MARINE MAMMAL COMMISSION

15 September 2014

Naval Facilities Engineering Command Northwest
Attention: Ms. Amy Burt-GOA Supplemental EIS/OEIS Project Manager
1101 Tautog Circle
Suite 203
Silverdale, Washington 98315-1101

Dear Ms. Burt:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the Navy's Draft Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement (DSEIS) for training activities to be conducted from 2016 to 2021 within the Temporary Maritime Activities Area (TMAA) in the Gulf of Alaska (GOA; 79 Fed. Reg. 49769). The DSEIS discusses the impacts of those activities on marine mammals in the Gulf of Alaska. The Commission has commented on other draft environmental impact statements and previously proposed regulations for similar activities in other Navy training and testing study areas (10 July 2012, 5 November 2012, 7 March 2013, 24 October 2013, 20 February 2014 Commission letters). In concert with this letter, the Commission is providing comments to the National Marine Fisheries Service (NMFS) regarding the Navy's application for a letter of authorization (LOA).

Background

The Navy proposes to conduct training activities in the waters off Kodiak, Alaska. The activities would involve the use of mid- and high-frequency sonar, weapons systems, explosive and non-explosive practice munitions and ordnance, high-explosive underwater detonations, expended materials, electromagnetic devices, high-energy lasers, vessels, and aircraft. Activities would occur in summer, defined as April–October. The activities and alternatives under the 2011 Final Environmental Impact Statement/Overseas Environmental Impact Statement (FEIS) for GOA have not changed. However, the marine mammal densities, criteria and thresholds, and acoustic analyses have been updated for the DSEIS.

Uncertainty in density estimates

<u>Uncertainty in general</u>—The Navy estimated marine mammal densities in GOA 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 2014b). The Navy acknowledged that estimates from both RES models and extrapolated densities include a high degree of uncertainty (Department of the Navy 2014b), but

it does not appear that the Navy included measures of uncertainty (e.g., standard deviation, coefficient of variation (CV), etc.) in those estimates.

For GOA, the Navy based some of its densities on stratified design-based estimates from Rone et al. (2014), which is a preferred approach to RES models and extrapolated estimates. However, the CVs were quite large in some instances. For example, the densities for killer whales were 0.005 (CV=0.60) for the inshore stratum, 0.002 (CV=0.77) for the offshore stratum, 0.002 (CV=0.77) for the seamount stratum, and 0.020 (CV=1.93) for the slope stratum. Using only the mean densities would very likely result in an underestimation of takes due to the CVs being so much greater than the mean point estimates. The abundance estimates for unidentified large whales also were prorated among blue, fin, and humpback whales within each stratum and incorporated proportionally into each species' density estimate. A high level of uncertainty and variability is inherent in using such prorated methods. In addition, the Rone et al. (2014) data were collected in summer (23 June–18 July 2013) but were considered representative of year-round densities. Further, some density estimates were based on data from Waite (2003) that included (1) a single sighting, for which the Navy noted the confidence in the density value was low and/or (2) f(0) and g(0) values derived from other surveys in the North Pacific[1] (Department of the Navy 2009).

The Commission understands that density data are not available for all areas where or times when activities may occur and that even when such data are available the densities could be underestimated. However, the Commission continues to believe that action proponents, including the Navy, should use the best available density estimate plus some measure of uncertainty (e.g., mean plus two standard deviations, mean plus the coefficient of variation, the upper limit of the confidence interval) in those instances. If one uses an average density estimate, there is approximately a 50 percent chance that the actual density is either greater or less than that estimate. Therefore, the Commission recommends that the Navy (1) account for uncertainty in extrapolated density estimates for all species by using the upper limit of the 95% confidence interval or the arithmetic mean plus two standard deviations and (2) then re-estimate the numbers of takes accordingly.

Pinniped densities—Similar to estimating cetacean densities, the Navy used data from Rone et al. (2014) to estimate densities of northern fur seals. Those data likely under-represent densities for the summer timeframe[2] in which activities are expected to occur. Adult males usually are on shore in the Pribilof Islands from May–August (some remain until November), while most adult females are on or near the breeding islands from June–November (Roppel 1984). Adult males may move south into GOA or the North Pacific Ocean or north into the Bering Sea. Adult females, pups, and juveniles[3] move south and remain at sea until at least the next breeding season. Because the Rone et al. (2014) study occurred from late June through July, the spring/summer migration of fur seals through the Gulf of Alaska to the Pribilof Islands was likely mostly missed. Therefore, the Commission believes that the densities would be underestimated even if the Navy incorporated the CVs from the Rone et al. (2014) data.

---

[1] Waite (2003) did not provide survey-specific f(0) and g(0) values; therefore, those values originated from other surveys that occurred in the North Pacific. Waite (2003) data also were collected in summer (June and July) but were applied to other seasons.
[2] Defined as April–October in the DEIS.
[3] Young animals typically begin returning to breeding islands when 1 to 3 years old.

The Commission indicated in its 2014 letter regarding the Navy's Northwest Training and Testing (NWTT) activities that movements of northern fur seals have been investigated using satellite telemetry from adult females in the non-breeding season (Ream et al. 2005, Melin et al. 2012) and from pups (Lea et al. 2009). The Commission further suggested that telemetry and dispersion data from Ream et al. (2005), in addition to unpublished data from the National Marine Mammal Laboratory (NMML), could be scaled to the population for a better approximation of density. Accordingly, the Commission recommends that the Navy consult with scientists at NMML to revise its northern fur seal density estimates by using movement and dispersion data from tagged fur seals specific to the study area and scaled to the population.

For estimating Steller sea lion and elephant seal densities, the Navy used abundance data from stock assessment reports divided by an area. The Navy cited Angliss and Allen (2009) for the combined Steller sea lion abundance estimate. However, those abundance estimates have increased (see Allen and Angliss (2014) for the most current abundance estimates) since the 2008 stock assessment report[4]. For elephant seals, the Navy indicated that only male elephant seals migrate as far north as GOA during foraging trips based on information collected from extensive satellite tagging studies (Le Boeuf et al. 2000) and, thus, included only males in its density estimate. The Navy apparently misinterpreted Le Boeuf et al. (2000), as Figures 1 and 12 depict female elephant seals in the GOA. In addition, to account for males at rookeries that were not counted and an increase in the population since 2005, the Navy doubled the number of males and juveniles reported in the stock assessment report (3,815) to 7,630. Although the Navy included such a correction, it still has underestimated the abundance of elephant seals by not including females.

Due to similar issues with pinniped densities for NWTT, the Commission suggested that the Navy update its Steller sea lion abundance estimate and contact NMML regarding unpublished satellite telemetry data[5] that could be used to better determine the area of Steller sea lion occurrence. For elephant seals, the Commission suggested the Navy use Robinson et al. (2012), which provided more recent satellite telemetry data on dispersion and movements of female northern elephant seals similar to those of LeBoeuf et al. (2000). Those suggestions, and ultimately recommendations, are applicable for GOA as well. Accordingly, the Commission recommends that the Navy (1) revise its Steller sea lion abundance estimates to include data from Allen and Angliss (2014) and consult with scientists at NMML[6] regarding unpublished data to revise its Steller sea lion densities and (2) include abundance data for female elephant seals and incorporate data from Robinson et al. (2012) into its estimates of northern elephant seal densities—a similar method of scaling movement and dispersion data from tagged animals to the population may be used for Steller sea lions and elephant seals as well.

---

[4]Although the Navy did correctly include animals from the Gulf of Alaska, southeast Alaska, and British Columbia rookeries in it density estimates, it indicated in the Steller sea lion introduction in the Department of the Navy (2014b) that only individuals from the eastern stock were expected to occur in the study area. The Commission notes that individuals from the Gulf of Alaska rookeries are part of the western, not the eastern stock.

[5] The Commission understands it is difficult to estimate densities when the best available data have not been published. Accordingly, the Commission recommended in its letter regarding the 2013 stock assessment reports that NMFS's Science Centers, including NMML, publish their data.

[6] The Commission can provide contact information for the appropriate scientists at NMML.

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 Commission considers the theory behind those weighting functions to be reasonable. However, the amplitudes of the final Type II weighting functions were adjusted by 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). 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 Commission's understanding is that Southall et al. (2007) did not use a 6-dB correction factor to extrapolate from impulsive to acoustic thresholds, but rather to estimate PTS thresholds from TTS thresholds based on peak pressure levels. Southall et al. (2007) did indicate that the TTS threshold for acoustic (non-impulsive) sources was 12 dB greater than for explosive sources (pulses) based on SELs (195 vs 183 dB re 1 μPa^2-sec[7], respectively). If the explosive threshold of 164.3 dB re 1 μPa^2-sec (based on Lucke et al. (2009) and used in Finneran and Jenkins (2012)) is increased by 12 dB, the resulting unadjusted TTS threshold would be 176.3 dB re 1 μPa^2-sec for acoustic sources. That threshold then should have been adjusted by 19.4 dB to yield a TTS threshold of 157 dB re 1 μPa^2-sec.

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 Commission 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

[7] Those TTS thresholds were based on Schlundt et al. (2000) and Finneran et al. (2002).

behavioral thresholds. Thus, if those thresholds were not adjusted by the appropriate amplitude factors, the Navy may have estimated the numbers of takes of marine mammals incorrectly. To address these concerns, the Commission recommends that NMFS require the Navy to (1) use 157 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) based on these changes to the TTS thresholds, adjust the PTS thresholds for high-frequency cetaceans exposed to acoustic sources by increasing the amended TTS threshold by 20 dB and for low-, mid-, and high-frequency cetaceans exposed to explosive sources by increasing the amended TTS thresholds by 15 dB and (b) adjust the behavioral thresholds for low-, mid-, and high-frequency cetaceans exposed to explosive sources by decreasing the amended TTS thresholds by 5 dB.

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 Commission 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 Commission believes that a threshold of 171 rather than 177 dB re 1 μPa^2-sec should have been used by the Navy. Further, as stated previously, the TTS thresholds serve as the basis for the PTS and behavioral thresholds and could have been underestimated. Therefore, the Commission recommends that the Navy (1) use 171 dB re 1 μPa^2-sec as the TTS threshold for phocids exposed to explosive sources and (2) based on that decrease in the TTS threshold for phocids, adjust the PTS and behavioral thresholds by increasing the TTS threshold by 15 dB and decreasing the TTS threshold by 5 dB, respectively.

Acoustic modeling

The SEIS indicated that the Navy would conduct the proposed activities from April–October. However, given that training activities likely would occur only during the month of July, the Navy selected July as the seasonal representative for its analyses (Department of the Navy 2014a). Because the GOA environment (i.e., sound speed profiles and wind speed) varies markedly by season, modeling for July would provide an appropriate basis for estimating takes during the April–October timeframe only if the environmental parameters in July are considered the worst-case scenario. Conversely, the Navy could have averaged the environmental data for each season[8], as it had for NWTT and the other Navy study areas. In either case, the timeframe in which modeling is conducted should be consistent with environmental conditions in the months when the proposed activities would be authorized to occur. Otherwise, if the Navy modeled only during July but the activities actually occur in April, the estimated numbers of takes could be underestimated due to colder temperatures and greater wind speeds that cause surface ducting conditions in GOA in the cold season[9]. The Commission made similar recommendations regarding this issue in its 18 November 2010 letter regarding the LOA for the same activities under the GOA Draft EIS. Therefore, the Commission again recommends that, if the Navy could conduct training activities from April–October, then it include the appropriate environmental parameters in its acoustic modeling based on those months[10] rather than assuming the activities would occur only during July. If it is indeed the case that activities will occur only during July, then the Navy should not be including a 7-month timeframe for it to conduct its activities.

Mitigation and monitoring measures

Ranges to impact criteria—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 DSEIS, 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 for certain activities the ranges to onset of TTS are much larger than those estimated previously. 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 DSEIS 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 could be expected to occur and the average range at which TTS could be expected to occur. Chapter 3 of the DSEIS also includes tables listing various ranges. However, the tables in Chapter 3 include (1) only a subset of the proposed activities (6 of the 9 explosive activities analyzed, Table 3.8-18), (2) the average rather than maximum ranges (Table 3.8-18), and (3) values that are not consistent with Table 5.3-2[11]. In addition, the DSEIS does not provide the ranges to PTS for acoustic sources for more than 1 ping (Table 3.8-11), as it does for TTS (i.e., 1, 5, and 10 pings; Table 3.8-12). Instead, the Navy assumed that marine mammals could

---

8 Although those generally are defined as either two (cold and warm) or four (winter, spring, summer, and fall) seasons, the Navy also could have averaged the environmental data for the timeframe of activities (April–October) since it did not include seasonality in its density estimates.

9 Defined as December–May.

10 Based either on the worst-case scenario or on averaging of the relevant months.

11 Table 5.3-2 also includes only a subset of the proposed activities (5 of the 9 explosive activities analyzed), some of which are not relevant to GOA (Bins E2 and 3).

not maintain a speed of 10 knots parallel the ship and receive adequate energy over successive pings to result in PTS. Further, the Navy indicated in Table 3.8-11 that the ranges to PTS for acoustic sources were "within representative ocean acoustic environments" and in Table 3.8-12 that the ranges to TTS for acoustic sources were "over a representative range of ocean environments", which the Commission assumes as not necessarily within GOA[12].

Absent GOA-specific information, the DSEIS process is not fully transparent and the Commission and public cannot comment on the appropriateness of the proposed mitigation zones. To address those shortcomings, the Commission 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 within GOA.

Passive and active acoustic monitoring—The Navy indicated in its DSEIS that the use of lookouts (i.e., observers) is expected to 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 visually detecting marine mammals. The Commission 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. The Navy has noted in the DSEIS that while data were collected as part of a proof-of-concept phase, those data are not fairly comparable as protocols were being changed and assessed, nor are those data statistically significant. The Commission agrees that the data are preliminary and may not be statistically significant but the basic information they provide is useful. In one instance, the marine mammal observers (MMOs) had sighted at least three marine mammals at distances less than 914 m (i.e., within the mitigation zone for mid-frequency active sonar for cetaceans), 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 neither details regarding those reports nor raw sightings data were provided to confirm this (Department of the Navy 2010). The Commission believes that the study will be very informative once completed but that a precautionary approach should be taken in the interim.

Therefore, the Commission 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 with passive acoustics during activities that generate impulsive sounds (i.e., primarily explosives[13]) but not during activities in which mid- and high-frequency active sonar would be used. 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 DSEIS. To ensure effective mitigation and monitoring, the Commission recommends that the Navy use passive and active acoustics,

[12] Unlike Table 3.8-18 in which the Navy indicated the ranges to effects were for marine mammals within the study area.
[13] Specifically for sinking exercises and exercises that use improved extended echo-ranging sonobuoys.

whenever practicable, to supplement visual monitoring during the implementation of its mitigation measures for all activities that could cause PTS, injury, or mortality beyond those explosive activities for which passive acoustic monitoring already was proposed.

Clearance time for deep-diving species—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 DSEIS, those acoustic activities would resume when (1) the animal has been observed exiting the mitigation zone, (2) the animal has been thought to have exited the mitigation zone based on its course and speed, (3) the mitigation zone has been clear from any additional sightings for a period of 30 minutes, (4) the ship has transited more than 1.8 km beyond the location of the last sighting, or (5) the ship concludes that dolphins are deliberately closing in on the ship to ride the ship's bow wave (and there are no other marine mammal sightings within the mitigation zone). The Commission 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 impacting the marine mammal to a greater degree. 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 clearance time 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 have been known to dive to considerable depths (> 1,400 m) and to 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 has been estimated at approximately 60 minutes (51.3 and 64.5 minutes for Blainville's and Cuvier's beaked whales, respectively; Baird pers. comm.). Recent data on Cuvier's beaked whales revealed a maximum dive duration of more than 137 minutes and dive depths of more than 2,990 m with a mean dive duration of 67.4 minutes (Schorr et al. 2014). Sperm whales also dive to great depths and can remain submerged for at least 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 acoustic 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.

Furthermore, 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. The Navy itself indicated in the DSEIS that beaked whales are notoriously difficult to detect at sea. 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, the Commission recommends that the Navy use a second clearance time category of 60 minutes for beaked whales and sperm whales if the animal has not been observed exiting the mitigation zone.

Request for Level A harassment and mortality takes

The Navy proposed an 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 harbor porpoises and beaked whales would avoid certain training 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 Commission 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.

The Navy also indicated that its post-model analysis considered the potential for mitigation to reduce PTS from exposure to sonar and other active acoustic sources and mortalities 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 Commission 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 in the current DSEIS, which states that although the use of lookouts was expected to increase the likelihood that marine species would be detected at the water's surface, it was unlikely that using those lookouts would help avoid impacts on all species because of the inherent limitations 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 demonstrated. However, the Navy 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 (explosive sources only). The Navy 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 or (2) there is one or more of the scenarios within the activity for which the <u>mitigation zone</u> cannot be observed visually on a continuous basis (but the <u>range to effects zone</u> can be observed visually for the majority of the scenarios); 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 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. The Navy further reinforced that fact in its DSEIS when stating the Navy believes that it is improper to use the proof-of-concept data to draw any conclusions on the effectiveness of Navy lookouts. Therefore, it is unclear what basis the Navy would have to assign the mitigation effectiveness scores, as the use of those scores to reduce the numbers of takes is unsubstantiated.

The information that the Navy provided in Chapter 5 of the DSEIS regarding the effectiveness of various mitigation measures does not necessarily comport with its determination of mitigation effectiveness scores. For example, the Navy indicated that the mitigation zone for sinking exercises is 4.6 km. However, the Navy stated it is highly unlikely that anything but a whale blow or large pod of dolphins will be seen at distances closer to 1.9 km near the perimeter of the mitigation zone. Further, the mortality zone is less than 229 m. The Commission is unsure how the Navy would implement a shut down or delay for odontocetes that are not in a large group or for pinnipeds in general. Nevertheless, the Navy concluded that the measure is likely effective and reduced the takes by the portion of animals that were likely to be seen, thus assigning the highest effectiveness score of 1 for the mortality zone and 0.5 for the injury zone (Table 3.8-19). Those effectiveness scores again seem to be measures of effort rather than of true effectiveness.

In addition, the Navy appears to be 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 DSEIS). 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 few pings. However, the Navy did not present data on the range to onset PTS for more than 1 ping and only provided data for "representative ocean acoustic environments", which may or may not be representative of GOA. 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 appear to be based on 1 ping as well (Table 5.3-2). 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) values (Table 3.8-9). 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., behavior and appearance, group size, blow characteristics), viewing conditions (e.g., sea state, wind speed, wind direction, wave height, and glare), the observer's ability to detect animals (e.g., experience, fatigue, and concentration), and platform characteristics (e.g., pitch, roll, speed, and height above water). In the DSEIS, 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 experienced researchers conducting scientific surveys, not on data from Navy lookouts whose effectiveness as observers has yet to be determined. The Commission 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 the Navy's development of mitigation effectiveness scores or g(0) values. Further, the Navy has acknowledged that it would be improper to use the proof-of-concept data to draw any conclusions on the effectiveness of Navy lookouts. Accordingly, applicable data simply do not exist currently to fulfill the Navy's post-analysis objective.

The Navy did indicate that, although distinct differences between marine mammal surveys and the proposed training activities exist, the use of g(0) as an approximate sightability factor for quantitatively adjusting model-estimated takes based on implementation of mitigation (mitigation effectiveness multiplied by g(0)) is an appropriate use of the best available science based on the way it has been applied. Consistent with its impact assessment processes, the Navy applied g(0) values in a conservative manner (erring on the side of overestimating the number of impacts) to adjust model-estimated takes within the applicable mitigation zones during training activities. That reasoning is unsupported by facts stated within the DSEIS itself. As an example, the mitigation zone for sinking exercises is 4.6 km with one lookout stationed on a vessel and one in an aircraft, the range to observe a whale blow or large pod of dolphins as purported by the Navy is 1.9 km, and the mortality zone is less than 229 m, yet the Navy assigned a mitigation effectiveness score of 1—fully effective. The Commission is concerned that the Navy not only is applying g(0) values based on experienced scientists and not lookouts—who according to the Navy have less experience detecting marine mammals than marine mammal observers used for line-transect surveys—but also believes that mitigation can be implemented at ranges beyond visual limits. Given these concerns, the Commission recommends that the Navy (1) use the total numbers of model-estimated Level A harassment[14] 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 LOA application.

Cumulative impacts

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

First, the DSEIS did 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 DSEIS indicated 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 DSEIS does not support a cumulative impacts analysis.

To address these fundamental concerns, the Commission recommends that the Navy revise its DSEIS 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.

Possible errors in the take tables

The Commission observed some possible errors in the take tables provided in the Navy's DSEIS, LOA application, and GOA technical report that includes the actual modeled data (GOA-TR; Department of the Navy 2014a). For example, in the GOA-TR, the model-estimated takes for TTS exceed those for behavior for Dall's porpoises (13,532 and 2,198, respectively) exposed to non-impulsive sources (acoustic sources) during training events under Alternative 2[15] (Table 13 in Department of the Navy 2014a), but not for harbor porpoises (0 and 7,411, respectively). The

[14] PTS and injury, if the latter was reduced as well.
[15] Alternative 2 in the DSEIS and GOA-TR is the Preferred Alternative, as discussed in the LOA application.

Commission is unsure how the takes would be so much greater for the TTS threshold when it is higher than the behavior threshold[16].

One possible explanation is that the Navy used the weighted threshold of 152 dB re 1 μPa^2-sec rather than the unweighted threshold of 176 dB re 1 μPa-sec[17] as the upper limit of BRF_2[18] (Finneran and Jenkins 2012) for high-frequency cetaceans other than harbor porpoises. If that is the case, then the estimated numbers of takes for behavior would have been underestimated. It would not be appropriate for the Navy to use a weighted threshold based on a Type II weighting function when the Navy indicated that it applied the Type I weighting functions (as normally are used in concert with either unweighted or M-weighted thresholds) to the estimated exposures—this logic would apply to mid- and low-frequency cetaceans as well. The Navy did not specify what it used as the upper limit of the BRF_2, but in previous environmental compliance documents for its Tactical Training Theater Assessment and Planning Program (TAP)[19], the Commission believes that the Navy assumed the pings emitted from the sound sources were 1 sec in length, thus the sound pressure level and sound exposure level were equivalent. That meant that the upper limit of BRF_2 as used in previous TAP documents was 195 dB re 1 μPa, which equated to 195 dB re 1 μPa^2-sec and the delineation of behavior and TTS takes occurred at 195. The assumption of a 1-sec ping may be appropriate for some sound sources but likely is not appropriate for all. Therefore, <u>the Commission recommends</u> that the Navy (1) describe what it used as the upper limit of BRF_1 for low-frequency cetaceans and the upper limits of BRF_2 for both mid- and high-frequency cetaceans, including whether it assumed a 1-sec ping for all sources and (2) if the upper limits of the BRFs were based on weighted thresholds, use the unweighted or M-weighted thresholds of 195 dB re 1 μPa^2-sec for low- and mid-frequency cetaceans and 176 dB re 1 μPa^2-sec for high-frequency cetaceans to revise its behavior take estimates for all marine mammals exposed to acoustic sources.

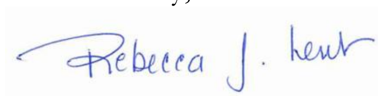
The Navy also appears to be rounding all take numbers from the GOA-TR down in its DSEIS and LOA application rather than rounding to the nearest whole number, which the Commission believes was the Navy's policy for species listed under the Marine Mammal Protection Act (MMPA) in its environmental compliance documents for its TAP Program. When determining the population within a modeling area in its GOA-TR, the Navy indicated the total true population is (1) rounded to 1 if the total true population is equal to or greater than 0.05 but less than 1.0 and (2) rounded to the nearest whole number if the total true population is equal to or greater than 1.0. For example, the model-estimated non-TTS (behavioral) takes for Stejneger's beaked whales exposed to non-impulsive sources during training events under Alternative 2 in the GOA-TR was 1,153.95 (Table 13 in Department of the Navy 2014a), but was rounded down to 1,153 in the DSEIS (Table 3.8-17) and LOA application (Table 5.2[20]). It is unclear why the Navy wouldn't be rounding to the nearest whole number in its DSEIS and LOA application. Accordingly, <u>the</u>

[16] Interestingly, the harbor porpoise TTS and behavior takes for non-impulsive sources under the Preferred Alternative in the NWTT-TR were 769 and 5,920, respectively. The Commission also is unsure how the TTS takes for harbor porpoises are 0 in the GOA-TR.
[17] Based on the Commission's rationale in the criteria and thresholds section of this letter.
[18] BRF_2 is used for all mid- and high-frequency cetaceans but beaked whales and harbor porpoises; while BRF_1 is used for low-frequency cetaceans.
[19] The environmental compliance documents under TAP are currently in place, including the final rules and associated letters of authorization under the MMPA that expire in 2015.
[20] The Commission understands that Table 5-2 includes takes for exposure to both non-impulsive and impulsive sources, but the model-estimated takes for non-TTS (behavior) and TTS were both 0.

Commission recommends that the Navy round its takes, based on those takes in the GOA-TR tables, to the nearest whole number or zero in all of its take tables in the DSEIS and LOA application.

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

Sincerely,



Rebecca J. Lent, Ph.D.
Executive Director

Cc: Jolie Harrison, National Marine Fisheries Service

References

Angliss, R.P., and B.M. Allen. 2009. Alaska marine mammal stock assessments, 2008. NOAA Technical Memorandum. NMFS–AFSC–193. 258 pp.

Allen, B.M., and R.P. Angliss. 2014. Alaska marine mammal stock assessments, 2013. NOAA Technical Memorandum NMFS–AFSC–277. National Marine Mammal Laboratory, Seattle, Washington. 304 pages.

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.

Department of Navy. 2009. Appendix E: Marine mammal density report. *in* Gulf of Alaska Navy training activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement. Department of the Navy, U.S. Pacific Fleet. 46 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. 2014a. Determination of acoustic effects on marine mammals and sea turtles for the Gulf of Alaska training activities Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement: Pre-final. Naval Undersea Warfare Center Division, Newport, Rhode Island. 76 pages.

Department of the Navy. 2014b. Pacific Navy Marine Species Density Database: Final Gulf of Alaska technical report. Naval Facilities Engineering Command Pacific, Pearl Harbor, Hawaii. 486 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.

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.

Lea, M.-A., D. Johnson, R. Ream, J. Sterling, S. Melin, and T. Gelatt. 2009. Extreme weather events influence dispersal of naive northern fur seals. Biology Letters 5:252–257.

LeBoeuf, B.J., D.E. Crocker, D.P. Costa, S.B. Blackwell, P.M. Webb, and D.S. Houser. 2000. Foraging ecology of northern elephant seals. Ecological Monographs 70:353–382.

Lucke, K., U. Siebert, P.A. Lepper, and M-A. Blanchet. 2009. Temporary shift in masked hearing thresholds in a harbor porpoise (*Phocoena phocoena*) after exposure to seismic airgun stimuli. Journal of the Acoustical Society of America 125:4060–4070.

Melin, S.R., J.T. Sterling, R.R. Ream, R. Towell, T.K. Zeppelin, A.J. Orr, B. Dickerson, N. Pelland, and C. Kuhn. 2012. A tale of two stocks: Studies of northern fur seals breeding at the northern and southern extent of the range. Alaska Fisheries Science Center Quarterly Report, Seattle, Washington. 6 pages.

Ream, R.R., J.T. Sterling, and T.R. Loughlin. 2005. Oceanographic features related to northern fur seal migratory movements. Deep-Sea Research II 52:823–843.

Robinson, P.W., D.P. Costa, D.E. Crocker, J.P. Gallo-Reynoso, C.D. Champagne, M.A. Fowler, C. Goetsch, K.T. Goetz, J. Hassrick, L.A. Hückstädt, C.E. Kuhn, J.L. Maresh, S.M. Maxell, B.I. McDonald, S.H. Peterson, S.E. Simmons, N.M. Teutschel, S. Villegas-Amtmann, and K. Yoda. 2012. Foraging behavior and success of a mesopelagic predator in the northeast Pacific Ocean: Insights from a data-rich species, the northern elephant seal. PLoS ONE 7(5): e36728. doi:10.1371/journal.pone.0036728.

Rone, B.K., A.B. Douglas, T.M. Yack, A.N. Zerbini, T.N. Norris, E. Ferguson, and J. Calambokidis. 2014. Report for the Gulf of Alaska Line-Transect Survey (GOALS) II: Marine mammal occurrence in the Temporary Maritime Activities Area (TMAA). Prepared by Cascadia Research Collective, Alaska Fisheries Science Center, and Bio-Waves, Inc. Naval Facilities Engineering Command Pacific, Honolulu, Hawaii. 186 pages.

Roppel, A.Y. 1984. Management of northern fur seals on the Pribilof Islands, Alaska, 1786–1981. NOAA Technical Report, NMFS-4. 32 pages.

Schlundt, C.E., J.J. Finneran, D.A. Carder, and S.H. Ridgway. 2000. Temporary shift in masked hearing thresholds (MTTS) of bottlenose dolphins and white whales after exposure to intense tones. Journal of the Acoustical Society of America 107:3496–3508.

Schorr, G.S., E.A. Falcone, D.J. Moretti, and R.D. Andrews RD. 2014. First long-term behavioral records from Cuvier's beaked whales (*Ziphius cavirostris*) reveal record-breaking dives. PLoS ONE 9(3): e92633. doi:10.1371/journal.pone.0092633.

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.

Waite, J. 2003. Cetacean Assessment and Ecology Program: Cetacean survey. Alaska Fisheries Science Center's quarterly research reports-July to September 2003. http://www.afsc.noaa.gov/Quarterly/jas2003/divrptsNMML2.htm

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.