MARINE MAMMAL COMMISSION

24 October 2013

Naval Facilities Engineering Command Pacific
Attention: MITT EIS/OEIS Project Manager
258 Makalapa Drive
Suite 100
Pearl Harbor, Hawaii 96860–3134

Dear Sir or Madam:

The Marine Mammal Commission (the MMC), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement (DEIS) for training and research, development, test, and evaluation activities to be conducted from 2015 to 2020 within the Mariana Islands Training and Testing study area (MITT; 78 Fed. Reg. 56682). The DEIS discusses the impacts of those activities on marine mammals in the western Pacific Ocean. The MMC has commented on other draft environmental impact statements and previously proposed regulations for similar activities at other Navy training and testing study areas, including the Hawaii-Southern California Fleet Training and Testing study area (HSTT; 10 July 2012, 5 November 2012, 7 March 2013 MMC letters).

RECOMMENDATIONS

The Marine Mammal Commission recommends that, prior to issuing the final environmental impact statement/overseas impact statement, the Navy—

- revise its DEIS by expanding the range of alternatives under consideration to include at least one with lesser levels of training and testing activities;
- either adjust its density estimates for all species by adding some measure of uncertainty (e.g., two standard deviations) or to use the upper confidence interval and then re-estimate the numbers of takes accordingly;
- (1) use 145 rather than 152 dB re 1 μPa^2-sec as the temporary threshold shift (TTS) threshold for high-frequency cetaceans exposed to acoustic sources, (2) use 169 rather than 172 dB re 1 μPa^2-sec as the TTS thresholds for mid- and low-frequency cetaceans exposed to explosive sources, (3) use 145 rather than 146 dB re 1 μPa^2-sec as the TTS threshold for high-frequency cetaceans for explosive sources, and (4)(a) adjust the permanent threshold shift (PTS) thresholds for high-frequency cetaceans exposed to acoustic sources and behavioral thresholds for low-, mid-, and high-frequency cetaceans exposed to explosive sources (i.e., by 20 and 15 dB, respectively) and (b) adjust the behavioral thresholds for low-, mid-, and high-frequency cetaceans exposed to explosive sources (i.e., by 5 dB) based on those decreases in the TTS thresholds;
- (1) use 171 and 194 dB re 1 μPa^2-sec as the TTS thresholds for phocids and otariids, respectively, exposed to explosive sources and (2) adjust the PTS and behavioral thresholds

by 15 and 5 dB, respectively, for both phocids and otariids based on those decreases in the TTS thresholds;

- use its spatially and temporally dynamic simulation models rather than simple probability calculations to estimate strike probabilities for specific activities (i.e., movements of vessels, torpedoes, unmanned underwater vehicles and expended munitions, ordnance, and other devices);
- provide the predicted average and maximum ranges for all impact criteria (i.e., behavioral response, TTS, PTS, onset slight lung injury, onset slight gastrointestinal injury, and onset mortality), for all activities (i.e., based on the activity category and representative source bins), and for all functional hearing groups of marine mammals;
- use passive and active acoustics, whenever practicable, to supplement visual monitoring during the implementation of its mitigation measures for all activities that could cause PTS, injury, or mortality;
- if an animal is not observed to have left the mitigation zone after a shutdown, use a second clearance time category of 60 minutes for deep-diving species (i.e., beaked whales and sperm whales);
- in deriving the take estimates for Level A harassment and mortality for mine neutralization activities in which divers use time-delay firing devices, (1) estimate the takes based on the possibility that marine mammals could be present in the mitigation zones when the explosives detonate and on updated, more realistic swim speeds and (2) incorporate those revised estimates into its application for a letter of authorization;
- (1) use the total numbers of model-estimated Level A harassment and mortality takes rather than reducing the estimated numbers of Level A harassment and mortality takes based on the Navy's proposed post-model analysis and (2) incorporate those take estimates into its application for a letter of authorization; and
- revise its DEIS to (1) include in its cumulative impacts analysis all potential risk factors, including those that are deemed individually minor but could be significant when considered collectively and (2) provide sufficient details to allow the reader to evaluate the utility of the Navy's conceptual framework for its cumulative impacts analysis.

BACKGROUND

The Navy proposes to conduct training and testing activities (1) at both at-sea ranges near and land-based training areas on Guam and the Commonwealth of the Northern Mariana Islands (the CNMI), (2) in operating areas and special-use airspace in the region of the Mariana Islands that are part of the Mariana Islands Range Complex (MIRC) and the Complex's surrounding seas, and (3) in the transit corridor between the MIRC and the Hawaii Range Complex. The activities would involve the use of low-, mid-, high- and very high-frequency sonar, weapons systems, explosive and non-explosive practice munitions and ordnance, high-explosive underwater detonations, expended materials, airguns, electromagnetic devices, high-energy lasers, vessels, underwater vehicles (including gliders), and aircraft.

RATIONALE

No Action Alternative

In this and several prior environmental impact statements for various range complexes and training and testing study areas, the Navy has used the term "no action" to mean continued use at the current level. The Navy cites guidance from the Council on Environmental Quality (CEQ) as the basis of its selection of this baseline as the No Action Alternative against which other alternatives are compared. CEQ has published guidance (http://ceq.hss.doe.gov/nepa/regs/40/1-10.HTM) that posits two alternative interpretations of what constitutes no action. The first is that the action would not take place at all. Under that alternative, the impacts of the other alternatives would be assessed against not conducting any training or testing activities. As characterized by the Navy (page 2-54 of the DEIS), the second interpretation "allows the No Action Alternative to be thought of in terms of continuing with the present course of action until that action is changed."

The referenced guidance states that—

> The first situation might involve an action such as updating a land management plan where ongoing management programs initiated under existing legislation and regulations will continue, even as new plans are developed. In these cases "no action" is "no change" from current management direction or level of management intensity. To construct an alternative that is based on no management at all would be a useless academic exercise. Therefore, the "no action" alternative may be thought of in terms of continuing with the present course of action until that action is changed. Consequently, projected impacts of alternative management schemes would be compared in the EIS to those impacts projected for the existing plan. *In this case, alternatives would include management plans of both greater and lesser intensity, especially greater and lesser levels of resource development.* (Emphasis added.)

The Navy has chosen to use a continuation of current activities as the No Action Alternative. The MMC understands that choice and considers it reasonable as long as the environmental impacts of all major current activities have been appropriately assessed. However, the MMC has serious concerns regarding the selection of the other alternatives because, as a set, they do not satisfy the requirement under the applicable guidance that the DEIS consider management of both greater and lesser intensity.

The Navy suggested in its DEIS that it need not consider any alternative under which reduced training and testing would be conducted. Specifically, the Navy states that such an alternative cannot be considered because it would not allow it to meet its mandates under 10 U.S.C. § 5062. However, the guidance provided by CEQ on No Action Alternatives explains that—

> the regulations require the analysis of the no action alternative even if the agency is under a court order or legislative command to act. This analysis provides a benchmark, enabling decisionmakers to compare the magnitude of environmental effects of the action alternatives. It is also an example of a reasonable alternative outside the jurisdiction of the agency which must be analyzed.

Thus, even though the Navy may prefer a different alternative that enables it to meet fully its obligations under Title 10, such alternatives must be analyzed in the DEIS. Therefore, the MMC recommends that the Navy revise its DEIS by expanding the range of alternatives under consideration to include at least one with lesser levels of training and testing activities.

Uncertainty in density estimates

The Navy estimated marine mammal densities in MITT based on (1) models that use direct survey sighting data and distance sampling theory, (2) models that use known or inferred habitat associations to predict densities (e.g., relative environmental suitability (RES) models), typically in areas where survey data are limited or non-existent, or (3) extrapolation from neighboring regional density estimates or population/stock assessments based on expert opinion (Department of the Navy 2013). The Navy did note that estimates from both RES models and extrapolated densities include a high degree of uncertainty (Department of the Navy 2013)—although it doesn't appear that the Navy included a measure of uncertainty (i.e., standard deviation, coefficient of variation, etc.) in those estimates.

For example, the Navy indicated that, in the absence of any other density data in this region, the minke and humpback whale density estimates were based on an LGL Limited (2008) survey in southeast Asia. Similarly, the data regarding *Kogia* spp. originated from line-transect surveys in Hawaii (Barlow 2006). The Navy believes that those data provide a reasonable approximation given their habitat assumptions (i.e., a mix of bathymetry but primarily deep water habitat), but noted the uncertainty regarding how representative these density data are to MITT. Further, the Navy used data from Fulling et al. (2011) to estimate the densities of various mysticetes and odontocetes. Although those surveys were conducted in Guam and the CNMI, Fulling et al. (2011) acknowledged that their estimates were probably of low precision and were underestimated because sighting conditions during the surveys were poor, with 66 percent of the total effort occurring in Beaufort sea states of 4 to 7.

The MMC understands that density data are not available for all areas in which activities occur, and in areas where such data are available the densities could be underestimated. However, the MMC continues to believe that action proponents, including the Navy, should use the best available density estimate plus some measure of uncertainty (i.e., mean plus two standard deviations, mean plus the coefficient of variation, the upper confidence interval) for each species. If one uses a "best" density estimate, there is a 50 percent change that the actual density is either greater or lesser than that estimate. In this case, the density estimates from Fulling et al. (2011) have an associated coefficient of variation, and that uncertainty could be incorporated into the density estimates. Further, the Navy indicated that uncertainty characterized in the original density data references were catalogued and retained for potential later use. Therefore, those values should be readily available for analysis. Therefore, the MMC recommends that NMFS require the Navy either to adjust its density estimates for all species by adding some measure of uncertainty (e.g., two standard deviations) or to use the upper confidence interval and then re-estimate the numbers of takes accordingly.

Criteria and thresholds

The Navy proposed to estimate the numbers of takes resulting from its activities by adjusting received sound levels at different frequencies based on the hearing sensitivity of various groups of marine mammals at those frequencies. The adjustments were based on "weighting" functions derived by Southall et al. (2007) and Finneran and Jenkins (2012; Type I and Type II weighting functions, respectively). Type I weighting functions (see Figure 1 in Southall et al. 2007) are flat over a wide range of frequencies and then decline at the extremes of the animal's hearing range. Type II weighting functions (Finneran and Jenkins 2012) are used only for cetaceans and combine the precautionary Type I curves developed by Southall et al. (2007) with equal loudness weighting functions derived from empirical studies of bottlenose dolphins (Finneran and Schlundt 2011).

The MMC considers the theory behind those weighting functions to be reasonable. However, the amplitudes of the final Type II weighting functions appear to have been shifted, lowering the sound exposure levels (SELs) at all frequencies by roughly 16–20 dB (compare Figures 2 and 6 of Finneran and Jenkins (2012)). For sonar-related activities, Finneran and Jenkins (2012) reduced the TTS thresholds for acoustic sources for low- and mid-frequency cetaceans (see Table 2 in Southall et al. 2007 for information on functional hearing groups) by 17 dB, assuming they rounded up from 16.5 dB. However, they only reduced the TTS threshold for high-frequency cetaceans by 18.3 rather than 19.4 dB (Table 4 in Finneran and Jenkins (2012)). Because data are lacking for TTS thresholds for high-frequency cetaceans exposed to acoustic (i.e., tonal) sources, Finneran and Jenkins (2012) indicated that a 6-dB correction factor then was added to the TTS threshold (because it was derived from exposure to non-explosive impulsive sources (i.e., from airguns) rather than acoustic sources) based on the method outlined in Southall et al. (2007). However, the MMC's understanding is that Southall et al. (2007) did not use a 6-dB correction factor to extrapolate between impulsive and acoustic thresholds, but rather to estimate PTS thresholds from TTS thresholds based on peak pressure levels. Therefore, the MMC does not support the increase of the reduced TTS threshold by 6 dB for the high-frequency cetaceans.

Further, it is unclear how the explosive thresholds (i.e., for underwater detonations) were adjusted downward to account for the amplitude decrease in the Type II weighting functions. For example, Finneran and Jenkins (2012) indicated that they used Finneran et al. (2002) TTS data of 186 dB re 1 μPa^2-sec to determine the TTS threshold for explosives for mid-frequency cetaceans, which also was supported by Southall et al. (2007). But if one uses the purported method of subtracting 16.5 dB from that threshold, the resulting Type II weighted SEL would be 169.5 (it appears it should be rounded down to 169 based on the Finneran and Jenkins (2012) document) rather than 172 dB re 1 μPa^2-sec. Finneran and Jenkins (2012) proposed to use 172 dB re 1 μPa^2-sec for low-frequency cetaceans as well. Lastly, they appear to use a correction factor of 18 rather than 19.4 to adjust the Type II weighted SEL for high-frequency cetaceans. The MMC is concerned that the TTS thresholds for explosive sources that the Navy used not only are greater than they should be based on the methods described but also are used as the basis for the PTS and behavioral thresholds. Thus, if those thresholds were not adjusted by the appropriate amplitude factor, the Navy may have underestimated the numbers of takes of marine mammals. To address these concerns, the MMC recommends that the Navy (1) use 145 rather than 152 dB re 1 μPa^2-sec as the TTS threshold for high-frequency cetaceans exposed to acoustic sources, (2) use 169 rather than 172 dB re 1 μPa^2-sec as the TTS thresholds for mid- and low-frequency cetaceans exposed to explosive sources, (3) use 145 rather than 146 dB re 1 μPa^2-sec as the TTS threshold for high-frequency cetaceans for explosive sources, and (4)(a) adjust the PTS thresholds for high-frequency cetaceans exposed to acoustic sources and behavioral thresholds for low-, mid-, and high-frequency cetaceans exposed to explosive sources (i.e., by 20 and 15 dB, respectively) and (b) adjust the behavioral thresholds for low-, mid-, and high-frequency cetaceans exposed to explosive sources (i.e., by 5 dB) based on those decreases in the TTS thresholds .

For determining TTS thresholds for pinnipeds for underwater detonations, the Navy used data from Kastak et al. (2005) and extrapolation factors from Southall et al. (2007). Kastak et al. (2005) estimated the average SEL for onset-TTS for pinnipeds exposed to octave-band underwater sound centered at 2.5 kHz (i.e., mid-frequency sound). However, underwater detonations produce broadband sound in the low-frequency range. The MMC recognizes that the data provided by Kastak et al. (2005) may be the only data available, but it is unclear if those data provide an appropriate basis for estimating the relevant thresholds. More importantly, the extrapolation factors from Southall et al. (2007) were not stated specifically in the Navy's analysis for underwater detonations, but it appears that the Navy used 6 dB. As noted in the previous paragraph, Southall et al. (2007) seem to have used 6 dB as the extrapolation factor for determining PTS thresholds from TTS thresholds based on peak sound pressure levels, not for extrapolating from acoustic to explosive thresholds. Further, Southall et al. (2007) determined the TTS threshold for harbor seals exposed to pulsed sound (explosive sources) by using a correction factor of 12 dB to reduce the Type I threshold of 183 dB re 1 μPa^2-sec for mid-frequency cetaceans, which equates to 171 dB re 1 μPa^2-sec. The MMC believes that threshold should have been used by the Navy rather than the 177 dB re 1 μPa^2-sec. Similarly, the threshold for otariids should be 194 rather than 200 dB re 1 μPa^2-sec. Further, as stated previously, the TTS thresholds serve as the basis for the PTS and behavioral thresholds and could have been underestimated. Therefore, the MMC recommends that the Navy (1) use 171 and 194 dB re 1 μPa^2-sec as the TTS thresholds for phocids and otariids, respectively, exposed to explosive sources and (2) adjust the PTS and behavioral thresholds by 15 and 5 dB, respectively, for both phocids and otariids based on those decreases in the TTS thresholds.

Probability of strike

The Navy estimated the probabilities of vessels, expended munitions, and non-explosive materials (e.g., sonobouys) striking a marine mammal. The Navy's method for determining those strike probabilities was based on simple probability calculations. For example, it used a Poisson model to estimate the probability of ship strikes based on the historical rate of ship strikes. Although the use of the Poisson model is not unreasonable for modeling the occurrence of rare and random events, such as a ship striking a marine mammal, the assumption that the encounter rate will remain at historical levels is questionable because the Navy proposes to increase the number of training and testing activities, the abundance of marine mammals could change (or as previously stated, could have been underestimated), and both the distribution of marine mammals and Navy activities may not be random. For these reasons, the Navy should provide a more accurate assessment based on the best available information for marine mammals and the locations and scheduled times of its activities.

In addition, the Navy estimated the probability of spent munitions or non-explosive materials striking marine mammals in Appendix G of its DEIS. In doing so, the Navy simply compared the aggregated footprint of some specific marine mammal species with the footprint of all objects that might strike them. Both of those were based only on densities of marine mammals in the action area and expected amount of materials to be expended within a year in those areas. By combining marine mammal densities and those activities over space and time into a single calculation, the Navy provided only a crude estimate of strike probabilities for the average condition, which likely was underestimated based on the shortcomings of the density data (as previously discussed). Here, again, neither marine mammals nor Navy activities are distributed homogeneously in space or time. To provide a more reliable estimate of possible takes from munitions and materials, the Navy should incorporate spatial and temporal considerations in its calculations to estimate takes. For example, the Navy's model for determining takes of marine mammals from sound-producing activities can account for the movement of sound sources and marine mammals. Using that model to estimate the probability of strike, the Navy could change the data collected by the animat dosimeters from a received sound level to a close approach distance, which would result in more realistic strike probabilities.

For the HSTT Final Environmental Impact Statement/Overseas Environmental Impact Statement (FEIS), the Navy indicated that it considered using a dynamic simulation model to estimate strike probabilities but determined that use of historical data was more appropriate for the analysis. The Navy believed that those data account for real-world variables over many years, and any model would be expected to be less accurate than the use of actual data. The MMC disagrees with that conclusion. First of all, the activities under the Preferred Alternative would increase over baseline (i.e., the No Action Alternative). As an example, the number of training activities involving vessel movement would increase by approximately 300 percent over the No Action Alternative and using the historical rate of ship strikes based on lesser numbers of vessels would underestimate the probability of ship strikes under the Preferred Alternative. Further, the MMC supports the use of actual data relevant to the activities proposed under the alternatives. However, those data should be used to seed the dynamic simulation models rather than in the current crude calculations of strike probabilities. Therefore, the MMC again recommends that the Navy use its spatially and temporally dynamic simulation models rather than simple probability calculations to estimate strike probabilities for specific activities (i.e., movements of vessels, torpedoes, unmanned underwater vehicles and expended munitions, ordnance, and other devices).

Mitigation and monitoring measures

Many of the proposed activities involve mitigation measures that currently are being implemented in accordance with previous environmental planning documents, regulations, or consultations. Most of the current mitigation zones for activities involving acoustic (e.g., mid- and high-frequency active sonar) or explosive sources (e.g., underwater detonations, explosive sonobuoys, surface detonations) were designed originally to reduce the potential for onset of TTS. For the DEIS, the Navy revised its acoustic propagation models by updating hearing criteria and thresholds and marine mammal density and depth data. Based on the updated information, the models now predict that certain activities may have adverse effects over greater distances than previously expected. Due to the ineffectiveness and unacceptable operational impacts associated with mitigating those large areas, the Navy is unable to mitigate for onset of TTS for every activity. For that reason, it proposes to base its mitigation zones for each activity on avoiding or reducing PTS.

Table 5.3-2 in the DEIS lists the Navy's predicted distances or ranges over which PTS and TTS might occur and the recommended mitigation zones. Rather than include all sources, the table categorizes sound sources by a representative source type within a source bin (e.g., Bin MF1: SQS-53 antisubmarine warfare hull-mounted sonar) and provides average and maximum distances from the sound source at which PTS and the average range at which TTS could be expected to occur. Chapter 3 of the DEIS also includes tables listing various ranges. However, the tables in Chapter 3 include only a subset of the proposed activities (6 of the 12 explosive activities analyzed) and the average rather than maximum ranges (see Table 3.4-19). In addition, the DEIS does not provide the ranges to PTS for acoustic sources for more than 1 ping (Table 3.4-10), as it does for TTS (i.e., 1, 5, and 10 pings; Table 3.4-11). Instead, the Navy simply assumed that marine mammals would not maintain a nominal speed of 10 knots parallel to a ship and thereby would not receive sound from more than a single ping. Absent that information, the DEIS process is not fully transparent and the MMC and public cannot comment on the appropriateness of the proposed mitigation zones. To address those shortcomings, the MMC recommends that the Navy provide the predicted average and maximum ranges for all impact criteria (i.e., behavioral response, TTS, PTS, onset slight lung injury, onset slight gastrointestinal injury, and onset mortality), for all activities (i.e., based on the activity category and representative source bins and including ranges for more than 1 ping), and for all functional hearing groups of marine mammals.

The Navy indicated in its DEIS that the use of lookouts (i.e., observers) would increase the likelihood of detecting marine mammals at the surface, but it also noted that it is unlikely that using lookouts will be able to help avoid impacts on all species entirely due to the inherent limitations of sighting marine mammals. The MMC agrees and has made numerous recommendations to the Navy in previous letters to characterize the effectiveness of visual observation. For a number of years, the Navy has been working with collaborators at the University of St. Andrews to study observer effectiveness. Although the data are preliminary, the marine mammal observers (MMOs) have sighted at least three marine mammals at distances less than 914 m (i.e., within the mitigation zone for mid-frequency active sonar), which were not sighted by Navy lookouts (Department of the Navy 2012). Further, MMOs have reported marine mammal sightings not observed by Navy lookouts to the Officer of the Deck, presumably to implement mitigation measures—however details regarding those reports or raw sightings data were not provided to confirm (Department of the Navy 2010). The MMC believes that these studies will be very useful once completed but that a precautionary approach should be taken in the interim.

Accordingly, the MMC believes that the Navy should supplement its visual monitoring efforts with other measures rather than simply reducing the size of the zones it plans to monitor. The Navy did propose to supplement visual monitoring using passive acoustics during activities that generate impulsive sounds (i.e., primarily explosives) but not during the use of low-, mid-, and high-frequency active sonar. The Navy uses visual, passive acoustic, and active acoustic monitoring during Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) sonar activities to augment its mitigation efforts over large areas. Therefore, it is not clear why the Navy did not propose to use those same monitoring methods as part of its mitigation measures for the other activities described in its DEIS. To ensure effective mitigation and monitoring, the MMC recommends that the Navy use passive and active acoustics, whenever practicable, to supplement visual monitoring during the implementation of its mitigation measures for all activities that could cause PTS, injury, or mortality.

The Navy has proposed to cease acoustic activities (i.e., active sonar transmissions, Bin MF1) when a marine mammal is detected within the mitigation zone. This raises the issue of when those activities should resume. According to the DEIS, those acoustic activities would resume when (1) the animal has been seen to leave the area, (2) the animal has not been detected for 30 minutes, (3) the animal is thought to have exited the mitigation zone based on its course speed and the relative motion between the animal and the source, (4) the vessel has transited more than 1.8 km beyond the location of the last detection, or (5) ship personnel conclude that dolphins are deliberately approaching the ship to ride its bow wave. The MMC questions some of those requirements when the position of the marine mammal is unknown. The key consideration is the position of the marine mammal relative to the sound source, which is best estimated as a function of the marine mammal's position when first sighted and the speed and heading of both the vessel and the marine mammal. If the vessel and marine mammal are not moving in the same direction, then the marine mammal may leave the mitigation zone relatively quickly. However, if they are moving in the same direction, then the marine mammal may remain within the mitigation zone for a prolonged period. Unless the marine mammal is resighted leaving or already outside the mitigation zone, the Navy should not resume its activity until it has had a reasonable chance of verifying that it can do so without further impacting the marine mammal. The delay should take into account that (1) a marine mammal may remain underwater where it is not visible, (2) it may change its heading and speed in response to a vessel or sound source, and (3) visual observation alone may not be sufficient to determine a marine mammal's position relative to a vessel or sound source after the initial sighting, unless the marine mammal surfaces again and is observed.

The dive time of a sighted marine mammal is a central consideration whenever mitigation measures depend on visual observation. For some medium-sized and large cetaceans, the proposed 30-minute pause may be inadequate, sometimes markedly so. Beaked and sperm whales, in particular, can remain submerged for periods far exceeding 30 minutes. Blainville's and Cuvier's beaked whales dive to considerable depths (> 1,400 m) and can remain submerged for more than 80 minutes (Baird et al. 2008). The grand mean dive duration for those species of beaked whales during foraging dives is approximately 60 minutes (51.3 and 64.5 minutes for Blainville's and Cuvier's beaked whales, respectively; Baird pers. comm.). Sperm whales also dive to great depths and can remain submerged for up to 55 minutes (Drouot et al. 2004), with a grand mean dive time of approximately 45 minutes (Watwood et al. 2006). If they continue foraging in the same area as a stationary source and that source is turned on after only 30 minutes, then beaked whales and sperm whales could be exposed to sound levels sufficient to cause Level A harassment.

In addition, lookouts may not detect marine mammals each time they return to the surface, especially cryptic species such as beaked whales, which are difficult to detect even under ideal conditions. Barlow (1999) found that "[a]ccounting for both submerged animals and animals that are otherwise missed by the observers in excellent survey conditions, only 23 percent of Cuvier's beaked whales and 45 percent of *Mesoplodon* beaked whales are estimated to be seen on ship surveys if they are located directly on the survey trackline." Therefore, after a shutdown, <u>the MMC recommends</u> that the Navy use a second clearance time category of 60 minutes for deep-diving species (i.e., beaked whales and sperm whales) if the animal is not observed to have left the mitigation zone.

For underwater detonations that involve time-delay firing devices, the Navy proposed to use a 915-m mitigation zone, which is smaller than the 1,326-m zone currently used. The current zone was based on a 20-lb net explosive weight charge, a time delay to detonation of 10 minutes, an average swim speed for dolphins of 3 knots, and an added buffer to account for marine mammals that may be transiting at speeds faster than the average. Although the MMC has commented on this matter in numerous letters and continues to believe that the use of 3 knots as an average swim speed is inaccurate and inadequate (see Au and Perryman 1982, Lockyer and Morris 1987, Mate et al. 1995, Ridoux et al. 1997, Rohr et al. 1998, Rohr and Fish 2004), it acknowledges that the procedure provides at least some protection for marine mammals that could swim into the mitigation zone after the charge is set. However, the Navy has proposed to decrease the number of lookouts currently used for mine neutralization activities using diver-placed time-delay firing devices, because it believes that the measure is impractical to implement and is currently resulting in an unacceptable impact on military readiness. In the HSTT FEIS, the Navy stated that the use of more than two boats for observation during those activities presents an unacceptable impact to readiness due to limited personnel resources. It also indicated that the reduction in the number of lookouts caused a corresponding decrease in the size of the mitigation zone to 915 m, because that is the maximum distance that lookouts in two small boats can observe realistically. As previously noted, in the current DEIS, the Navy did not provide the ranges to the various thresholds for mine neutralization activities that utilize time-delay firing devices (lack of Bin E-6 in Table 3.4-19), limiting the MMC's and public's ability to evaluate the proposed 915-m mitigation zone. However, in the HSTT FEIS, the Navy did indicate that the 915-m mitigation zone would cover the range to mortality for all charge sizes (up to 20 lbs) for up to the 9-min delay, assuming a nominal swim speed of 3 knots. In that FEIS, the Navy asserted that the 915-m mitigation zone is both practical and protective.

The MMC does not agree that those measures are sufficiently protective. Accordingly, because the Navy has (1) never implemented the MMC's recommendation to adjust the size of the mitigation zone based on a more accurate marine mammal swim speed to provide adequate protection and to justify this measure as mitigation and (2) reduced the size of the mitigation zone for the DEIS, the MMC believes that the Navy should include all model-estimated takes for Level A harassment and mortality for mine neutralization activities in which divers use time-delay firing devices and in which marine mammals could be present in those zones when the explosives detonate. Therefore, the MMC recommends that, in deriving the take estimates for Level A harassment and mortality for mine neutralization activities in which divers use time-delay firing devices, the Navy (1) estimate those takes based on the possibility that marine mammals could be present in the mitigation zones when the explosives detonate and on updated, more realistic swim speeds and (2) incorporate those revised estimates into its letter of authorization application.

Request for Level A harassment and mortality takes

The Navy proposed additional post-model analysis of acoustic and explosive effects to include (1) animal avoidance of repeated sound exposures, (2) sensitive species avoidance of areas of activity before a sound source or explosive is used, and (3) effective implementation of mitigation measures. That analysis effectively reduced the model-estimated numbers of Level A harassment (i.e., PTS and injury) and mortality takes.

The Navy assumed that marine mammals likely would avoid repeated high level exposures to a sound source that could result in injuries (i.e., PTS). It therefore adjusted its estimated numbers of takes to account for marine mammals swimming away from a sonar or other active source and away from multiple explosions to avoid repeated high-level sound exposures. The Navy also assumed that beaked whales would avoid certain training and testing activity areas because of high levels of vessel or aircraft traffic before those activities. For those types of activities, the Navy appears to have reduced the model-estimated takes from Level A harassment (i.e., PTS) to Level B harassment (i.e., TTS) during use of sonar and other active acoustic sources and from mortality to Level A harassment (i.e., injury) during use of explosive sources. The Commission recognizes that, depending on conditions, marine mammals may avoid areas of excessive sound or activity. Indeed, one of the concerns regarding sound-related disturbance is that it causes marine mammals to abandon important habitat on a long-term or even permanent basis. That being said, the MMC knows of no scientifically established basis for predicting the extent to which marine mammals will abandon their habitat based on the presence of vessels or aircraft. That would be essential information for adjusting the estimated numbers of takes.

As an example, the Navy indicated that beaked whales that were model-estimated to be within range of the mortality threshold were assumed to avoid the activity for missile exercises (air-to-surface; see Table 3.4-20). But in Chapter 5 of the DEIS, the Navy indicated that missile exercises involve the aircraft firing munitions at a target location typically up to 27 km away (and infrequently at ranges up to 138 km away). When an aircraft is conducting the exercise, it can travel close to the intended impact area so that it can be visually observed. However, the Navy indicated that there is a chance that animals could enter the impact area after the visual observations have been completed and the activity has commenced. The MMC understands that to mean the aircraft clears the zone around the target and then travels to its firing location to commence the activity. Therefore, the MMC is unsure why the Navy would reduce any mortality or Level A harassment take estimates based on mitigation measures that are followed by a time lag before the activities actually commence, which could allow for the animals to re-enter the mitigation zone around the target.

The Navy also indicated that its post-model analysis considered the potential for highly effective mitigation to prevent Level A harassment from exposure to sonar and other active acoustic sources and Level A harassment and mortality from exposure to explosive sources. Clearly, the purpose of mitigation measures is to reduce the number and severity of takes. However, the effectiveness of the Navy's mitigation measures has not been demonstrated and remains uncertain. This is an issue that the MMC has raised many times in the past, and the Navy has recognized the need to assess the effectiveness of its mitigation measures in its Integrated Comprehensive Monitoring Program and even in this DEIS, which states that although the use of lookouts is expected to increase the likelihood that marine species would be detected at the water's surface, it is unlikely that using those lookouts would help avoid impacts to all species because of the inherent limits of visual monitoring.

According to data in the monitoring reports mentioned previously (Department of the Navy 2010, 2012), the effectiveness of the lookouts has yet to be proven. However, the Navy has proposed to adjust its take estimates based on both mitigation effectiveness scores and g(0)—the probability that an animal on a vessel's or aircraft's track line will be detected. According to its proposed approach, for each species the Navy would multiply a mitigation effectiveness score and a g(0) to estimate the percentage of the subject species that would be observed by lookouts and for which mitigation would be implemented, thus reducing the estimated numbers of marine mammal takes for Level A harassment and mortality (explosives only). The Navy then would reduce the estimated numbers of Level A harassment (i.e., PTS) and mortality takes for that species to Level B (i.e., TTS) or Level A harassment (i.e., injury) takes, respectively.

To implement that approach, the Navy assigned mitigation effectiveness scores of—

1 if the entire mitigation zone can be observed visually on a continuous basis based on the surveillance platform(s), number of lookouts, and size of the range to effects zone;

0.5 if (1) over half of the mitigation zone can be observed visually on a continuous basis, (2) there is one or more of the scenarios within the activity for which the mitigation zone cannot be observed visually on a continuous basis (but the range to effects zone can be observed visually for the majority of the scenarios), or (3) the mitigation zone can be continuously observed, but the activity may occur at night; or

N/A if (1) less than half of the mitigation zone can be observed visually on a continuous basis or (2) the mitigation zone cannot be observed visually on a continuous basis during most of the scenarios within the activity due to the type of surveillance platform(s), number of lookouts, and size of the mitigation zone.

The difficulty with this approach is in determining the appropriate adjustment factors. Again, the information needed to judge effectiveness has not been made available. In addition, the Navy has not provided the criteria (i.e., the numbers and types of surveillance platforms, numbers of lookouts, and sizes of the respective zones) needed to elicit the three mitigation effectiveness scores. Moreover, the coverage afforded by the mitigation measures is not adequate to ensure that those measures will be effective. That is, measures of effort (i.e., numbers and types of surveillance platforms, numbers of lookouts, and sizes of mitigation zones) are not necessarily measures of, or even linked to, effectiveness. The Navy also has not yet demonstrated that such measures of effort are synonymous with effectiveness nor has it demonstrated the effectiveness of the visual monitoring measures, as discussed previously. Therefore, the use of those scores to reduce the numbers of takes is unsubstantiated.

The information that the Navy provided in Chapter 5 of the DEIS regarding the effectiveness of various mitigation measures doesn't necessarily comport with its determination of mitigation effectiveness scores. For example, the Navy indicated that small- and medium-caliber gunnery exercises could involve a participating vessel or aircraft firing munitions at a target location that may be up to 3.7 km away (although it also indicated that the platforms typically are much closer). The MMC is unclear how the Navy would implement a shutdown or delay if the mitigation zone is 183 m and is being observed from up to 3.7 km away. It also stated that large vessels or aircraft platforms would provide a more effective observation platform for lookouts than small boats, but it is highly unlikely that anything but a whale blow or large pod of dolphins will be seen at distances around 3.7 km. The Navy then used the highest effectiveness score of 1 for lookouts to observe mid- and low-frequency cetaceans (except beaked whales) from aircraft, large vessels, and small boats (Table 3.4-21). Those effectiveness scores again seem to be measures of effort rather than of true effectiveness.

In addition, the Navy is inconsistent in its use of the terms "range to effects zone" and "mitigation zone," which are not the same (see Table 5.3-2 of the DEIS). More importantly, some of the mitigation zones may be smaller than the estimated range to effects zones. For example, the Navy proposed a mitigation zone of 183 m after a 10 dB reduction in power for its most powerful active acoustic sources (e.g., Bin MF1) and assumed that marine mammals would leave the area near the sound source after the first 3–4 pings. However, the Navy did not present data on the range to onset PTS for more than 1 ping. It also is unclear how the Navy evaluated sources that have a typical duty cycle of several pings per minute (i.e., dipping sonar), as the range to onset PTS for those sources were based on 1 ping as well (Table 5.3-2). Furthermore, the Navy provided both the average and maximum ranges to PTS in Table 5.3-2 but did not clarify which range to effects zone it considered for the mitigation effectiveness scores. For small- and medium-caliber gunnery exercises that involve a participating vessel, those zones range from 76 m for the average range to effects zone to 167 m for the maximum range to effects zone with an overall mitigation zone of 183 m. Without the relevant information, mitigation based on those zones cannot be evaluated fully or deemed effective and assigning mitigation effectiveness scores is inappropriate.

The Navy used numerous references to estimate species-specific g(0)s. Those sources were based on both vessel- and aircraft-based scientific surveys of marine mammals. It also indicated that various factors are involved in estimating g(0), including sightability and detectability of the animal (e.g., species-specific behavior and appearance, school size, blow characteristics, dive characteristics, and dive interval), viewing conditions (e.g., sea state, wind speed, wind direction, sea swell, and glare), the observer's ability to detect animals (e.g., experience, fatigue, and concentration), and platform characteristics (e.g., pitch, roll, yaw, speed, and height above water). In the DEIS, the Navy noted that due to the various detection probabilities, levels of experience, and dependence on sighting conditions, lookouts would not always be effective at avoiding impacts on all species. Yet it based its g(0) estimates on data from seasoned researchers conducting scientific surveys, not on data from Navy lookouts whose effectiveness as observers has yet to be determined. The MMC recommended earlier in this letter that the Navy supplement its mitigation and monitoring measures because the observer effectiveness study has yet to be completed or reviewed. It therefore would be inappropriate for the Navy to reduce the numbers of takes based on the proposed post-analysis approach because, as the Navy has described its approach, it does not address the issue of observer effectiveness in developing mitigation effectiveness scores or g(0) values.

Further, the Navy used g(0) values from surveys conducted in areas off the west coast of the United States during Beaufort sea states of 0–5 (Barlow and Forney 2007, Barlow 2010[1]), but sea states in MITT can range from 0–7 with heavy winds and/or large swells up to 3 m in height (Ligon et al. 2010, Oleson and Hill 2010, Fulling et al. 2011, HDR 2011, Hill et al. 2011, HDR 2012). Therefore, the MMC believes it is not appropriate to use g(0) values from areas off the west coast of the United States as surrogates for g(0) values in MITT. Moreover, Fulling et al. (2011) indicated that failure to detect or verify species identification of the more cryptic cetaceans (*Kogia* spp., minke whales, and beaked whales) was not surprising as more than half of the survey was conducted in Beaufort sea states greater than 4 and sighting those species is difficult even when sighting conditions are optimal (sea state less than 2). Less than optimal sighting conditions in Guam and the CNMI have contributed to the low sighting rate of marine mammals during research surveys and also would contribute to a low sighting rate of Navy lookouts, thus diminishing their effectiveness. Lastly, the Navy used greater g(0) values for vessel than aircraft platforms. The assumption that vessel-based observers are more effective may be true for areas off the west coast of the United States, but Mobley (2007) observed numerous cryptic species (*Kogia* spp. and beaked whales) during

[1] The Navy also indicated it used Carretta et al. 2010 as a source for g(0) values in MITT. However, that document is the 2009 stock assessment report for the Pacific region and does not contain g(0) values for species that would occur in MITT—g(0) values were provided for the harbor porpoise, which does not occur in MITT.

aerial surveys in areas more relevant to the DEIS that were not observed during the Fulling et al. (2011) or the HDR (2011) vessel surveys. Again, this difference was likely due to the better sighting conditions during the aerial surveys in Guam and the CNMI. Thus, the g(0) values from the Barlow and Forney (2007) and Barlow (2010) are not directly applicable to MITT. Based on all of these concerns, the MMC recommends that the Navy (1) use the total numbers of model-estimated Level A harassment and mortality takes rather than reducing the estimated numbers of Level A harassment and mortality takes based on the Navy's proposed post-model analysis and (2) incorporate those take estimates into its letter of authorization application.

Cumulative impacts

The Navy's analysis of cumulative impacts on marine mammals extends the evaluations in Chapter 3 of individual and multiple sound-producing activities under the various alternatives. The Navy's analytical framework is commendable, but its description and use of the framework in the DEIS falls short in several important respects.

First, the DEIS does not include the detailed information needed to assess the reliability of the framework. Without that information, the framework is a conceptual model only and the reader does not have sufficient information to judge its practical utility and, therefore, the soundness of the Navy's decision-making based on that model.

Second, the DEIS indicates that the Navy omitted from its overall cumulative impact analysis stressors or activities found to have a negligible impact on an individual species. Doing so runs counter to the idea behind a cumulative impact assessment. CEQ's regulations for implementing the National Environmental Policy Act point out that "[c]Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). In essence, the approach used in the DEIS does not support a cumulative impacts analysis.

To address these fundamental concerns, the MMC recommends that the Navy revise its DEIS to (1) include in its cumulative impacts analysis all potential risk factors, including those that are deemed individually minor but could be significant when considered collectively and (2) provide sufficient details to allow the reader to evaluate the utility of the Navy's conceptual framework for its cumulative impacts analysis.

The MMC appreciates the opportunity to provide comments on the Navy's DEIS. Please contact me if you have questions concerning the MMC's recommendations or rationale.

Sincerely,

Rebecca J. Lent, Ph.D.
Executive Director

References

Au, D., and W. Perryman. 1982. Movement and speed of dolphin schools responding to an approaching ship. Fishery Bulletin 80(2):371–379.

Baird, R.W., D.L. Webster, G.S. Schorr, D.J. McSweeney, and J. Barlow. 2008. Diel variation in beaked whale diving behavior. Marine Mammal Science 24:630-642.

Barlow, J. 1999. Trackline detection probability for long-diving whales. Pages 209–221 *in* G.W. Garner, S.C. Amstrup, J.L. Laake, B.F.J. Manly, L.L. McDonald, and D.G. Robertson (eds.), Marine Mammal Survey and Assessment Methods. Balkema, Rotterdam, The Netherlands.

Barlow, J. 2006. Cetacean abundance in Hawaiian waters estimated from a summer/fall survey in 2002. Marine Mammal Science 22(2):446-464.

Barlow, J. 2010. Cetacean abundance in the California Current estimated from a 2008 ship-based line transect survey. NOAA Technical Memorandum NMFS-SWFSC-456. National Oceanic and Atmospheric Administration, La Jolla, California. 24 pages.

Barlow, J., and K.A. Forney. 2007. Abundance and population density of cetaceans in the California Current ecosystem. Fishery Bulletin 105: 509–526.

Carretta, J.V., K.A. Forney, M.S. Lowry, J. Barlow, J. Baker, D. Johnston, and L. Carswell. 2010. U.S. Pacific marine mammal stock assessments: 2009. NOAA-TM-NMFS-SWFSC-453. National Oceanic and Atmospheric Administration, La Jolla, California. 336 pages.

Department of the Navy. 2010. Appendix C–Cruise report, marine species monitoring and lookout effectiveness study: Submarine Commanders Course, February 2010, Hawaii Range Complex. *in* Marine mammal monitoring for the U.S. Navy's Hawaii Range Complex and Southern California Range Complex Annual Report 2010. Department of the Navy, U.S. Pacific Fleet. 31 pages.

Department of the Navy. 2012. Cruise report, marine species monitoring and lookout effectiveness study: Koa Kai, November 2011, Hawaii Range Complex. *in* Marine species monitoring for the U.S. Navy's Hawaii Range Complex 2012 Annual Report. Department of the Navy, U.S. Pacific Fleet, Honolulu, Hawaii. 12 pages.

Department of the Navy. 2013. Pacific Navy marine species density database technical report. U.S. Department of the Navy, NAVFAC Pacific, Pearl Harbor, Hawaii. 311 pages.

Drouot V., A. Gannier, and J.C. Goold. 2004. Diving and feeding behaviour of sperm whale (*Physeter macrocephalus*) in the northwestern Mediterranean Sea. Aquatic Mammals 30:419–426.

Finneran, J.J., and A.K. Jenkins. 2012. Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis. SPAWAR Marine Mammal Program, San Diego, California, 64 pages.

Finneran, J. J., C.E. Schlundt, R. Dear, D.A. Carder, and S.H. Ridgway. 2002. Temporary shift in masked hearing thresholds (MTTS) in odontocetes after exposure to single underwater impulses from a seismic watergun. Journal of the Acoustical Society of America 111(6): 2929–2940.

Finneran, J.J., and C.E. Schlundt. 2011. Subjective loudness level measurements and equal loudness contours in a bottlenose dolphin (*Tursiops truncatus*). Journal of the Acoustical Society of America 130(5):3124–3136.

Fulling, G.L., P.H. Thorson, and J. Rivers. 2011. Distribution and abundance estimates for cetaceans in the waters off Guam and the Commonwealth of the Northern Mariana Islands. Pacific Science 65(3):321-343.

HDR. 2011. Guam marine species monitoring survey vessel-based monitoring surveys: Winter 2011. Prepared for U.S. Department of the Navy, NAVFAC Pacific, Pearl Harbor, Hawaii. 15 pages.

HDR. 2012. Guam and Saipan Marine Species monitoring: Winter–spring survey. Prepared for U.S. Department of the Navy, NAVFAC Pacific, Pearl Harbor, Hawaii. 19 pages.

Hill, M., A.D. Ligon, M.H. Deakos, A. Ü, E. Norris and E.M. Oleson. 2011. Cetacean surveys of Guam and CNMI Waters: August–September, 2011. 24 pages.

Kastak, D., B.L., Southall, R.J. Schusterman, and C.R. Kastak. 2005. Underwater temporary threshold shift in pinnipeds: effects of noise level and duration. Journal of the Acoustical Society of America 118:3154–3163.

LGL Limited. 2008. Environmental assessment of a marine geophysical survey by the R/V *Marcus G. Langseth* in southeast Asia, March–July 2009. LGL report TA4553-1. LGL Ltd., Environmental Research Associates, King City, Ontario. 215 pages.

Ligon, A. D., M.H. Deakos, and C.U. Adam. 2011. Small-boat cetacean surveys off Guam and Saipan, Mariana Islands, February–March 2010. Prepared for Pacific Island Fisheries Science Center, Honolulu, Hawaii, 34 pages.

Lockyer, C., and R. Morris. 1987. Observations on diving behavior and swimming speeds in a juvenile *Tursiops truncatus*. Aquatic Mammals 13:31–35.

Mate, B.R., K.A. Rossback, S.L. Nieukirk, R.S. Wells, A.B. Irvine, M.D. Scott, and A.J. Read. 1995. Satellite-monitored movements and dive behavior of a bottlenose dolphin (*Tursiops truncatus*) in Tampa Bay, Florida. Marine Mammal Science 11(4):452–463.

Mobley, J. R. 2007. Marine mammal monitoring surveys in support of Valiant Shield training exercises (Aug. 13-17, 2007): Final report. Prepared for Commander, U.S. Pacific Fleet. 12 pages.

Oleson, E. M., and M.C. Hill. 2010. 2010 Report to PACFLT: Report of cetacean surveys in Guam, CNMI, and the high-seas. Pacific Islands Fisheries Science Center, Honolulu, Hawaii. 29 pages.

Ridoux, V., C. Guinet, C. Liret, P. Creton, R. Steenstrup, and G. Beauplet. 1997. A video sonar as a new tool to study marine mammals in the wild: Measurements of dolphin swimming speed. Marine Mammal Science 13:196–206.

Rohr, J.J., and F.E. Fish. 2004. Strouhal numbers and optimization of swimming by odontocete cetaceans. Journal of Experimental Biology 207:1633–1642.

Rohr, J.J., E.W. Hendricks, L. Quigley, F.E. Fish, J.W. Gilpatrick, and J. Scardina-Ludwig. 1998. Observations of dolphin swim speed and Stouhal number. Space and Naval Warfare Systems Center Technical Report 1769, San Diego, California, 56 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(4):411–521.

Watwood S.L., P.J.O. Miller, M. Johnson, P.T. Madsen, and P.L. Tyack. 2006. Deep-diving foraging behavior of sperm whales (*Physeter macrocephalus*). Journal of Animal Ecology 75:814–825.