



MARINE MAMMAL COMMISSION

23 June 2016

Ms. Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Ms. Harrison:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the National Marine Fisheries Service's (NMFS) 13 June 2016 notice (81 Fed. Reg. 38516) and the letter of authorization application submitted by the Northwest Fisheries Science Center (NWFS) seeking issuance of regulations under section 101(a)(5)(A) of the Marine Mammal Protection Act. The taking would be incidental to fisheries research surveys during a five-year period.

Background

NWFS plans to conduct fisheries research surveys in the Pacific Ocean from the Mexican to Canadian borders and in inland waters of Washington and Oregon. The objectives are to monitor fish stock recruitment, abundance, survival, biological rates, geographic distribution, and ecosystem process changes. Researchers would conduct approximately 36 survey programs during the five-year period. The surveys could occur on NMFS-owned and -operated vessels, charter vessels, or commercial fishing vessels during daytime and nighttime hours.

NWFS requested authorization to take by Level A harassment, serious injury, or mortality individuals from up to 21 species, stocks, or genera of marine mammals¹ incidental to gear interactions. The takes would occur through marine mammal interactions with fisheries survey gear. NWFS would use trawls, longlines, other hook-and-line methods, gillnets, fyke nets, beach seines, other types of gear (e.g., epibenthic tow sled, traps/pots, plankton nets, etc.), and remotely operated vehicles to conduct the surveys. However, marine mammals are likely to interact only with trawls, hook and line (including longlines), and seines based on historical data from research surveys and commercial fisheries. Researchers would implement standard mitigation measures including using a move-on rule², pingers, marine mammal excluder devices, continuous visual monitoring, and/or net tending. In addition, NWFS would conduct concurrent hydrographic, bathymetric, and oceanographic sampling. Researchers could use multi-frequency, narrow-beam echosounders,

¹ Including unidentified pinnipeds and unidentified cetaceans.

² If one or more marine mammals are observed within 500 m of or approaching the planned fishing location, NWFS would move to a different section of the sampling area. If after moving on marine mammals remain within 500 m or near the planned fishing location, NWFS may decide to move again or to skip the station.

multibeam echosounders, narrow-beam sonar (i.e., fish-finding sonar), acoustic Doppler current profilers, and net monitoring systems that operate at frequencies from 38 to 330 kHz at source levels of 200 to 224 dB re 1 μ Pa at 1 m. NWFSC has requested to take by Level B harassment individuals from numerous marine mammal species, stocks, and genera incidental to use of the acoustic sources and vessel presence. Researchers would implement various monitoring and reporting measures during the proposed activities.

Appropriate threshold for non-impulsive, acoustic sources

Although NMFS has proposed to authorize the taking by Level B harassment from the use of echosounders and other sonars by the NWFSC, NMFS has not provided consistent guidance for determining when prospective applicants should request such taking. On several occasions, NMFS has determined that sound emitted from echosounders, other sonars (side-scan and fish-finding), and subbottom profilers³ have the potential to cause Level B harassment. However, NMFS has yet to adopt generally applicable guidance regarding when such authorizations are needed (e.g., for the National Science Foundation and associated entities, oil and gas industry, geological and geophysical survey operators and researchers, shipping industry, or the general public). The Commission believes that NMFS should provide that guidance and follow a consistent approach in assessing the potential for taking by Level B harassment from echosounders, other sonars, and subbottom profilers including whether applicants should include requests for authorizations of such taking in their applications. Therefore, the Commission recommends that NMFS develop criteria (e.g., based on source level, peak frequency, bandwidth, signal duration and duty cycle, affected species or stocks) and guidance for determining when prospective applicants should request taking by Level B harassment from the use of echosounders, other sonars, and subbottom profilers.

The Commission also believes that NMFS is using an outdated and incorrect behavior threshold for echosounders, other sonars, and subbottom profilers. A decade ago NMFS categorized sound sources as either impulsive or continuous when determining its generic thresholds for Level B harassment based on behavioral disturbance (160 vs 120 dB re 1 μ Pa, respectively; 70 Fed. Reg. 1871). Since that time, the U.S. Navy has updated the criteria and thresholds⁴ it uses for non-impulsive, acoustic sources (i.e., sonar and other acoustic sources) and impulsive⁵ explosive sources (i.e., underwater detonations; see Finneran and Jenkins (2012) for the Navy's current criteria and thresholds). NMFS instructs applicants who plan to use underwater detonations during their proposed activities to utilize the Navy's current explosive criteria and thresholds. However, for non-impulsive, acoustic sources, NMFS continues to rely on the generic thresholds from the 2005 guidance, which does not reflect the best available science.

NMFS is aware of that shortcoming and is in the process of updating the criteria and thresholds for PTS and TTS but not as of yet for behavior. Numerous studies have been published in recent years, and will be published in the near term, regarding behavioral effects on marine mammals, dose response functions, and suggested thresholds. Further, the Navy very likely will

³ For subbottom profilers that are considered 'chirps' or are used in 'chirp' mode.

⁴ The Navy uses NMFS's generic thresholds only for vibratory pile-driving, impact pile-driving, and airgun activities (120 and 160 dB re 1 μ Pa, respectively).

⁵ Including thresholds for mortality, injury, permanent threshold shift (PTS), temporary threshold shift (TTS), and behavior.

update its behavior thresholds for the various types of sound sources (including non-impulsive, acoustic sources) for its upcoming Phase III environmental planning documents. As such, the Commission again recommends that NMFS formulate a strategy for updating its generic behavior thresholds for all types of sound sources (i.e., impulsive and non-impulsive, which can be either intermittent or continuous) and incorporate new data regarding behavior thresholds as soon as possible—the Commission believes such revised behavior thresholds should be peer reviewed, made available to the public for review, and finalized within the next year or two.

As discussed in previous letters to NMFS regarding echosounders, other sonars, and subbottom profilers, those sources have temporal and spectral characteristics which suggest that a lower, more precautionary Level B harassment threshold of 120 dB re 1 μ Pa would be more appropriate than the 160-dB re 1 μ Pa threshold that continues to be used. Numerous researchers⁶ have observed various species of marine mammals, including the same species that could be harassed by NWFSC, responding to sound from sources (e.g., acoustic deterrent devices, acoustic harassment devices, pingers, echosounders, multibeam sonars) with characteristics similar to those used by NWFSC at received levels below 160 dB re 1 μ Pa. Specifically, harbor porpoises and beaked whales respond at some of the lowest source levels (Culik et al. 2001, Kastelein et al. 2001, Carlstöm et al. 2002, Barlow and Cameron 2003, Caretta et al. 2008). These observations support Lurton and DeRuiter's (2011) suggestion that 130 dB re 1 μ Pa may be a reasonable rough estimate for the behavioral response threshold of marine mammal species that are sensitive to these sources. The Navy already uses Level B behavioral harassment thresholds for non-impulsive, acoustic sources that are much lower than 160 dB re 1 μ Pa. In its Phase II documents, the Navy used unweighted thresholds⁷ of 120 and 140 dB re 1 μ Pa for harbor porpoises and beaked whales, respectively.

Additionally, the terms impulsive and continuous are not dichotomous and should not be used in a mutually exclusive manner. Rather, sources should be characterized as impulsive or non-impulsive. As stated in NMFS's 2014 draft criteria and thresholds for PTS and TTS⁸, impulsive sources are transient, brief (less than 1 second), and broadband and typically consist of high peak pressure with rapid rise time and rapid decay (American National Standards Institute (ANSI) 1986, National Institute for Occupational Safety and Health (NIOSH) 1998, ANSI 2005). In contrast, non-impulsive sources can be broadband, narrowband, or tonal, brief or prolonged, continuous or intermittent, and typically do not have a high peak pressure with rapid rise time (typically only small fluctuations in sound level), which is characteristic of impulsive signals (ANSI 1995, NIOSH 1998)⁹. The Commission does not consider echosounders, other sonars, or subbottom profilers to be impulsive, even if they have intermittent characteristics¹⁰, because those sources lack the high peak pressure and rapid rise time of an impulsive source. Indeed NMFS has indicated that the proposed

⁶ See Watkins and Schevill 1975, Olesiuk et al. 1995, Kastelein et al. 1997, Kastelein et al. 2000, Kastelein et al. 2001, Morton 2000, Culik et al. 2001, Johnston 2002, Morton and Symonds 2002, Kastelein et al. 2005, Barlow and Cameron 2003, Kastelein et al. 2006a and 2006b, Carretta et al. 2008, Carlström et al. 2009, Lurton and DeRuiter 2011, Brandt et al. 2012 and 2013, Götz and Janik 2013, Hastie et al. 2014, Kastelein et al. 2015a and 2015b, Tougaard et al. 2015.

⁷ NMFS's generic thresholds also are unweighted step functions.

⁸ Similar definitions are given in the preamble in the *Federal Register* notice as well.

⁹ NMFS stated that those definitions are not meant to reflect how it has previously characterized sound for behavioral thresholds. However, the Commission continues to believe that NMFS is not basing that characterization on best available science.

¹⁰ Which NMFS has repeatedly used as the basis for its characterization of echosounders, other sonars, and subbottom profilers as impulsive rather than continuous.

sources are relatively high frequency, directional, and brief repeated signals—characteristics that are not reflective of impulsive sources.

All of these facts support using 120 dB re 1 μ Pa as the Level B harassment threshold. Therefore, for non-impulsive, acoustic sources (including echosounders, other sonars, and subbottom profilers) that NMFS plans to regulate and until such time that NMFS revises its generic Level B harassment thresholds for non-Navy-related acoustic sources, the Commission recommends that NMFS require NWFSC to estimate the numbers of marine mammals taken based on the 120- rather than the 160-dB re 1 μ Pa threshold.

Category 1 sources

NMFS has delineated two categories of acoustic sources, Category 1 (>180 kHz) and Category 2 (10–180 kHz), in the *Federal Register* notice. NMFS indicated that Category 1 sources are outside the known functional hearing capability of any marine mammal, but that sound emitted from those sources may be audible if sufficiently loud (e.g., Møhl 1968). In addition, NMFS stated that Category 1 sources are highly unlikely to be of sufficient intensity to result in behavioral harassment and any individual marine mammal would be unlikely to even receive a signal that would almost certainly be inaudible.

Further, NMFS acknowledged two recent studies that demonstrated behavioral responses by marine mammals to acoustic signals at frequencies above 180 kHz (Deng et al. 2014, Hastie et al. 2014). Deng et al. (2014) determined that three commercially available sonars¹¹ generated sound at frequencies below the center frequency (center frequency ranging from 200–260 kHz and sub-harmonic sounds ranging from 90–130 kHz) and within the hearing range of some marine mammals (e.g., mid- and high-frequency odontocetes). Those sounds were likely detectable by the animals over distances of up to several hundred meters (see Table 1) and could potentially affect the behavior of marine mammals in fairly close proximity to the sources (Deng et al. 2014). Hastie et al. (2014) conducted behavioral response experiments with captive gray seals exposed to two sonars¹² and determined that both sonars had significant effects on the seals' behavior—effects that would be deemed Level B harassment by NMFS. When the 200-kHz sonar was active, the seals spent significantly more time hauled out. Although the seals did not haul out when the 375-kHz sonar was active, they did surface at locations farther from the source than when the sonar was inactive. Hastie et al. (2014) indicated that, although peak sonar frequencies may be above marine mammal hearing ranges, high levels of sound can be produced within those hearing ranges that elicit behavioral responses—the 200- and 375-kHz sonars had source levels of 166 and 135 dB re 1 μ Pa at 1 m, respectively, at 20 kHz.

Although NMFS mentioned those two references in the *Federal Register* notice, it indicated that detectability of the sources by the animals was in reference to ambient noise¹³ rather than to NMFS's established 160-dB re 1 μ Pa threshold. NMFS based that assessment on the source levels

¹¹ Kongsberg SM2000 200-kHz multibeam imaging sonar, BioSonics DT-X split-beam scientific echosounder operated at 210 kHz, and Imagenex model 965 260-kHz multibeam imaging sonar.

¹² CodaOctopus Echoscope 2 375-kHz multibeam sonar and the BioSonics DT-X 200-kHz split-beam scientific echosounder used by Deng et al. (2014).

¹³ Which is closer NMFS's 120-dB re 1 μ Pa threshold.

(135–166 dB re 1 μ Pa at 1 m) being either below NMFS's generic 160-dB re 1 μ Pa threshold or the sound attenuating to such a level within a few meters of the source. The Commission would not refute those suppositions if the (1) generic 160-dB re 1 μ Pa threshold was applicable for assessing Level B harassment from non-impulsive, acoustic sources—a fact that clearly is contradicted by the Hastie et al. (2014) study or (2) responses above ambient, and specifically those that reflect clear avoidance and displacement, were not the very behavioral reactions that constitute Level B harassment. Rather than reassessing the applicability of its generic threshold, NMFS has chosen to apply that threshold to situations that clearly are inappropriate. Therefore, until such time that NMFS amends its generic Level B harassment thresholds, the Commission recommends that NMFS estimate numbers of takes associated with those acoustic sources (or similar acoustic sources) with frequencies above 180 kHz that have been shown to elicit behavioral responses above the 120-dB re 1 μ Pa threshold.

The Commission hopes you find this letter useful. Please contact me if you have questions regarding our rationale or recommendations.

Sincerely,



Rebecca J. Lent, Ph.D.
Executive Director

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