



MARINE MAMMAL COMMISSION

5 September 2017

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 (Scripps) 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 northeastern Pacific Ocean in September 2017. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 17 August 2017 notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (82 Fed. Reg. 39276).

Background

Scripps proposes to conduct a geophysical survey off Washington and Oregon within the U.S. exclusive economic zone. The purpose is to train scientists how to plan seismic surveys, acquire data, and manage activities at sea. The survey also would provide data regarding the sediment and crustal structure within the Cascadia continental margin. The survey would be conducted along approximately 1,057 km of tracklines in waters estimated to be 130 to 2,600 m in depth. Scripps would use the R/V *Roger Revelle* to operate a two-airgun array at a tow depth of 3 m. In addition, the *Revelle* would (1) tow a 8-km hydrophone streamer and (2) use a multibeam echosounder (MBES) and subbottom profiler (SBP) during the survey. The survey is expected to last for five days¹.

NMFS preliminarily has determined that, at most, the proposed activities would result in the incidental taking of small numbers of up to 27 species of marine mammals by Level A and/or B harassment 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 effecting the least practicable impact on the affected species or stocks. Those measures include (1) refraining from operating the multibeam echosounder in transit to and from the survey area, (2) using two protected species

¹ A 25-percent contingency appears to have been added for airgun testing and repeat coverage of any areas where initial data quality is substandard.

observers to monitor the Level A and B² harassment zones for 30 minutes before, during, and for 30 minutes after the survey, (3) implementing speed and course alterations, and (4) using shut-down³ and ramp-up procedures. In addition, Scripps would shut down the airguns immediately if a large whale⁴ with a calf, an aggregation⁵ of large whales, a killer whale, or a North Pacific right whale is sighted², regardless of the distance from the *Revelle*. Ramp-up procedures would not be initiated until the animal(s) has not been seen at any distance for 30 minutes. Further, Scripps would shut down the array if the animal(s) is observed at any distance. Scripps would report any injured or dead marine mammal to NMFS's Office of Protected Resources and the Pacific Islands Regional Stranding Coordinator² using its phased approach.

The Commission noted multiple missing or inconsistent mitigation measures in NMFS's proposed authorization and believes NMFS should include standard mitigation, monitoring, and reporting measures in a consistent manner for all related authorizations. Therefore, the Commission recommends that NMFS include standard mitigation, monitoring, and reporting measures consistently for all authorizations involving geophysical surveys.

Uncertainty in modeling Level A and B harassment zones

Scripps used Lamont-Doherty Earth Observatory's (LDEO) model to estimate the extent of the Level A and B harassment zones and the numbers of marine mammal takes. The Commission has raised concerns regarding LDEO's model for more than seven years. In more recent years, other stakeholders⁶ have expressed similar concerns regarding the appropriateness of those methods (80 Fed. Reg. 67713). LDEO uses the Nucleus source model and a simple ray trace-based modeling approach⁷ that assumes spherical spreading, a constant sound speed, and no bottom interactions for surveys in deep water (Diebold et al. 2010). As noted in numerous Commission letters, multiple LDEO-affiliated studies⁸ have emphasized the importance of incorporating site-specific environmental and operational parameters into estimating Level A and B harassment zones.

In addition, the Commission has provided extensive comments regarding the inappropriateness of LDEO's model, which should be reviewed in conjunction with this letter (see the Commission's most recent [2 May 2016 letter](#)) and are not reiterated herein. The Commission continues to believe LDEO's model does not represent best available science and again recommends that NMFS require Scripps, in collaboration with LDEO, to re-estimate the proposed Level A and B harassment zones and associated takes of marine mammals using 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

² NMFS informed the Commission that it incorrectly omitted from the *Federal Register* notice these standard measures, which would be included in the final authorization.

³ Shut downs would not be required for small delphinids (*Delphinus* spp., *Tursiops* spp., *Stenella* spp., *Lissodelphis* spp. and *Lagenodelphis* spp.) that are traveling and voluntarily approaching the source vessel to interact with the vessel and/or airgun array.

⁴ A sperm whale or mysticete.

⁵ Six or more individuals that do not appear to be traveling and are feeding, socializing, etc.

⁶ Natural Resources Defense Council and Whale and Dolphin Conservation.

⁷ Essentially a MATLAB algorithm.

⁸ Tolstoy et al. (2004), Tolstoy et al. (2009), Diebold et al. (2010), and Crone et al. (2014).

characteristics⁹ at a minimum) parameters for the proposed incidental harassment authorization. Specifically, the Commission reiterates that LDEO should be using the ray-tracing 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. The Commission underscores the need for NMFS to hold LDEO, Scripps, NSF, and other-affiliated entities¹⁰ 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).

With NMFS’s finalization of its updated acoustic thresholds for permanent threshold shift (i.e., Level A harassment) in summer 2016, many action proponents have had to adjust the manner in which they estimate the extent of the Level A harassment zones. Specifically, LDEO claims 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. Thus, LDEO used NMFS’s user spreadsheet to estimate the Level A harassment zones for the various functional hearing groups.

To do so, LDEO computed ‘modified’ frequency-weighted, farfield source levels and noted that those are more appropriate than the ‘actual’ farfield source levels¹¹ because an ‘actual’ farfield source level “does not take into account the large array effect near the source and is calculated as a point source”¹². The modified farfield source levels¹³ are essentially back-calculated source levels¹⁴ based on the relevant frequency-weighted threshold. The *Federal Register* notice further indicated that, although the array effect is not expected to be as pronounced for the two-airgun array as it would be for a larger airgun array, the modified farfield source level was considered more appropriate than use of the actual farfield source level. LDEO’s method did incorporate the spectral aspects of the two-airgun array to better refine the frequency-specific weighting function adjustments for the SEL_{cum} thresholds rather than using NMFS’s simple weighting factor adjustment (i.e., 1 kHz for seismic). The Commission supports incorporation of spectral data but wonders why the spectral levels were effectively cut off at 3 kHz, since airguns emit energy above 3 kHz. In addition, the Commission is unaware of any other seismic operators using such a circuitous approach to estimate harassment zones. 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 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. The use of truncated spectra and modified farfield source levels further support the Commission’s continued recommendation that NMFS require LDEO, and in turn Scripps and other affiliated entities, to revise its sound propagation modeling methodology.

⁹ 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.

¹⁰ Including the U.S. Geological Survey (USGS).

¹¹ Deemed a ‘theoretical representation of the source level’ or a ‘theoretical far-field signature’ in the application.

¹² Where the effects of the array are the greatest and coherent summation does not occur.

¹³ Although Scripps did not present both the modified and actual source levels in its application, the University of Hawaii (UH) presented those data in its recent application. UH’s source levels were similar for some functional hearing groups but the modified source levels varied from the actual source levels by approximately 3 to 18 dB for other functional hearing groups. Specifically, otariids (OW) for SEL_{cum} thresholds and OW and mid-frequency cetaceans for peak sound pressure level (SPL_{peak}) thresholds (Tables 2 and 4 in UH’s application).

¹⁴ Assuming spherical propagation loss.

Moreover, LDEO implemented a high-pass filter for the unweighted SPL_{peak} thresholds based on the lowest frequency of the generalized hearing range for the various functional hearing groups (Table 1 in NMFS 2016). The use of filtered airgun signals to estimate the range to the SPL_{peak} thresholds has dramatic consequences¹⁵. And, although NMFS had proposed to use high-pass filters to estimate ranges to the SPL_{peak} thresholds for UH recently proposed geophysical survey (82 Fed. Reg. 34370), NMFS did not take that approach for Scripps' geophysical survey. Rather, NMFS indicated that it believes that sound produced from the *Revelle* airgun array should be considered flat and that a high-pass filter of any type should not be used (82 Fed. Reg. 39299). The Commission made a similar recommendation in its [3 August 2017 letter](#) on UH's geophysical survey and fully supports NMFS's stance on this issue. Further, NMFS should refrain from allowing any action proponent to use high-pass filters when estimating the ranges to the various SPL_{peak} thresholds until such time that it has fully considered implications of their use.

Rounding of take estimates

The method used to estimate the numbers of takes during the proposed activities, which summed fractions of takes for each species across project days, does not account for and negates the intent of NMFS's 24-hour reset policy. As the Commission has indicated in previous letters regarding this matter¹⁶, the issue at hand involves policy rather than mathematical accuracy. The Commission notes that, although NMFS developed criteria associated with rounding that it had planned to share with the Commission a few months ago, it has yet to do so. Therefore, the Commission recommends that NMFS share the rounding criteria with the Commission such that this matter can be resolved in the near future.

Insufficient and inappropriate information

Basic information was missing in both NMFS's *Federal Register* notice and Scripps' application. For example, neither document provided the type or operating frequency of the MBES or SBP to be used during the survey. Information also was lacking regarding various densities, the Level A daily ensonified areas, and the number of days of activities¹⁷ that informed NMFS's analysis. The Commission further mentioned to NMFS the inappropriate use of some density data and mathematical errors in the proposed numbers of Level B harassment takes¹⁸.

Specifically, the density that was used for Dall's porpoises had been derived from surveys in Beaufort sea states (BSSs) of 0–3 (0.0544 porpoises/km²; Barlow 2016). Scripps very likely would be operating in BSSs greater than 3, as previous geophysical surveys in waters of northern California, Oregon, and Washington have occurred in BSSs of 0–7 during the same season¹⁹. All

¹⁵ For example, the range to the SPL_{peak} threshold for high-frequency cetaceans using the high-pass filter was estimated to be 12.5 m rather than 34.9 m absent that filter (Table 4 in the application).

¹⁶ See the Commission's [29 November 2016 letter](#) detailing this issue.

¹⁷ In the application and *Federal Register* notice (82 Fed. Reg. 39294), the numbers of takes for both Level A and B harassment were determined by multiplying densities by the daily ensonified area and number of days of activities.

¹⁸ The proposed numbers of Level B harassment takes for harbor porpoises and harbor seals were incorrect as specified in Table 8 of the *Federal Register* notice. Those takes may be further revised depending on whether the numbers of Level A harassment takes were calculated appropriately.

¹⁹ Also during the warm season. One of the surveys off Oregon in a similar location as Scripps' survey had comparable time spent in BSSs of 0–3 as 4–5 (57 vs 43 percent, respectively; Allen et al. 2012).

other cetacean densities were based on BSSs 0–5²⁰. It is therefore unclear why NMFS did not use the Dall's porpoise density of 0.0583 porpoises/km² that was derived in BSSs 0–5. For pinniped densities, four of the five species' densities were calculated using methods from the U.S. Navy (Navy; 2010) with updated population sizes based on the 2015 stock assessment reports. Harbor seal densities were calculated using the population estimate for the Oregon/Washington Coastal stock and the range for that stock from the 2015 Pacific stock assessment report. The Commission understands that correction factors also were used for four of the five species but were not specified in either the application or the *Federal Register* notice. It is unclear what the original and corrected abundance estimates²¹ were and whether the areas over which those abundance estimates pertained were appropriate. The Commission notes that some of the pinniped data²² from Navy (2010) was updated in Navy (2015) and used by NMFS in other incidental take authorizations in recent years. Thus, NMFS clearly assumed that data from Navy (2010) was superseded by data from Navy (2015) and that Navy (2015) represented the best available science at that time. The Commission has commented extensively on the appropriateness of the Navy's derivation methods for pinniped densities in this region, including Navy (2015; see the Commission's [17 June 2015 letter](#) detailing this issue). The Commission likely would have similar comments on this proposed authorization, but review of the method is not possible absent all of the pertinent information²³. In addition, the various daily ensonified areas used to estimate the proposed numbers of Level A harassment takes were not included in either the notice or the application. Further, the number of days of activities used to estimate the numbers of takes appear to have been 6.25 days but was not stipulated in the *Federal Register* notice. The Commission recommends that NMFS (1) use the Dall's porpoise density derived from BSSs 0–5 rather than 0–3, (2) incorporate the Commission's 2015 recommendations regarding derivation of pinniped densities, paying particular attention to the areas over which the densities are estimated and the relevant correction factors but, above all else, update the pinniped densities with the revised areas and correction factors from Navy (2015), and (3) ensure the estimated numbers of Level A and B harassment takes are correct based on the relevant densities, daily ensonified areas, and number of days of activities.

Immediately upon publication of the proposed authorization, the Commission identified these deficiencies and requested all of this information from NMFS, who in turn requested it from the action proponent. Given that this information is necessary for NMFS to conduct its analysis and make the required determinations, the Commission is unsure how NMFS concluded that its analysis is either accurate or based on best available science. All of this information should have been obtained and reviewed prior to NMFS publishing the proposed authorization in the *Federal Register* and should have been included in the *Federal Register* notice to ensure a complete and transparent review and public comment process. For these reasons, the Commission recommends that NMFS (1) provide all relevant information to the public and provide an opportunity for a fully-informed comment period or provide an explanation regarding why the lack of such information did not undermine the opportunity for meaningful public comment and (2) provide all relevant information in the *Federal Register* notice for the final authorization. In addition, the Commission

²⁰ Except *Kogia* spp. that were only observed in BSSs 0–3.

²¹ For example, the application indicated that the abundance estimate for California sea lions was updated based on the stock assessment report from 2015. That report indicated a total of 296,750 sea lions, which is orders of magnitude greater than the abundance upon which the density appears to have been based.

²² Including applicable areas and correction factors based on age/sex differentiation and haul-out behavior.

²³ Some of the information was provided one business day before this letter was sent.

recommends that NMFS include all pertinent information for all future proposed incidental take authorizations published in the *Federal Register*.

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

Sincerely,



Rebecca J. Lent, Ph.D.,
Executive Director

References

- Allen, J., K. Douglas, E. Ellis, H. Ingram, and T. Moreno. 2012. Protected species mitigation and monitoring report: Cascadia thrust zone structures in the Northeast Pacific Ocean, 3 July 2012 – 6 July 2012, R/V Marcus G. Langseth. RPS, Houston, Texas. 56 pages.
- Barlow, J. 2016. Cetacean abundance in the California Current estimated from ship-based line-transect surveys in 1991-2014. National Oceanic and Atmospheric Administration (NOAA) Administrative Rep. LJ-16-01. 31 p. + appendix.
- Crone, T.J., M. Tolstoy, and H. Carton. 2014. Estimating shallow water sound power levels and mitigation radii for the R/V *Marcus G. Langseth* using an 8 km long MCS streamer. *Geochemistry, Geophysics, Geosystems* 15, doi:10.1002/2014GC005420.
- Diebold, J.B., M. Tolstoy, L. Doermann, S.L. Nooner, S.C. Webb, and T.J. Crone. 2010. R/V *Marcus G. Langseth* seismic source: Modeling and calibration. *Geochemistry, Geophysics, Geosystems* 11(12), Q12012, doi:10.1029/2010GC003216.
- Navy. 2010. Appendix D: Marine mammal densities and depth distribution. *In* NAVSEA NUWC Keyport Range Complex Extension Environmental Impact Statement/Overseas Environmental Impact Statement. Naval Facilities Engineering Command Northwest, Keyport, Washington.
- Navy. 2015. Pacific Navy Marine Species Density Database: Revised Final Northwest Training and Testing Technical Report. Naval Facilities Engineering Command Pacific, Pearl Harbor, Hawaii. 488 pages.
- NMFS. 2016. Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing: Underwater acoustic thresholds for onset of permanent and temporary threshold shifts. Office of Protected Resources, NMFS, Silver Spring, Maryland. NOAA Technical Memorandum NMFS-OPR-55. 178 pages.
- Tolstoy, M., J. Diebold, S.C. Webb, D.R. Bohnstiehl, E. Chapp, R.C. Holmes, and M. Rawson. 2004. Broadband calibration of the R/V *Ewing* seismic sources. *Geophysical Research Letters* 31, L14310, doi:10.1029/2004GL020234.
- Tolstoy, M., J. Diebold, L. Doermann, S. Nooner, S.C. Webb, D.R. Bohnstiehl, T.J. Crone, and R.C. Holmes. 2009. Broadband calibration of R/V *Marcus G. Langseth* four-string seismic sources. *Geochemistry, Geophysics, Geosystems* 10, Q08011, doi:10.1029/2009GC002451.