20 May 2013

Mr. P. Michael Payne, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Dear Mr. Payne:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the application submitted by the Southwest Fisheries Science Center (Center) seeking authorization under section 101(a)(5)(A) of the Marine Mammal Protection Act to take small numbers of marine mammals by harassment. The taking would be incidental to fisheries research activities during a five-year period. The Commission also has reviewed the Center's draft environmental assessment and the National Marine Fisheries Service's 2 May 2013 notice (78 Fed. Reg. 25703) announcing receipt of the application and proposing to issue regulations, subject to certain conditions.

RECOMMENDATIONS

The Marine Mammal Commission recommends that, prior to publishing the proposed rule and finalizing the programmatic environmental assessment, the National Marine Fisheries Service—

- require the Center to re-estimate the numbers of marine mammals taken based on the 120-dB re 1 μPa threshold rather than the 160-dB re 1 μPa threshold for non-impulsive intermittent sound sources; and
- consult with experts in the field of sound propagation and marine mammal hearing to revise the acoustic criteria and thresholds as necessary to specify threshold levels that would be more appropriate for a wider range of sound sources, including echosounders and fish-finding sonar.

RATIONALE

The Center plans to conduct fisheries research surveys along the U.S. West Coast, throughout the eastern tropical Pacific Ocean, and in the Scotia Sea off Antarctica during a five-year period. The objectives are to (1) evaluate the status of exploited fishery resources and the marine environment and (2) provide scientific information regarding fisheries management to the Pacific Fishery Management Council and numerous other domestic and international fisheries management organizations. Researchers would conduct approximately 14 surveys 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.

The Center requested to take by Level A harassment or mortality individuals from up to 17 species or stocks of marine mammals incidental to gear interactions. The takes would occur through marine mammal interactions with fisheries survey gear. To conduct the surveys, the Center would use pelagic trawl gear, pelagic longlines, bottom-contacted trawl gear, and other types of gear (i.e., bongo nets, manta nets, fish egg samplers) but, based on historical data, marine mammals are likely to interact only with pelagic trawl and longline gear. In addition, the Center would conduct concurrent hydrographic, oceanographic, and meteorologic sampling. Researchers could use multi-frequency, narrow-beam scientific echosounders, multi-beam echosounders, acoustic Doppler current profilers, narrow-beam sonar (i.e., fish-finding sonar), and multi-beam sonar that operate at frequencies from 18 to 333 kHz at source levels of 205 to 224 dB re 1 μPa at 1 m. The Center has requested to take by Level B harassment individuals from up to 51 species or stocks of marine mammals incidental to use of the acoustic sources.

Threshold for the non-impulsive intermittent sources

The Service has categorized sound sources as either impulsive or continuous to establish acoustic criteria and thresholds for Level B harassment (70 Fed. Reg. 1871; see Figure 1). Impulsive sounds are those with a rapid rise time, high peak pressure, and rapid decay. They are brief (<1 second) and may be repetitive (e.g., an airgun) or singular (e.g., an explosion). Non-impulsive sounds do not have those characteristics and they can be divided into those that are either temporally continuous or intermittent. Continuous sounds are those for which the sound pressure level is elevated consistently above the ambient level during the operation of the sound source—they are not interrupted by a silent period. Examples include sounds from drilling and vessel engines or dynamic positioning systems.

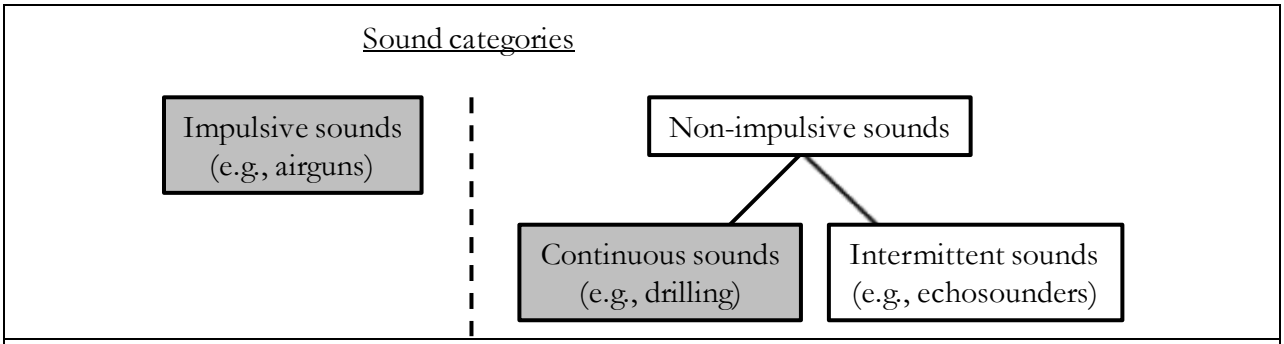

Figure 1. Sound categories–shaded boxes indicate those sounds for which the National Marine Fisheries Service has established acoustic thresholds for Level B harassment.

Relying on the results of Malme et al. (1983, 1984), the Service established a 160-dB re 1 μPa threshold to estimate the area (or zone) in which animals could be harassed by impulsive sounds and a 120-dB re 1 μPa threshold to estimate the area (or zone) in which animals could be harassed by continuous sounds. However, the Service has yet to establish or apply a consistent threshold for non-impulsive, intermittent sounds, such as those produced by echosounders and fish-finding sonars proposed for use by the Center. Those sources generally emit a steady ping, ping, ping that do not exhibit the rapid rise, high peak pressure, and rapid decay used to define impulsive sounds,

but they also are not continuous. Based on their characteristics, echosounders and sonars fall into a category of sounds for which the Service has yet to establish a threshold.

Although the Service has proposed to use the 160-dB re 1 μPa threshold for the sound sources that the Center would use, it has not applied the 160-dB re 1 μPa threshold consistently to all non-impulsive, intermittent sources. In a 2011 notice (76 Fed. Reg. 43639) the Service determined that for non-impulsive sound sources, whether continuous or intermittent, Level B harassment is presumed to begin at received levels of 120 dB re 1 μPa. Recently, the Service reiterated that position when it indicated that Level B harassment is considered to have occurred when marine mammals are exposed to sounds at or above 120 dB re 1 μPa for non-pulsed (i.e., non-impulsive) sounds (78 Fed. Reg. 22096). Consistent with that more precautionary determination, the Commission has recommended in numerous letters that the Service require applicants to recalculate Level B harassment zones for non-impulsive, intermittent sounds based on the 120-dB re 1 μPa threshold for non-impulsive sounds, rather than the 160-dB re 1 μPa threshold used by the Service for impulsive sounds. The Service has disagreed with that recommendation.

Noting the inconsistency, the Commission inquired about the appropriate threshold to be applied to non-impulsive, intermittent sources. The Service explained its reasoning for applying the 160-dB re 1 μPa threshold to that type of sound source as follows.

> When comparing non-impulsive, intermittent sounds at distances relevant for behavioral harassment to our current criteria for impulsive and continuous sounds (and the data upon which they are based), the temporal characteristics associated with these types of sound sources are more similar to impulsive sounds (which are also intermittent) than to continuous sounds.

This may be true for some sounds, but other sounds may vary from the well-separated blasts of an airgun to the more rapid staccato of an echosounder to sounds timed so closely together that the interval between them is not discernible to the animal—that is, they are effectively continuous. How marine mammals respond to the relatively rapid sounds associated with echosounders is not clear. In the face of this uncertainty, the Service has chosen the least protective threshold.

In its rationale for applying the 160-dB re 1 μPa threshold to non-impulsive, intermittent sources, the Service also noted the following.

> Furthermore, impulsive sounds lose many of the characteristics that make them potentially injurious (e.g., rise time and high peak pressure) at distances further from the source (i.e., beyond injury zone) making them even more similar to non-impulsive, intermittent sources. Thus, the 160 dB_{rms} threshold is more appropriate than the 120 dB_{rms} threshold for non-impulsive, intermittent sounds.

Although the acoustic discreteness of all sounds deteriorates with propagation, the intervals between intermittent sounds also tend to disappear with the sounds becoming more continuous in nature. Here, too, the Service has interpreted those changes in sound in the far field in the least precautionary way, seemingly ignoring contrary arguments and the associated uncertainty.

The Service has acknowledged that impulsive and non-impulsive, intermittent sound sources also may vary in other characteristics (i.e., spectral characteristics). That distinction is particularly relevant in this instance, because sound from echosounders is emitted in 0.06- to 5-msec pulses every 0.25 to 2 seconds and primarily at frequencies from 18 to 200 kHz. Those source characteristics differ considerably from an impulsive source that emits a broadband sound with a rapid rise time and decay in the lower frequency range (i.e., the medium penetration sub-bottom profiler, with energy levels of 1 kJ from 100 to 1,000 Hz).

The Commission recognizes that the Service has a limited basis for setting acoustic thresholds. However, in the face of uncertainty regarding the importance of various sound characteristics and their impacts on marine mammal behavior, the Commission believes that the Service should be taking a more precautionary approach. Such an approach is necessary for two reasons. First, it is more protective and provides greater assurance that the impacts of the sound will, indeed, be negligible. Second, a more precautionary approach generally provides a stronger incentive for parties (e.g., agencies, industry) to support the research needed to address the uncertainty.

Moreover, the Service has indicated in numerous *Federal Register* notices for incidental taking authorizations that some species of marine mammals have reacted to non-impulsive sources—especially those that are similar in source characteristics to those proposed for use by the Center.

> Southall et al. (2007) concluded that the existing data indicate that harbor porpoises are likely sensitive to a wide range of anthropogenic sounds at low received levels (around 90 to 120 dB), at least for initial exposures. All recorded exposures above 140 dB induced profound and sustained avoidance behavior in wild harbor porpoises (Southall et al. 2007).

The Service also indicated that in some cases animals in the wild exhibited significant responses to received levels between 90 and 120 dB re 1 μPa from non-impulsive sources, while in other cases those responses were not observed at received levels from 120 to 150 dB re 1 μPa. The Commission agrees that certain received levels may elicit a response from some individuals and not others. However, all received levels mentioned by the Service are less than the 160-dB re 1 μPa threshold. In addition, numerous researchers have observed various species of marine mammals, including those that would be harassed by the Center, responding to sources (e.g., acoustic deterrent devices, acoustic harassment devices, pingers) with characteristics similar to those to be used by the Center and 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, Culik et al. 2001, Johnston 2002, Morton and Symonds 2002, Kastelein et al. 2005, Kastelein et al. 2006a and 2006b, Carretta et al. 2008).

Therefore, until such time that the Service includes non-impulsive, intermittent sounds in its revised acoustic criteria and thresholds, the Marine Mammal Commission recommends that the National Marine Fisheries Service require the Center to re-estimate the numbers of marine mammals taken based on the 120-dB re 1 μPa threshold rather than the 160-dB re 1 μPa threshold. The Marine Mammal Commission further recommends that the Service consult with experts in the field of sound propagation and marine mammal hearing to revise the acoustic criteria and thresholds as necessary to specify threshold levels that would be more appropriate for a wider range of sound sources, including echosounders and fish-finding sonar.

Please contact me if you have questions about the Commission's recommendations or rationale.

Sincerely,

Timothy J. Ragen, Ph.D.
Executive Director

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