



# MARINE MAMMAL COMMISSION

22 March 2016

Ms. Nicole LeBoeuf, 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. LeBoeuf:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the National Marine Fisheries Service's<sup>1</sup> (NMFS) 16 March 2016 notice (81 Fed. Reg. 14095) and its revised revised (rev.2) draft guidance regarding the acoustic thresholds for activities causing an onset permanent threshold shift (PTS) and temporary threshold shift (TTS) for marine mammal species under NMFS's jurisdiction<sup>2</sup> and application of those thresholds under the regulatory context of the Marine Mammal Protection Act (the MMPA), Endangered Species Act (the ESA), and National Marine Sanctuaries Act. NMFS's proposed rev.2 thresholds are based on changes to a Navy technical report that was developed in support of the Navy's Phase III compliance documentation for training and testing activities (Finneran 2015).

## Background

NMFS proposed to issue guidance regarding criteria and thresholds for assessing the effects of anthropogenic sound on marine mammals in 2005 (70 Fed. Reg. 1871). NMFS developed its draft guidance<sup>3</sup> and in 2013 and early 2014 provided it for peer review, interagency review, and public review. In January 2015, the Navy provided NMFS with a technical report (Finneran 2015) describing the Navy's proposed methodology for updating the auditory weighting functions and subsequent numeric thresholds for PTS and TTS for its Phase III acoustic effects analyses. NMFS preliminarily determined that Finneran (2015) reflected the best available science and decided to revise its original draft guidance based on the updated auditory weighting functions and thresholds from that technical report. NMFS provided Finneran (2015) for peer review<sup>4</sup>, but it was not provided to the relevant agencies for interagency review. Based on comments from the public

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 The draft guidance was provided on behalf of NMFS and the National Ocean Service, referred to collectively as NMFS herein.

<sup>2</sup> NMFS did not include in-air PTS and TTS thresholds for pinnipeds, only underwater thresholds were included.

<sup>3</sup> Some of which was based on Finneran and Jenkins (2012) that was developed in support of the Navy's Phase II efforts.

<sup>4</sup> The Commission provided NMFS a list of peer reviewers for both the original draft guidance in 2013 and Finneran (2015).

review of the original draft guidance, NMFS also conducted a peer review of its methods for defining the appropriate threshold usage for sources characterized as impulsive and non-impulsive in 2015. While NMFS was working to address public comments on the revised (rev.1) draft guidance, NMFS and the Navy decided to further evaluate certain aspects of Finneran (2015). As a result, NMFS has updated or modified portions of the rev.1 draft guidance, which primarily includes the methodology for deriving the composite audiogram for low-frequency cetaceans (LF). The rev.2 draft guidance has been made available to the public and the peer reviewers who reviewed Finneran (2015) for a 14-day comment period.

The Commission previously recommended that, due to the complexity of the documents and the significance of the acoustic thresholds, a comment period of at least 60 days be allotted to provide sufficient time for both interagency and public review of the draft guidance. Although the task to review the rev.2 draft guidance is less extensive than reviewing the proposed guidance in its entirety, the Commission believes that a longer time period should have been allotted for both public and peer review of the rev.2 draft guidance.

### **Criteria and thresholds in general**

Numerous studies regarding PTS, TTS, and behavioral effects of various sound sources on marine mammals, dose response functions, and suggested thresholds have been published in recent years, or will be published in the near-term, including an update to Southall et al. (2007). Rather than NMFS developing its own criteria and thresholds, the Commission continues to believe it is time for NMFS to consider incorporating into its guidance, as reference, technical reports (i.e., Finneran 2015) and peer-reviewed literature (i.e., the update to Southall et al. (2007)<sup>5</sup>) that have already compiled and evaluated the best available science. NMFS likely would need to provide guidance for implementation of those criteria and thresholds under this approach, but would not be tasked with their development. Given that it has taken NMFS nearly 10 years to develop the proposed criteria and thresholds and more than two additional years to finalize them (including two revisions to the original draft), incorporation by reference should be a less time-consuming task and still reflect more recent, peer-reviewed best available science. Accordingly, the Commission recommends that NMFS formulate a strategy for updating its criteria and thresholds<sup>6</sup> that includes incorporating as reference technical reports and peer-reviewed literature rather than developing its own criteria and thresholds. The Commission would be happy to contribute to and participate in any meetings that NMFS may have regarding formulation of this strategy.

As the Commission has stated in previous letters, NMFS's approach for implementing the final thresholds remains unclear. This is especially important for those action proponents who already have submitted incidental take authorization applications that will not have been issued before the new thresholds are finalized. Because the final thresholds would be considered the best available science, the Commission recommends that NMFS (1) provide specific guidance regarding how action proponents who have already submitted incidental take authorization applications should incorporate the final thresholds and (2) require all other prospective applicants to use the final thresholds for any applications yet to be submitted—the latter also should absolve NMFS from

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<sup>5</sup> NMFS even indicated in rev.2 draft guidance that it may re-evaluate some of the methodology included therein once the update to Southall et al. (2007) is published.

<sup>6</sup> Including PTS, TTS, mortality, injury, and behavior.

allowing action proponents to use ‘alternate’ thresholds, as recommended in the Commission’s previous letters on both the original draft guidance from 2014 and the rev.1 draft guidance from 2015.

Lastly, NMFS indicated in its rev.1 draft guidance that it would convene staff from its various offices, regions, and Science Centers to re-evaluate and update the acoustic threshold levels at least every 3 to 5 years<sup>7</sup> as new data become available and, as deemed appropriate, provide opportunities for changes based on adaptive management. The Commission questioned that timeframe in its 31 August 2015 letter and recommended that NMFS review its guidance every 3 years. Given the number of new papers published on this subject, the Commission now believes that an even shorter interval between reviews is warranted to ensure that the thresholds are kept current based on the best available science. Therefore, the Commission recommends that NMFS convene a small panel with the relevant expertise to review the final guidance every 2 years and revise as necessary or implement any necessary adaptive management measures to ensure that action proponents are using thresholds based on the best available science.

### **Low-frequency cetaceans**

For LF, empirical data are lacking regarding general hearing thresholds and audiograms, equal latency/loudness contours, and TTS. Finneran (2015), and correspondingly, the rev.1 draft guidance, based the LF composite audiogram (which is used to derive the weighting function) on predicted audiograms, amongst other parameters and assumptions. Upon re-evaluation of Finneran (2015), the Navy recommended, and NMFS concurred, that some of those preliminary data (e.g., Ketten and Mountain 2009, Ketten 2014, Ketten and Mountain 2014) relating to predicted audiograms for LF should not be included at this time, which left only two studies available for consideration (i.e., a predicted audiogram for a humpback whale from Houser et al. (2001) and a fin whale from Cranford and Krysl (2015)). Those two studies alone are not enough to derive a predicted audiogram for the entire LF functional hearing group. Thus, an alternative approach was used to predict the composite audiogram and associated weighting function for LF (see the rev.2 draft guidance for specific details on that very complex approach), which is consistent with the methods used to derive composite audiograms for the other functional hearing groups.

The resulting LF composite audiogram, and associated weighting function, is wider than those included in the rev.1 draft guidance and the predicted audiograms from the various studies previously mentioned. But given the paucity of data for LF, the Commission believes that the more precautionary approach is appropriate. The Commission did note, and shared with NMFS, a few minor errors in the derivation process or explanation thereof. As an example, 30 kHz was used to delineate the upper bound of the most sensitive hearing range (i.e., the region with thresholds within 40 dB of best sensitivity). However, the studies included in rev.2 draft guidance show that the upper bound ranges from 7.5 to 25 kHz (Houser et al. 2001, Parks et al. 2007, Tubelli et al. 2012, Cranford and Krysl 2015). It is unclear whether the use of 30 kHz is an error, or if not, why it was chosen. It may have been chosen as a conservative value compared to the other available data, a choice which the Commission would support. This issue, and the others conveyed to NMFS, should not significantly affect the shape of the composite audiogram. Although minor in nature, the

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<sup>7</sup> This review time frame also was noted in the rev.2 draft guidance.

Commission still believes all issues should be resolved prior to the guidance being finalized and recommends that NMFS amend the guidance accordingly.

In addition, the Navy and NMFS re-evaluated the LF thresholds, specifically considering the appropriateness of using a 65 dB threshold at the frequency of best hearing based on data associated with ambient noise levels from 200 to 400 kHz from Clark and Ellison (2004). Given that the rev.2 draft guidance determined that the best hearing sensitivity<sup>8</sup> for LF occurs at 5.6 kHz<sup>9</sup> based on the new composite audiogram derivation method, both the Navy and NMFS concluded that the use of those data from Clark and Ellison (2004) would no longer be appropriate. Thus, the Navy and NMFS took a similar approach for the LF thresholds and used the median threshold at the frequency of best hearing for the other in-water marine mammal functional hearing groups as a surrogate for LF. That value then informs both the TTS and ultimately the PTS sound exposure level<sup>10</sup> thresholds for both impulsive and non-impulsive sources. The Commission believes that approach is both consistent with the other methods used in the rev.2 draft guidance and reasonable.

### **Peak pressure thresholds**

Data to derive peak sound pressure level ( $SPL_{peak}$ ) thresholds are only available for mid-frequency cetaceans (MF) and high-frequency cetaceans (HF). For the other functional hearing groups (LF, phocids in water (PW), and otariids in water), the Navy and NMFS relied on the  $SPL_{peak}$  threshold for MF cetaceans as a surrogate in the rev.1 draft guidance. The Commission recommended in its letter on the rev.1 draft guidance that NMFS use a dynamic range methodology to inform the  $SPL_{peak}$  thresholds for those functional hearing groups rather than MF as a surrogate. The Navy and NMFS agreed with that approach, and it was implemented in the rev.2 draft guidance.

The Commission also recommended in its letter on the rev.1 draft guidance that NMFS use dual metrics of  $SEL_{cum}$  and  $SPL_{peak}$  only for impulsive sources and use  $SEL_{cum}$  for non-impulsive sources, given that non-impulsive sounds do not have a peak pressure component. In the rev.2 draft guidance, NMFS determined that for non-impulsive sources, the  $SEL_{cum}$  metric was likely to result in the largest isopleth and thus greater numbers of marine mammal exposures. Thus, NMFS removed the  $SPL_{peak}$  thresholds for non-impulsive sources from the relevant tables in the rev.2 draft guidance. However, NMFS provided the caveat, that if there are instances in which a non-impulsive sound has the potential to exceed the  $SPL_{peak}$  threshold level associated with impulsive sounds, those thresholds should still be considered (i.e., dual metrics). The Commission is unaware of an instance in which that could occur. Furthermore, if the  $SPL_{peak}$  thresholds for non-impulsive sources were removed from the relevant tables in the rev.2 draft guidance, the possibility of using them should have been removed in their entirety. Therefore, the Commission again recommends that NMFS use dual metrics of  $SEL_{cum}$  and  $SPL_{peak}$  only for impulsive sources and use  $SEL_{cum}$  for non-impulsive sources and remove any and all caveats to that approach from the final guidance.

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<sup>8</sup>  $f_0$  or the frequency of best hearing.

<sup>9</sup> And was 3.5 kHz in the rev.1 draft guidance.

<sup>10</sup>  $SEL_{cum}$ .

## Other updates or modifications

NMFS made a few other minor updates or modifications as described in the rev.2 draft guidance. Specifically, the white-beaked dolphin was moved from MF to HF cetaceans, a newly published harbor porpoise audiogram was included for HF cetaceans, and multiple datasets that included individuals with hearing loss and/or non-representative hearing were removed from the PW weighting function. As a result of the modifications associated with the proposed changes in the rev.2 draft guidance, the normalized composite audiograms, weighting function parameters and associated weighting functions, and thresholds have changed slightly for many of the functional hearing groups. The Commission agrees with all those changes.

Lastly, the Commission had recommended in its letter on the rev.1 draft guidance and original draft guidance that NMFS clearly define the time over which energy should be accumulated for the various  $SEL_{cum}$  thresholds. In rev.2 draft guidance, NMFS defined that period to be 24 hours and included that in the updated threshold tables.

The Commission appreciates the consideration of and changes made in response to its letters on previous drafts of the guidance and hopes you find this letter on the rev.2 draft guidance useful as well. Please contact me if you have questions concerning the Commission's recommendations or rationale.

Sincerely,



Rebecca J. Lent, Ph.D.  
Executive Director

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