



# MARINE MAMMAL COMMISSION

8 April 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 off New Jersey from June–August 2015. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 17 March 2015 notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (80 Fed. Reg. 13962) and commented on the same activity in a 31 March 2014 letter.

In several previous Commission letters, including most recently the letter of 1 April 2015 concerning a marine geophysical survey to be conducted off New Zealand, the Commission has raised issues that reflect ongoing concerns that apply more broadly to certain incidental take authorization applications, not just those from LDEO. The enclosed 1 April 2015 letter should be read in conjunction with this letter, as it provides additional background and rationale regarding the Commission's general concerns and some of the recommendations contained herein.

## Background

LDEO proposes to conduct a high-energy, 3D geophysical survey 25 to 85 km offshore of New Jersey. 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 the present. The survey would be conducted in waters estimated to be 20<sup>1</sup> to 75 m in depth with approximately 4,906 km of tracklines. LDEO would use the R/V *Marcus G. Langseth* to operate a four-airgun array (nominal source level of up to 240.4 dB re 1μPa at 1 m (peak) with a maximum discharge volume of 700 in<sup>3</sup>) at a tow depth of either 4.5 or 6 m. The arrays would be used in an

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<sup>1</sup> Although NMFS indicated the minimum water depth would be approximately 30 m, LDEO indicated that the minimum water depth would be approximately 20 m in its application.

alternating (flip-flopping) firing sequence. The *Langseth* also would tow either (1) four hydrophone streamers (3,000 m in length) or (2) two hydrophone streamers (also 3,000 m in length) and a P-Cable hydrophone streamer system 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 a temporary modification in the behavior of small numbers of up to 32 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 (1) refraining from operating the multibeam echosounder and sub-bottom profiler in transit to and from the project area, (2) monitoring the exclusion and buffer zones (based on Level A and B harassment, respectively), and (3) using power-down, shut-down, and ramp-up procedures. LDEO also would shut down 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. In addition, LDEO would power down the array, if possible, when concentrations of humpback, sei, fin, blue, and/or sperm whales (six or more individuals that do not appear to be traveling and are feeding, socializing, etc.) are observed within the buffer zone.

### **Inconsistencies and inaccurate information**

The marine mammal species that could be affected, marine mammal densities, take estimation method, and numbers of takes estimated in the *Federal Register* notice differ from those used in LDEO's application. NMFS is proposing to authorize takes for some species that were not included in LDEO's application. The Commission is unsure why those species and associated takes were not included in LDEO's 2015 application given their potential occurrence in the project area and the fact that they were included in the authorization issued by NMFS in 2014. NMFS also determined that the density estimates obtained from the Strategic Environmental Research and Development Program spatial decision support system (SERDP SDSS) Marine Animal Model Mapper<sup>2</sup> were different than those provided in LDEO's application based on a recent upgrade to the Mapper's model algorithms and amended the densities accordingly. In addition, NMFS used a take estimation method in the *Federal Register* notice that incorporated a time element rather than LDEO's standard area x density method. The Commission now understands, through consultation with NMFS staff, that NMFS intends to use yet another method to estimate the numbers of takes that will likely yield greater take estimates than those proposed to be authorized, which is discussed in detail herein. The Commission is concerned that, by changing its methodology and publishing underestimates of the potential impacts in the proposed authorization, NMFS is undermining the public review process. Lastly, also as discussed herein, the distances to relevant sound thresholds based on in-situ and extrapolated measurements are not accurately presented in NMFS's notice.

Because of the inconsistencies between the application and the *Federal Register* notice and, as detailed herein, the fact that large portions of the notice are either incorrect or not reflective of how

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<sup>2</sup> Based on the Department of the Navy's OPAREA Density Estimates (NODE) for the Northeast Operating Areas in summer.

NMFS apparently plans to assess the proposed activity, neither the Commission nor the public are able to provide informed comments on the proposed authorization or to be confident that only a small number of animals from each species or stock would be taken. For these reasons, the Commission recommends that NMFS (1) amend its proposed authorization to include correct radii for the exclusion and buffer zones based on in-situ and extrapolated measurements, a detailed description of its revised take estimation method, and the numbers of takes it proposes to authorize and (2) allow for additional public comment after publishing a revised proposed authorization in the *Federal Register*. In addition, the Commission recommends that, in the future, NMFS require LDEO and NSF to provide revised applications that reflect the best available scientific information concerning the species affected, marine mammal densities, take estimation method, and estimated numbers of takes, before it deems the application complete and publishes a proposed authorization.

### **Uncertainty in modeling exclusion and buffer zones**

Since 2010, 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. Briefly, LDEO performs acoustic modeling for geophysical research funded by NSF. For at least 6 years, LDEO has estimated 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 studies<sup>3</sup> have underscored the importance of incorporating site-specific environmental and operational parameters into estimating exclusion and buffer zones. The recent Crone et al. (2014)<sup>4</sup> 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 contrast to the most widely accepted current approaches in the scientific literature, LDEO’s 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.

To estimate the proposed exclusion and buffer zones for the survey off New Jersey, LDEO used various extrapolations and scaling factors. Specifically, propagation measurements were obtained in shallow water of the Gulf of Mexico for the *Langseth’s* 3,300-in<sup>3</sup> array towed at 6 m depth, in both cross-line (athwartship) and in-line (foreward and aft) directions. A 95<sup>th</sup> percentile fit to the cross-line measurements (which were obtained at ranges approximately 2–14.5 km from the source) was used to extrapolate the near-field measurements at less than 2 km and far-field measurements at more than 14.5 km. The cross-line measurements and extrapolations were more conservative than the in-line measurements and extrapolations and thus were used to derive the mitigation radii for the proposed survey off New Jersey. The differences in array volumes, airgun configurations, and tow depths between the Gulf of Mexico and New Jersey surveys were accounted for by various scaling factors calculated based on the radii obtained from the LDEO model for deep water. However, the use of those scaling factors for shallow-water surveys has not been substantiated. Tolstoy et al. (2009) verified that, in shallow water, sound is expected to reverberate in

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<sup>3</sup> Tolstoy et al. (2004), Tolstoy et al. (2009), Diebold et al. (2010), and most recently, Crone et al. (2014).

<sup>4</sup> 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.

the water column and upper seafloor and, therefore, sound propagation in shallow water would be highly dependent on local seafloor geology<sup>5</sup>—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) indicated that data differences between the two studies at shallow-water depths may have been due to site-specific differences.

Because LDEO has failed to verify the applicability of its model to conditions outside the Gulf of Mexico, the Commission has recommended in many of its letters that NMFS and/or the respective applicants 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 site-specific environmental<sup>6</sup> and operational<sup>7</sup> parameters. The Commission understands that LDEO has been analyzing hydrophone data from waters off Washington and New Jersey to allow comparisons of empirically derived estimates to model-estimated exclusion and buffer zones. For the survey off Washington, Crone et al. (2014) indicated that the zones can be reliably established with the hydrophone streamer only in shallow water, perhaps in depths no greater than about 200 m. They also stated that additional investigations into the use of hydrophone data for the determination of sound power levels from previous surveys, and perhaps new targeted calibration experiments, could help refine the effects of water depth and seafloor slope on power levels measured with the streamer in intermediate-depth waters and provide more concrete guidelines on the depth ranges for which the streamer can be reliably used for sound power level estimates<sup>8</sup>. Further, Crone et al. (2014) indicated that the modeled zones were greater than the measured zones in waters 200 m or less, which could be due to differences in bottom and sub-bottom properties between the Washington and the Gulf of Mexico sites—some of the very factors that the Commission believes should be included in the model.

For New Jersey, LDEO analyzed one of the lines (a 700-in<sup>3</sup> source towed at 4.5 m depth and shot upslope in water depths ranging from approximately 50 to 20 m) using hydrophone data from its truncated survey in 2014<sup>9</sup> to verify the accuracy of its acoustic modeling approach for estimating exclusion and buffer zones (Crone 2015). The Commission understands that Crone (2015) used a simple logarithmic regression model<sup>10</sup> to fit the data that were collected 500 m to 3.5 km in line from the source. He then estimated the cross-line mean based on a 1.63 correction factor (Carton pers. comm.) and used a 95<sup>th</sup> percentile fit to the regression model for all shots along the line. Since the closest hydrophone was 500 m from the source, the distances to the 180-dB re 1  $\mu$ Pa threshold were extrapolated based on the model—in some instances, the extrapolation was more than 400 m. Crone (2015) provided neither the slope nor the y-intercept for the logarithmic regression model. Specifics on the model are essential, as is basic information for comparing modeled to measured radii, similar to the information included in Tolstoy et al. (2009) and Crone et al. (2014). It is noteworthy that

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<sup>5</sup> 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.

<sup>6</sup> Such as sound speed profiles, refraction in the water column, bathymetry/water depth, sediment properties/bottom loss, and wind speed.

<sup>7</sup> Such as tow depth, source level, number/spacing of active airguns.

<sup>8</sup> Moreover, hydrophone streamers measure power levels in only one direction (behind the vessel). Previous studies have indicated that power levels vary as a function of azimuth.

<sup>9</sup> Due to mechanical issues and inclement weather.

<sup>10</sup> Although the document itself indicated a logarithmic spreading model.

polynomial and non-parametric cubic spline models best represented the data off Washington (Crone et al. 2014), neither of which are logarithmic in nature and a linear least squares method was fit to the typical spherical spreading model to extrapolate the 160-dB re 1  $\mu$ Pa radii to account for radii that fall beyond the length of the hydrophone streamer. In addition to issues surrounding the model specifics, Crone (2015) did not specify the basis for the cross-line correction factor, the sound speed profile when the measurements were collected, or whether the near-field extrapolated data would have been better fitted with another model, since propagation loss in the near- and far-field may not necessarily be the same.

In addition, NMFS misrepresented the data from Crone (2015) in Table 4 of the *Federal Register* notice. NMFS included the in-line measured and extrapolated means (78 and 1,521 m for the 180- and 160-dB re 1  $\mu$ Pa thresholds, respectively) rather than the 95<sup>th</sup> percentile cross-line predicted means (273 and 3,505 for the 180- and 160-dB re 1  $\mu$ Pa thresholds, respectively), which LDEO generally uses for its best-fit model. Thus, the percent differences in the model predicted radii and the 95<sup>th</sup> percentile cross-line predicted radii based on in-situ measurements were approximately 28 and 33 percent for the 180- and 160-dB re 1  $\mu$ Pa thresholds rather than 79.3 and 70.9 percent as specified in Table 4. Further, Crone (2015) indicated that the contour of the seafloor along the line was quite flat and varied by only a few meters along most of its 50-km length, which limited the shadowing and focusing that have been seen in other datasets (Crone et al. 2014). He then noted that the variability observed in Figures 3 and 4 for the 180- and 160-dB re 1  $\mu$ Pa thresholds, respectively, likely was caused by the shadowing and focusing of seismic energy from bathymetric features. Those two statements do not comport.

Although the far-field values appear to support the use of LDEO's model for the 160-dB re 1  $\mu$ Pa threshold, measurements for the cross-line direction, other tow depths, and the near-field that informs the radii for mitigation are still lacking. Until those data are available, the Commission continues to believe the use of a simplistic model and various extrapolations and scaling factors does not represent the best available science, especially since Crone et al. (2014) indicated polynomial and non-parametric cubic spline models best fit the data off Washington. The environmental conditions in the New Jersey survey area<sup>11</sup>, which should include sound speed profiles that represent cold-water conditions (increased sound speeds), surface ducts, and in-water refraction, as well as bathymetry and sediment characteristics that reflect sound should be incorporated into such a model. Therefore, the Commission recommends that NMFS (1) require LDEO to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals 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, U.S. Geological Survey (USGS), Scripps Institute of Oceanography (Scripps), Antarctic Contract Support (ASC), or any other relevant entity. In addition, the Commission continues to believe that LDEO, NSF, and related entities (USGS, Scripps, ASC) should be held to the same standard as other action proponents (i.e., U.S. Navy, Air Force, Bureau of Ocean Energy Management, and the oil and gas industry).

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<sup>11</sup> Which differ substantially from warm- or temperate-water regions where LDEO normally operates.

## Take estimation methods and overall numbers of takes

LDEO used its standard area<sup>12</sup> x density method to estimate the numbers of takes, which likely underestimated both the numbers of individuals exposed and the total number of takes because the survey would occur in a small area (12 x 50 km) 24 hours per day for approximately 30 days. To help address the shortcomings of LDEO's method, NMFS used its own take estimation method, an approach that it believed followed a recommendation the Commission included in its 2014 letter on the proposed survey. NMFS's method used the total ensonified area (including overlap and the 25 percent contingency) for the 30 days multiplied by (1) the revised density estimates from SERDP SDSS summer NODE data, (2) an adjustment factor of 25 percent based on Wood et al. (2012), and (3) an estimate of re-exposure, which was essentially the percent overlap of the survey. Unfortunately, the specific method adopted contains various deficiencies. It is unclear why overlap in the estimation was included, not only because it is removed at the end of the calculation but, more importantly, because NMFS normally indicates that an animal can be taken only once per day. Furthermore, an area x density method, which still serves as the basis for NMFS's method, assumes uniform distribution. At no time does NMFS actually account for the survey occurring for 30 days, thus a time element was not actually incorporated.

In addition, the Wood et al. (2012) correction factor of 1.25 was inaccurately described and incorrectly applied, which the Commission has observed for multiple recent proposed authorizations by NMFS. Briefly, Wood et al. (2012) determined a turnover rate of 2.5 for mysticetes based on tagged blue whales foraging for a mean of 21 days off the west coast of the United States (Bailey et al. 2009) and the proposed 53 days for the Pacific Gas and Electric (PG&E) survey off Diablo Canyon. It is important to note that the 21-day mean also included a standard deviation of 27 days due to blue whales spending from 3 to 115 days foraging within an area-restricted search patch. Wood et al. (2012) also included a turnover rate of 1 for resident species and 1.25 for other odontocetes and pinnipeds. Although justification for the 1.25 turnover rate was not provided by Wood et al. (2012), that rate would imply that individuals of those species would remain in the area for 24 days in the context of the 30 days of the NJ survey, which is highly unlikely since the area off New Jersey is more of a migratory corridor than a prime foraging area for at least some of those species. In addition, the Commission is concerned that NMFS misinterpreted what the turnover rates in Wood et al. (2012) actually mean. A correction factor of 1.25 does not imply that 25 percent of the animals would move away from the area and not be re-exposed. If that were the case, the 1.25 turnover rate would imply four individuals were exposed on a given day and on the following day, and during the remaining 28 days, three of those individuals would be exposed continually and only one would move beyond the range of the source. That would assume emigration rather than immigration, which was the intent of Wood et al. (2012). Furthermore, the assumption of a 25 percent emigration rate reduces the overall number of takes rather than increase the number of animals that could be affected. By using this approach, NMFS apparently would assume that 30 days of potential exposures would equate to only one take for the majority of the animals, whereas the smaller percentage of the animals leaving the zone would be taken during a very short timeframe (e.g., the time it would take to leave the zone before being re-exposed).

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<sup>12</sup> Based on the estimated ensonified area calculated from the overall survey area, the estimated buffer zone, and a 25 percent contingency to account for repeating tracklines.

NMFS's approach is neither consistent with the intent of Wood et al. (2012) nor consistent with NMFS's assumptions regarding a 24-hour reset. More importantly, it does not represent a science-based method to determine the total number of individuals taken on a given day and the total number of exposures for a survey, for which at least two other methods could have been used. First, the total area (including the 25 percent contingency) without overlap that would be ensonified on a given day could have been multiplied by each species-specific density to yield the number of individuals taken on a given day. To determine the total number of exposures or takes, the number of individuals taken on a given day should have been multiplied by 30 days. The second method would use the total ensonified area for the entire survey (including the 25 percent contingency) without overlap multiplied by the density to yield the total number of exposures. The total number of exposures then should have been divided by 30 to yield the number of individuals taken on a given day. If NMFS plans to determine the number of individuals taken during the proposed survey following an approach similar to what was intended by Wood et al. (2012), NMFS will have to review the scientific literature for applicable information regarding migratory, residence, and foraging patterns for the various species off the East Coast and relate those data to the 30-day survey period for the proposed survey off New Jersey to derive applicable turnover rates.

In line with these comments, the Commission understands that since publication of the *Federal Register* notice, NMFS is in the process of revising its take estimation methodology for the proposed survey. The Commission understands that the total numbers of exposures likely will decrease but the estimated numbers of individuals that could be taken likely will increase—the numbers of individuals currently serves as the authorized numbers of takes should the authorization be issued. Because the details of NMFS's revised take estimation method and the degree to which the numbers of takes to be authorized have increased are unknown, it is unclear if the number of takes for each species or stock would still be considered small numbers. Since neither the Commission nor the public can comment effectively on the revised take estimation method or the proposed numbers of takes to be authorized, NMFS should, as recommended herein, republish the *Federal Register* notice with updated information and allow for an additional comment period on the proposed authorization. This is especially important for an activity such as the New Jersey survey, which has garnered much attention and scrutiny. However, if NMFS chooses not to amend and republish its notice, the Commission recommends that NMFS (1) use one of the two methods described herein to estimate the total number of takes for each species/stock for the survey and (2) if NMFS intends to estimate the total number of individuals for each species/stock taken during the survey<sup>13</sup>, include a review of the applicable scientific literature regarding migratory, residence, and foraging patterns for the various species off the East Coast and relate those data to the 30-day survey period for the proposed survey off New Jersey.

### **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. The discussion of monitoring measures in the Commission's 1 April 2015 letter details these general concerns and provides the background and rationale for the following recommendation. Consistent with that discussion, the Commission again recommends that NMFS

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<sup>13</sup> Which likely will be based on the numbers of animals taken during a given day.

consult with LDEO and other relevant entities (e.g., NSF, USGS, Scripps, ASC) 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 based on the extent of the Level B harassment zones extending from more than 10 km in some instances and to more than 26 km in other instances (79 Fed. Reg. 52125). And, although the Commission has made this recommendation in numerous previous letters, the Commission believes 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 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. The Commission would welcome another meeting to help further this goal.

The Commission looks forward to collaborating with NMFS on the various guidance documents and 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

Enclosure

## References

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# MARINE MAMMAL COMMISSION

1 April 2015

Ms. Jolie Harrison, Chief  
Permits and Conservation Division  
Office of Protected Resources  
National Marine Fisheries Service  
1315 East-West Highway  
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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 the Scripps Institution of Oceanography (Scripps), on behalf of Scripps and 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 Zealand in May and June 2015. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 20 March 2015 notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (80 Fed. Reg. 15060).

Some issues raised in previous Commission letters regarding similar geophysical surveys reflect ongoing concerns that apply more broadly to incidental take authorization applications, not just those from Scripps. The Commission has recommended numerous times that NMFS adjust density estimates used to estimate the numbers of potential takes by incorporating some measure of uncertainty when available density data originate from other geographical areas and temporal scales<sup>1</sup>. In this instance, Scripps used various extrapolations<sup>2</sup> and adjustments based on numerous assumptions in the absence of applicable density data off New Zealand. It would have been very useful if NMFS had a policy or other guidance available to inform the proposed authorization that would set forth a consistent approach for how applicants should incorporate uncertainty in density estimates. In addition, the Commission previously has recommended that NMFS follow a consistent approach in assessing the potential for taking by Level B harassment from exposure to specific types of sound sources (e.g., echosounders, sub-bottom profilers, side-scan sonar, and fish-finding sonar) by all applicants who propose to use them<sup>3</sup>. Scripps would be using such sources during its activities off New Zealand, including when the airgun array would not be in use. The Commission understands that NMFS plans to develop clearer policies and guidance to address these concerns.

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<sup>1</sup> Including the age of the data.

<sup>2</sup> Including data from the California Current, Eastern Tropical Pacific Ocean, and the Southern Ocean.

<sup>3</sup> Please refer to the Commission's 23 February 2015 and 30 January 2014 letters detailing its rationale.

The Commission would welcome the opportunity to work with NMFS as it develops these broadly applicable policies.

## **Background**

Scripps has proposed to conduct a low-energy geophysical survey in the exclusive economic zone of New Zealand. The purpose of the proposed survey is to investigate the thermal structure of the Hikurangi subduction zone and gas hydrate-related bottom simulation reflections. The survey would be conducted in waters estimated to be 200–3,000 m in depth with approximately 1,250 km of tracklines. The R/V *Roger Revelle* would tow a two-airgun array (nominal source level of 230.6 dB re 1  $\mu$ Pa at 1 m (peak) with a maximum discharge volume of 90 in<sup>3</sup>) at 2 m depth. The *Revelle* also would tow one 600-m hydrophone streamer during the survey; ocean bottom seismometers that were deployed previously would be used during the seismic portion of the survey as well. Scripps would conduct heat-flow measurements during the survey and operate a 3.5-kHz subbottom profiler, 12-kHz multibeam echosounder, and various acoustic pingers to locate instruments throughout the survey.

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 32 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 measures. Those measures include (1) monitoring exclusion and buffer zones, (2) using shut-down and ramp-up procedures, and (3) speed and course alterations, if safe and practicable.

Despite repeated recommendations in previous letters and discussions regarding the Commission's concerns with NMFS, NSF, Lamont-Doherty Earth Observatory (LDEO), and U.S. Geological Survey (USGS), some major issues remain unresolved. These ongoing concerns are summarized in the following sections.

## **Uncertainty in modeling exclusion and buffer zones**

The Commission has identified issues with 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 beginning in 2010. Briefly, LDEO performs acoustic modeling for geophysical research funded by NSF. For at least 6 years, LDEO has estimated 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 the Commission's previous letters (see the Commission's enclosed 14 December 2014 letter for detailed rationale regarding its comments on LDEO's model), numerous studies<sup>4</sup> have underscored the importance of incorporating site-specific environmental and operational parameters into estimating exclusion and buffer zones. The recent Crone et al. (2014)<sup>5</sup> study indicated that, in shallow and sloped environments, the complexity of local geology and bathymetry and the typical lack of

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<sup>4</sup> Tolstoy et al. (2004), Tolstoy et al. (2009), Diebold et al. (2010), and most recently, Crone et al. (2014).

<sup>5</sup> 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.

sufficient information regarding this complexity can make it difficult to predict sound levels accurately as a function of distance from the source array. In contrast to the most widely accepted current approaches in the scientific literature, LDEO's 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.

To estimate the proposed exclusion and buffer zones for the survey off New Zealand, LDEO used two G airguns as a proxy for two GI airguns within the Nucleus modeling software and assumed a maximum tow depth of 2 m. LDEO also used a correction factor of 1.5 to derive relevant zones for intermediate water depths from modeled deep-water results<sup>6</sup>. However, LDEO has not substantiated the applicability of the 1.5 correction factor in environments other than the Gulf of Mexico and has provided no evidence that the 1.5 correction factor is appropriate when using LDEO's model to estimate the relevant zones for the two G guns that will be used off New Zealand, nor has it substantiated the use of its model for deep water depths outside the Gulf of Mexico.

Because LDEO has failed to verify the applicability of its model to conditions outside the Gulf of Mexico, the Commission has recommended in many of its letters that NMFS and/or applicants 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 site-specific environmental<sup>7</sup> and operational<sup>8</sup> parameters. The Commission understands that LDEO has been analyzing hydrophone data from waters off Washington State<sup>9</sup> to allow comparisons of empirically derived estimates to model-estimated exclusion and buffer zones. Crone et al. (2014) indicated that the zones can be reliably established with the hydrophone streamer only in shallow water, perhaps in depths no greater than about 200 m. They also stated that additional investigations into the use of hydrophone data for the determination of sound power levels from previous surveys, and perhaps new targeted calibration experiments, could help refine the effects of water depth and seafloor slope on power levels measured with the streamer in intermediate-depth waters and provide more concrete guidelines on the depth ranges for which the streamer can be reliably used for sound power level estimates<sup>10</sup>. Further, Crone et al. (2014) indicated that the modeled zones were greater than the measured zones in waters 200 m or less, which could be due to differences in bottom and sub-bottom properties between the Washington and the Gulf of Mexico sites—some of the very factors that the Commission believes should be included in the model.

In general, the Commission does not support LDEO's continued use of a simplistic model and various correction factors because it is not based on best available science. This is particularly

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<sup>6</sup> Based on past practice and empirical measurements from the 36-airgun array in the Gulf of Mexico from Diebold et al. (2010).

<sup>7</sup> Such as sound speed profiles, refraction in the water column, bathymetry/water depth, sediment properties/bottom loss, and wind speed.

<sup>8</sup> Such as tow depth, source level, number/spacing of active airguns.

<sup>9</sup> And New Jersey.

<sup>10</sup> Moreover, hydrophone streamers measure power levels in one direction (behind the vessel) only. Previous studies have indicated that power levels vary as a function of azimuth.

true for the environmental conditions in the New Zealand survey area<sup>11</sup>, which should include sound speed profiles that represent cold-water conditions (increased sound speeds), surface ducts, and in-water refraction, as well as bathymetry and sediment characteristics that reflect sound—parameters that are not accounted for in LDEO’s model. Therefore, the Commission recommends that NMFS (1) require Scripps to have LDEO re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals 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 Scripps, NSF, LDEO, USGS, Antarctic Contract Support (ASC), or any other relevant entity. The Commission also continues to believe that Scripps, NSF, LDEO and related entities (ASC, USGS) should be held to the same standard as other action proponents (i.e., U.S. Navy, Air Force, Bureau of Ocean Energy Management, and the oil and gas industry).

### **Species proposed to be taken**

As stated previously, there is a dearth of available marine mammal data for waters off New Zealand. NMFS indicated that it discounted 18 marine mammal species with ranges that may potentially occur in the southwest Pacific Ocean and/or are in the stranding record—NMFS based that presumption on Baker et al. (2010) and their categorizing those species as ‘vagrants’. However, many other action proponents include certain species (including Arnoux’s beaked whales, pygmy beaked whales, and Risso’s dolphins) in their marine mammal impact assessments<sup>12</sup> for seismic activities off New Zealand. Those species also are present in the DOC’s sightings database for marine mammals present (either alive or stranded) in New Zealand’s waters. Because Arnoux’s and pygmy beaked whales are not thoroughly studied and their habitat ranges are poorly understood<sup>13</sup>, the Commission believes that it would have been prudent for NMFS to include them in the proposed authorization since they have been observed dead-stranded in New Zealand. Similarly, the range of Risso’s dolphins does overlap with New Zealand waters based on information on various government websites, including NMFS’s website<sup>14</sup>. Further, Risso’s dolphins have been observed in New Zealand both alive<sup>15</sup> and dead. Thus, the Commission believes the potential to take those species exists and recommends that NMFS include Arnoux’s beaked whales, pygmy beaked whales, and Risso’s dolphins in its incidental harassment authorization and authorize the associated takes based on group size.

### **Monitoring measures**

In previous letters, the Commission has indicated that the measures in support of monitoring and reporting requirements 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

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<sup>11</sup> Which differ substantially from warm- or temperate-water regions where LDEO normally operates.

<sup>12</sup> As required by New Zealand’s Department of Conservation (DOC) and its 2013 Code of Conduct for Minimizing Acoustic Disturbance to Marine Mammals from Seismic Survey Operations.

<sup>13</sup> Although the assumed range of Arnoux’s beaked whales does include waters off New Zealand.

<sup>14</sup> <http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/rissosdolphin.htm>.

<sup>15</sup> News articles have indicated that DOC has estimated approximately 2,000 Risso’s dolphins occur in New Zealand waters.

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 project 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 have some sense of how the estimates compare to real likely exposure (80 Fed. Reg. 4891). The Commission disagrees for the reasons specified herein.

First, 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 does not support NMFS's own acknowledgement that marine mammals are distributed patchily—based on species-specific group size and behavior state. Furthermore, NMFS indicated that the number of marine mammals detected during the geophysical surveys is a small percentage of those predicted to be taken, which is expected due to marine mammals spending a large portion of their time underwater (80 Fed. Reg. 4891). It is that latter factor that the Commission has repeatedly recommended that NMFS and LDEO incorporate in their monitoring efforts.

The Commission continues to believe that  $g(0)$  and  $f(0)$  values<sup>16</sup> should be based on the ability of protected species observers to detect marine mammals rather than on hypothetically optimal estimates derived from scientific surveys<sup>17</sup> (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 when the airguns are active and inactive. 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 has been discussed with NMFS, LDEO, and relevant entities in the past. The Commission acknowledges that those values may not be as accurate as using a well-planned, randomized sampling design typically used during marine mammal scientific surveys, but adjusting by those rudimentary values would be preferable to assuming that only those animals detected during the survey equated to the total numbers taken, which is clearly an underestimate of reality.

Therefore, the Commission again recommends that NMFS consult with LDEO and other relevant entities (e.g., NSF, USGS, ASC, Scripps) to develop, validate, and implement a monitoring

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<sup>16</sup> These values vary based on platform characteristics, observer skill, environmental conditions, and sightability and detectability of the species.

<sup>17</sup> Values that the Commission understands LDEO and relevant entities incorporated in past monitoring reports.

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. Although the Commission has made this recommendation in numerous previous letters, the Commission believes 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 correction factors be developed for every survey. Rather, it is important for NSF, LDEO, 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. The Commission would welcome another meeting to help further this goal.

The Commission looks forward to collaborating with NMFS on the various guidance documents and 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

Enclosure

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