24 August 2015

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) 9 July 2015 notice (80 Fed. Reg. 39542), its revised 6 August and 17 August 2015 notices (80 Fed. Reg. 46939 and 80 Fed. Reg. 49196, respectively), and the letter of authorization application submitted by the Northeast Fisheries Science Center (NEFSC) seeking issuance of regulations under section 101(a)(5)(A) of the Marine Mammal Protection Act. The taking would be incidental to fisheries research activities during a five-year period.

Background

NEFSC plans to conduct fisheries research surveys in the Atlantic Ocean from the United States–Canada border to Florida, primarily in the Northeast U.S. Continental Shelf Large Marine Ecosystem. The objectives are to monitor fish stock recruitment, abundance, survival, biological rates, geographic distribution, and ecosystem process changes. Researchers would conduct approximately 48 survey programs during the five-year period. The surveys could occur on Service-owned and -operated vessels, charter vessels, or commercial fishing vessels during daytime and nighttime hours.

NEFSC requested authorization to take by Level A harassment, serious injury, or mortality of individuals from up to 12 species or stocks of marine mammals[1] incidental to gear interactions. The takes would occur through marine mammal interactions with fisheries survey gear. NEFSC would use trawls, longlines, gillnets, fyke nets, beach seines, other types of gear (e.g., dredges, traps/pots, plankton nets, etc.), and remotely operated vehicles to conduct the surveys, but marine mammals are likely to interact only with trawls, longlines, gillnets, and fyke nets based on historical data. Researchers would implement standard mitigation measures[2] including using a move-on rule[3], pingers, marine mammal excluder devices, continuous visual monitoring, and/or net tending. In addition, NEFSC would conduct concurrent hydrographic, bathymetric, and oceanographic

[1] Including unidentified pinnipeds and unidentified cetaceans.
[2] Including Take Reduction Plan mitigation measures and gear requirements for the respective fishery and area (e.g., sinking ground lines, weak links, pingers).
[3] If one or more marine mammals are observed within 1.85 km of or near the planned fishing location (depending on the type of survey) in the 30 minutes before setting the gear, NEFSC would move to a different section of the sampling area. If after moving on marine mammals remain within 1.85 km or near the planned fishing location, NEFSC may decide to move again or to skip the station.

sampling. Researchers could use multi-frequency, narrow-beam echosounders, multibeam echosounders, narrow-beam sonar (i.e., fish-finding sonar), acoustic Doppler current profilers, and net monitoring systems that operate at frequencies from 18 to 333 kHz at source levels of 190 to 224 dB re 1 μPa at 1 m. NEFSC 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.

Non-impulsive, acoustic sources and the appropriate behavioral threshold

Although NMFS has proposed to authorize the taking by Level B harassment from the use of subbottom profilers, echosounders, and other sonars by the NEFSC, 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 subbottom profilers, echosounders, and other sonars (side-scan and fish-finding) have the potential to cause Level B harassment. Similar to NEFSC sources, NMFS has issued multiple incidental harassment authorizations to Cape Wind Associates for the use of a shallow-penetration subbottom profiler, medium-penetration subbottom profiler, single-beam echosounder, multibeam echosounder, side-scan sonar, and magnetometer to conduct site assessment surveys for renewable energy development off Nantucket Island (76 Fed. Reg. 80891, 78 Fed. Reg. 19217, 79 Fed Reg. 25835) and an authorization to Hilcorp Alaska, LLC, for the use of a subbottom profiler, multibeam echosounder, single-beam echosounder, side-scan sonar, and/or magnetometer to conduct a shallow geohazard survey in the Beaufort Sea (80 Fed. Reg. 39062). In addition, NMFS is considering rulemaking to authorize Level B harassment takes for the use of only high-frequency sound sources (single-beam and multibeam echosounders and side-scan sonar) to conduct hydrographic surveys (78 Fed. Reg. 1205). 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 subbottom profilers, echosounders, and other sonars, 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 subbottom profilers, echosounders, and other sonars.

The Commission also believes that NMFS is using an outdated and incorrect behavior threshold when subbottom profilers, echosounders, and other sonars are proposed for use. A decade ago NMFS categorized sound sources as either impulsive or continuous when determining thresholds for Level B harassment based on behavioral disturbance (160 vs 120 dB re 1 μPa, respectively; 70 Fed. Reg. 1871). Since that time, the U.S. Navy has updated the criteria and thresholds[4] it uses for non-impulsive, acoustic sources (i.e., sonar and other acoustic sources) and impulsive explosive sources (i.e., underwater detonations; see Finneran and Jenkins (2012) for the

[4] The Navy uses NMFS's "old" thresholds only for vibratory pile-driving, impact pile-driving, and airgun activities (120 and 160 dB re 1 μPa, respectively).

Navy's current criteria and thresholds). NMFS instructs applicants who plan to use underwater detonations during their activities to utilize the Navy's current impulsive criteria and thresholds[5]. However, for other non-impulsive, acoustic sources, NMFS relies on the thresholds from the 2005 guidance. That guidance is outdated and not reflective of 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 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. The Commission does not believe NMFS can ignore those studies any longer. As such, the Commission recommends that NMFS formulate a strategy for updating the behavior thresholds for all types of sound sources (i.e., impulsive and non-impulsive, which can be both 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 subbottom profilers[6], echosounders, and other sonars, those sources have temporal and spectral characteristics which suggest that a lower, more precautionary Level B harassment threshold of 120 dB re 1 μPa would be more appropriate than the 160-dB re 1 μPa threshold that continues to be used. Numerous researchers have observed various species of marine mammals, including the same species that could be harassed by NEFSC, responding to sound from sources (e.g., acoustic deterrent devices, acoustic harassment devices, pingers, echosounders, multibeam sonars) with characteristics similar to those used by NEFSC at received levels below 160 dB re 1 μPa (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). 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 μPa may be a reasonable rough estimate for the behavioral response threshold of sensitive marine mammal species 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 μPa. The Navy currently uses unweighted thresholds[7] of 120 and 140 dB re 1 μPa 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 as NMFS does. NMFS should be characterizing sources as impulsive or non-impulsive. As stated in NMFS's 2014 draft criteria and thresholds for PTS and TTS[8], 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

[5] Including thresholds for mortality, injury, permanent threshold shift (PTS), temporary threshold shift (TTS), and behavior.
[6] For subbottom profilers that are considered 'chirps' or are in 'chirp'mode.
[7] NMFS's 'old' thresholds also are unweighted, step functions.
[8] Similar definitions are given in the preamble in the *Federal Register* notice as well.

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 subbottom profilers, echosounders, and other sonars to be impulsive, even if they have intermittent characteristics[10], because those sources lack the high peak pressure and rapid rise time of an impulsive source. Indeed NMFS has indicated that the proposed sources are relatively high frequency, directional, and brief repeated signals[11]—characteristics that are not reflective of impulsive sources.

All of these facts support the Commission's continued stance that NMFS should be requiring NEFSC, and other applicants utilizing similar sources, to use 120 dB re 1 μPa as the Level B behavioral threshold. Therefore, for non-impulsive, acoustic sources (including subbottom profilers, echosounders, and other sonars) that NMFS plans to regulate and until such time that NMFS revises its Level B behavioral thresholds for non-Navy-related acoustic sources, the Commission recommends that NMFS require NEFSC to estimate the numbers of marine mammals taken based on the 120- rather than the 160-dB re 1 μPa threshold.

Category 1 sources

NMFS has delineated two categories of acoustic sources, Category 1 (>180 kHz) and 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). NMFS further 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. Therefore, NMFS did not expect Category 1 sources to have any effect on marine mammals and they were not considered further in the proposed rule.

Recent research raises questions regarding NMFS's assumption. Deng et al. (2014) determined that three commercially available sonars[12] 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). Although NMFS stated in the *Federal Register* notice that those sounds would be detectable at maximum distances of only a few meters, Deng et al. (2014) indicated that such 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 within fairly close

[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 subbottom profilers, echosounders, and other sonars as impulsive rather than continuous.
[11] NMFS stated in the *Federal Register* notice that the signals from the acoustic sources proposed for use by NEFSC have high rise times, which is incorrect. Further, NMFS indicated that the sources would be operated from moving platforms, which has no bearing on the source characteristics. Both acoustic (e.g., military sonar) and impulsive (e.g., airguns) sources are operated from moving platforms.
[12] Kongsberg SM2000 200-kHz multibeam imaging sonar, BioSonics DT-X 210-kHz split-beam scientific echosounder, and Imagenex model 965 260-kHz multibeam imaging sonar.

proximity to the sources. In addition, Hastie et al. (2014) conducted behavioral response experiments with captive gray seals exposed to two sonars[13]. They determined that both sonars had significant effects on the seals' behavior. 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 μPa at 1 m, respectively, at 20 kHz. NMFS mentioned these two references in the *Federal Register* notice, however, its interpretation of the results does not necessarily comport with the results from those studies. Therefore, the Commission recommends that NMFS incorporate the findings of the recent scientific literature on acoustic sources with frequencies above 180 kHz into its criteria and guidance for determining when prospective applicants should request authorization for taking by Level B harassment from the use of echosounders, sonars, and subbottom profilers.

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

Sincerely,

Rebecca J. Lent

Rebecca J. Lent, Ph.D.
Executive Director

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