



MARINE MAMMAL COMMISSION

11 July 2017

Ms. Shannon Bettridge, Acting Chief
Marine Mammal and Sea Turtle Conservation Division
Office of Protected Resources
National Marine Fisheries Service
Attn: Acoustic Guidance
1315 East-West Highway
Silver Spring, MD 20910-3226

Dear Ms. Bettridge:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the National Marine Fisheries Service's¹ (NMFS) 31 May 2017 notice (82 Fed. Reg. 24950) and its August 2016 Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing: Underwater acoustic thresholds for onset of permanent and temporary threshold shifts² (Technical Guidance; NMFS 2016). NMFS's Technical Guidance is based on a Navy technical report that was developed in support of the Navy's Phase III compliance documentation for training and testing activities (Finneran 2016). The Commission has commented on various versions of the Technical Guidance, most recently in its [22 March 2016 letter](#). In short, the Commission supports the weighting functions and associated thresholds as stipulated in Finneran (2016) and thus NMFS's Technical Guidance. Those weighting functions and thresholds are a necessary advancement from NMFS's old step function thresholds and an improvement on the weighting functions and associated thresholds from Southall et al. (2007).

Background

Presidential Executive Order (EO) 13795³, Implementing an America-First Offshore Energy Strategy, states in section 2 that "it shall be the policy of the United States to encourage energy exploration and production, including on the Outer Continental Shelf, in order to maintain the Nation's position as a global energy leader and foster energy security and resilience for the benefit of the American people, while ensuring that any such activity is safe and environmentally responsible" (82 Fed. Reg. 20815). Among the requirements of EO 13795 is section 10, which calls for a review of NMFS's Technical Guidance stating that "the Secretary of Commerce shall review [NMFS' Technical Guidance] for consistency with the policy set forth in Section 2 of this order and, after consultation with the appropriate Federal agencies, take all steps permitted by law to rescind or revise that guidance, if appropriate." NMFS further welcomes comments on two particular aspects of the Technical Guidance—

¹ The draft guidance was provided on behalf of NMFS and the National Ocean Service, referred to collectively as NMFS herein.

² PTS and TTS, respectively.

³ From 28 April 2017.

- (1) Peer-reviewed scientific literature: Information regarding the availability of published new science relevant to marine mammal hearing or impacts of noise on hearing since the publication of the Technical Guidance and suggestions for how to consider new information within the Technical Guidance; and
- (2) Implementation support: Recommendations regarding how NMFS can further aid in the application and implementation of the Technical Guidance (based on difficulties encountered and/or ways NMFS can facilitate and/or improve implementation for action proponents).

Peer-reviewed scientific literature

Given that peer-reviewed literature on marine mammal hearing or impacts of noise on hearing will continue to be published, it is incumbent upon NMFS to review those publications to ensure that the thresholds are kept current based on the best available science. Nevertheless, NMFS should not be expected to revise its Technical Guidance each time a new paper is published. Rather, NMFS should convene a small panel to review the Technical Guidance periodically and revise it, as necessary. Although the Commission had recommended that NMFS review the Technical Guidance every 2–3 years, NMFS indicated that a 3–5 year review timeframe was appropriate and did not need to be modified (81 Fed. Reg. 51699).

Numerous publications have been published in recent years, or will be published in the near-term, regarding PTS, TTS, dose response functions, suggested thresholds, and behavioral responses to various sound sources on marine mammals. Included in these publications is an update to Southall et al. (2007), which provided the fundamental rationale for the revised metrics used in NMFS's Technical Guidance.

The Commission continues to believe that rather than NMFS developing its own independent criteria and thresholds, NMFS should incorporate into its guidance, as reference, technical reports (i.e., Finneran 2016) and peer-reviewed literature (i.e., the update to Southall et al. (2007)⁴) that have already compiled and evaluated the best available science. The Commission made this recommendation in its [22 March 2016 letter](#) on the revised draft Technical Guidance. NMFS disagreed, stating that the process of developing Technical Guidance requires a more thorough evaluation of the science in the context of statutory requirements. The Commission does not dispute the importance of the statutory context but notes that the PTS and TTS thresholds ultimately adopted in NMFS's Technical Guidance are based solely on Finneran (2016), which is itself a technical report that compiled and evaluated the best available science. Thus, NMFS has in effect 'incorporated a technical report into its guidance' as recommended by the Commission, rather than developing its own criteria and thresholds *de novo*. The Commission again recommends that NMFS review the Technical Guidance at least every 3 years, including updating its criteria and thresholds⁵ by incorporating, as reference, technical reports and peer-reviewed literature and providing the opportunity for public comment when the Technical Guidance is revised or augmented.

⁴ NMFS had indicated in its revised draft guidance from 2016 that it may re-evaluate some of the methodology included therein once the update to Southall et al. (2007) is published.

⁵ Including PTS, TTS, mortality, injury, and behavior.

In regard to new publications on marine mammal hearing or impacts of noise on hearing, the Commission is aware of only one relevant publication. Branstetter et al. (2017) measured behavioral audiograms of eight captive killer whales, two of which had apparent age-related hearing loss. However, the other six audiograms could supplement the current composite audiogram⁶ for mid-frequency cetaceans (MF). The addition of those audiograms could affect the composite audiograms, weighting functions, and/or weighted thresholds for MF and the other functional hearing groups⁷. Results from other studies have been presented at various fora but have yet to be peer-reviewed and published. Therefore, those studies cannot be considered. As such, the Commission recommends that NMFS, in consultation with the Navy, review Branstetter et al. (2017) and determine whether inclusion of the killer whale audiogram data would alter the composite audiograms, weighting functions, and/or weighted thresholds for the various functional hearing groups. NMFS and the Navy also should determine whether those modifications would warrant revision of the current weighting functions and associated thresholds as stipulated in NMFS (2016) and Finneran (2016).

Implementation support

In its development of the Technical Guidance, NMFS recognized that action proponents may have varying abilities to model and estimate takes and that the Technical Guidance may be more complex than some action proponents are able to incorporate. Accordingly, NMFS developed optional user tools in the form of an alternative methodology and associated user spreadsheet to assist action proponents with the application of the more complex weighting functions and associated thresholds. The user spreadsheet requires input of two to six parameters⁸ plus a weighting factor adjustment⁹, which is supplied within the spreadsheet. Many of those parameters are required to estimate the range to the previous Level A harassment thresholds and the current Level B harassment thresholds. In general, it should take action proponents a matter of minutes to utilize NMFS's user spreadsheet to estimate the associated Level A harassment (PTS) zones. Thus, implementing the new weighted thresholds is neither onerous nor time-consuming.

The Commission commends NMFS for providing the user spreadsheet to aid in implementation of the new weighted thresholds. However, there are some shortcomings that need to be addressed within the alternative methodology for determining the extent of the Level A harassment zones based on the associated PTS cumulative sound exposure level (SEL_{cum}) thresholds for the various types of sound sources, including stationary sound sources. For determining the range to the PTS SEL_{cum} thresholds, NMFS uses a baseline accumulation period of 24 hours unless an activity would occur for less time (e.g., 8 hours). The Commission supports that approach if an action proponent is able to conduct more sophisticated sound propagation and animal modeling. However, that approach is less than ideal for action proponents that either are unable, or choose not, to conduct more sophisticated modeling.

⁶ Composite audiograms were based only on behavioral data, not auditory evoked potential data (Finneran 2016, NMFS 2016).

⁷ Specifically, those changes could affect the composite audiograms, weighting functions, and thus weighted thresholds at the various frequencies for MF and low-frequency cetaceans. In addition, the weighting functions (due a possible change in ΔT) and resulting weighted thresholds at the various frequencies for high-frequency cetaceans, phocids, and otariids could be affected as well. The absolute weighted thresholds should not change.

⁸ e.g., source level, activity duration, propagation loss, pulse duration, repetition rate, source velocity for moving sources.

⁹ The specific frequency of the sound source also can be used rather than the general weighting factor adjustments.

For example, by using this approach the Level A harassment zones for both low- and high-frequency cetaceans were estimated to be much greater (1.85 and 2.84 km, respectively) than the Level B harassment zone (1.20 km) for a recent proposed incidental harassment authorization (IHA) involving pile-driving activities¹⁰ (82 Fed. Reg. 15507). A similar trend was observed in another proposed IHA involving pile-driving activities (82 Fed. Reg. 17816–17817). Based on the extent of those zones, it is assumed that an animal would experience permanent hearing damage via PTS at ranges that far exceed the ranges at which an animal would exhibit a behavioral response. That notion runs counter to the logic that permanent and temporary physiological effects are expected to occur closest to the sound source, with behavioral responses triggered at lower received levels, and thus at farther distances. Numerous Navy environmental impact statements¹¹, as well as a National Research Council (NRC) report (Figure 4-1; NRC 2005), support this logic.

NMFS has yet to address this issue adequately. Specifically, it stated that animals would not likely remain in the area with intense sound that could cause severe levels of hearing damage and that, in reality, animals avoid those areas (82 Fed. Reg. 15511). NMFS further stated that marine mammals taken by Level B harassment would most likely exhibit overt brief disturbance and avoidance of the area (82 Fed. Reg. 15511). However, those conclusions do not comport with NMFS's proposed Level A and B harassment zones—thus, an animal would experience PTS before behaviorally responding and avoiding the area.

The Commission does not question the Level A harassment thresholds themselves, but rather the manner in which the PTS SEL_{cum} thresholds are currently implemented. The Level A and B harassment zones do not make sense biologically or acoustically due to NMFS's unrealistic assumption that the animals remain stationary throughout the entire day of the activity¹², which is particularly problematic when action proponents are using a simple area x density method for take estimation. By assuming a stationary receiver, all of the energy emitted during a 24-hour period is accumulated for the PTS SEL_{cum} thresholds. The Commission continues to believe that it would be prudent for NMFS to consult with scientists and acousticians to determine the appropriate accumulation time that action proponents should use to determine the extent of the Level A harassment zones based on the associated PTS SEL_{cum} thresholds in such situations. Those zones should incorporate more than a few hammer strikes or acoustic pulses but less than an entire work day's worth of strikes or pulses. This recommendation is similar to one made in the Commission's [31 August 2015 letter](#) on NMFS's proposed Technical Guidance and multiple more recent letters¹³. As such, the Commission again recommends that NMFS consult with both internal¹⁴ and external scientists and acousticians to determine the appropriate accumulation time that action proponents should use to determine the extent of the Level A harassment zones based on the associated PTS SEL_{cum} thresholds for the various types of sound sources, including stationary sound sources, when

¹⁰ This IHA also incorporated the spectra of the actual source rather than a single weighting factor adjustment and absorption at higher frequencies, which reduced the Level A harassment zones from those predicted from the user spreadsheet alone.

¹¹ With which NMFS has been a cooperating agency.

¹² Which generally has been more of an issue for stationary sound sources. However, this also could be an issue for moving sound sources that have short distances between transect lines, in which the user spreadsheet may not be appropriate for use unless the source level could be adjusted accordingly.

¹³ 11 May and 11 April 2017 letters.

¹⁴ Including staff in the Marine Mammal and Sea Turtle Conservation Division of the Office of Protected Resources and staff in the Office of Science and Technology.

simple area x density methods are employed. Estimated swimming speeds of various species and behavior patterns (including residency patterns)¹⁵ should be considered. Evaluating various scenarios using animat modeling could help address this issue as well.

The Commission believes that the development and implementation of NMFS's Technical Guidance are consistent with allowing activities vital to our nation's security and economy to proceed, including those mentioned in EO 13795. Please contact me if you have questions concerning the Commission's recommendations or rationale.

Sincerely,



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

References

- Branstetter, B.K., J. St. Leger, D. Acton, J. Stewart, D. Houser, J.J. Finneran, and K. Jenkins. 2017. Killer whale (*Orcinus orca*) behavioral audiograms. *The Journal of the Acoustical Society of America* 141:2387–2398. <http://dx.doi.org/10.1121/1.4979116>.
- Finneran, J.J. 2016. Auditory weighting functions and TTS/PTS exposure functions for cetaceans and marine carnivores. May 2016. SSC Pacific, San Diego, California. 73 pages.
- NMFS. 2016. Technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing: Underwater acoustic thresholds for onset of permanent and temporary threshold shifts. Office of Protected Resources, NMFS, Silver Spring, Maryland. NOAA Technical Memorandum NMFS-OPR-55. 178 pages.
- NRC. 2005. Marine mammal populations and ocean noise: Determining when noise causes biologically significant effects. The National Academies Press, Washington, D.C. 126 pages.
- Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene, Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, and P.L. Tyack. 2007. Marine mammal noise exposure criteria: Initial scientific recommendation. *Aquatic Mammals* 33:411–521.

¹⁵ Results from monitoring reports, including animal responses, submitted in support of incidental harassment authorizations issued by NMFS also may inform this matter.