MARINE MAMMAL COMMISSION

27 September 2016

LCDR Mark Murnane
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Dear LCDR Murnane:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the U.S. Navy's (the Navy) Draft Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement (DSEIS) for Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar (81 Fed. Reg. 58920). The DSEIS addresses the impacts on marine mammals from conducting training, testing, and routine military operations that use SURTASS LFA sonar and is associated with the letter of authorization (LOA) application that the Navy will submit to the National Marine Fisheries Service (NMFS).

Background

The Navy proposes to use up to four SURTASS LFA sonar systems, including the Compact LFA sonar source, on four different vessels for military readiness activities during training, testing, and routine military operations from 2017–2022. Operations would occur in the Pacific, Atlantic, and Indian Oceans and in the Mediterranean Sea[1]. At-sea missions for each vessel would not exceed 240 days of active sonar transmissions. Under the No Action Alternative, the SURTASS LFA sonar systems would not be operated by any of the four vessels. Alternative 1, the Preferred Alternative, would allow SURTASS LFA sonar to transmit for up to 255 hours; whereas, Alternative 2 would allow up to 432 hours of transmission time. In addition to time-area closures, mitigation measures would include visual, passive acoustic and active acoustic monitoring to implement delay and shut-down procedures.

Uncertainty in density estimates

The Navy estimated marine mammal densities in the 26 representative mission areas based on direct estimates from line-transect surveys that occurred in or near each of the mission areas. If density estimates were not available from a line-transect survey in a specific mission area, then the Navy extrapolated estimates from a region with similar oceanographic characteristics to the mission area. Densities for some mission areas also were derived from the Navy's Marine Species Density Database (NMSDD; Department of the Navy (DoN) 2016), which currently is not available to the

[1] Operations would not occur in Arctic and Antarctic waters, see Figure 1-1 in the DEIS.

public. However, assuming that version is similar to previous versions, the Commission continues to have concerns regarding the density estimates used. Previous versions of the database included densities derived from (1) models that use line-transect survey sighting data and distance sampling theory, (2) models that use known or inferred habitat associations to predict densities (e.g., relative environmental suitability (RES) models), typically in areas where survey data are limited or non-existent, or (3) extrapolation from neighboring regional density estimates or population/stock assessments. In previous letters the Commission noted the varying types of areas[2] from which sightings or abundance estimates were extrapolated and the inappropriate use of haul-out correction factors for pinnipeds[3] for density estimates of the latter type. The Navy has acknowledged that estimates from RES models and extrapolated densities include a high degree of uncertainty (DoN 2015), but uncertainty was not discussed in the current DSEIS. The Commission understands that density data are not available for all areas where, or times when, activities may occur and that even when such data are available the densities could be underestimated. Thus, the Commission continues to believe that action proponents, including the Navy, should use the best available density estimates plus some measure of uncertainty (e.g., mean plus two standard deviations, mean plus the coefficient of variation, the upper limit of the confidence interval) in those instances.

The Navy also used multiple data sources to inform various density estimates stipulated in Table 3-6 of the DSEIS. For example, the Navy cited four different sources (Tillman 1977, Ferguson and Barlow 2001 and 2003, LGL Limited 2008) for the blue whale density estimate in the West Philippine Sea (mission area 3). Two of those sources are from the eastern tropical Pacific Ocean; one is in reference to sei rather than blue whales, and the other likely included density estimates that were themselves extrapolated from another region and/or from sightings data[4]. Not only is the representativeness of those estimates questionable, but it also is unclear whether and how sightings data were used to derive the various densities and whether, when referencing multiple sources, mean or maximum[5] density estimates were used. For these reasons, the Commission recommends that the Navy make available to the public the current version of NMSDD as referenced in DoN (2016) as soon as possible and before the LOA application is published in the *Federal Register*. The Commission further recommends that the Navy, in its LOA application and final SEIS, (1) specify how density estimates were derived and what statistic (e.g., mean, median, maximum) was used when multiple sources are referenced in Table 3-6 and (2) account for uncertainty in extrapolated density estimates for all species by using the upper limit of the 95% confidence interval or the arithmetic mean plus two standard deviations and re-estimate the numbers of takes accordingly.

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[2] Including the entire range of the stock, the foraging range, the geographic area of occurrence, etc.
[3] See the Commission's most recent 3 March 2016, 17 June 2015, and 31 March 2014 letters on these issues.
[4] Similar issues exist for the blue whale abundance estimate in the West Philippine Sea. The Commission also notes that Thomas et al. (2016) indicated that populations of blue whales in the far west appear to have been extirpated and that abundance estimates of blue whales in the eastern North Pacific Ocean are less than 3,000. Further, NMFS's 2015 stock assessment report for the blue whale stock in the eastern North Pacific Ocean indicated a minimum population estimate of 1,551. Neither estimate support the Navy's abundance estimate of 9,250 blue whales in the West Philippine Sea.
[5] Or some other statistic.

Single ping equivalent (SPE)

The Navy has used SPE as the metric to estimate behavioral response[6] of marine mammals to SURTASS LFA sonar for more than 15 years. The Navy has described SPE as an intermediate calculation for input into the behavior risk function[7] that accounts for the energy of all LFA sonar transmissions that an animat may receive in a 24-hour period. However, SPE is not an energy-based metric or based on any sort of physical quantity[8]. It is a quasi-metric that the Navy has used to apply its behavior risk function[9] since the first SURTASS LFA sonar EIS was drafted in 1999 and finalized in 2001. The Navy has defined SPE[10] as the sum of the squares of the root-mean-square sound pressures (SP_{rms}) of individual pulses, with units similar to that of root-mean-square sound pressure level (SPL_{rms})[11]; whereas, sound exposure level (SEL) is an energy-based metric related to the summed products of the root-mean-square intensities squared and the signal duration of individual pulses[12], with units dB re 1 μPa^2-sec. For a single pulse, or for a set of pulses dominated by a single large pulse, the SPE effectively reduces to the SPL_{rms} of the dominant pulse. For multiple pulses, SPE only has a physical interpretation if one assumes that the intensity of a sonar pulse can be negative (in terms of linear SPL_{rms} values or SP_{rms}). Since intensities cannot be negative, SPE has no valid derivation from physical principles. The use of SPE has been claimed to be more conservative than using an SPL-based threshold, but SPE is in fact less conservative than an SEL-based threshold, particularly when multiple pulses of similar intensity are involved. The difference between SPE and SEL increases as the number of pulses received increases, thus SPE becomes less "conservative" with the increasing number of pulses.

It also is unclear how received levels (in units of SPL) from the LFS SRP[13] that apparently were used to inform the shape of the risk function reconcile with the x-axis of that function, which is based on SPE. Since the received levels were not measured in SPE, the Commission is unsure if the LFS SRP data were converted to SPEs but suspects that they were not. Using SPL-based parameters as the basis for an SPE-based function is unfounded. In addition, the DSEIS noted that the basement value (B) of the risk function is 120 dB and the 50 percent risk value (K) is 45 dB, but the 2012 final SEIS indicated that B is 119 dB and K is 46 dB. Since much of the information regarding SPE and the risk function was contained in previous versions of the EIS, errors such as these are not unexpected.

The Commission's greatest concern regarding the Navy's use of SPE for SURTASS LFA sonar is that the Navy does not use that metric for estimating behavior harassment takes for any other low-frequency (LF) sonar source. Rather, since 2007 the Navy has used the Feller (1968) function based on SPL-based parameters for most species, with the exception of using an

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[6] Level B harassment.
[7] Based on the Feller (1968) function and parameters gleaned from data obtained during the Low Frequency Sound Scientific Research Program (LFS SRP) in 1997 and 1998. LFS SRP yielded few data to inform such functions, likely due to the methods used nearly 20 years ago.
[8] It also is not a metric recognized by the American National Standards Institute.
[9] Which is in units of SPE as well.
[10] See the 2012 final SEIS for the equation.
[11] dB re 1 μPa.
[12] More simplistically, SPE is merely proportional to intensity and SEL is the intensity summed over time.
[13] Which appear to have been inferred based on the location of the whales and vessel rather than obtained via direct measurements from acoustic recording tags on the whales.

unweighted 140 dB re 1 μPa for beaked whales and 120 dB re 1 μPa for harbor porpoises in recent years (Finneran and Jenkins 2012). Even if the Navy made the case that the SPE-based risk function is more conservative than a comparable SPL-based risk function, that assumption may not be true when comparing the SPE-based risk function and the step-function SPL thresholds for beaked whales and harbor porpoises. This is of concern because although beaked whales and harbor porpoises are less likely to be affected by SURTASS LFA sonar than mysticetes, the Navy has estimated takes for beaked whales in 25 of its 26 mission areas and for harbor porpoises in 5 of its 26 mission areas—one of which had 601 harbor porpoise takes[14] estimated from a 24-hour SURTASS LFA sonar transmission.

If the Navy's intent is to include a measure of energy in its assessment of behavioral risk from exposure to SURTASS LFA sonar, it would have been more logical to use SEL-based thresholds rather than using SPE. A review of the history of the use of SPE suggests that it is a metric that continues to be used mainly out of habit rather than because it is considered the best available science for providing conservative estimates of cumulative impacts of sonar transmissions on behavior. For all of these reasons, the Commission recommends that in its LOA application and final SEIS, the Navy use either (1) a metric (i.e., SPL or SEL) and associated thresholds that are based on physics rather than SPE or (2) the behavioral response metrics and thresholds that the Navy currently uses for all other LF sonar sources based on Finneran and Jenkins (2012). In either instance, the Navy should investigate the effects of SURTASS LFA sonar using updated methods, including controlled exposure experiments if feasible, given that the LFS SRP data are nearly 20 years old.

Level A and B harassment takes

In the DSEIS, the Navy provided probabilities associated with Level A and B harassment[15] rather than the estimated numbers of takes (see Table 4-7). The Commission commented on this issue in its review of the 2011 DSEIS, but the Navy has not changed its approach. In the current DSEIS, the probabilities of Level A and B harassment are based on the percentage of marine mammal stocks potentially affected by 24 hours of exposure to SURTASS LFA sonar transmissions estimated for a single season[16] in 26 mission areas. To estimate the number of marine mammals taken within a single day in a specific mission area, one must multiply the percentage of the stock affected by the relevant density estimate. That process becomes quite unwieldy when one considers that there are more than 25 species or genera of marine mammals within 26 different mission areas. Determining the model-estimated numbers of takes in a given year[17] is simply impractical.

Given that the Navy's presentation of estimated takes is neither transparent nor manageable, the onus ultimately falls on the public and relevant agencies to calculate the numbers of estimated takes. Such an approach runs counter to the guidance provided in the National Environmental Policy Act (NEPA) implementing regulations. Section 1502.8 of the regulations states that

[14] Based on 0.1602 percent of the 375,358 harbor porpoises potentially being taken in a 24-hour period in the Eastern North Atlantic mission area.
[15] Based on permanent threshold shift (PTS) and temporary threshold shift (TTS) and behavior, respectively.
[16] Generally, the season with the sound speed profile resulting in the longest range acoustic propagation.
[17] Although the Navy indicated it would limit operation of SURTASS LFA sonar to ensure that no more than 12 percent of any marine mammal stock would be taken by Level B harassment annually from transmissions of all SURTASS LFA sonar sources, ascertaining the numbers of takes that could occur is nearly impossible.

environmental impact statements shall be written in plain language and may use appropriate graphics so that decision makers and the public can readily understand them. The Commission believes that the Navy has not met this directive under NEPA and again recommends that the Navy specify the numbers of marine mammals that could be taken by Level A and B harassment incidental to operating SURTASS LFA sonar rather than providing only the probabilities of such takes in its LOA application and final SEIS.

The Commission also noticed possible errors in Table 4-7. In various instances, the table indicated that the percent of the stock affected by TTS was greater than that affected by behavior for multiple species of mysticetes in at least 12 of the 26 mission areas. Thus, once calculated out to takes, the TTS takes would be greater than behavior takes, which does not seem probable given the metrics and thresholds the Navy used for LF cetaceans. Therefore, the Commission recommends that the Navy ensure that Table 4-7 does not contain any errors for the various species of mysticetes or, if it is indeed accurate, explain why TTS takes are greater than behavior takes for some species of mysticetes in some portion of the mission areas in its LOA application and final SEIS.

In addition, the Navy stated that it does not expect its use of SURTASS LFA sonar to cause Level A harassment (PTS) of any marine mammals or stocks based on the application of the full suite of mitigation measures that would be employed when the sonar is transmitting. The header in Table 4-7 stipulated that the percentage of any marine mammal stock affected by Level A harassment with mitigation applied is 0.0000 percent. It is unclear whether that statement means that there were no model-estimated Level A harassment takes when considering a 24-hour operating period, whether mitigation was considered within the animat modeling scenarios, or whether all model-estimated Level A harassment takes were reduced to zero. Appendix B, which discussed the marine mammal impact analysis, did not mention inclusion of mitigation within the modeling scenarios or reduction of any of the model-estimated numbers of Level A harassment takes based on mitigation measure implementation—the latter being a tack that the Navy has taken for other DSEISs. Given that the Navy indicated that it had requested and NMFS had authorized[18] a small number of Level A harassment takes, it would be prudent to delineate the numbers of model-estimated Level A harassment takes to compare to those that the Navy proposes to request for NMFS to authorize. Therefore, the Commission recommends that the Navy specify the numbers of model-estimated Level A harassment takes of marine mammals in the absence of implementing mitigation measures and any and all assumptions (including within the animat modeling scenarios) that were made to reduce those takes to zero in its LOA application and final SEIS.

Offshore Biologically Important Areas (OBIAs)

Through the implementation of the proposed mitigation measures, the Navy would ensure that SURTASS LFA sonar received levels would be less than 180 dB re 1 μPa[19] within (1) 22 kilometers of any land or (2) the boundary of a designated OBIA[20] during biologically important seasons. Designation of OBIAs was based on the area being inhabited at least seasonally by marine mammal species whose best hearing sensitivity is in the LF range and on the area's biological importance as indicated by (1) its high marine mammal density, (2) its known/defined

[18] And presumably will be included for the upcoming proposed rulemaking.
[19] root-mean-square.
[20] Which must be beyond 22 km of land.

breeding/calving grounds, foraging grounds, or migration routes, (3) being inhabited by small, distinct populations with limited distribution, or (4) being designated as critical habitat. The Navy currently has recognized 22 OBIAs.

After reviewing more than 100 marine areas for potential designation, the Navy has proposed to expand the extent of five OBIAs and add an additional six (see Table 4-4). The Commission agrees with the expansion and addition of those OBIAs but is unable to evaluate why more than 95 of the other areas considered were excluded since no details on those areas were provided. It can only be assumed that the other areas did not meet the OBIA selection criteria and/or were rejected based on the Navy's operational practicability review, but details on the Navy's rationale need to be included. The only marine area that was discussed in any detail was Tanner and Cortes Bank, which the Navy indicated would be placed on the OBIA watchlist to be reviewed as more information becomes available. However, three other marine areas (Challenger Bank, Southeast Shoal, and Hellenic Trench; see Table C-1) also were apparently placed on the OBIA watchlist without any further discussion in the DSEIS. In addition, the Commission questions why the Navy did not propose to add Gray's Reef National Marine Sanctuary[21] (NMS) and the portions of the NMS of American Samoa that lie beyond the 22-km stand-off zone. The Navy stated that marine mammals (including North Atlantic right whales) occur at least seasonally in waters of Gray's Reef NMS but did not explain why that NMS was not considered an OBIA or placed on the OBIA watchlist. For the NMS of American Samoa, the Navy indicated that, although marine mammals have not been well studied there, at least 12 species (including humpback and sperm whales) have been observed.

The Commission notes that lack of data or insufficient data is not an adequate basis for the Navy to refrain from proposing precautionary measures, especially when such data do not exist for most of the world's oceans. This is a point that the Commission made in its 2011 letter on the previous DSEIS and the U.S. Court of Appeals for the Ninth Circuit (the Court) made when it recently remanded the SURTASS LFA sonar case (see *National Resources Defense Council, Inc., et al.* v. *Penny Pritzker et al.*). Specifically, the Court indicated that the Navy and NMFS should have considered whether a precautionary approach would give more protection to marine mammals, and then whether that protection would impede military training to a degree making that mitigation impracticable. The Commission recognizes that the Court's decision was issued just recently and that the Navy was still reviewing that decision when the current DSEIS published in the *Federal Register*. The Commission looks forward to both the Navy's and NMFS's presumed supplementation of the OBIA process—one that should ensure that the various marine areas that did not meet the existing OBIA selection criteria and/or were not placed on the OBIA watchlist in the 2012 final SEIS are re-evaluated in accordance with the Court's guidance and provide clear justification for why (1) more than 95 marine areas in Table C-1, NMS of America Samoa, and Gray's Reef NMS did not meet any of the OBIA selection criteria and/or were not placed on the OBIA watchlist in the current DSEIS and (2) Challenger Bank, Southeast Shoal, and Hellenic Trench were placed on the OBIA watchlist in the current DSEIS.

[21] Which lies entirely beyond the 22-km stand-off zone.

The Commission appreciates the opportunity to provide comments on the Navy's DSEIS. Please contact me if you have questions concerning the Commission's recommendations or rationale.

Sincerely,

Rebecca J. Lent, Ph.D.
Executive Director

cc: Jolie Harrison, National Marine Fisheries Service

References

DoN. 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.

DoN. 2016. Navy marine species density database. Geospatial global database. Accessed by DoN March, April, and May 2016. Chief of Naval Operations, DoN.

Feller, W. 1968. Introduction to probability theory and its application: Volume 1, 3rd edition. John Wiley & Sons, New York, New York. 528 pages.

Ferguson, M.C., and J. Barlow. 2001. Spatial distribution and density of cetaceans in the eastern tropical Pacific Ocean based on summer/fall research vessel surveys in 1986–1996.NMFS Southwest Fisheries Science Center Administrative Report LJ–01–04. La Jolla, California. 63 pages.

Ferguson, M.C., and J. Barlow. 2003. Addendum: Spatial distribution and density of cetaceans in the eastern tropical Pacific Ocean based on summer/fall research vessel surveys in 1986–96. NMFS Southwest Fisheries Science Center Administrative Report LJ–01–04, Addendum. La Jolla, California. 100 pages.

Finneran, J.J., and A.K. Jenkins. 2012. Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis. SPAWAR Marine Mammal Program, San Diego, California, 64 pages.

LGL Limited. 2008. Environmental assessment of a marine geophysical survey by the R/V *Marcus G. Langseth* in Southeast Asia, March–July 2009. Prepared for Lamont-Doherty Earth Observatory and National Science Foundation Division of Ocean Sciences. 215 pages

Thomas, P.O., R.R. Reeves, and R.L. Brownell. 2016. Status of the world's baleen whales. Marine Mammal Science 32:682–734.

Tillman, M. F. 1977. Estimates of population size for the North Pacific sei whale. Report of the International Whaling Commission Special Issue (1):98–106.