MARINE MAMMAL COMMISSION

2 May 2016

Ms. Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
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Dear Ms. Harrison:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the application submitted by Lamont-Doherty Earth Observatory (LDEO), in collaboration with the National Science Foundation (NSF), seeking authorization under section 101(a)(5)(D) of the Marine Mammal Protection Act (the MMPA) to take small numbers of marine mammals by harassment. The taking would be incidental to three marine geophysical surveys to be conducted in the southeastern Pacific Ocean between June 2016 and June 2017. The Commission also has reviewed the National Marine Fisheries Service's (NMFS) 19 April 2016 notice announcing receipt of the application and proposing to issue the authorization, subject to certain conditions (81 Fed. Reg. 23118).

Background

LDEO proposes to conduct three 2D geophysical surveys off Chile in its territorial waters[1] and exclusive economic zone (EEZ). The purpose is to study the (1) structure of the upper and lower plates that slipped during the 2014 Pisagua/Iquique earthquake sequence and of the plates to the south where a seismic gap remains unruptured for the northern survey, (2) extent and location of seafloor displacement and related subsurface fault movement relative to the 2015 Illapel earthquake for the central survey, and (3) deep plate boundary thrust fault that can produce some of the world's largest earthquakes and tsunamis for the southern survey. The surveys would be conducted in waters estimated to be 50 to 7,600 m in depth along approximately 9,633 km of tracklines. LDEO would use the R/V *Marcus G. Langseth* to operate a 36-airgun array at a tow depth of 9–12 m. The *Langseth* also would (1) tow a hydrophone streamer (8–15 km in length), (2) use up to 68 ocean-bottom seismometers, and/or (3) deploy an unmanned submersible vehicle (i.e., wave glider) to collect data during the surveys. In addition, LDEO would operate a 10.5- to 13-kHz multibeam echosounder and a 3.5-kHz sub-bottom profiler continuously during the surveys. The surveys are expected to last for a total of 75 days[2].

[1] NMFS does not authorize the taking of marine mammals within the territorial waters (in this case within 12 nmi) of a foreign country but does consider such taking when determining whether the activity would have a negligible impact on the affected species or stocks.
[2] Which includes a 25 percent contingency for equipment failures, resurveying of lines, and other operational needs.

NMFS preliminarily has determined that, at most, the proposed activities would result in the incidental taking of small numbers of up to 44 species of marine mammals by Level B harassment and 26 species of marine mammals by Level A harassment[3] and that any impact on the affected species would be negligible. NMFS does not anticipate any take of marine mammals by death or serious injury. It also believes that the potential for temporary or permanent hearing impairment will be at the least practicable level because of the proposed mitigation measures. Those measures include (1) refraining from operating the multibeam echosounder and sub-bottom profiler in transit to and from the survey area, (2) monitoring the exclusion and buffer zones (based on Level A and B harassment, respectively), (3) implementing speed and course alterations if those alterations do not compromise operational safety, and (4) using power-down, shut-down, and ramp-up procedures. In addition, LDEO would power down the array, if possible, when concentrations of large whales (six or more individuals that do not appear to be traveling and are feeding, socializing, etc.) are observed within the Level B harassment zone. Further, LDEO would report any injured or dead marine mammal to the Office of Protected Resources using NMFS's phased approach. The Commission believes that stranded marine mammals also should be reported to the local stranding network, as is standard practice for other incidental take authorizations, and thus recommends that NMFS require LDEO to report any injured or dead marine mammal to the Government of Chile's Servicio Nacional de Pesca y Acuicultura[4] in addition to the Office of Protected Resources.

Uncertainty in modeling exclusion and buffer zones

The Commission has raised concerns about the method used to estimate exclusion and buffer zones (based on Level A and B harassment, respectively) and the numbers of takes incidental to NSF-funded geophysical research for nearly six years. Recently, other stakeholders[5] have expressed similar concerns regarding the appropriateness of those methods (80 Fed. Reg. 67713). LDEO performs acoustic modeling[6] for geophysical research funded by NSF[7] to estimate exclusion and buffer zones using a simple ray trace–based modeling approach that assumes spherical spreading, a constant sound speed, and no bottom interactions for surveys in deep water (Diebold et al. 2010). As noted in numerous Commission letters, multiple LDEO-affiliated studies[8] have emphasized the importance of incorporating site-specific environmental and operational parameters into estimating exclusion and buffer zones. Most recently, a group of technical experts[9] confirmed that site-specific modeling should be conducted for each seismic survey because each individual acoustic footprint differs based on the source array (including total operational volume,

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[3] The Commission understands that NMFS proposed to authorize taking by Level A harassment to account for situations in which marine mammals may enter the Level A harassment zone before the airguns can be either powered or shut down, namely because standard mitigation measures included in incidental take authorizations rely primarily on visual monitoring and implementation may not occur until an animal is observed within the specified zone.
[4] SERNAPESCA. The Commission has provided NMFS with the relevant contact information.
[5] Natural Resources Defense Council and Whale and Dolphin Conservation.
[6] LDEO applies a correction factor to the deep-water radii for surveys in intermediate water and scales empirically-derived measurements from the calibration study in the Gulf of Mexico for surveys in shallow water.
[7] Including NSF's Division of Polar Programs and Antarctic Support Contract (ASC) and projects funded by the U.S. Geological Survey (USGS).
[8] Tolstoy et al. (2004), Tolstoy et al. (2009), Diebold et al. (2010), and most recently, Crone et al. (2014).
[9] Including experts from government, academia, the oil and gas industry, and multiple consulting companies (JASCO Applied Science, Seiche Limited, Styles Group, etc.) tasked with reviewing and providing information relevant to New Zealand Seismic Code of Conduct for Minimizing Acoustic Disturbance to Marine Mammals from Seismic Survey Operations.

configuration, operating pressure/source level, tow depth, etc.) and the bathymetry, substrate, and sound speed profile (which varies by season) associated with the survey area (Department of Conservation (DOC) in prep).

To estimate the proposed exclusion and buffer zones for the surveys in the southeastern Pacific Ocean, LDEO used its model for the 36-airgun array in deep water and the mitigation airgun in general. The use of LDEO's simple model has yet to be substantiated relative to conditions beyond the Gulf of Mexico, including waters off Chile. The Chilean waters, as indicated by both NMFS and LDEO, have a narrow continental shelf with complex bathymetry, upwelling conditions, and high productivity—which are conducive to creating surface duct conditions. LDEO's simple model also is not appropriate for modeling (1) acoustic frequencies greater than 100 Hz due to the isovelocity sound speed assumption, (2) propagation in water depths less than 2 km due to interaction with the ocean floor, which would increase received levels significantly at large ranges from the source, and (3) rough sea states due to eliminating any interference pattern between the direct and surface-reflected (ghost) path, which is assumed by the LDEO model. In addition, LDEO applied a correction factor of 1.5 to the deep-water radii for surveys in intermediate water and scaled, based on tow depth, empirically-derived measurements from the calibration study in the Gulf of Mexico for surveys in shallow water. NMFS did state in the *Federal Register* notice that LDEO used a process to confirm the conservative nature of its radii for a shallow-water seismic survey, which was based on the empirical measurements LDEO routinely uses from the Gulf of Mexico survey likely overestimating the size of the empirically-derived exclusion and buffer zones from Crone et al. (2014)[10]. NMFS indicated it had reviewed that preliminary information when considering how those data reflect on the accuracy of LDEO's current modeling approach and concluded that modeling of the distances likely results in predicted distances that are conservative. The Commission questions the reliance on shallow-water data since the proposed surveys would occur in intermediate and deep water, in addition to shallow water. Further, the shallow-water 'model' continues to rely on scaled empirical measurements from the Gulf of Mexico as a proxy for other shallow-water survey areas—a method no other action proponent that conducts seismic surveys employs, whether in the United States or abroad.

With regard to shallower water environments, LDEO has used numerous models[11] to fit empirical data collected with hydrophone streamers off Washington and New Jersey. In those cases, extrapolation also was necessary for the various thresholds due to the radii being either beyond the range of the hydrophone streamer or closer to the ship than what the streamer could collect. These recent examples highlight the inherent site-specific and near- and far-field differences related to deriving both exclusion and buffer zones. Although LDEO's model and other methodologies do not incorporate environmental characteristics of the specific southeastern Pacific survey areas[12], the most widely accepted modeling approaches that currently are used, and historically have been used,

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[10] Crone et al. (2014) used hydrophone data from waters off Washington State to compare empirically derived to predicted exclusion and buffer zones for LDEO's 36-airgun array towed at 9 m with a total volume of 6,600 in^3. Data were used only for water depths of up to 200 m.

[11] A non-parametric smoothing cubic spline model, spherical spreading model with an attenuation term, and high-degree polynomial model were used in Crone et al. (2014) for waters off Washington and a simple logarithmic spreading loss model (the spreading loss factor/fitting parameters were not specified) was used in Crone (2015) for waters off New Jersey.

[12] Including sound speed profiles and refraction within the water column, bathymetry/water depth, sediment properties/bottom loss, wind speed, and absorption coefficients.

by other action proponents conducting seismic surveys do incorporate those characteristics. Specific types[13] of propagation models[14] are used routinely to model sound propagation associated with seismic surveys. Those models account for source frequency, water depth, and range dependence, none of which are accounted for in a simple spherical spreading model or the other methods used by LDEO. Specifically, DOC (in prep) indicated that the modeler or acoustician should have sufficient understanding of the physics of underwater acoustic propagation to ensure the results being produced by any model are accurate and make sense in physical terms. The Commission is not convinced that is true for LDEO's model and the various extrapolations and scaling factors used. Further, other action proponents generally collect empirical sound source and sound propagation measurements to verify their modeled outputs—this is becoming routine both in the United States and abroad[15].

Despite the Commission's repeated comments on this issue, LDEO continues to base its 'modeling' approaches on significantly outdated and seemingly inaccurate methods and NMFS continues to make the determination that they represent the best available science. The Commission again underscores that LDEO, NSF, and related entities (ASC, USGS, Scripps Institution of Oceanography (Scripps)) should be held to the same standard as other action proponents (i.e., Bureau of Ocean Energy Management, the oil and gas industry, U.S. Navy, U.S. Air Force). In addition, many propagation models (including those mentioned previously) are publicly available[16] via the Ocean Acoustics Library[17], which is supported by the U.S. Office of Naval Research. Given that LDEO normally employs an acoustician, investigating and ultimately implementing such models should not be an insurmountable task.

The Commission believes LDEO's use of a simplistic model, various extrapolations, and correction and scaling factors does not represent best available science and therefore strongly recommends that NMFS (1) require LDEO to re-estimate the proposed exclusion and buffer zones and associated takes of marine mammals using site-specific environmental (including sound speed profiles, bathymetry, and sediment characteristics[18] at a minimum) and operational (including number/type/spacing of airguns, tow depth, source level/operating pressure, operational volume) parameters for the proposed incidental harassment authorization and (2) impose the same requirements for all future incidental harassment authorizations submitted by LDEO, NSF, ASC, USGS, Scripps, or any other relevant entity.

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[13] Including normal mode (e.g., KRAKEN), wavenumber integration (e.g., OASES), and parabolic equation (e.g., RAM, PDPE). BELLHOP also is useful for propagation modeling of sound above 100 Hz with range dependent environmental specifications (e.g., bathymetry).
[14] See Etter (1996) for the original review of such models or Etter (2013), which is the fourth edition of that book.
[15] In some other countries, collection of those data is required rather than voluntary.
[16] As are environmental parameters.
[17] Either as documented source code or as ready-to-use executables for various computer platforms at http://oalib.hlsresearch.com.
[18] Those data can be obtained from the National Geophysical Data Center, Leveticus, 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.

Uncertainty in density estimates

LDEO acknowledged uncertainty regarding the representativeness of the density data and the assumptions used to calculate the numbers of takes. Specifically, LDEO indicated that uncertainty in the density data was based on oceanographic conditions, including occasional El Niño and La Niña events, which influence the year-to-year distribution and numbers of marine mammals present in the equatorial tropical and southeastern Pacific Ocean. However, neither LDEO nor NMFS addressed the main types of uncertainty inherent in the density data. Those include (1) geographical differences (i.e., the majority of the densities originated from the equatorial tropical Pacific and the California Current system), (2) temporal differences (i.e., some data were collected in the mid-1980's and the data were collected in summer and fall, although the proposed activities could occur at anytime during the year), and (3) accuracy of the data (i.e., densities for some Northern Hemisphere species were used as proxies for similar Southern Hemisphere species). The same data and methods were used for a 2012 NSF-funded geophysical survey off Chile, for which the Commission also questioned their applicability. At that time, NMFS indicated it had confidence in the assumptions and calculations used to estimate densities for the survey areas off Chile (77 Fed. Reg. 27191) and did not make any adjustments to account for the inherent uncertainty.

The Commission has recommended numerous times in the last four years that NMFS adjust density estimates using some measure of uncertainty when available density data originate from different geographical areas, temporal scales, and seasons and that it formulate policy or guidance regarding a consistent approach for how applicants should incorporate uncertainty in density estimates. In 2013 NMFS indicated 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). The Commission is unaware of any such guidance being developed since that time but continues to believe that it is necessary, especially for an action proponent such as LDEO that primarily operates in areas outside the U.S. EEZ where site- and species-species density estimates tend to be scant. Thus, the Commission recommends that NMFS (1) adjust density estimates using some measure of uncertainty when available density data originate from different geographical areas, temporal scales, and seasons and (2) provide an update on the development of its guidance for addressing such uncertainty.

Monitoring measures

The Commission has indicated for many years that the monitoring and reporting requirements adopted under section 101(a)(5) of the MMPA need to be sufficient to provide a reasonably accurate assessment of the manner of taking and the numbers of animals taken incidental to the specified activity. The Commission continues to believe 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 are accounted for by g(0) and f(0) values[19]. In response to the Commission's 8 December 2015 letter on LDEO's survey off Brazil, NMFS indicated it agreed with the Commission's

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

recommendation to improve the post-survey reporting requirements for NSF and LDEO by accounting for takes using applicable g(0) and f(0) values (81 Fed. Reg. 2177). NMFS met with Commission staff in December 2015 to discuss ways to develop and validate a monitoring program that would provide a scientifically sound and reasonably accurate assessment of the types of marine mammal takes and the actual numbers of marine mammals taken, accounting for applicable g(0) and f(0) values.

At that time NMFS indicated it would work with NSF to develop ways to improve its post-survey take estimates and included a requirement that NSF do so, in collaboration with NMFS and the Commission, in the incidental harassment authorization for LDEO's survey off Brazil (81 Fed. Reg. 2177). The Commission is unsure if any progress has been made toward fulfilling that requirement but would welcome the opportunity to participate in such a collaborative approach. Therefore, the Commission again recommends that NMFS consult with LDEO and other relevant entities (e.g., NSF, ASC, USGS, Scripps) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and reliable estimates of the numbers of marine mammals taken by incorporating appropriate estimates of g(0) and f(0) values, based in part on monitoring data collected during geophysical surveys.

Lastly, the Commission understands that LDEO's passive acoustic monitoring (PAM) system[20] is used to supplement visual detection of marine mammals, primarily odontocetes that could occur within the mitigation zone[21]. NMFS would require that only one dedicated PAM observer be on board, with the other protected species observers relieving the PAM observer, as necessary. The Commission is unsure whether this provides sufficient coverage when the survey operations are occurring throughout a 24-hour period. In this regard, the Commission notes that the Acoustical Society of America has convened a panel of experts to develop various PAM standards. While those standards likely won't be finalized for another 18 months, NMFS should anticipate the need to incorporate them into mitigation and monitoring requirements of incidental take authorizations at that time.

The Commission looks forward to collaborating 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

[20] Which is towed at a depth of less than 20 m and within 250 m of the seismic vessel, making detection of baleen whales difficult.
[21] Or within a few kilometers of the vessel.

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May 18, 2016

Subject: 0648-XE451- *Comment on* "Marine Geophysical Survey in the Southeast Pacific Ocean, 2016-2017"

Dear Ms. Harrison:

The Marcus Langseth Science Oversight Committee (MLSOC) welcomes the opportunity to comment on the application for an Incidental Harassment Authorization (IHA) for the proposed seismic programs along the coast of Chile to address earthquake processes and related earthquake and tsunami hazards. This program utilizes *R/V Marcus G Langseth (R/V Langseth)*, a unique asset of the Federal Academic Fleet with its specially designed capabilities to conduct the proposed seismic program. MLSOC supports the application for an IHA and endorses NMFS commitment to science-based decisions in its regulatory process.

The MLSOC is a committee within the University National Oceanographic Laboratories System (UNOLS) and consists of a diverse group of professionals, including geophysicists, geologists, oceanographers, and marine engineers, who provide advice on the scientific operations of *R/V Langseth.* The committee's members have extensive experience conducting seismic operations around the world aboard *R/V Langseth* and other seismic vessels, as well as knowledge and experience in mitigation and monitoring identified and/or required under the National Environmental Policy Act (NEPA), Executive Order 12114 (Environmental Effects Abroad of Major Federal Actions), the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). One role of the Committee is to advise both the National Science Foundation (NSF) and the ship operator Lamont-Doherty Earth Observatory (L-DEO) on safe, efficient, cost-effective, and scientifically compelling operations of *R/V Langseth*.

As a U.S. research vessel, *R/V Langseth* operates entirely within the U.S. regulatory process, and, when appropriate, international laws, including for mitigating any potential impacts of sound on the environment. Executive Order 12114 requires agencies, in this case NSF, to consider the potential environmental impacts of their proposed actions. The Draft Environmental Analysis (EA), the associated application for an IHA, and NMFS's Notice of Intent to issue an IHA for these seismic experiments along the coast of Chile describe the proposed research program, its potential consequences, possible alternatives, the monitoring plan, and mitigation measures that would minimize any potential adverse impacts. Among the factors considered in developing the research plan were:

a. Minimum energy source size to accomplish scientific objectives;
b. Mitigation and shut down procedures for marine species;

c. Protected Species Visual Observers (PSVO) observations for a standard amount of time, generally 30 minutes prior to the start of the survey to clear a specified area around the vessel, and to monitor marine species occurrence, abundance, and behavior during seismic operations;
d. Startup of the energy source includes ramp-up procedures over a standard amount of time (generally 30 mins) that serves to alert animals of the activity and allows them to vacate the area if disturbed;
e. No start-up of the seismic source during poor visibility or at night unless at least one airgun has been operating;
f. PSVOs, independently contracted biologists, have authority to shut down the seismic source when marine mammals, sea turtles, and diving and foraging endangered/threatened seabirds are detected in or about to enter designated exclusion zones; and
g. Passive Acoustic Monitoring (PAM) and infrared sensors during day and night to complement visual monitoring.
h. Abiding by any additional regulations required by foreign States when operating within their waters.

The research plan also utilizes the Lamont-Doherty Earth Observatory (L-DEO) model for predicting the exclusion and buffer zones. While the L-DEO model has been criticized for not accounting for all variables that could affect signal propagation and amplitude, the model yields reliable values from two perspectives.

First, the model results, when compared with actual measurements of in-situ amplitudes during R/V *Langseth* surveying, demonstrate that modeled exclusion radii are larger than measured radii. The most comprehensive study comes from the Gulf of Mexico in water depths of ~50 m, ~1000 m, and ~1600 m (Tolstoy et al., 2009; Diebold et al., 2010), where the model predictions of radii always exceeded the actual measurements for the two deeper water sites (Diebold et al., 2010). These results were robustly demonstrated for shallow water (<25 m - ~200 m) offshore Cascadia, where the modelled radii were 2-3 times larger than the measured results (Crone et al., 2014). An additional study of *Langseth* signals from surveys in 2014 and 2015 in shallow water (~20-75 m) on the New Jersey shelf are consistent with these earlier results (Crone, 2015, L-DEO personal communication). Hence, the L-DEO model results are conservative and precautionary and provide consistent results across surveys and years for statistical comparison. Insinuations that the L-DEO models are invalid because they do not represent more complicated environments are unwarranted. Actual measurement of signal amplitudes, as done in recent experiments, are a better guide for judging the accuracy of mitigation radii than invoking more sophisticated, complicated models, some of which are unproven for airgun propagation. The current L-DEO model utilizes an approach that data are now showing is robust, reliable, *and conservative* in a range of environments, geological settings, and water depths.

Second, the proposed exclusion and mitigation radii of the L-DEO model are larger than radii specified by regulations of many other countries. For the proposed Chile survey, exclusion radii vary from 2060-2480 m (water depths <100 m), to 927-1116 m (water depths >1000 m). Many countries specify exclusion radii at fixed distances of 500 m (UK, Canada, Brazil, and Australia), 1000 m (Ireland and New Zealand for its largest Level 1 surveys), or 1500 m (New Zealand, when calves are present)[1]. The exclusion radii developed from the L-DEO model are broadly consistent with the larger radii in these

[1] http://www.doc.govt.nz/Documents/conservation/native-animals/marine-mammals/seismic-survey-code-of-conduct-reference-document.pdf; and http://www.doc.govt.nz/our-work/seismic-surveys-code-of-conduct/frequently-asked-questions/

independently developed regulations for deep water, and, for shallow water, they are considerably larger and more conservative.

The monitoring and mitigation strategies proposed for the Chile margin survey are reasonable when compared to in-situ measurements and are consistent with or more conservative than internationally accepted standards. The proposed monitoring and mitigation measures are based on standards set in the *Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey* (NSF/USGS PEIS – link provided below), which included public input, expert review, and are precautionary because of the uncertainties associated with impacts of man-made sound on animals and unknowns about the behavior, abundances, and distributions of marine animals. As required by NMFS, the proposed IHA for the Chilean survey was prepared using the current NOAA acoustic guidance. Though NOAA published new draft guidelines in December 2013 and again in July, 2015 for assessing the effects of anthropogenic sound on marine mammals (http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm), these are still undergoing revision after a third public comment period that ended on March 30, 2016.

There is often public confusion regarding the potential impacts to marine mammals from seismic surveys because the U.S MMPA uses the term "take" to describe both disturbance and injury. The IHA application for the Chile margin research program is an application only to "incidentally" disturb animals, not to seriously injure them. The proposed monitoring and mitigation described in a – h above is designed to minimize potential disturbance to marine mammals, as well as to avoid the possibility of injury. While NMFS may issue Level A take for the proposed activity, we do not think that the activity, combined with the proposed monitoring and mitigation measures, would result in Level A injuries to marine species.

While NSF proposes exclusion and buffer radii that are arguably larger than warranted from actual measurements (e.g., Crone et al., 2014, Crone, 2015 L-DEO personal communication), MLSOC would like to emphasize the problems created by this approach:

- *Loss of survey data* – summarized aptly by Crone et al. (2014): "Conservative mitigation radii are preferred to those that are underestimated; however, excessively conservative radii … may cause unnecessary power-downs and shutdowns like those that plagued the 2012 COAST project on the *R/V Langseth*, and lead to large unnecessary losses of survey data" (Crone et al., 2014, p. 3805). Overly cautious restrictions such as used in COAST can inhibit research that could provide critical information for improving policies related to public safety from geohazards. As more data similar to that published by Crone et al. (2014) are acquired, analyzed, and published, NSF will work with NMFS to incorporate these results into estimates of mitigation radii based on the best available scientific information.
- *Overestimation of takes* – MLSOC compared authorized and actual takes from recent *R/V Langseth* surveys that indicate a large discrepancy exists. For the 2014 *R/V Langseth* USGS program on the Atlantic margin, the IHA permit authorized 11,367 takes, but only three unidentified dolphins were observed as potentially exposed to airgun sounds within the buffer zone (> 160 dB)[2]. For the 2014 *R/V Langseth* NSF survey off Cape Hatteras, the IHA permit authorized 15,493 takes, for which there were 248 cetaceans and four sea turtles that were observed within the buffer zone (>160 dB)[3]. For the 2015 *R/V Langseth* USGS Atlantic survey, the IHA authorized takes for 12,230 animals, but only one unidentified delphinid was potentially exposed to airgun sounds within the buffer zone (>160 dB)[4]. For the 2015 *Langseth*

[2] http://www.nmfs.noaa.gov/pr/permits/incidental/research/usgslangseth_2014iha_monrepphase1.pdf
[3] http://www.nmfs.noaa.gov/pr/permits/incidental/research/ldeo_ncseismic_2015iha_monitrpt.pdf
[4] http://www.nmfs.noaa.gov/pr/permits/incidental/research/usgslangseth_2014iha_monrepphase2.pdf

Mediterranean survey, the IHA authorized takes of 7,796 animals (all marine mammals), for which 15 unidentified dolphins were observed within the predicted exclusion zone[5]. The percentages of reported takes compared to authorized takes are 0.03 %, 1.6 %, 0.01 %, 0.19 % respectively, or negligible to very small. While these numbers do not account for species not seen by PSVOs or heard from Passive Acoustic Monitoring (PAM), it is hard to believe any corrective weighting functions to account for unseen or unheard animals could realistically demonstrate that authorized takes are underestimated. The low take numbers also demonstrate that conservative, precautionary approaches to estimating take calculations could be significantly overestimating potential impacts to marine species and would instead mislead the public as to the level of impacts that may result from acoustic sources.

The low take numbers from recent surveys are evidence that mitigation and monitoring do work to minimize exposure and potential harm. Part of the rationale for mitigation and monitoring, including exclusion and buffer radii, and ramp-ups, is that animals are given the opportunity and will move away from a sound that might disturb them. The actual take numbers suggest that this may be happening. While MLSOC applauds NMFS' proactive efforts to protect marine species and the marine environment through the IHA process, we also encourage NMFS to take into consideration documented PVSO observations, such as those noted above, when (i) assessing future *R/V Langseth* and academic seismic survey IHA applications and mitigation and monitoring requirements, (ii) developing acoustic guidance policy, and (iii) assessing actual impacts on marine species resulting from seismic surveys.

Acoustic sources are essential and irreplaceable tools for the collection of data for scientific research in the oceans. Seismic methods are the only tool available for peering directly into the seafloor and acquiring the data necessary to advance understanding of volcanic, earthquake, and tsunami hazards. The proposed Chile margin seismic programs fit wholly within this framework and will provide invaluable data on the deep margin structure and characteristics of the subduction zone megathrust that control earthquake size, rupture area, and tsunamigenesis. The results from Chile will provide new insight into great earthquakes worldwide and will contribute to understanding how large faults generate devastating tsunamis.

If seismic research programs such as that proposed for the Chile margin using *R/V Langseth* are not permitted, the future of this unique national asset and the innovative research that it enables will be lost. The U.S. will have no way to investigate and study marine geologic features of critical interest to understand and reduce potential impacts to life and property of the public from global geohazards. Further, this means government officials will not be able to make informed polices to better protect its citizens, for example from earthquake or tsunami hazards, especially along populated coastline areas. If the *R/V Langseth* cannot conduct these programs that are relevant to U.S. national interests, what role will science play in policies that safeguard public safety, resilience, and stability?

NSF and L-DEO have followed the appropriate IHA process and have conformed to the associated requirements. Based on the information and analysis provided by NSF and L-DEO, the proposed activities meet the criteria established for issuance of an IHA, particularly because the mitigation radii are in all likelihood considerably larger than they need to be. Despite the overestimation of radii, take estimates still remain small and would have negligible impacts on species or stock. Therefore, the MLSOC urges NMFS to approve this application for an IHA.

R/V Langseth, and its predecessor, *R/V Ewing*, completed more than a decade's worth of academic/government seismic programs with the highest standards of mitigation and monitoring and

[5] http://www.nmfs.noaa.gov/pr/permits/incidental/research/nsf_med_2015iha_monrep.pdf

without the dire, unfounded results purported by opponents of the activities (e.g., no marine mammal mass strandings or disruption to fishing). This letter is to affirm that there is significant support from the MLSOC for the IHA to be issued for the proposed activity and for the survey to be conducted. As a consequence of past seismic research activities, academic scientists have provided significant contributions to society through results which have enhanced our understanding of the Earth, Earth processes, and geohazards. Additionally, observations made by the PSVOs aboard seismic expeditions are contributing to better understanding of the distribution and behavior of marine mammals and sea turtles. We encourage NMFS – as a science based agency – to use science to make informed decisions, perform its regulatory duties, and issue IHAs in an appropriate and timely manner.

Respectfully submitted,

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