



# MARINE MAMMAL COMMISSION

20 July 2018

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) 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 two marine geophysical surveys to be conducted in the North Pacific Ocean in 2018 and 2019. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 28 June 2018 notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (83 Fed. Reg. 30480).

## Background

LDEO proposes to conduct two geophysical surveys, one in the U.S. exclusive economic zone of the Main Hawaiian Islands (MHI) and one in international waters near the Emperor Seamount (Emperor). The purpose of the surveys is to investigate the formation and evaluation of the Hawaiian-Emperor Seamount Chain and to inform a more comprehensive assessment of the geohazards for the Hawaiian Islands region. The MHI survey would be conducted along approximately 3,455 km of tracklines in waters estimated to be 700 to more than 5,000 m in depth. The Emperor survey would be conducted along approximately 2,202 km of tracklines in waters estimated to be 1,500 to 6,000 m in depth. LDEO use the R/V *Marcus G. Langseth* (*Langseth*) to operate a 36-airgun array with a maximum discharge volume of 6,600 in<sup>3</sup> at a tow depth of 12 m. In addition, the *Langseth* would (1) tow a 15-km hydrophone streamer and (2) operate a 12-kHz multibeam echosounder, 3.5-kHz subbottom profiler, and acoustic Doppler current profiler continuously during the surveys<sup>1</sup>, and (3) deploy up to 70 ocean bottom seismometers (OBSs) during the surveys. Seismic operations could occur on up to 19 days for the MHI survey and 13 days<sup>2</sup> for the Emperor survey. The MHI survey was planned to begin in mid-August 2018, with the Emperor survey likely beginning in late spring/early summer 2019.

<sup>1</sup> These devices would not be used during transits.

<sup>2</sup> A 25-percent contingency was added for airgun testing and repeat coverage of any areas where initial data quality is deemed substandard or when partial equipment failure occurs. However, NMFS incorrectly indicated that the 25-percent contingency was 3 rather than 5 days for the MHI survey and 5.5 rather than 3 days for the Emperor survey.

NMFS preliminarily has determined that the proposed activities could cause Level A and/or B harassment 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 A and B<sup>3</sup> harassment zones for 30 minutes before, during, and for 60 minutes after the surveys, (2) implementing speed and course alterations, and (3) using power-down, shut-down<sup>4</sup>, and ramp-up procedures<sup>5</sup>. In addition, LDEO would shut down the airguns immediately if a large whale<sup>6</sup> with a calf or an aggregation<sup>7</sup> of large whales is observed regardless of the distance from the *Langseth*. Ramp-up procedures would not be initiated until the animal(s) has not been seen at any distance for 30 minutes<sup>8</sup>. LDEO would report any injured or dead marine mammal to NMFS's Office of Protected Resources and the Pacific Islands Regional Stranding Coordinator using its phased approach.

### Density estimates

*The MHI survey*—LDEO used Bradford et al. (2015, 2017) and methods described in Department of the Navy (2017). The Commission informally noted that the densities should be 25 not 5.36 animals/1,000 km<sup>2</sup> for striped dolphins and 21 rather than 4.17 animals/1,000 km<sup>2</sup> for Fraser's dolphins<sup>9</sup> based on Bradford (2017)<sup>10</sup>. The Commission also indicated that LDEO divided by three the unidentified *Mesoplodon* spp. density of 1.89 animals/1,000 km<sup>2</sup> from Bradford et al. (2017) (resulting in 0.63 animals/1,000 km<sup>2</sup>) for ginkgo-toothed, Deraniyagala's, and Hubb's beaked whale densities rather than assuming each of those species could have a density of 1.89 animals/1,000 km<sup>2</sup>, which has been past practice. In addition, the Commission noted that LDEO based the false killer whale densities, and ultimately the take estimates, on animals/1,000 km<sup>2</sup> rather than animals/100 km<sup>2</sup> as reported by Bradford et al. (2015). NMFS further indicated it would amend all

---

The total number of days would increase to 38 days for the MHI survey and decrease to 40 days for the Emperor survey, including numerous days devoted to equipment deployment and retrieval for each survey.

<sup>3</sup> The Commission informally noted that NMFS did not clearly state in the proposed authorization that LDEO is to monitor the Level B harassment zone and enumerate takes beyond the 1,000-m buffer zone.

<sup>4</sup> Shut downs would not be required for small delphinids (*Delphinus* spp., *Tursiops* spp., *Stenella* spp., *Steno* spp., *Lagenodelphis* spp., *Lissodelphis* spp., and *Lagenorhynchus* spp.) that are traveling and voluntarily approaching the source vessel to interact with the vessel and/or airgun array. Power and shut downs would be required if observers are able to localize a marine mammal acoustically within the exclusion zone.

<sup>5</sup> The Commission informally noted some errors in the various mitigation measures stipulated throughout the *Federal Register* notice. Specifically, the 15-minute clearance time should apply to small odontocetes and pinnipeds and the 30-min clearance time should apply to mysticetes and large odontocetes including sperm whales, pygmy sperm whales, dwarf sperm whales, and beaked whales. The Commission also noted that NMFS omitted the standard measure to implement a shut down if a species, for which authorization was granted but the takes have been met, approaches the Level A or B harassment zones. NMFS indicated it would correct all errors and omissions in the final authorization.

<sup>6</sup> A sperm whale or mysticete.

<sup>7</sup> Six or more individuals that do not appear to be traveling and are feeding, socializing, etc.

<sup>8</sup> The Commission informally noted that NMFS omitted these standard mitigation measures from the proposed authorization. NMFS has indicated the measures would be included in the final authorization.

<sup>9</sup> Table 7 in the *Federal Register* included the correct density but that density was not used to estimate takes.

<sup>10</sup> The Commission also noted that Bradford et al. (2017) did not include group size of humpbacks. NMFS clarified that that was an error and the group size originated from Mobley et al. (2001).

takes accordingly<sup>11</sup>. Based on additional Commission comments on average group size from Bradford et al. (2017), NMFS plans to increase the number of recalculated Level B harassment takes of killer whales to five. The Commission believes all revised take estimates should be incorporated in the final authorization but has some additional concerns for the MHI survey.

LDEO used portions of the monk seal density estimation method<sup>12</sup> from Department of the Navy (2017), primarily the abundance and area estimates. The Commission has commented on those underlying data in multiple letters to NMFS<sup>13</sup>. Specifically, the Navy noted that its monk seal abundance estimate of 1,272 was less than that reported by Baker et al. (2016), but that those more recent data were not available when the Navy's modeling process began. The Commission asserts that the Baker et al. (2016) data have been available for almost two years and should have been incorporated accordingly, particularly since the data would yield greater densities<sup>14</sup> and the species is endangered. Thus, neither the Navy nor LDEO in this instance used the best available densities. The Commission recommends that NMFS re-calculate the monk seal density based on an abundance of 1,324 from Baker et al. (2016) and re-estimate the number of Level B harassment takes of monk seals.

In addition, NMFS estimated that 10 percent of the estimated 233 Level B harassment takes of melon-headed whales would originate from the Kohala resident stock<sup>15</sup>, equating to 5.2 percent of the population (Table 7 in the *Federal Register* notice). NMFS did not provide justification for the assumed 10 percent<sup>16</sup>. But if only one group of the Kohala stock of melon-headed whales<sup>17</sup> was taken by Level B harassment, nearly all of the 233 takes would be used. Thus, it is unclear how NMFS could make a small numbers determination for this stock and, as such, why it did not propose that shut-down measures be implemented whenever melon-headed whales are observed within the Kohala resident habitat. The Commission recommends that NMFS require LDEO to implement shut-down procedures if a melon-headed whale or group of melon-headed whales is observed in the habitat of the Kohala resident stock and ensure that the estimated number of Level B harassment takes is sufficient based on group size of melon-headed whales for the Hawaiian Islands stock. Similar issues<sup>18</sup> exist for the various MHI insular stocks<sup>19</sup> of spinner and common bottlenose dolphins. However, the group sizes for those species are much less than for melon-

---

<sup>11</sup> Including amending all takes for both surveys based on originally using incorrect numbers of days of activities. Some numbers of takes increased, while others decreased for each survey. It is unclear what is driving that phenomenon.

<sup>12</sup> LDEO did not account for a haul-out correction factor to estimate the number of animals at sea, since it was using a simple area x density method rather than animat modeling.

<sup>13</sup> See the Commission's [2 July 2018 letter](#) and [13 November 2017 letter](#).

<sup>14</sup> The 2015 abundance estimate is 19 percent greater than what the Navy used.

<sup>15</sup> Survey line 1 transits directly through the Kohala resident stock's habitat, which includes waters less than 2,500 m in depth off the Kohala Peninsula and west coast of Hawaii.

<sup>16</sup> Based on the revised take estimates, NMFS indicated that the recalculated Level B harassment takes of 235 would account for 53 percent of the population.

<sup>17</sup> Forney et al. (2017) reported a median group size of 210 for the Kohala resident stock, while Aschettino et al. (2011) reported a median group size of 275 for both the Hawaiian Islands and Kohala resident stocks combined. Aschettino et al. (2012) further indicated that two of the smallest groups (4 and 17 individuals) were both followed shortly thereafter by encounters with larger groups of animals (275 and 350, respectively), suggesting the animals may have branched off from a main group. Both references highlight the large group size of melon-headed whales.

<sup>18</sup> NMFS indicated that the recalculated takes would account for 74 to 467 percent of the various MHI insular stocks. It is similarly unclear whether NMFS could make a small numbers determination based on the total numbers of takes for those stocks.

<sup>19</sup> Oahu, Hawaii Island, and/or 4-Islands stocks.

headed whales. Thus, Level B harassment of a few groups<sup>20</sup> may be able to be authorized, while still meeting the small numbers threshold under the MMPA. The Commission recommends that NMFS (1) authorize only those numbers of Level B harassment takes of the various MHI insular stocks of spinner and bottlenose dolphins for which NMFS can make a small numbers determination and (2) if the authorized takes are met for any of those stocks, require LDEO to implement shut-down procedures if a spinner or bottlenose dolphin or group of dolphins is observed approaching or within the Level B harassment zone in the habitat of the specific MHI insular stock.

*The Emperor survey*—LDEO used various datasets for estimating densities in the area of the Emperor survey. Some originated from data collected 30 to 35 years ago (e.g., Buckland et al. 1993, Miyashita 1993), while others originated from other geographic regions (Barlow 2006, LGL Limited 2017) with presumed assumptions<sup>21</sup>. The Commission has noted numerous times<sup>22</sup> that NMFS should adjust the 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, temporal scales, and species. In this instance, LDEO used various extrapolations and adjustments in the absence of applicable density data for the Emperor survey area. As the Commission has repeatedly asserted, NMFS should have a policy or other guidance that sets forth a consistent approach for how applicants should incorporate uncertainty in density estimates—an issue that is particularly problematic and persistent for both geophysical surveys and military activities<sup>23</sup>.

Many of the references from which the density data originated<sup>24</sup> include coefficients of variation (CVs), standard errors (SEs), or confidence intervals (CI), which provide information on uncertainty relative to the underlying data. The Commission therefore recommends that NMFS adjust the density estimates using some measure of uncertainty (i.e., CV, SD, SE, upper CI) for the Emperor survey area.

NMFS indicated in 2013 that it was evaluating available density information and working on guidance that would outline a consistent approach for addressing uncertainty in specific situations where certain types of data are or are not available (78 Fed. Reg. 57354). To move toward resolution of this issue, which is relevant to a multitude of different activities, the Commission recommends that NMFS convene a working group of scientists (including those from NMFS's science centers and academia) to determine how best to incorporate uncertainty in density data that are extrapolated<sup>25</sup>. The Navy has funded the University of St. Andrews and other collaborators to investigate various aspects of density surface modeling through its DenMod working group. Unfortunately, that working group is *not* developing guidance for incorporating uncertainty in density data in regions where no data exist and data from neighboring regions are absent (thus,

---

<sup>20</sup> Depending on the specific stock and the size of the stock, as spinner dolphins occur in larger groups than bottlenose dolphins.

<sup>21</sup> The elephant seal density in the Emperor survey area was assumed to be 10 percent of the density of the west coast of the United States as reported by LGL Limited (2017).

<sup>22</sup> See the Commission's [23 October 2017 letter](#), [5 September 2017 letter](#), [2 May 2016 letter](#), and [1 April 2015 letter](#) as examples.

<sup>23</sup> Especially for pinnipeds when a simple abundance divided by area method is used.

<sup>24</sup> e.g., Buckland (1993), Miyashita (1993), Hakamada et al. (2009), Hakamada and Matsuoka (2015), Hakamada et al. (2017). Many of these sources also include estimates of  $g(0)$  and  $f(0)$ . However, it is unclear how and if LDEO incorporated those estimates into its calculated densities.

<sup>25</sup> Beyond those methods that can be used for extrapolating data from neighboring regions, as used in Mannocci et al. (2017).

when developing density surface models is not possible) or when single point abundance data are used relative to an assumed area. In addition, products from the DenMod working group would not be available until December 2021 at the earliest, and this issue needs to be resolved before that time.

Similar to the previous comments on the densities for the MHI survey, the Commission informally noted that LDEO based the killer whale densities, and ultimately the take estimates, on animals/1,000 km<sup>2</sup> rather than animals/100 km<sup>2</sup> as stated in LDEO's application<sup>26</sup>. The Commission also informally noted that the Level A harassment takes for humpback<sup>10</sup> and sei whales were not increased to average group size. NMFS indicated it would amend all takes accordingly<sup>10</sup> and include two Level A harassment takes for humpback whales and three Level A harassment takes for sei whales. All revised take estimates should be included in the final authorization.

### **Flaws in modeling methodologies**

LDEO used its 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 and has provided extensive comments regarding the inappropriateness of that model<sup>27</sup> for nearly eight years. In more recent years, other stakeholders<sup>28</sup> have expressed similar concerns regarding the inappropriateness of those methods (80 Fed. Reg. 67713). LDEO uses the Nucleus source model and a simple ray trace-based modeling approach<sup>29</sup> that assumes spherical spreading, a constant sound speed, and no bottom interactions for surveys in deep water (Diebold et al. 2010).

The Commission notes that LDEO's model provides results only for deep water (>1,000 m) and only up to a depth of 2,000 m—the current survey occurs in waters from 700 to 6,000 m in depth. For intermediate water depths (100 to 1,000 m), LDEO applied a correction factor of 1.5 to the deep-water results. Environmental conditions including the presence of a surface duct, in-water refraction, and bathymetry and sediment characteristics were not accounted for in LDEO's modeling approach. Many studies, including multiple LDEO-associated studies,<sup>30</sup> have emphasized the importance of incorporating site-specific environmental and operational parameters into estimating Level A and B harassment zones. LDEO's simple model and crude assumptions, that could very well represent underestimated harassment zones in deep water and overestimated harassment zones in intermediate water, are not considered best available science.

These issues have been further complicated with the finalization a few years ago 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<sub>cum</sub>) thresholds. In the absence

---

<sup>26</sup> Which cited Forney and Wade (2003).

<sup>27</sup> Which should be reviewed in conjunction with this letter (see the Commission's [2 May 2016 letter](#)) and are not reiterated herein.

<sup>28</sup> Natural Resources Defense Council and Whale and Dolphin Conservation.

<sup>29</sup> Essentially a MATLAB algorithm.

<sup>30</sup> Tolstoy et al. (2004), Tolstoy et al. (2009), Diebold et al. (2010), and Crone et al. (2014).

of such a model, LDEO used NMFS's user spreadsheet to estimate the Level A harassment zones<sup>31</sup> for the various functional hearing groups.

To estimate the Level A harassment zones, LDEO computed 'modified' frequency-weighted, farfield source levels. LDEO noted that those are more appropriate than the 'actual' farfield source levels<sup>32</sup> because an 'actual' farfield source level "does not take into account the interactions of the two airguns that occur near the source center and is calculated as a point source (single airgun)"<sup>33</sup>. The modified farfield source levels<sup>34</sup> are essentially back-calculated source levels<sup>35</sup> 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 four-airgun array as it would be for a larger airgun array, the modified farfield source level was considered more appropriate than use of the theoretical farfield signature. 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. LDEO also appears to be using both radial distances (i.e., slant ranges) and radii indiscriminately. Radial distances have been used for metrics based on  $SEL_{cum}$  and SPL root-mean-square ( $SPL_{rms}$ ), and radii have been used for metrics based on  $SPL_{peak}$ , which would yield smaller zones. Therefore, the Commission recommends that NMFS require LDEO to specify why it is using radial distances for  $SEL_{cum}$  and  $SPL_{rms}$  metrics and radii for  $SPL_{peak}$  metrics.

LDEO's method did incorporate the spectral aspects of the 36-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 2.5 to 3 kHz, since airguns emit energy above 3 kHz. The Commission suspects that this anomaly occurred because the Nucleus source model only provides data up to 2.5 or 3 kHz, which would affect the estimated ranges to the Level A harassment thresholds for various species (including mid-

---

<sup>31</sup> The Level A harassment zone for peak sound pressure levels ( $SPL_{peak}$ ) for the 36-airgun array was incorrectly based on radii rather than radial distances (i.e., slant ranges) for low-frequency (LF) and high-frequency (HF) cetaceans and phocids (PW) in the *Federal Register* notice—the zones would increase to 45 m for LF, 365 m for HF, and 52 m for PW. NMFS plans to include that revision in the final authorization. However, this is the third proposed authorization involving LDEO's model for which the Commission noted errors in the  $SPL_{peak}$  zones (see the Commission's [2 July 2018 letter](#) and [21 May 2018 letter](#)). LDEO is using indiscriminately both radial distances and radii. LDEO should be using radial distances consistently for  $SEL_{cum}$ , SPL root-mean-square, and  $SPL_{peak}$ , as radii would yield smaller zones (see Figures A-7 to 10 in the application). Table 5 of the *Federal Register* also included errors in the Level A harassment zones for  $SEL_{cum}$ —the zones should be 1 m for HF and 10.4 m for PW for the 36-airgun array and 0.5 m for LF for the mitigation airgun. NMFS plans to include these revisions as well in the final authorization.

<sup>32</sup> Deemed a 'theoretical representation of the source level' or a 'theoretical far-field signature' in the application.

<sup>33</sup> Where the effects of the array are the greatest and coherent summation does not occur.

<sup>34</sup> Although LDEO 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.

<sup>35</sup> Assuming spherical propagation loss.

frequency (MF) and HF<sup>36</sup> cetaceans). Airgun sound in the MF and HF<sup>37</sup> range contributes to the overall sound exposure level for those species and should not be assumed to be to zero above 3 kHz. Other source models (including Gundalf Optimizer<sup>38</sup> and JASCO's Airgun Array Source Model<sup>39</sup> (AASM)) provide sound levels into the HF range and could have been used. The Commission recommends that NMFS provide justification for why it believes that LDEO's use of the Nucleus source model, which does not provide data above 2.5 kHz, is appropriate for determining the extents of the Level A harassment zones for MF and HF cetaceans.

The use of truncated spectra and modified farfield source levels further supports the Commission's continued recommendation that NMFS require LDEO and other affiliated entities<sup>40</sup>, to revise their source and sound propagation modeling methodologies. The Commission additionally 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, 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 characteristics<sup>41</sup> at a minimum) parameters, (2) a comprehensive source model (i.e., Gundalf Optimizer or AASM) and (3) an appropriate sound propagation model 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.

Furthermore, LDEO will be deploying a 15-km hydrophone streamer that would transfer the acoustic data to an on-board processing system and up to 70 OBSs that would receive and store additional acoustic data for analysis. Both of those could be used to determine whether the extents of the Level A and B harassment zones are accurate. NMFS has been including in numerous authorizations the requirement that sound source verification studies (SSVs) be conducted for a myriad of activities, including seismic surveys, high-resolution geophysical surveys, confined underwater blasting, and various construction-related activities. SSVs have been required when action proponents use proxy source levels, as well as proxy sound propagation assumptions. Given the shortcomings noted for LDEO's source and sound propagation modeling and the requirements that other action proponents are obliged to fulfill, the Commission recommends that NMFS require LDEO to archive, analyze, and compare the in-situ data collected by the hydrophone streamer and OBSs to LDEO's modeling results for the extents of the Level A and B harassment zones based on the various water depths to be surveyed and provide the data and results to NMFS.

---

<sup>36</sup> Particularly since the Level A harassment threshold is 155 dB re 1  $\mu$  Pa<sup>2</sup>-sec.

<sup>37</sup> 1–10 kHz and > 10 kHz, respectively.

<sup>38</sup> <https://www.gundalf.com/environmental/>

<sup>39</sup> [http://www.nmfs.noaa.gov/pr/permits/incidental/oilgas/boem\\_2016rule\\_app\\_appendix.pdf](http://www.nmfs.noaa.gov/pr/permits/incidental/oilgas/boem_2016rule_app_appendix.pdf)

<sup>40</sup> Including U.S. Geological Survey (USGS) and Scripps Institution of Oceanography (Scripps).

<sup>41</sup> 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.

## Mitigation measures

NMFS proposed to include numerous mitigation measures consistent with its recently proposed incidental harassment authorizations for G&G activities<sup>42</sup> in the Atlantic Ocean (82 Fed. Reg. 26244). The Commission is encouraged that NMFS is striving for consistency regarding mitigation measures for the same type of activities (i.e., geophysical or seismic surveys) but questions why some other related measures were not included. Specifically, NMFS did not propose to prohibit the use of power downs or the mitigation airgun. NMFS recently stated that, in a mitigation and monitoring workshop for seismic surveys, industry representatives indicated that power downs may ultimately increase sound input to the marine environment due to the need to subsequently re-shoot the trackline to prevent gaps in data acquisition (unpublished workshop report, 2012; 82 Fed. 26255). For that reason and because a power down may not actually be useful, NMFS proposed to require operators to implement a full shutdown rather than allowing a power down (82 Fed. 26255). Similarly, NMFS stated that there was no information to suggest that the mitigation airgun is an effective protective strategy, while it was certain that use of that technique would involve input of extraneous sound energy into the marine environment, including when use of the mitigation airgun is limited to some maximum time period (82 Fed. 26255). For those reasons, NMFS concluded that use of the mitigation airgun was not appropriate and did not propose to allow its use. The Commission agrees with NMFS on both of those restrictions. Given that neither the efficacy of the measures has changed nor the energy that would be emitted would be substantially reduced, the Commission recommends that NMFS use a consistent approach for requiring all geophysical and seismic survey operators to abide by the same general mitigation measures, including prohibiting LDEO from using power downs and the mitigation airgun during its geophysical surveys.

## 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  $f(0)$  values<sup>43</sup>. In response to the Commission's [8 December 2015 letter](#) regarding an LDEO survey off Brazil, NMFS indicated that it agreed with the Commission's recommendation to improve the post-survey reporting requirements by accounting for takes using applicable  $g(0)$  and  $f(0)$  values (81 Fed. Reg. 2177). NMFS recently proposed to use the approach the Commission developed in summer 2016 to better estimate the numbers of marine mammals taken by Level A and B harassment (see the Addendum<sup>44</sup>) for seismic activities in the Gulf of Mexico (83 Fed. Reg. 29287).

Additionally, the Commission continues to believe that LDEO and other NSF-affiliated entities should pool the sightings data from their monitoring reports across all surveys and derive

---

<sup>42</sup> Using similar-sized airgun arrays.

<sup>43</sup> These values vary based on, among other things, platform characteristics, observer skill, environmental conditions, and sightability and detectability of the species.

<sup>44</sup> A similar method should be used for pinnipeds with applicable  $g(0)$  and  $f(0)$  values.

$f(0)$  values specific to geophysical surveys<sup>45</sup> for the various species or genera (i.e., *Kogia* spp., *Mesoplodon* spp., *Delphinus* spp., etc.). The Commission's recommended method of using published data does not absolve action proponents from fulfilling this analytical need, which has been recommended and discussed between the agencies for many years. Therefore, until such time that a better method is developed or LDEO and other NSF-affiliated entities derive geophysical survey-specific  $f(0)$  values, the Commission recommends that NMFS require LDEO to use the Commission's method as described in the Addendum<sup>62</sup> to better estimate the numbers of marine mammals taken by Level A and B harassment for the incidental harassment authorization. All other NSF-affiliated entities<sup>46</sup> and all seismic operators should use the Commission's method as well.

### **Proposed one-year authorization renewals**

NMFS has indicated that it may issue a second one-year<sup>47</sup> incidental harassment authorization renewal for this and other future authorizations on a case-by-case basis without additional public notice or comment opportunity when (1) another year of identical, or nearly identical activities, as described in the 'Specified Activities' section of the *Federal Register* notice is planned or (2) the originally planned activities would not be completed by the time the incidental harassment authorization expires and a renewal would allow for completion of the authorized activities beyond the timeframe described in the 'Dates and Duration' section of the notice. NMFS would consider issuing a renewal only if—

- the request for renewal is received no later than 60 days prior to the expiration of the current authorization;
- the activities to be conducted either are identical to the previously analyzed and authorized activities or include changes so minor (e.g., reduction in pile size) that they do not affect the previous analyses, take estimates, or mitigation and monitoring requirements;
- a preliminary monitoring report provides the results of the required monitoring to date and those results do not indicate impacts of a scale or nature not previously analyzed or authorized;
- the status of the affected species or stocks and any other pertinent information, including the mitigation and monitoring requirements, remain the same and appropriate; and
- the original determinations under the MMPA remain valid.

The Commission agrees that NMFS should take appropriate steps to streamline the authorization process under section 101(a)(5)(D) of the MMPA to the extent possible. However, 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) clearly states that proposed authorizations are subject to publication in the *Federal Register* and elsewhere and that there be a

---

<sup>45</sup>  $g(0)$  values from the literature would still need to be used. LGL (2008) indicated that the  $f(0)$  values that were used for that monitoring report were taken from results of previous work, not from observations made during that particular survey. It further stated that sighting rates during the present survey were either too small or, at most, marginal to provide meaningful data on  $f(0)$  based on group size. This implies that LDEO and other NSF-affiliated entities either have incorporated or could incorporate  $f(0)$  values specific to geophysical surveys.

<sup>46</sup> Including USGS, Scripps, etc.

<sup>47</sup> 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.

presumably concurrent opportunity for public review and comment. NMFS's proposed renewal process would bypass the public notice and comment requirements when it is considering the renewal.

The Commission further notes that NMFS recently implemented an abbreviated authorization process by publishing the required information<sup>48</sup> via an abbreviated *Federal Register* notice and by referencing the relevant documents. The abbreviated process preserves the full opportunity for public review and comment, does not appear to be unduly burdensome on either the applicant or NMFS, and is much preferred over NMFS's proposed renewal process<sup>49</sup>. Thus, the Commission recommends that NMFS refrain from implementing its proposed renewal process and instead use abbreviated *Federal Register* notices and reference existing documents to streamline the incidental harassment authorization process.

If NMFS believes that its proposed renewal process is consistent with the applicable statutory requirements and intends that process to be generally applicable to all incidental harassment authorizations that meet the specified criteria, it should not seek to adopt such a process through a brief notice at the end of a specific proposed authorization. That process should be adopted through more general procedures, preferably a rulemaking, that provides NMFS's rationale and analysis regarding why it believes the proposed renewal process is consistent with the requirements of section 101(a)(5)(D) of the MMPA and adequate public notice and opportunity for comment. If NMFS adopts the proposed renewal process notwithstanding the Commission's recommendation, the Commission further recommends that NMFS provide the Commission and the public with a legal analysis supporting its conclusion that the process is consistent with the requirements under section 101(a)(5)(D) of the MMPA. Furthermore, if NMFS decides to bypass the notice and comment process in advance of issuing a renewal, it should nevertheless publish notice in the *Federal Register* whenever such a renewal has been issued.

### **Adequacy of applications**

The Commission has repeatedly expressed concern over NMFS's failure to provide an adequate opportunity for public comment. The opportunity for public comment provided under section 101(a)(5)(D)(iii) of the MMPA should be a meaningful one that allows NMFS sufficient time to not only solicit public comments, but also to analyze, assess, and respond to those comments and, as appropriate, revise its proposed authorization and the underlying rationale in light of those comments. In this instance, LDEO submitted its application to NMFS on 16 March 2018, but the application was not deemed complete until 13 June. As evident from the Commission's comments and concerns referenced herein, the application made available for public review was less than 'complete'<sup>50</sup>.

---

<sup>48</sup> Including any changes to the proposed activities or assumptions made and results from the draft monitoring report.

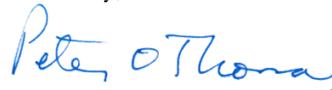
<sup>49</sup> See the Commission's [30 April 2018 letter](#) detailing this matter.

<sup>50</sup> The Commission notes that it has taken an unnecessarily long time for applicants to provide answers to outstanding questions, correct information, and final take estimates for this and other recent authorizations involving geophysical surveys. That lag in responsiveness reduces the time the Commission is able to consider the information and draft and finalize its letters. All of these shortcomings should be addressed by NMFS and the applicant long before the 30-day comment period begins, so as not to undermine the public comment period and to allow adequate time to consider the information.

The Commission recommends that NMFS require earlier submission of applications and other documentation so that it has adequate 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, and consider the comments received from the public. LDEO and NSF schedule geophysical surveys sufficiently in advance, generally a year or more, to enable them to submit applications with greater lead time. Thus, it is unclear why they don't submit them sooner. In addition, the quality of the applications and the accuracy of the resulting take estimates have diminished in recent years. The Commission contends that NMFS should not be processing applications that include incomplete information or inaccuracies. The Commission and the public rely on the accuracy of the applications and the proposed authorizations in formulating comments and recommendations. Incomplete information and inaccuracies undermine the adequacy and meaningfulness of the public review process.

The Commission appreciates the work involved in reviewing and processing incidental take authorization applications and 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,



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

## References

- Aschettino, J.M., R.W. Baird, D.J. McSweeney, D.L. Webster, G.S. Schorr, J.L. Huggins, K.K. Martien, S.D. Mahaffy, and K.L. West. 2012. Population structure of melon-headed whales (*Peponocephala electra*) in the Hawaiian Archipelago: Evidence of multiple populations based on photo-identification. *Marine Mammal Science* 28(4):666–689.
- Baker, J.D., A.L. Harting, T.C. Johanos, and C.L. Littnan. 2016. Estimating Hawaiian monk seal range-wide abundance and associated uncertainty. *Endangered Species Research* 31:317–324.
- Barlow, J. 2006. Cetacean abundance in Hawaiian waters estimated from a summer/fall survey in 2002. *Marine Mammal Science* 22(2):446–464.
- Bradford, A.L., E.M. Oleson, R.W. Baird, C.H. Boggs, K.A. Forney, and N.C. Young. 2015. Revised stock boundaries for false killer whales (*Pseudorca crassidens*) in Hawaiian waters. NMFS-PIFSC-47, NMFS, Pacific Islands Fisheries Science Center, Honolulu, Hawaii. 29 pages.
- Bradford, A.L., K.A. Forney, E.M. Oleson, and J. Barlow. 2017. Abundance estimates of cetaceans from a line-transect survey within the U.S. Hawaiian Islands Exclusive Economic Zone. *Fishery Bulletin* 115(2):129–142.

- Buckland, S.T., K.L. Cattanaach, and R.C. Hobbs. 1993. Abundance estimates of Pacific white-sided dolphin, northern right whale dolphin, Dall's porpoise and northern fur seal in the North Pacific, 1987-1990. *International North Pacific Fisheries Commission* 53(3):387–407.
- 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.
- Department of the Navy. 2017. U.S. Navy marine species density database Phase III for the HSTT study area. Naval Facilities Engineering Command Pacific, Pearl Harbor, Hawaii. 274 pages.
- 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.
- Forney, K.A., B.L. Southall, E. Slooten, S. Dawson, A.J. Read, R.W. Baird, and R.L. Brownell, Jr. 2017. Nowhere to go: Noise impact assessments for marine mammal populations with high site fidelity. *Endangered Species Research* 32:391–413.
- Hakamada, T. and K. Matsuoka. 2015. The number of blue, fin, humpback, and North Pacific right whales in the western North Pacific in the JARPNII offshore survey area. Paper SC/F16/JR13 presented to the IWC Scientific Committee, May 2015, San Diego, USA (unpublished). 12 pages.
- Hakamada, T., K. Matsuoka, and T. Miyashita. 2009. Distribution and the number of western North Pacific common minke, Bryde's, sei and sperm whales distributed in JARPN II Offshore component survey area. Paper SC/J09/JR15 presented to the expert workshop to review the ongoing JARPN II Programme, January 2009, Yokohama, Japan (unpublished). 18 pages.
- Hakamada, T., M. Takahashi, K. Matsuoka, and T. Miyashita. 2017. Abundance estimate for western North Pacific Bryde's whale by sub-areas based on IWC-POWER and JARPNII sighting surveys. Paper SC/MAR17/RMP/02 presented to the RMP Bryde's whale workshop, March 2017, Tokyo, Japan(unpublished). 12 pages.
- LGL Limited. 2017. Final environmental assessment of a low-energy marine geophysical survey by the *R/V Roger Revelle* in the Northeastern Pacific Ocean, September 2017. Report FA0114-2, St. John's, Newfoundland and Labrador. 73 pages.
- Miyashita, T. 1993. Abundance of dolphin stocks in the western North Pacific taken by the Japanese drive fishery. *Reports of the International Whaling Commission* 43:417–437.
- Mobley, J., Jr., S. Spitz, and R. Grotedefendt. 2001. Abundance of humpback whales in Hawaiian waters: results of 1993–2000 aerial surveys. Prepared for the Hawaiian Islands Humpback Whale National Marine Sanctuary and the Hawaii Department of Land and Natural Resources. 16 pages.
- Tolstoy, M., J. Diebold, S.C. Webb, D.R. Bohnenstiehl, 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. Bohnenstiehl, 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.

## ADDENDUM

### **The Commission's recommended method for estimating the number of cetaceans in the vicinity of geophysical surveys based on the number of groups detected**

For each geophysical survey, observers collect the number of sightings observed, group size, distance and angle to sighting, distance travelled on survey effort, Beaufort sea state (BSS), wind speed, swell height, etc. A simple method to estimate the total number of cetaceans potentially taken by Level B harassment<sup>51</sup> can therefore be used. This method incorporates  $f(0)$  and BSS-specific  $g(0)$  values from Barlow (2015)<sup>52</sup> that were derived using Distance sampling methods (Buckland et al. 2001, 2004) and sightings data from each geophysical survey. The number of animals detected by an observer on a ship is an underestimate of the true number of animals in the vicinity of the ship because the observer inevitably misses some groups. If we know that we have detected  $n$  objects, and the probability of detecting each object is  $p$ , a standard way to estimate the total number of objects is  $n/p$ . We know  $n$  for each species from the data collected on each survey, so the problem is to find  $p$  for each species. Normally  $p$  is estimated from the data collected on each survey as part of a line-transect analysis. The probability  $p$  for each species depends principally on the distance of the animals from the observer, but may also depend on other factors such as group size and sea state.

In the absence of a line-transect analysis, the Commission suggests taking estimates of  $p$  from other studies which use ships of similar size and searching methods. In the parlance of line-transect analysis,  $p$  is a product of the probability of detecting a group of animals directly on the trackline ( $g(0)$ ) and the probability of detecting a group of animals within the half-strip width on each side of the trackline ( $\mu/w$ , where  $w$  is the transect truncation distance beyond which data are not recorded and  $\mu$  is the effective strip half-width). The effective strip half-width also may be expressed as  $\mu = 1/f(0)$ , where  $f(0)$  is the estimated probability density function of observed perpendicular distances  $y$  evaluated at  $y = 0$ .

Based on the Commission's understanding of the ships and areas for the geophysical surveys,  $g(0)$  and  $f(0)$  from Barlow (2015) should be appropriate. The species discussed in the references may be different from those observed during the geophysical survey, but data from similar species can be used. Since  $g(0)$  and  $f(0)$  values for each species or genera depend on group size, BSS, swell height and other factors, those factors should be taken into account if possible.

The probability of detecting a group of cetaceans can therefore be expressed as

$$p = g(0) \frac{\mu}{w} = \frac{g(0)}{w f(0)} .$$

---

<sup>51</sup> Given the slow speed of the vessel during geophysical surveys and the perceived abilities of the observers, animals taken by Level A harassment generally should be reported as the actual number of animals observed during surveys. However, if the BSS-specific effective strip half-width is less than the extent of the estimated Level A harassment zones, the extrapolation method discussed herein should be used rather than reporting the uncorrected number of animals observed.

<sup>52</sup> Other references that provide similar information can be used as well.

If there are  $n$  sightings of a species along a section of trackline, the estimated number of groups within a given BSS, within a perpendicular distance  $w$  on each side of the trackline, and within a given Level B harassment zone<sup>53</sup> is

$$N_{groups} = \frac{n}{p} = \frac{nw f(0)}{g(0)} = \frac{nw}{\mu g(0)},$$

and the estimated number of individual animals in that given BSS then is

$$N = \frac{n}{p} S = \frac{nw}{\mu g(0)} S,$$

where  $S$  is the mean group size for the species.

The number of animals seen within each BSS should be summed for each Level B harassment zone. That total number then must be scaled by the distance to the Level B harassment threshold relative to the truncation distance to estimate the total number of animals potentially taken during a given survey.

Example calculation for common dolphins when sightings data are partitioned by group size and BSS

Suppose we have detected  $n = 3$  groups within a BSS of 2, with a mean group size of  $S = 120$ , and  $n = 2$  groups within a BSS of 3, with a mean group size of  $S = 130$ —both in a Level B harassment radii = 11 km. From Table 2 of Barlow (2015),  $\mu = 3.54$  km and  $w = 5.5$  km and  $\mu = 3.24$  km and  $w = 5.5$  km from Table 3,  $g(0) = 0.940$ . The estimated total number of dolphins potentially taken during the survey is therefore

$$\begin{aligned} N &= \frac{(3)(5.5)}{(3.54)(0.94)} 120 = 595 \\ N &= \frac{(2)(5.5)}{(3.24)(0.94)} 130 = 470 \\ N &= 595 + 470 = 1065 \frac{11}{5.5} = 2130 \end{aligned}$$

One has to be particularly careful when enumerating the number of sightings and mean group size for geophysical surveys. Given that the vessel is traveling so slowly, often a sighting of a large group of animals is observed at a distance and a smaller sub-pod can break off and close in on the vessel. Ideally, each vessel would have a tracker who monitors the position of the different sightings. If the operators are not able to afford a separate individual to track each sighting, the observers must be cognizant of tracking each sighting until it passes abeam. For example, if 65 Pacific white-sided dolphins are observed 2 km from the vessel and then a group of 7 Pacific white-

---

<sup>53</sup> Which differ depending on water depth and airgun array size.

sided dolphins are observed approaching the vessel<sup>54</sup> a short time later, this should be enumerated as a single sighting of 65 dolphins rather than 2 sightings of 65 and 7 dolphins each. Further, large whales can be documented via multiple sightings. If there are 4 sightings of a single humpback whale and its trajectory has taken it across the path of the vessel, that sighting should be documented as 1 sighting of 1 whale rather than 4 sightings of 1 whale.\*\*

If sightings data partitioned into the various BSSs are not available, an even more simple and rapid method can be used by assuming single, overall values for the various parameters for each species or genera. Those values can be obtained from Barlow and Forney (2007).

The probability of detecting a group of cetaceans again is expressed as

$$p = g(0) \frac{\mu}{w} = \frac{g(0)}{w f(0)} .$$

If there are  $n$  sightings of a species along a section of trackline, the estimated number of groups within a perpendicular distance  $w$  on each side of the trackline and within a given Level B harassment zone is

$$N_{groups} = \frac{n}{p} = \frac{n w f(0)}{g(0)} = \frac{n w}{\mu g(0)} ,$$

and the estimated number of individual animals is

$$N = \frac{n}{p} S = \frac{n w}{\mu g(0)} S ,$$

where  $S$  is the mean group size for the species. That total number then must be scaled by the distance to the Level B harassment threshold relative to the truncation distance to estimate the total number of animals potentially taken during a given survey.

Example calculation for common dolphins when sightings data partitioned into the various BSSs are not available

Suppose we have detected  $n = 10$  groups, with a mean group size of  $S = 120$  within a Level B harassment radii = 8 km. From Table 1 of Barlow and Forney (2007),  $\mu = 2.22$  km and  $w = 4.0$  km and from Table 3,  $g(0) = 0.970$ . The estimated total number of dolphins potentially taken during the survey is therefore

$$N = \frac{(10)(4)}{(2.22)(0.97)} 120 \frac{8}{4} = 4458$$

---

<sup>54</sup> And, if that smaller sub-group comes within the Level A harassment zone, it should be enumerated as such.

## References

- Barlow, J. 2015. Inferring trackline detection probabilities,  $g(0)$ , for cetaceans from apparent densities in different survey conditions. *Marine Mammal Science* 31:923–943.
- Barlow, J., and K.A. Forney. 2007. Abundance and population density of cetaceans in the California Current ecosystem. *Fishery Bulletin* 105:509–526.
- Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers and L. Thomas. 2001. *Introduction to distance sampling: Estimating abundance of biological populations*. Oxford University Press, Oxford, U.K.
- Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers and L. Thomas. 2004. *Advanced distance sampling*. Oxford University Press, Oxford, U.K.