



MARINE MAMMAL COMMISSION

30 August 2019

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 Scripps Institution of Oceanography (SIO)¹ 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 incidental to conducting a marine geophysical survey in the southwestern Atlantic Ocean in fall 2019. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 12 August 2019 notice² announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (84 Fed. Reg. 39896).

Background

SIO proposes to conduct a low-energy geophysical survey in the exclusive economic zone of the Falkland Islands and in international waters. The purpose of the survey is to examine deep ocean water masses that originate in the Southern Ocean and intersect the continental margin of Argentina as part of a future International Ocean Discovery Program project. The survey would be conducted with either a single airgun or a two-airgun array³ and a single 200-m to 1.6-km hydrophone streamer⁴ along approximately 7,500 km of tracklines. The R/V *Thomas G. Thompson* (*Thompson*) would operate the airgun arrays at a tow depth of 2 to 4 m in waters 50 to 5,700 m in depth. In addition, the *Thompson* would operate a multibeam echosounder and subbottom profiler.

¹ And funded by the National Science Foundation (NSF).

² The Commission noted multiple typographical errors, inconsistencies, and omissions in the preamble and proposed authorization. NMFS indicated it would fix those issues for the final authorizations. As one example, Table 5 in the *Federal Register* notice included typographical errors for various Level A harassment zones for the 36-airgun array and incorrect notation of N/A for source levels for the mitigation airgun for mid-frequency cetaceans and otariids. Table 6 also included a typographical error for the 18-airgun array. In addition, the bow-riding mitigation exception was inconsistent between the preamble and proposed authorization and incorrectly included various genera. Further, pilot whales and Risso's dolphins were omitted from the 30-minute clearance time requirement and pinnipeds were omitted from the 15-minute clearance time requirement in certain measures stipulated in the preamble. Similar omissions were noted in the proposed authorization as well.

³ With a maximum discharge volume of 90 in³.

⁴ Portions of the survey would operate at 5 knots, while the other portion would operate at 8 knots.

The survey could occur on up to 28 days, with an additional 7 days⁵ for operational contingencies (i.e., weather delays, equipment failure, etc.).

NMFS preliminarily has determined that the proposed activities could cause Level A⁶ and/or B harassment⁷ of small numbers of numerous species or stocks 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 has preliminarily determined that the proposed mitigation measures provide the means of effecting the least practicable impact on the affected species or stocks. Those measures include (1) using protected species observers to monitor the Level A⁸ and B⁹ harassment zones for 30 minutes before, during, and for 60 minutes¹⁰ after the survey, (2) implementing speed and course alterations, and (3) using shut-down¹¹ and ramp-up procedures. In addition, SIO would shut down the airguns immediately if (1) a beaked whale, *Kogia* spp., or southern right whale, (2) a large whale¹² with a calf, or (3) an aggregation¹³ of large whales is observed within 500 m of the *Thompson*. Ramp-up procedures would not be initiated until the animal(s) has not been seen for 30 minutes. LDEO would report any injured or dead marine mammal to NMFS's Office of Protected Resources using its phased approach.

Flaws in modeling methodology

For more than 9 years, the Commission has raised concerns regarding Lamont-Doherty Earth Observatory's (LDEO) model used by SIO to estimate the extent of the Level A and B

⁵ The Commission informally noted that the preamble incorrectly specified 5 rather than 7 contingency days, which includes both weather days and SIO's assumed 25-percent contingency for equipment failure and other issues. SIO indicated that the ship schedule has changed due to the change in the number of contingency days. It plans to leave port in Montevideo, Uruguay, on 11 September rather than 12 September and return to port on 31 October rather than 29 October as noted in the preamble. NMFS indicated it would revise the preamble accordingly for the final authorization.

⁶ NMFS did not propose to authorize Level A harassment takes for any species in the preamble or draft authorization. It has since decided to add Level A harassment takes for some high-frequency cetaceans. Specifically, NMFS plans to authorize 50 Level A harassment takes and 2,206 Level B harassment takes of hourglass dolphins, 10 Level A harassment takes and 411 Level B harassment takes of Peale's dolphins, and 23 Level A harassment takes and 117 Level B harassment takes of Commerson's dolphins in the final authorization.

⁷ The Commission informally noted that NMFS erroneously assumed a group size of one for Blainville's beaked whales. NMFS indicated that it would authorize seven Level B harassment takes of Blainville's beaked whales in the final authorization.

⁸ And a standard exclusion zone of 100 m.

⁹ The Commission informally noted that the Level B harassment zones stipulated in Table 9 of the preamble and Appendix D of SIO's application were incorrect. The Level B harassment zones for deep and shallow water were interchanged for both the 5- and 8-knot survey speeds. SIO indicated that Table 1 in the application denoted the correct Level B harassment zones and those zones were used to inform the relevant ensonified areas. NMFS plans to include the correct Level B harassment zones in the final authorization.

¹⁰ The Commission informally noted that this standard requirement was omitted from the preamble and the proposed authorization. NMFS indicated the requirement would be included in the final authorization.

¹¹ Shut downs would not be required for small delphinids (*Delphinus* spp., *Tursiops* spp., *Stenella* spp., *Steno* spp., *Lissodelphis* spp., *Lagenorhynchus* spp., and *Lagenodelphis* spp.) that are traveling and voluntarily approaching the source vessel to interact with the vessel and/or airgun array. NMFS did not consistently include the 30-minute clearance time requirement for dwarf and pygmy sperm whales, Risso's dolphins, and pilot whales in the preamble and in section 4.e.i through iii in the proposed authorization. NMFS indicated those species would be included consistently in the final authorization.

¹² A sperm whale or mysticete.

¹³ Six or more individuals that do not appear to be traveling and are feeding, socializing, etc.

harassment zones and the numbers of marine mammal takes and has provided extensive comments regarding the inappropriateness of that model¹⁴ and LDEO's other 'modeling' approaches. LDEO uses the Nucleus source model and a simple ray trace–based modeling approach that assumes spherical spreading, a constant sound speed, and no bottom interactions for surveys in deep water (Diebold et al. 2010). LDEO's model is essentially a MATLAB algorithm that truncates the radii at 2,000 m in depth, even though the survey in this instance would occur in waters up to 5,700 m in depth. Environmental conditions, including the presence of a surface duct, in-water refraction, and bathymetry and sediment characteristics are not accounted for in LDEO's modeling approach.

Many studies, including multiple LDEO-associated studies (Tolstoy et al. 2004, Diebold et al. 2006, Tolstoy et al. 2009, Diebold et al. 2010, and Crone et al. 2014 and 2017), have emphasized the importance of incorporating site-specific environmental and operational parameters into estimating Level A and B harassment zones that could very well be underestimated in deep water by LDEO's model. For example, Tolstoy et al. (2009) noted the effect that the sound speed profile had on refracting the sound downward in the Gulf of Mexico, and NSF's Programmatic Environmental Impact Statement regarding marine seismic research described even more prevalent sound channels with downward refraction at both the mid-Atlantic Ridge and sub-Antarctic sites (Appendix B), similar to SIO's survey site. Tolstoy et al. (2009) also indicated that only the direct arrivals were included in the analysis of the deep-water site and seafloor reflections, which may become significant at greater distances, were not considered. Thus, the harassment zones may in fact not be sufficient, which is alluded to in Diebold et al. (2006) as well. For deep and intermediate water depths, NMFS has additionally stated that LDEO's in-situ measurements cannot be used to readily derive Level A and Level B harassment zones because the calibration hydrophone was located at a roughly constant depth of 350–500 m, which likely did not intersect all the sound pressure level (SPL) isopleths at their widest point (Tolstoy et al. 2004). Therefore, in intermediate waters (100–1,000 m), LDEO assumes 1.5 times the estimated Level B harassment zones in deep water. Based on these shortcomings, the Commission recommends that NMFS specify (1) why it believes that sound channels with downward refraction, as well as seafloor reflections, are not likely to occur during SIO's survey and (2) the degree to which both of those parameters would affect the estimation (or underestimation) of Level B harassment zones in deep and intermediate water depths.

For shallow water (< 100 m), LDEO uses in-situ measurements obtained in the Gulf of Mexico at a tow depth of 6 m scaled to the relevant tow depth of each survey, and presumably scaled to the relevant airgun spacing distance¹⁵, and applies those measurements to all ocean basins. The use of simple correction factors and ratios to account for water depth, tow depth, and airgun spacing has yet to be validated. In fact, LDEO's assumptions and methods in shallow water overestimate the Level A and B harassment zones (Barton et al. 2006, Diebold et al. 2006, Crone et al. 2014 and 2017). Those same LDEO scientists have indicated that the simple modeling approach is insufficient when geophysics become more complex (Diebold et al. 2006) and depths are shallow with varying sound speed profiles (Barton et al. 2006). As such, the Commission recommends that NMFS specify how it has validated use of LDEO's correction factors and ratios to account for

¹⁴ Which should be reviewed in conjunction with this letter (see the Commission's [2 May 2016 letter](#)) and are not reiterated herein.

¹⁵ The method LDEO uses to account for airgun spacing in shallow water was not discussed in the *Federal Register* notice. SIO plans to use both 2-m and 8-m spacing between the two airguns.

differing water depths, tow depths, and airgun spacing for surveys that occur in both intermediate and shallow water.

More than 35 Commission letters on this matter have yet to sway NSF to follow methods that are widely agreed to constitute the best available science. LDEO's modeling approach has not changed in more than a decade and the refusal to change appears to contradict NSF's mission to *advance the progress of science*. In more recent years, several stakeholders¹⁶ have expressed similar concerns regarding the inappropriateness of LDEO's modeling methods to no avail (80 Fed. Reg. 67713).

Three years ago, these issues were further complicated with finalization of NMFS's updated acoustic thresholds for permanent threshold shift (i.e., Level A harassment). LDEO continues to claim that its model cannot incorporate more than a single shot and thus cannot readily estimate ranges to the cumulative sound exposure level (SEL_{cum}) thresholds. To estimate the Level A harassment zones, LDEO computed 'modified' frequency-weighted, farfield source levels, which are essentially back-calculated source levels¹⁷ based on the distance to the relevant frequency-weighted Level A harassment threshold for a single shot. LDEO similarly estimated modified farfield source levels for peak sound pressure levels (SPL_{peak}), which also are back-calculated source levels based on the distance to the Level A harassment threshold for a single shot. For the two-airgun array operating at an 8-m separation, NMFS denoted the SPL_{peak} source levels as N/A for mid-frequency (MF) cetaceans and otariids in Table 6 of the *Federal Register* notice. The SPL_{peak} source levels do in fact exist, the 'modified' source levels however may not exist. Unfortunately, this could not be confirmed since SIO did not include the relevant isopleths for the 8-m airgun separation in Figures A-14 and 15 of the application¹⁸. In addition, SIO included NMFS's user spreadsheets (Tables A-4 and -5) from a previous survey using the *R/V Revelle* at source velocities that do not match those of the current survey (4 and 10 knots rather than 5 and 8 knots)¹⁹. This adds unnecessary confusion to a modeling approach that is already convoluted. As such, the Commission recommends that NMFS ensure that all SPL_{peak} and SEL_{cum} source levels, modified source levels, and related adjustment factors²⁰ are specified and all relevant isopleth figures and user spreadsheet tables are included in all future NSF-funded and -affiliated²¹ applications prior to processing them.

The Commission is unaware of any other seismic operators using such a circuitous approach to estimate harassment zones for either metric. Generally, source levels are inputs to models rather than products of those models, and the sound field from spatially-distributed sources (e.g., airgun arrays) is modeled as sums of point sources, under the assumption that individual

¹⁶ Natural Resources Defense Council and Whale and Dolphin Conservation.

¹⁷ Assuming spherical propagation loss.

¹⁸ SIO included the figures for two airguns in the 2-m gun separation configuration rather than the 8-m gun separation configuration.

¹⁹ The Level A harassment zones end up being the same because the same shot intervals (25 m shot interval for the 2-m separation configuration and a 50-m shot interval for the 8-m separation configuration) were used for both the *Thompson* and *Revelle* surveys. This is only determined if one uses the velocities and repetition rates in Table A-4 and -5 to determine the *Revelle* shot intervals.

²⁰ Table A-3 of SIO's Appendix did not specify the adjustment factor of -24.57 for phocids, which is based on the modified SEL_{cum} source level of 206.86 dB re 1 μ Pa²-sec and results in the 0.1 m zone stated in Table 7 of the *Federal Register* notice.

²¹ Including U.S. Geological Survey (USGS).

airgun pressures do not substantially influence each other. Such an approach is straightforward, easy to implement, and accounts for both the ‘near-field’ and ‘far-field’ effects. Another shortcoming of LDEO’s modeling approach is that its source model cuts off spectral levels at 2.5 to 3 kHz. Since airguns emit energy above 3 kHz, the frequency limits of Nucleus would affect the estimated ranges to the Level A harassment thresholds for various species (including MF and high-frequency (HF²²) cetaceans). Other source models (including Gundalf Optimizer²³ and JASCO’s Airgun Array Source Model (AASM)) provide sound levels into the HF range and should have been used.

The use of modified farfield source levels and truncated spectra further supports the Commission’s continued recommendation that NMFS require LDEO and other affiliated entities, to revise their source and sound propagation modeling methodologies. The Commission again underscores the need for NMFS to hold LDEO, NSF, and affiliated entities to the same standard as other action proponents (e.g., Bureau of Ocean Energy Management, the oil and gas industry, the renewable energy industry, U.S. Navy, U.S. Air Force), as LDEO’s model does not represent the best available science. Thus, the Commission again recommends that NMFS require LDEO to re-estimate the proposed Level A and B harassment zones and associated takes of marine mammals using (1) both operational (including number/type/spacing of airguns, tow depth, source level/operating pressure, operational volume) and site-specific environmental (including sound speed profiles, bathymetry, and sediment characteristics²⁴ at a minimum) parameters, (2) a comprehensive source model (i.e., Gundalf Optimizer) and (3) an appropriate sound propagation model (i.e., BELLHOP) for the proposed incidental harassment authorization.

Specifically, the Commission reiterates that LDEO should be using the ray-tracing sound propagation model BELLHOP—which is a free, standard propagation code that readily incorporates all environmental inputs listed herein, rather than the limited, in-house MATLAB code currently in use. Although the Commission has recommended that LDEO use BELLHOP for several years, NMFS has yet to address the Commission’s assertion that BELLHOP should be used in lieu of LDEO’s model or any of the Commission’s more recent counterpoints regarding the continued use of LDEO’s model and other ‘modeling’ approaches. The Commission recommends that NMFS specify why it believes that LDEO’s model and other ‘modeling’ approaches provide more accurate, realistic, and appropriate Level A and B harassment zones than BELLHOP.

Monitoring measures

The Commission maintains 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. Those assessments should account for all animals in the various survey areas, 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 is achieved by incorporating $g(0)$ and $f(0)$ values²⁵, and those

²² Particularly since the Level A harassment threshold is 155 dB re 1 μ Pa²-sec.

²³ <https://www.gundalf.com/environmental/>

²⁴ Those data can be obtained from the National Geophysical Data Center, Leviticus, and the U.S. Navy Oceanographic and Atmospheric Master Library’s databases including Generalized Digital Environmental Model, Digital Bathymetric Database Variable-Resolution, Surface Marine Gridded Climatology.

²⁵ These values vary based on, among other things, platform characteristics, observer skill, environmental conditions, and sightability and detectability of the species.

animals that are not detected during nighttime hours. In response to previous Commission letters regarding this matter, NMFS requested that the Commission develop a method to improve post-survey reporting requirements—the Commission provided NMFS with that method in 2016 (see the Addendum in the Commission’s most recent [1 May 2019 letter](#)).

Since that time, NMFS agreed to use the Commission’s method to better estimate the numbers of marine mammals taken by Level A and B harassment during numerous geophysical surveys. NMFS also has indicated that it welcomed LDEO’s input on a method to generate a similar quantitative method but, in the absence of a new method, recommended that LDEO use the Commission’s method for its geophysical surveys (84 Fed. Reg. 27249 and 35076). Although NMFS has included requirements for the action proponents to refine the total numbers of animals taken for quite some time, LDEO, SIO, and other NSF-affiliated entities²⁶ do not appear to have complied with those requirements, particularly in recent years. The numbers of marine mammals reported to be taken should include extrapolations based on relevant $f(0)$ and $g(0)$ values, the actual extents of the Level A²⁷ and B harassment zones relative to the observable extents, and the periods the airguns are active during nighttime (including dawn and dusk) relative to daylight hours. Until such time that a better method is developed or SIO, LDEO, and other NSF-affiliated entities derive geophysical survey-specific $f(0)$ values, the Commission recommends that NMFS require SIO to use the Commission’s method as described in the Addendum to its 1 May 2019 letter *and* apply relevant corrections for airgun activity in daylight vs nighttime (including dawn and dusk) to better estimate the numbers of marine mammals taken by Level B harassment in the incidental harassment authorization. The Commission further recommends that NMFS require SIO to specify in the final monitoring report (1) the number of days the survey occurs and the array is active and (2) the percentage of time and total time the array is active during daylight vs nighttime hours (including dawn and dusk)²⁸.

Proposed one-year authorization renewals

NMFS has indicated that it may issue a second one-year²⁹ incidental harassment authorization renewal³⁰ for this and other future authorizations if various criteria are met and after an expedited public comment period of 15 days. The Commission is concerned that the renewal process proposed in the *Federal Register* notice is inconsistent with the statutory requirements—section 101(a)(5)(D)(iii) clearly states that proposed authorizations are subject to a 30-day comment period—and Congressional expectations regarding the length of the comment period when it

²⁶ Including USGS.

²⁷ Which should not be an issue for SIO’s authorization.

²⁸ The Commission made this same recommendation in its [1 July 2019 letter](#) regarding an LDEO survey off Oregon and Washington. However, NMFS did not address it in the *Federal Register* notice for issuance of that authorization. The Commission expects it will be addressed and the relevant reporting requirements will be specified in SIO’s authorization.

²⁹ NMFS informed the Commission that the renewal would be issued as a one-time opportunity, after which time a new authorization application would be required. NMFS has yet to specify this in any *Federal Register* notice detailing the new proposed renewal process but should do so.

³⁰ The Commission informally noted that NMFS incorrectly stated in the ‘Summary of Request’ section of the preamble that the planned activity is not expected to exceed one year, hence a subsequent authorization is not expected to be issued (84 Fed. Reg. 39896). That supposition refutes NMFS’s request for public comments on a possible 1-year renewal (84 Fed. Reg. 39896 and 39227). NMFS indicated that the phrase in the ‘Summary of Request’ section was included in error.

passed that provision³¹.

Another significant issue with the proposed 15-day comment period is the burden that it places on reviewers, who will need to review the original authorization and supporting documentation³², the draft monitoring report(s), the renewal application or request³³, and the proposed authorization and then formulate comments very quickly. Depending on how frequently NMFS invokes the renewal option, how much the proposed renewal or the information on which it is based deviates from the original authorization, and how complicated the activities are and the taking authorization is, those who try to comment on all proposed authorizations and renewals, such as the Commission, would be hard pressed to do so within the proposed 15-day comment period. Therefore, the Commission recommends that NMFS refrain from using the proposed renewal process for SIO's authorization. The renewal process should be used sparingly and selectively, by limiting its use only to those proposed incidental harassment authorizations that are expected to have the lowest levels of impacts to marine mammals and that require the least complex analyses. Notices for other types of activities should not include the possibility that a renewal might be issued using the proposed foreshortened 15-day comment period. If NMFS intends to use the renewal process frequently *or* for authorizations that require a more complex review (such as SIO's authorization) or for which much new information has been generated (e.g., multiple or extensive monitoring reports), the Commission recommends that NMFS provide the Commission and other reviewers the full 30-day comment opportunity set forth in section 101(a)(5)(D)(iii) of the MMPA.

Ongoing general concerns

The Commission has repeatedly expressed concern over errors, inconsistencies, and omissions in applications, *Federal Register* notices, and proposed authorizations involving SIO and other NSF-funded and -affiliated surveys. Many of those issues affect the extents of the Level A and B harassment zones, numbers of Level A and B harassment takes to be authorized, and mitigation and monitoring measures to be required. In the last year³⁴, the Commission notes that all of the authorizations involving NSF-funded and -affiliated surveys included incorrect densities or group sizes, errors in the estimated numbers of Level A and/or B harassment takes, and incomplete, incorrect, or inconsistent mitigation, monitoring, or reporting requirements in the proposed authorization. To a lesser degree, but still prevalent, were issues involving incorrect extents of the Level A and B harassment zones and/or ensouffled areas³⁵. It is evident that NMFS must take a more active and diligent role in reviewing its proposed authorizations prior to publication in the *Federal Register*. NMFS cannot rely solely on the Commission or the public to

³¹ See, for example, the legislative history of section 101(a)(5)(D), which states "...in some instances, a request will be made for an authorization identical to one issued the previous year. In such circumstances, the Committee expects the Secretary to act expeditiously in complying with the notice and comment requirements." (H.R. Rep. No. 439, 103d Cong., 2d Sess. 29 (1994)). The referenced "notice and comment requirements" specify a 30-day comment period.

³² Including the original application, hydroacoustic and marine mammal monitoring plans, take estimation spreadsheets, etc.

³³ Including any proposed changes or any new information.

³⁴ Incidental harassment authorizations that published in the *Federal Register* from June 2018 to June 2019 were reviewed.

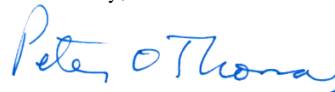
³⁵ Which do not reflect the Commission's concerns with LDEO's subpar modeling approach. If those issues had been included, 100 percent of the authorizations would have included incorrect extents of the Level A and B harassment zones and/or ensouffled areas.

continue to catch careless errors that should be identified during internal review processes. Therefore, the Commission again recommends that NMFS conduct a more thorough review of the applications and *Federal Register* notices to ensure not only accuracy, completeness, and consistency, but also to ensure that they are based on best available science, prior to submitting them to the *Federal Register* for public comment.

The Commission also repeatedly has expressed concern regarding the amount of time that NMFS has to consider comments provided by both the Commission and the public regarding authorizations involving NSF-funded and -affiliated surveys. In this instance, the public comment period closes the day the *Thompson* is scheduled to leave port in Montevideo on 11 September. Accordingly, the Commission again recommends that NMFS require earlier submission of applications and other documentation so that it has sufficient time to review and provide comments on the adequacy and accuracy of the application, allow applicants to make necessary revisions or additions to the application, draft its proposed authorization, publish it in the *Federal Register* in a timely manner, and consider the comments received from the public.

Please contact me if you have questions concerning the Commission's recommendations.

Sincerely,



Peter O. Thomas, Ph.D.,
Executive Director

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