.

The Commission looks forward to collaborating with NMFS on the various issues raised in this letter. Please contact me if you have questions concerning the Commission's recommendations.

Sincerely,



Rebecca J. Lent, Ph.D.
Executive Director

²¹ Values that the Commission understands LDEO and relevant entities incorporated in past monitoring reports.

²² Survey-specific.

References

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