and fishing mortality rates during 2003, as presented in the 2004 stock assessment, NMFS decided to delay the completion of the EIS to be able to incorporate the 2005 stock assessment in the EIS.

During 2005, the Technical Committee and Stock Assessment Subcommittee reviewed model inputs and the model itself to determine if the results from the 2004 assessment truly reflected status of the population or were an artifact of data or model errors. They concluded that a number of the indices used in the 2004 effort were not consistent with what was observed in the population as a whole, or were contradictory to the majority of other reliable time series. Those indices were removed from subsequent model runs. The Technical Committee believes the current assessment reflects the true status of the population (within reasonable ranges of certainty). Both the 2004 and 2005 Striped Bass Stock Assessments are available on ASMFC's website under *Interstate Fisheries Management-striped bass* at *http://www.asmfc.org.*

Addendum I to Amendment 6

During the development of Amendment 6, there were concerns over the impacts of bycatch mortality on the overall population. To address these concerns, ASMFC is currently developing Addendum 1 to Amendment 6 to increase the accuracy of data on striped bass bycatch in all sectors of the striped bass fishery. Addendum I will outline mandatory data collection and bycatch mortality studies for the commercial, recreational, and for-hire fisheries for striped bass.

Further Public Participation

Due to the significant time that has passed since the nine initial scoping hearings were held in November-December 2003, NMFS is seeking additional scoping on its preliminary draft analyses of Federal management options to open the EEZ to the harvest of Atlantic Striped Bass. See **ADDRESSES** for information on how to obtain a copy of the draft document and where to send comments.

At this time, a preferred option has not been identified. Options being considered in this draft document include: (1) Open the entire EEZ, implement a 28–inch (71.1–cm) minimum size limit, and allow states to adopt more restrictive regulations for fishermen and vessels licensed in their state (ASMFC recommendation); (2) open the entire EEZ, implement a 28–inch (71.1–cm) minimum size limit, allow states to adopt more restrictive regulations for fishermen and vessels licensed in their state, implement a recreational bag limit of 2 fish per day, require circle hooks for all commercial and recreational hook and line fishing using bait, and commercial trip limits and bycatch trip limit options; (3) open the entire EEZ, implement a 28–inch (71.1–cm) minimum size limit, allow states to adopt more restrictive regulations for fishermen and vessels licensed in their state, allow hook and line gear only, implement a recreational bag limit of 2 fish per day, require circle hooks for all commercial and recreational hook and line fishing using bait, and implement a commercial trip limit of 30 fish per trip or day whichever is greater; and (4) status quo - maintain moratorium in EEZ.

Authority: 16 U.S.C. 5151 *et seq.*

Dated: April 19, 2006.

James P. Burgess,

Acting Director, Office of Sustainable Fisheries, National Marine Fisheries Service.

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[I.D. 011806L]

Small Takes of Marine Mammals Incidental to Specified Activities; Rim of the Pacific (RIMPAC) Antisubmarine Warfare (ASW) Exercise Training Events Within the Hawaiian Islands Operating Area (OpArea)

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice; receipt of application and proposed incidental take authorization; request for comments.

SUMMARY: NMFS has received an application from the U.S. Navy (Navy) for an Incidental Harassment Authorization (IHA) to take marine mammals, by harassment, incidental to conducting RIMPAC ASW training events, in which submarines, surface ships, and aircraft from the United States and multiple foreign nations participate in ASW training exercises, utilizing mid-frequency sonar (1 kilohertz (kHz) to 10 kHz), in the U.S. Navy's Hawaiian Operating Area (OpArea) in the summer of 2006. Pursuant to the Marine Mammal Protection Act (MMPA), NMFS is requesting comments on its proposal to issue an authorization to the Navy to incidentally harass several species of marine mammals during the training exercises.

DATES: Comments and information must be received no later than May 24, 2006.

ADDRESSES: Comments on the application should be addressed to Steve Leathery, Chief, Permits, Conservation and Education Division, Office of Protected Resources, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, MD 20910–3225. The mailbox address for providing email comments is *PR1.011806L@noaa.gov*. NMFS is not responsible for e-mail comments sent to addresses other than the one provided here. Comments sent via e-mail, including all attachments, must not exceed a 10–megabyte file size.

A copy of the application containing a list of the references used in this document may be obtained by writing to the address specified above, telephoning the contact listed below (see **FOR FURTHER INFORMATION CONTACT**), or visiting the internet at: *http://www.nmfs.noaa.gov/pr/permits/incidental.htm*.

Documents cited in this notice may be viewed, by appointment, during regular business hours, at the aforementioned address.

In March, 2006, the Navy prepared a revised 2006 Supplement on the 2002 Programmatic Environmental Assessment on RIMPAC. That document will be posted on the Navy's website (*http://www.smdcen.us/rimpac06/*) concurrently with this notice and the Navy will be accepting public comments.

The Navy has also prepared a Draft Environmental Impact Statement (DEIS) for its Undersea Warfare Training Range (USWTR), which contains detailed supporting information for some of the issues discussed in this document and may be viewed at: *http://projects.earthtech.com*.

NMFS' Ocean Acoustics Program has made additional information and references relating to the effects of anthropogenic sound available on the NMFS website at: *http://www.nmfs.noaa.gov/pr/acoustics/bibliography.htm*.

FOR FURTHER INFORMATION CONTACT: Jolie Harrison, Office of Protected Resources, NMFS, (301) 713–2289, ext 166.

SUPPLEMENTARY INFORMATION:

Background

Sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of marine mammals

by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed authorization is provided to the public for review.

Authorization shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s), will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses, and that the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth. NMFS has defined ''negligible impact'' in 50 CFR 216.103 as ''...an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.''

Section 101(a)(5)(D) of the MMPA established an expedited process by which citizens of the United States can apply for an authorization to incidentally take small numbers of marine mammals by harassment. The National Defense Authorization Act of 2004 (NDAA) (Public Law 108–136) removed the ''small numbers'' limitation and amended the definition of ''harassment'' as it applies to a ''military readiness activity'' to read as follows:

(i) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild [Level A Harassment]; or (ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered [Level B Harassment]

Section 101(a)(5)(D) establishes a 45–day time limit for NMFS review of an application followed by a 30–day public notice and comment period on any proposed authorizations for the incidental harassment of marine mammals. Within 45 days of the close of the comment period, NMFS must either issue or deny issuance of the authorization.

Summary of Request

NMFS received an application from the Navy for the taking, by harassment, of several species of marine mammals incidental to conducting RIMPAC ASW training events, in which submarines, surface ships, and aircraft from the United States and multiple foreign nations participate in ASW training exercises, in the OpArea, in the summer of 2006. The RIMPAC ASW exercises are considered a military readiness activity. Based on discussions between the agencies regarding behavioral thresholds and mitigation and monitoring, the Navy submitted a modified application on March 16, 2006.

Description of the Activity

RIMPAC 2006 ASW activities are scheduled to take place from June 26, 2006, to about July 28, 2006, with ASW training events planned on 21 days. The OpArea is approximately 210,000 square nautical miles (nm), however, nearly all RIMPAC ASW training would occur in the six areas delineated in Figure 2–1 in the Navy's application (approximate 46,000 square nm). ASW events typically rotate between these six modeled areas. Sonar training exercises will occur within these areas for the most part; however, sonar may be operated briefly for battle preparation while forces are in transit from one of the modeled areas to another. These six areas were used for analysis as being representative of the marine mammal habitats and the bathymetric, seabed, wind speed, and sound velocity profile conditions within the entire OpArea. For purposes of this analysis, all likely RIMPAC ASW events were modeled as occurring in these six areas.

As a combined force during the exercises, submarines, surface ships, and aircraft will conduct ASW against opposition submarine targets. Submarine targets include real submarines, target drones that simulate the operations of an actual submarine, and virtual submarines interjected into the training events by exercise controllers. ASW training events are complex and highly variable. For RIMPAC, the primary event involves a Surface Action Group (SAG), consisting of one to five surface ships equipped with sonar, with one or more helicopters, and a P–3 aircraft searching for one or more submarines. There will be approximately four SAGs for RIMPAC 2006. For the purposes of analysis, each event in which a SAG participates is counted as an ASW operation. There will be approximately 44 ASW operations during RIMPAC with an average event length of approximately 12 hours.

One or more ASW events may occur simultaneously within the OpArea. Each event was identified and modeled separately. If a break of more than 1 hour in ASW operations occurred, then the subsequent event was modeled as a separate event. Training event durations ranged from 2 hours to 24 hours. A total of 532 training hours were modeled for RIMPAC acoustic exposures. This total includes all potential ASW training that is expected to occur during RIMPAC.

Active Acoustic Sources

Tactical military sonars are designed to search for, detect, localize, classify, and track submarines. There are two types of sonars, passive and active. Passive sonars only listen to incoming sounds and, since they do not emit sound energy in the water, lack the potential to acoustically affect the environment. Active sonars generate and emit acoustic energy specifically for the purpose of obtaining information concerning a distant object from the sound energy reflected back from that object.

Modern sonar technology has developed a multitude of sonar sensor and processing systems. In concept, the simplest active sonars emit omnidirectional pulses (''pings'') and time the arrival of the reflected echoes from the target object to determine range. More sophisticated active sonar emits an omnidirectional ping and then rapidly scans a steered receiving beam to provide directional, as well as range, information. More advanced sonars transmit multiple preformed beams, listening to echoes from several directions simultaneously and providing efficient detection of both direction and range.

The tactical military sonars to be deployed in RIMPAC are designed to detect submarines in tactical operational scenarios. This task requires the use of the sonar mid-frequency (MF) range (1 kilohertz [kHz] to 10 kHz) predominantly.

The types of tactical acoustic sources that would be used in training events during RIMPAC are discussed in the following paragraphs. For more information regarding how the Navy's determined which sources should not be included in their analysis, see the Estimates of Take Section later in this document.

Surface Ship Sonars – A variety of surface ships participate in RIMPAC, including guided missile cruisers, destroyers, guided missile destroyers, and frigates. Some ships (e.g., aircraft carriers) do not have any onboard active sonar systems, other than fathometers. Others, like guided missile cruisers, are equipped with active as well as passive sonars for submarine detection and tracking. For purposes of the analysis, all surface ship sonars were modeled as equivalent to SQS–53 having the nominal source level of 235 decibels (dB) re 1mPa2–s (SEL). Since the SQS–

53 hull mounted sonar is the U.S. Navy's most powerful surface ship hull mounted sonar, modeling this source is a conservative assumption tending towards an overestimation of potential effects (although, the conservativeness is offset some by the fact that the Navy did not model for any of the times (though brief and infrequent) that they may use a source level higher than 235 dB). Sonar ping transmission durations were modeled as lasting 1 second per ping and omnidirectional, which is a conservative assumption that overestimates potential exposures, since actual ping durations will be less than 1 second. The SQS–53 hull mounted sonar transmits at center frequencies of 2.6 kHz and 3.3 kHz.

Submarine Sonars – Submarine sonars can be used to detect and target enemy submarines and surface ships. However, submarine active sonar use is very rare in the planned RIMPAC exercises, and, when used, very brief. Therefore, use of active sonar by submarines is unlikely to have any effect on marine mammals, and it was not modeled for RIMPAC 2006.

Aircraft Sonar Systems – Aircraft sonar systems that would operate during RIMPAC include sonobuoys and dipping sonar. Sonobuoys may be deployed by P–3 aircraft or helicopters; dipping sonars are used by carrier-based helicopters. A sonobuoy is an expendable device used by aircraft for the detection of underwater acoustic energy and for conducting vertical water column temperature measurements. Most sonobuoys are passive, but some can generate active acoustic signals as well. Dipping sonar is an active or passive sonar device lowered on cable by helicopters to detect or maintain contact with underwater targets. During RIMPAC, these systems active modes are only used briefly for localization of contacts and are not used in primary search capacity. Because active mode dipping sonar use is very brief, it is extremely unlikely its use would have any effect on marine mammals. The AN/AQS 13 (dipping sonar) used by carrier based helicopters was determined in the Environmental Assessment/Overseas Environmental Assessment of the SH–60R Helicopter/ALFS Test Program, October 1999, not to be problematic due to its limited use and very short pulse length. Therefore, the aircraft sonar systems were not modeled for RIMPAC 2006.

Torpedoes – Torpedoes are the primary ASW weapon used by surface ships, aircraft, and submarines. The guidance systems of these weapons can be autonomous or electronically controlled from the launching platform through an attached wire. The autonomous guidance systems are acoustically based. They operate either passively, exploiting the emitted sound energy by the target, or actively, ensonifying the target and using the received echoes for guidance. All torpedoes used for ASW during RIMPAC would be located in the range area managed by Pacific Missile Range Facility (PMRF) and would be non-explosive and recovered after use.

Acoustic Device Countermeasures (ADC) – ADCs are, in effect, submarine simulators that make noise to act as decoys to avert localization and/or torpedo attacks. Previous classified analysis has shown that, based on the operational characteristics (source output level and/or frequency) of these acoustic sources, the potential to affect marine mammals was unlikely, and therefore they were not modeled for RIMPAC 2006.

Training Targets – ASW training targets are used to simulate target submarines. They are equipped with one or a combination of the following devices: (1) acoustic projectors emanating sounds to simulate submarine acoustic signatures; (2) echo repeaters to simulate the characteristics of the echo of a particular sonar signal reflected from a specific type of submarine; and (3) magnetic sources to trigger magnetic detectors. Based on the operational characteristics (source output level and/or frequency) of these acoustic sources, the potential to affect marine mammals is unlikely, and therefore they were not modeled for RIMPAC 2006.

Range Sources – Range pingers are active acoustic devices that allow each of the in-water platforms on the range (e.g., ships, submarines, target simulators, and exercise torpedoes) to be tracked by the range transducer nodes. In addition to passively tracking the pinger signal from each range participant, the range transducer nodes also are capable of transmitting acoustic signals for a limited set of functions. These functions include submarine warning signals, acoustic commands to submarine target simulators (acoustic command link), and occasional voice or data communications (received by participating ships and submarines on range). Based on the operational characteristics (source output level and/or frequency) of these acoustic sources, the potential to affect marine mammals is unlikely, and therefore they were not modeled for RIMPAC 2006.

For detailed information regarding the proposed activity, please see the Navy's application and the associated Environmental Assessment (EA) (see **ADDRESSES**).

Description of Marine Mammals Potentially Affected by the Activity

There are 27 marine mammal species with possible or confirmed occurrence in the Navy's OpArea (Table 1): 25 cetacean species (whales, dolphins, and porpoises) and 2 pinnipeds (seals). In addition, five species of sea turtles are known to occur in the OpArea.

The most abundant marine mammals are rough-toothed dolphins, dwarf sperm whales, and Fraser's dolphins. The most abundant large whales are sperm whales. There are three seasonally migrating baleen whale species that winter in Hawaiian waters: minke, fin, and humpback whales. Humpback whales utilize Hawaiian waters as a major breeding ground during winter and spring (November through April), but should not be present during the RIMPAC exercise, which takes place in July. Because definitive information on the other two migrating species is lacking, their possible presence during the July timeframe is assumed, although it is considered unlikely. Seven marine mammal species listed as federally endangered under the Endangered Species Act (ESA) occur in the area: the humpback whale, North Pacific right whale, sei whale, fin whale, blue whale, sperm whale, and Hawaiian monk seal.

The Navy has used data compiled from available sighting records, literature, satellite tracking, and stranding and bycatch data to identify the species of marine mammals present in the OpArea. A combination of inshore survey data (within 25 nm; Mobley *et al.*, 2000) and offshore data (from 25 nm offshore out to the U.S. EEZ, Barlow 2003) was used to estimate the density and abundance of marine mammals within the OpArea (Table 1). Additional information regarding the status and distribution of the 27 marine mammal species that occur in the OpArea may be found in the Navy's application and the associated EA (See **ADDRESSES**) and in NMFS' Stock Assessment Reports, which are available at: *http://www.nmfs.noaa.gov/pr/PR2/Stock__Assessment__Program/individual__sars.html*.

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	Scientific Name	Occurs[1]	Group Size[2]	Overall Abund.	Animals/km2 Offshore	Animals/km2 Inshore	Estimated Takes tts	Estimated Takes sub-tts	Estimated Takes UnID'd	Estimated Takes total	Model'd Expos ÷ Abund. (%)
Order Cetacea											
Suborder Mysticeti (baleen whales)											
North Pacific right whale*	*Eubalaena japonica*	Rare			-	-			0		
Humpback whale*	*Megaptera novaeangliae*	Regular			-	-	0	0	0	0	
Minke whale	*Balaenoptera acutorostrata*	Rare			-	-	0	0	0	0	
Sei whale*	*Balaenoptera borealis*	Rare	3.4	77	0	-	1	27	1	29	38
Fin whale*	*Balaenoptera physalus*	Rare	2.6	174	0.0001	-	3	61	1	65	37
Blue whale*	*Balaenoptera musculus*	Rare					0	0	0	0	
Bryde's whale	*Balaenoptera edini/brydei**	Regular	1.5	493	0.0002	-	0	96	1	97	20
Suborder Odontoceti (toothed whales)											
Sperm whale*	*Physeter macrocephalus*	Regular	7.8	7,082	0.0029	0.001	34	1,417	1	1,452	21
Pygmy sperm whale	*Kogia breviceps*	Regular	1	7,251	0.003	-	14	1,367	1	1,382	19
Dwarf sperm whale	*Kogia sima*	Regular	2.3	19,172	0.0078	-	48	3,898	1	3,947	21
Cuvier's beaked whale	*Ziphius cavirostris*	Regular	2	12,728	0.0052	0.0006	29	2,428	61	2,518	20
Blainville's beaked whale	*Mesoplodon densirostris*	Regular	2.3	2,138	0.0009	0.0009	3	443	11	457	21
Longman's beaked whale	*Indopacetus pacificus*	Regular	17.8	766	0.0003	-	0	140	5	145	19
Rough-toothed dolphin	*Steno bredanensis*	Regular	14.8	19,904	0.0081	0.0017	49	3,809	205	4,063	20
Common bottlenose dolphin	*Tursiops truncatus*	Regular	9.5	3,263	0.0013	0.0103	11	1,137	35	1,183	36
Pantropical spotted dolphin	*Stenella attenuata*	Regular	60	10,260	0.0042	0.0407	52	4,129	288	4,469	44
Spinner dolphin	*Stenella longirostris*	Regular	29.5	2,804	0.0011	0.0443	37	2,776	80	2,893	103
Striped dolphin	*Stenella coeruleoalba*	Regular	37.3	10,385	0.0042	0.0016	26	2,438	292	2,756	27
Risso's dolphin	*Grampus griseus*	Regular	15.4	2,351	0.001	-	3	443	25	471	20
Melon-headed whale	*Peponocephala electra*	Regular	89.2	2,947	0.0012	0.0021	4	621	1	626	21
Fraser's dolphin	*Lagenodelphis hosei*	Rare	286.3	16,836	0.0069	-	41	3,212	174	3,427	20
Pygmy killer whale	*Feresa attenuata*	Regular	14.4	817	0.0003	-	0	140	1	141	17
False killer whale	*Pseudorca crassidens*	Regular	10.3	268	0.0001	0.0017	0	137	1	138	51
Killer whale	*Orcinus orca*	Regular	6.5	430	0.0002	-	0	96	1	97	23
Short-finned pilot whale	*Globicephala macrorhynchus*	Regular	22.3	8,846	0.0036	0.0237	37	2,938	1	2,976	34
Order Carnivora											
Suborder Pinnipedia (seals, sea lions, walruses)											
Family Phocidae (true seals)											
Hawaiian monk seal*	*Monachus scauinslandi*	Regular					1	0		1	
Northern elephant seal	*Mirounga angustirostris*	Rare									

Table 1. Estimated Abundance and Take of Animals in OpArea During RIMPAC ASW exercises

Potential Effects on Marine Mammals

The Navy has requested an IHA for the take, by harassment, of marine mammals incidental to RIMPAC ASW exercises in the OpArea. Section 101(a)(5)(D) of the MMPA, the section pursuant to which IHAs are issued, may not be used to authorize mortality or serious injury leading to mortality. The Navy's analysis of the RIMPAC ASW exercises concluded that no mortality or serious injury leading to mortality would result from the proposed activities. However, NMFS believes, based on our interpretation of the limited available data bearing on this point, that some marine mammals may react to mid-frequency sonar, at received levels lower than those thought to cause direct physical harm, with behaviors that may, in some circumstances, lead to physiological harm, stranding, or, potentially, death. Therefore, NMFS is proposing to require additional mitigation and monitoring measures that were not originally proposed in the Navy's application to ensure (in addition to the standard statutory requirement to effect the ''least practicable adverse impact upon the affected species or stoc'') that mortality or serious injury leading to mortality does not result from the proposed activities. Below, NMFS describes the potential effects on marine mammals of exposure to tactical sonar. However, due to the mitigation and monitoring required by this IHA, NMFS does not expect marine mammals to be exposed to sound of the strength or duration necessary to potentially induce the more severe of the effects discussed below.

Metrics Used in Acoustic Effect Discussions

This section includes a brief explanation of the two sound measurements (sound pressure level (SPL) and sound exposure level (SEL)) frequently used in the discussions of acoustic effects in this document.

SPL

Sound pressure is the sound force per unit area, and is usually measured in micropascals (mPa), where 1 Pa is the pressure resulting from a force of one newton exerted over an area of one square meter.

The sound levels to which most mammals are sensitive extend over many orders of magnitude and, for this reason, it is convenient to use a logarithmic scale (the decibel (dB) scale) when measuring sound. SPL is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure level in underwater acoustics is 1 mPa, and the units for SPLs are dB re: 1 mPa.

SPL (in dB) = 20 log (pressure / reference pressure)

SPL is an instantaneous measurement and can be expressed as the peak, the peak-peak, or the root mean square (rms). Root mean square, which is the square root of the arithmetic average of the squared instantaneous pressure values, is typically used in discussions of the effects of sounds on vertebrates. SPL does not take the duration of a sound into account.

SEL

In this proposed authorization, effect thresholds are expressed in terms of sound exposure level SEL. SEL is an energy metric that integrates the squared instantaneous sound pressure over a stated time interval. The units for SEL are dB re: 1 mPa2–s.

SEL = SPL + 10log(duration)

As applied to tactical sonar, the SEL includes both the ping SPL and the duration. Longer-duration pings and/or higher-SPL pings will have a higher SEL.

If an animal is exposed to multiple pings, the SEL in each individual ping is summed to calculate the total SEL. Since mammalian threshold shift (TS) data show less effect from intermittent exposures compared to continuous exposures with the same energy (Ward, 1997), basing the effect thresholds on the total received SEL may be a conservative approach for treating multiple pings; as some recovery may occur between pings and lessen the effect of a particular exposure.

The total SEL depends on the SPL, duration, and number of pings received. The acoustic effects on hearing that result in temporary threshold shift (TTS) and permanent threshold shift (PTS), do not imply any specific SPL, duration, or number of pings. The SPL and duration of each received ping are used to calculate the total SEL and determine whether the received SEL meets or exceeds the effect thresholds. For example, the sub-TTS behavioral effects threshold of 173 dB SEL would be reached through any of the following exposures:

A single ping with SPL = 173 dB re 1 mPa and duration = 1 second.

A single ping with SPL = 170 dB re 1 mPa and duration = 2 seconds.

Two pings with SPL = 170 dB re 1 mPa and duration = 1 second.

Two pings with SPL = 167 dB re 1 mPa and duration = 2 seconds.

Potential Physiological Effects

Physiological function is any of a collection of processes ranging from biochemical reactions to mechanical interaction and operation of organs and tissues within an animal. A physiological effect may range from the most significant of impacts (i.e., mortality and serious injury) to lesser effects that would define the lower end of the physiological impact range, such as non-injurious short-term impacts to auditory tissues.

Exposure to some types of noise may cause a variety of physiological effects in mammals. For example, exposure to very high sound levels may affect the function of the visual system, vestibular system, and internal organs (Ward, 1997). Exposure to high-intensity sounds of sufficient duration may cause injury to the lungs and intestines (e.g., Dalecki *et al.*, 2002). Sudden, intense sounds may elicit a ''startle'' response and may be followed by an orienting reflex (Ward, 1997; Jansen, 1998). The primary physiological effects of sound, however, are on the auditory system (Ward, 1997).

Hearing Threshold Shift

In mammals, high-intensity sound may rupture the eardrum, damage the small bones in the middle ear, or over-stimulate the electromechanical hair cells that convert the fluid motions caused by sound into neural impulses that are sent to the brain. Lower level exposures may cause hearing loss, which is called a threshold shift (TS) (Miller, 1974). Incidence of TS may be either permanent, in which case it is called a permanent threshold shift (PTS), or temporary, in which case it is called a temporary threshold shift (TTS). PTS consists of non-recoverable physical damage to the sound receptors in the ear, which can include total or partial deafness, or an impaired ability to hear sounds in specific frequency ranges. TTS is recoverable and is considered to result from temporary, non-injurious impacts to hearing-related tissues. Hearing loss may affect an animal's ability to react normally to the sounds around it.

The amplitude, duration, frequency, and temporal pattern of sound exposure all affect the amount of associated TS. As amplitude and duration of sound exposure increase, so, generally, does the amount of TS. For continuous sounds, exposures of equal energy will lead to approximately equal effects (Ward, 1997). For intermittent sounds, less TS will occur than from a continuous exposure with the same energy (some recovery will occur between exposures) (Kryter *et al.*, 1966; Ward, 1997). Additionally, though TTS is temporary, very prolonged exposure to sound strong enough to elicit TTS, or

shorter-term exposure to sound levels well above the TTS threshold, can cause PTS, at least in terrestrial mammals (Kryter, 1985).

Additional detailed information regarding threshold shifts may be viewed in the Navy's RIMPAC application and in the USWTR DEIS.

Acoustically Mediated Bubble Growth

One theoretical cause of injury to marine mammals is rectified diffusion (Crum and Mao, 1996), the process of increasing the size of a bubble by exposing it to a sound field. This process could be facilitated if the environment in which the ensonified bubbles exist is supersaturated with gas. Repetitive diving by marine mammals can cause the blood and some tissues to accumulate gas to a greater degree than is supported by the surrounding environmental pressure (Ridgway and Howard, 1979). The deeper and longer dives of some marine mammals (for example, beaked whales) are theoretically predicted to induce greater supersaturation (Houser *et al.*, 2001b). If rectified diffusion were possible in marine mammals exposed to high-level sound, conditions of tissue supersaturation could theoretically speed the rate and increase the size of bubble growth. Subsequent effects due to tissue trauma and emboli would presumably mirror those observed in humans suffering from decompression sickness.

It is unlikely that the short duration of sonar pings would be long enough to drive bubble growth to any substantial size, if such a phenomenon occurs. However, an alternative but related hypothesis has also been suggested: stable bubbles could be destabilized by high-level sound exposures such that bubble growth then occurs through static diffusion of gas out of the tissues. In such a scenario the marine mammal would need to be in a gas-supersaturated state for a long enough period of time for bubbles to become of a problematic size. Yet another hypothesis has speculated that rapid ascent to the surface following exposure to a startling sound might produce tissue gas saturation sufficient for the evolution of nitrogen bubbles (Jepson *et al.*, 2003). In this scenario, the rate of ascent would need to be sufficiently rapid to compromise behavioral or physiological protections against nitrogen bubble formation. Collectively, these hypotheses can be referred to as ''hypotheses of acoustically mediated bubble growth.''

Although theoretical predictions suggest the possibility for acoustically mediated bubble growth, there is considerable disagreement among scientists as to its likelihood (Piantadosi and Thalmann, 2004; Evans and Miller, 2003). To date, Energy Levels (ELs) predicted to cause *in vivo* bubble formation within diving cetaceans have not been evaluated (NOAA, 2002b). Further, although it has been argued that traumas from some recent beaked whale strandings are consistent with gas emboli and bubble-induced tissue separations (Jepson *et al.*, 2003), there is no conclusive evidence of this. Because evidence supporting the potential for acoustically mediated bubble growth is debatable, this proposed IHA does not give it any special treatment. Additionally, the required mitigation measures, which are designed to avoid behavioral disruptions that could result in abnormal vertical movement by whales through the water column, should also reduce the potential for creating circumstances that theoretically contribute to harmful bubble growth.

Additional information on the physiological effects of sound on marine mammals may be found in the Navy's IHA application and associated Environmental Assessment, the USWTR DEIS, and on the Ocean Acoustic Program section of the NMFS website (see **ADDRESSES**).

Stress Responses

In addition to PTS and TTS, exposure to mid-frequency sonar is likely to result in other physiological changes that have other consequences for the health and ecological fitness of marine mammals. There is mounting evidence that wild animals respond to human disturbance in the same way that they respond to predators (Beale and Monaghan, 2004; Frid, 2003; Frid and Dill, 2002; Gill *et al.*, 2000; Gill and Sutherland, 2001; Harrington and Veitch, 1992; Lima, 1998; Romero, 2004). These responses manifest themselves as interruptions of essential behavioral or physiological events, alteration of an animal's time or energy budget, or stress responses in which an animal perceives human activity as a potential threat and undergoes physiological changes to prepare for a flight or fight response or more serious physiological changes with chronic exposure to stressors (Frid and Dill, 2002; Romero, 2004; Sapolsky *et al.*, 2000; Walker *et al.*, 2005).

Classic stress responses begin when an animal's central nervous system perceives a potential threat to its homeostasis. That perception triggers stress responses regardless of whether a stimulus actually threatens the animal; the mere perception of a threat is sufficient to trigger a stress response (Sapolsky *et al.*, 2005; Seyle, 1950). Once an animal's central nervous system perceives a threat, it develops a biological response or defense that consists of a combination of the four general biological defense responses: behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune response.

The physiological mechanisms behind stress responses involving the hypothalamus-pituitary-adrenal glands have been well-established through controlled experiment in the laboratory and natural settings (Korte *et al.* 2005; McEwen and Seeman, 2000; Moberg, 1985; 2000; Sapolsky *et al.*, 2005). Relationships between these physiological processes, animal behavior, neuroendocrine responses, immune responses, inhibition of reproduction (by suppression of pre-ovulatory luteinizing hormones), and the costs of stress responses have also been documented through controlled experiment in both laboratory and free-living animals (for examples see, Holberton *et al.*, 1996; Hood *et al.*, 1998; Jessop *et al.*, 2003; Krausman *et al.*, 2004; Lankford *et al.*, 2005; Reneerkens *et al.*, 2002; Thompson and Hamer, 2000; Tilbrook *et al.*, 2000).

The available evidence suggests that: with the exception of unrelieved pain or extreme environmental conditions, in most animals (including humans) chronic stress results from exposure to a series of acute stressors whose cumulative biotic costs produce a pathological or pre-pathological state in an animal. The biotic costs can result from exposure to an acute stressor or from the accumulation of a series of different stressors acting in concert before the animal has a chance to recover.

Although these responses have not been explicitly identified in marine mammals, they have been identified in other vertebrate animals and every vertebrate mammal that has been studied, including humans. Because of the physiological similarities between marine mammals and other mammal species, NMFS believes that acoustic energy sufficient to trigger onset PTS or TTS is likely to initiate physiological stress responses. More importantly, NMFS believes that marine mammals might experience stress responses at received levels lower than those necessary to trigger onset TTS.

Potential Behavioral Effects

For a military readiness activity, Level B Harassment is defined as ''any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural

behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered.''

As discussed above, TTS consists of temporary, short-term impacts to auditory tissue that alter physiological function, but that are fully recoverable without the requirement for tissue replacement or regeneration. An animal that experiences a temporary reduction in hearing sensitivity suffers no permanent injury to its auditory system, but, for an initial time post-exposure, may not perceive some sounds due to the reduction in sensitivity. As a result, the animal may not respond to sounds that would normally produce a behavioral reaction (such as a predator or the social calls of conspecifics, which play important roles in mother-calf relations, reproduction, foraging, and warning of danger). This lack of response qualifies as a temporary disruption of normal behavioral patterns - the animal is impeded from responding in a normal manner to an acoustic stimulus.

NMFS also considers disruption of the behavior of marine mammals that can result from sound levels lower than those considered necessary for TTS to occur (often referred to as sub-TTS behavioral disruption). Though few studies have specifically documented the effects of tactical mid-frequency sonar on the behavior of marine mammals in the wild, many studies have reported the effects of a wide range of intense anthropogenic acoustic stimuli on specific facets of marine mammal behavior, including migration (Malme *et al.*, 1984; Ljungblad *et al.*, 1988; Richardson *et al.*, 1999), feeding (Malme *et al.*, 1988), and surfacing (Nowachek *et al.*, 2004). Below, NMFS summarizes the results of two studies and one after-the-fact investigation wherein the natural behavior patterns of marine mammals exposed to levels of tactical mid-frequency sonar, or sounds similar to mid-frequency sonar, lower than those thought to induce TTS were disrupted to the point where it was abandoned or significantly altered:

(1) Finneran and Schlundt (2004) analyzed behavioral observations from related TTS studies (Schlundt *et al.*, 2000; Finneran *et al.*, 2001; 2003) to calculate cetacean behavioral reactions as a function of known noise exposure. During the TTS experiments, 4 dolphins and 2 white whales were exposed during a total of 224 sessions to 1–s pulses between 160 and 204 dB re 1 microPa (root-mean-square sound pressure level (SPL)), at 0.4, 3, 10, 20, and 75 kHz. Finneran and Schlundt (2004) evaluated the behavioral observations in each session and determined whether a ''behavioral alteration'' (ranging from modifications of response behavior during hearing sessions to attacking the experimental equipment) occurred. For each frequency, the percentage of sessions in which behavioral alterations occurred was calculated as a function of received noise SPL. By pooling data across individuals and test frequencies, respective SPL levels coincident with responses by 25, 50, and 75 percent behavioral alteration were documented. 190 dB re 1 microPa (SPL) is the point at which 50 percent of the animals exposed to 3, 10, and 20 kHz tones were deemed to respond with some behavioral alteration, and the threshold that the Navy originally proposed for sub-TTS behavioral disturbance.

(2) Nowacek *et al.* (2004) conducted controlled exposure experiments on North Atlantic right whales using ship noise, social sounds of con-specifics, and an alerting stimulus (frequency modulated tonal signals between 500 Hz and 4.5 kHz). Animals were tagged with acoustic sensors (D-tags) that simultaneously measured movement in three dimensions. Whales reacted strongly to alert signals at received levels of 133–148 dB SPL, mildly to conspecific signals, and not at all to ship sounds or actual vessels. The alert stimulus caused whales to immediately cease foraging behavior and swim rapidly to the surface. Although SEL values were not directly reported, based on received exposure durations, approximate received values were on the order of 160 dB re: 1 microPa^2–s.

(3) NMFS (2005) evaluated the acoustic exposures and coincident behavioral reactions of killer whales in the presence of tactical mid-frequency sonar. In this case, none of the animals were directly fitted with acoustic dosimeters. However, based on a Naval Research Laboratory (NRL) analysis that took advantage of the fact that calibrated measurements of the sonar signals were made in situ and using advanced modeling to bound likely received exposures, estimates of received sonar signals by the killer whales were possible. Received SPL values ranged from 121 to 175 dB re: 1 microPa. The most probable SEL values were 169.1 to 187.4 dB re: 1 microPa^2–s; worst-case estimates ranged from 177.7 to 195.8 dB re: 1 microPa^2–s. Researchers observing the animals during the course of sonar exposure reported unusual alterations in swimming, breathing, and diving behavior.

For more detailed information regarding how marine mammals may respond to sound, see the Navy's IHA application, the Navy's associated EA, Richardson's Marine Mammals and Noise (1995), or the references cited on NMFS' Ocean Acoustic Program website (see **ADDRESSES**)

Proposed Harassment Thresholds

For the purposes of the proposed IHA for this activity, NMFS recognizes three levels of take; Level A Harassment (Injury), Level B Harasssment (Behavioral Disruption), and mortality (or serious injury that may lead to mortality) (Table 2). Mortality, or serious injury leading to mortality, may not be authorized with an IHA.

NMFS has determined that for acoustic effects, acoustic thresholds are the most effective way to consistently both apply measures to avoid or minimize the impacts of an action and to quantitatively estimate the effects of an action. Thresholds are commonly used in two ways: (1) To establish a shut-down or power down zone, i.e., if an animal enters an area calculated to be ensonified above the level of an established threshold, a sound source is powered down or shut down; and (2) to calculate take, for example, if the Level A Harassment threshold is 215 dB, a model may be used to calculate the area around the sound source that will be ensonified to that level or above, then, based on the estimated density of animals and the distance that the sound source moves, NMFS can estimate the number of marine mammals exposed to 215 dB. The rationale behind the acoustic thresholds proposed for this authorization are discussed below.

Levels of Take Pursuant to the MMPA	Basis of Threshold	Proposed Threshold
Level A harassment (Injury)	Permanent Threshold Shift (PTS).	215 dB (SEL).
Level B Harassment (Behavioral Effects)	Temporary Threshold Shift (PTS).	195 dB.
	Sub-TTS Behavioral Effects ..	173 dB (SEL).
Mortality, or Serious Injury That May Lead to Mortality (Stranding)	Not enough information for quantitative threshold.	May not be authorized with an IHA.

Table 2. The three levels of take addressed in the MMPA, how NMFS measures them in regard to acoustic effects, and the propsed thresholds for this authorization.

TTS

Because it is non-injurious, NMFS considers TTS as Level B harassment (behavioral disruption) that is mediated by physiological effects on the auditory system. The smallest measurable amount of TTS (onset-TTS) is taken as the best indicator for slight temporary sensory impairment. However, as mentioned earlier, NMFS believes that behavioral disruptions may result from received levels of tactical sonar lower than those thought to induce TTS and, therefore, NMFS does not consider onset TTS to be the lowest level at which Level B Harassment may occur. NMFS considers the threshold for Level B Harasment as the received levels from which sub-TTS behavioral disruptions are likely to result (discussed in Sub-TTS sub-section). However, the threshold for Level A Harassment (PTS) is derived from the threshold for TTS and, therefore, it is necessary to describe how the TTS threshold was developed.

The proposed TTS threshold is primarily based on the cetacean TTS data from Schlundt *et al.* (2000). These tests used short-duration tones similar to sonar pings, and they are the most directly relevant data for the establishing TTS criteria. The mean exposure EL required to produce onset-TTS in these tests was 195 dB re 1 microPa^2–s. This result is corroborated by the short-duration tone data of Finneran *et al.* (2000, 2003) and the long-duration noise data from Nachtigall *et al.* (2003a,b). Together, these data demonstrate that TTS in cetaceans is correlated with the received EL and that onset-TTS exposures are fit well by an equal-energy line passing through 195 dB re 1 microPa^2–s.

The justification for establishing the 195 dB acoustic criteria for TTS is described in detail in both the Navy's RIMPAC IHA application and the USWTR DEIS (see ADDRESSES).

PTS

PTS consists of non-recoverable physical damage to the sound receptors in the ear and is, therefore, classified as Level A harassment under the MMPA. For acoustic effects, because the tissues of the ear appear to be the most susceptible to the physiological effects of sound, and because threshold shifts (TSs) tend to occur at lower exposures than other more serious auditory effects, NMFS has determined that permanent threshold shift (PTS) is the best indicator for the smallest degree of injury that can be measured. Therefore, the acoustic exposure associated with onset-PTS is used to define the lower limit of the Level A harassment.

PTS data do not currently exist for marine mammals and are unlikely to be obtained due to ethical concerns. However, PTS levels for these animals may be estimated using TTS data and relationships between TTS and PTS. NMFS proposes the use of 215 dB re 1 mPa^2–s as the acoustic threshold for PTS. This threshold is based on a 20 dB increase in exposure EL over that required for onset-TTS (195 dB). Extrapolations from terrestrial mammal data indicate that PTS occurs at 40 dB or more of TS, and that TS growth occurs at a rate of approximately 1.6 dB TS per dB increase in EL. There is a 34 dB TS difference between onset-TTS (6 dB) and onset-PTS (40 dB). Therefore, an animal would require approximately 20dB of additional exposure (34 dB divided by 1.6 dB) above onset-TTS to reach PTS.

The justification for establishing the 215 dB acoustic criteria for PTS is described in detail in both the Navy's RIMPAC IHA application and the Undersea Warfare Training Range USWTR DEIS (see **ADDRESSES**).

Sub-TTS Behavioral Disruption

NMFS believes that behavioral disruption of marine mammals may result from received levels of mid-frequency sonar lower than those believed necessary to induce TTS, and further, that the lower limit of Level B Harassment may be defined by the received sound levels associated with these sub-TTS behavioral disruptions. As of yet, no controlled exposure experiments have been conducted wherein wild cetaceans are deliberately exposed to tactical mid-frequency sonar and their reactions carefully observed. However, NMFS believes that in the absence of controlled exposure experiments, the following investigations and reports (described previously in the Behavioral Effects section) constitute the best available scientific information for establishing an appropriate acoustic threshold for sub-TTS behavioral disruption: (1) Finneran and Schlundt (2004), in which behavioral observations from TTS studies of captive bottlenose dophins and beluga whales are analyzed as a function of known noise exposure; (2) Nowachek et al. (2004), in which controlled exposure experiments were conducted on North Atlantic right whales using ship noise, social sounds of con-specifics, and an alerting stimulus; and (3) NMFS (2005), in which the behavioral reactions of killer whales in the presence of tactical mid-frequency sonar were observed, and analyzed after the fact. Based on these three studies, NMFS has set the sub-TTS behavioral disruption threshold at 173 dB re 1 mPa^2–s (SEL).

The Finneran and Schlundt (2004) analysis is an important piece in the development of an appropriate acoustic threshold for sub-TTS behavioral disruption because: (1) researchers had superior control over and ability to quantify noise exposure conditions; (2) behavioral patterns of exposed marine mammals were readily observable and definable; and, (3) fatiguing noise consisted of tonal noise exposures with frequencies contained in the tactical mid-frequency sonar bandwidth. In Finneran and Schlundt (2004) 190 dB re 1 mPa (SPL) is the point at which 50 percent of the animals exposed to 3, 10, and 20 kHz tones were deemed to respond with some behavioral alteration. This 50 percent behavior alteration level (190 dB SPL) may be converted to an SEL criterion of 190 dB re 1 mPa^2–s (the numerical values are identical because exposure durations were 1–s), which provides consistency with the Level A (PTS) effects threshold, which are also expressed in SEL. The Navy proposed 190 dB (SEL) as the acoustic threshold for sub-TTS

behavioral disruption in the first IHA application they submitted to NMFS.

NMFS acknowledges the advantages arising from the use of behavioral observations in controlled laboratory conditions; however, there is considerable uncertainty regarding the validity of applying data collected from trained captives conditioned to not respond to noise exposure in establishing thresholds for behavioral reactions of naive wild individuals to a sound source that apparently evokes strong reactions in some marine mammals. Although wide-ranging in terms of sound sources, context, and type/extent of observations reported, the large and growing body of literature regarding behavioral reactions of wild, naive marine mammals to anthropogenic exposure generally suggests that wild animals are behaviorally affected at significantly lower levels than those determined for captive animals by Finneran and Schlundt (2004). For instance, some cetaceans exposed to human noise sound sources, such as seismic airgun sounds and low frequency sonar signals, have been shown to exhibit avoidance behavior when the animals are exposed to noise levels of 140–160 dB re: 1 mPa under certain conditions (Malme *et al.*, 1983; 1984; 1988; Ljungblad *et al.*, 1988; Tyack and Clark, 1998). Richardson *et al.* (1995) reviewed the behavioral response data for many marine mammal species and a wide range of human sound sources.

Two specific situations for which exposure conditions and behavioral reactions of free-ranging marine mammals exposed to sounds very similar to those proposed for use in RIMPAC are considered by Nowacek et al. (2004) and NMFS (2005) (described previously in Behavioral Effects subsection). In the Nowacek et al. (2004) study, North Atlantic right whales reacted strongly to alert signals at received levels of 133–148 dB SPL, which, based on received exposure durations, is approximately equivalent to 160 dB re: 1 mPa2–s (SEL). In the NMFS (2005) report, unusual alterations in swimming, breathing, and diving behaviors of killer whales observed by researchers in Haro Strait were correlated, after the fact, with the presence of estimated received sound levels between 169.1and 187.4 dB re: 1 mPa^2–s (SEL).

While acknowledging the limitations of all three of these studies and noting that they may not necessarily be predictive of how wild cetaceans might react to mid-frequency sonar signals in the OpArea, NMFS believes that these three studies are the best available science to support the selection of an acoustic sub-TTS behavioral disturbance threshold at this time. Taking into account all three studies, NMFS has established 173 dB re: 1 mPa^2 (SEL) as the threshold for sub-TTS behavioral disturbance.

Stranding and Mortality

Over the past 10 years, there have been four stranding events coincident with military mid-frequency sonar use that are believed to most likely have been caused by exposure to the sonar. These occurred in Greece (1996), the Bahamas (2000), Madeira (2000) and Canary Islands (2002). A number of other stranding events coincident to the operation of mid-frequency sonar and resulting in the death of beaked whales or other species (minke whales, dwarf sperm whales, pilot whales) have been reported, though the majority have not been investigated to the level of the Bahamas stranding and, therefore, other causes cannot be ruled out. One of these strandings occurred in Hanalei Bay during the last RIMPAC exercise in 2004.

Greece, Madeira, and Canary Islands

Twelve Cuvier's beaked whales stranded along the western coast of Greece in 1996. The test of a low- and mid-frequency active sonar system conducted by NATO was correlated with the strandings by an analysis published in *Nature*. A subsequent NATO investigation found the strandings to be closely related, in time, to the movements of the sonar vessel, and ruled out other physical factors as a cause.

In 2000, four beaked whales stranded in Madeira while several NATO ships were conducting an exercise near shore. Scientists investigating the stranding found that the injuries, which included blood in and around the eyes, kidney lesions, and pleural hemorrhage, as well as the pattern of the stranding suggested that a similar pressure event precipitated or contributed to strandings in both Madeira and Bahamas (see Bahamas sub-section).

In 2002, at least 14 beaked whales of three different species stranded in the Canary Islands while a naval exercise including Spanish vessels, U.S. vessels, and at least one vessel equipped with mid-frequency sonar was conducted in the vicinity. Four more beaked whales stranded over the next several days. The subsequent investigation, which was reported in both *Nature* and *Veterinary Pathology*, revealed a variety of traumas, including emboli and lesions suggestive of decompression sickness.

Bahamas

NMFS and the Navy prepared a joint report addressing the multi-species stranding in the Bahamas in 2000, which took place within 24 hours of U.S. Navy ships using active mid-frequency sonar as they passed through the Northeast and Northwest Providence Channels. Of the 17 cetaceans that stranded (Cuvier's beaked whales, Blainsville's beaked whales, Minke whales, and a spotted dolphin), seven animals died on the beach (5 Cuvier's beaked whales, 1 Blainsville's beaked whale, and the spotted dolphin) and the other 10 were returned to the water alive (though their fate is unknown). A comprehensive investigation was conducted and all possible causes of the stranding event were considered, whether they seemed likely at the outset or not. The only possible contributory cause to the strandings and cause of the lesions that could not be ruled out was intense acoustic signals (the dolphin necropsy revealed a disease and the death is considered unrelated to the others).

Based on the way in which the strandings coincided with ongoing naval activity involving tactical mid-frequency sonar use, in terms of both time and geography, the nature of the physiological effects experienced by the dead animals, and the absence of any other acoustic sources, the investigation team concluded that mid-frequency sonars aboard U.S. Navy ships that were in use during the sonar exercise in question were the most plausible source of this acoustic or impulse trauma. This sound source was active in a complex environment that included the presence of a surface duct, unusual and steep bathymentry, a constricted channel with limited egress, intensive use of multiple, active sonar units over an extended period of time, and the presence of beaked whales that appear to be sensitive to the frequencies produced by these sonars. The investigation team concluded that the cause of this stranding event was the confluence of the Navy mid-frequency sonar and these contributory factors working together, and further recommended that the Navy avoid operating mid-frequency sonar in situations where these five factors would be likely to occur. This report does not conclude that all five of these factors must be present for a stranding to occur, nor that beaked whales are the only species that could potentially be affected by the confluence of the other factors. Based on this, NMFS believes that the presence of surface ducts, steep bathymetry, and/or constricted channels added to the operation of mid-frequency

sonar in the presence of cetaceans (especially beaked whales and, potentially, deep divers) may increase the likelihood of producing a sound field with the potential to cause cetaceans to strand, and therefore, necessitates caution.

Hanalei Bay

Approximately 150–200 melon-headed whales (*Peponocephala electra* - a deep water species) live stranded (i.e. the animals entered and remained in unusual habitat) in Hanalei Bay on the morning of July 3, 2004 at approximately 7 a.m. RIMPAC exercises involving mid-frequency sonar were conducted on July 3, but the official exercise did not commence until approximately 8 a.m. and, thus, could not have been the original triggering event. However, as six naval surface vessels traveled to the operational area the previous day, each intermittently transmitted active sonar during ''coordinated submarine training exercises'' as they approached Kauai from the south. NMFS conducted a detailed sound propagation analysis of the sonar transmissions of Japanese and U.S. naval vessels transiting from Pearl Harbor to Kauai on the afternoon and evening of 2 July 2004. Predicted sound fields were calculated for five positions along the known tracks. For each ship position where active sonar was used, transit speeds from areas to the south and east of Kauai necessary to reach Hanalei Bay by 7a.m. were determined. These transit rates were then compared with the ship locations and predicted sound fields. Results indicate that animals exposed to military sonar signals near the vessels could have reached the Bay while swimming at rates believed sustainable over relatively long periods for this species.

The analysis is by no means conclusive evidence that exposure to tactical sonar on 2 July resulted in the pod of whales stranding in Hanalei Bay on July 3. However, based on these results, NMFS concludes that it was possible that sonar transmissions caused behavioral responses in the animals that led to their swimming away from the sound source, into the sound shadow of the island of Kauai, and entering Hanalei Bay (a shallower environment than they usually inhabit). Further, it is possible that sonar transmissions during the official RIMPAC exercise on July 3 could have prevented some of whales from leaving the Bay (witnesses observed whales attempting several times to depart the Bay, only to return rapidly once just outside it). The Navy modeled the sound transmissions during the event and calculated that the received level at Hanalei Bay from the sonar operated at the PMRF range on July 3 would have been approximately 147.5 dB re 1 mPa.

Beaked Whales

Recent beaked whale strandings have prompted inquiry into the relationship between mid-frequency active sonar and the cause of those strandings. Although Navy mid-frequency active tactical sonar has been identified as the most plausible contributory source to the 2000 Bahamas stranding event, the specific mechanisms that led to that stranding are not understood, and there is uncertainty regarding the ordering of effects that led to the stranding. It is uncertain whether beaked whales were directly injured by sound (a physiological effect) prior to stranding or whether a behavioral response to sound occurred that ultimately caused the beaked whales to strand and be injured.

Several potential physiological outcomes caused by behavioral responses to high-intensity sounds have been suggested by Cox *et al.* (in press). These include: gas bubble formation caused by excessively fast surfacing; remaining at the surface too long when tissues are supersaturated with nitrogen; or diving prematurely when extended time at the surface is necessary to eliminate excess nitrogen. Baird *et al.* (2005) found that slow ascent rates from deep dives and long periods of time spent within 50 m of the surface were typical for both Cuvier's and Blainsville's beaked whales, the two species involved in mass strandings related to naval sonar. These two behavioral mechanisms may be necessary to purge excessive dissolved nitrogen concentrated in their tissues during their frequent long dives (Baird *et al.*, 2005). Baird *et al.* (2005) further suggests that abnormally rapid ascents or premature dives in response to high-intensity sonar could indirectly result in physical harm to the beaked whales, through the mechanisms described above (gas bubble formation or non-elimination of excess nitrogen).

During the RIMPAC exercise there will be use of multiple sonar units in an area where three beaked whale species may be present. A surface duct may be present in a limited area for a limited period of time. Although most of the ASW training events will take place in the deep ocean, some will occur in areas of high bathymetric relief. However, none of the training events will take place in a location having a constricted channel with limited egress similar to the Bahamas. Consequently, not all five of the environmental factors believed to contribute to the Bahamas stranding (mid-frequency sonar, beaked whale presence, surface ducts, steep bathymetry, and constricted channels with limited egress) will be present during RIMPAC ASW exercises. However, as mentioned previously, NMFS believes caution should be used anytime either steep bathymetry, surface ducting conditions, or a constricted channel is present in addition to the operation of mid-frequency tactical sonar and the presence of cetaceans (especially beaked whales).

In order to avoid the potential for mortality or serious injury leading to mortality (in the form of strandings), NMFS is requiring additional mitigation and monitoring beyond that proposed in the Navy's application. However, given the information regarding beaked whale strandings and the uncertainty regarding the mechanisms for the strandings, NMFS will treat all predicted behavioral disturbance of beaked whales as potential non-lethal injury. All predicted Level B harassment of beaked whales is therefore given consideration as non-lethal Level A harassment.

Estimated Take by Incidental Harassment

In order to estimate acoustic exposures from the RIMPAC ASW operations, acoustic sources to be used were examined with regard to their operational characteristics. Systems with acoustic source levels below 205 dB re 1 mPa were not included in the analysis given that at this source level (205 dB re 1 mPa) or below, a 1–second ping would attenuate below the behavioral disturbance threshold of 173 dB at a distance of about 100 meters. As additional verification that they did not need to be considered further, sources at this level were modeled, using spreadsheet calculations, to determine the marine mammal exposures estimated to result from their operation. For example, a sonobuoy's typical use yielded an exposure area that produced 0 marine mammal exposures based on the maximum animal density. Such a source was called non-problematic and was not modeled in the sense of running its parameters through the environmental model Comprehensive Acoustic System Simulation (CASS), generating an acoustic footprint, etc. The proposed counter measures source level was less than 205 dB but its operational modes were such that a simple ''look'' was not applicable, and a separate study was conducted to ensure it did not need to be considered further.

In addition, systems with an operating frequency greater than 100 kHz were not

analyzed in the detailed modeling as these signals attenuate rapidly, resulting in very short propagation distances. Acoustic countermeasures were previously examined and found not to be problematic. The AN/AQS 13 (dipping sonar) used by carrier based helicopters was determined in the Environmental Assessment/Overseas Environmental Assessment of the SH–60R Helicopter/ALFS Test Program, October 1999, not to be problematic due to its limited use and very short pulse length (2 to 5 pulses of 3.5 to 700 msec). Since 1999, during the time of the test program, there have been over 500 hours of operation, with no environmental effects observed. The Directional Command Activated Sonobuoy System (DICASS) sonobuoy was determined not to be problematic having a source level of 201dB re 1 mPa. These acoustic sources, therefore, did not require further examination in this analysis.

Based on the information above, only hull mounted mid-frequency active tactical sonar was determined to have the potential to affect marine mammals protected under the MMPA and ESA during RIMPAC ASW training events.

Model

An analysis was conducted for RIMPAC 2006, modeling the potential interaction of hull mounted mid-frequency active tactical sonar with marine mammals in the OpArea. The model incorporates site-specific bathymetric data, time-of-year-specific sound speed information, the sound source's frequency and vertical beam pattern, and multipath pressure information as a function of range, depth and bearing. Results were calculated based on the typical ASW activities planned for RIMPAC 2006. Acoustic propagation and mammal population and density data were analyzed for the July timeframe since RIMPAC occurs in July. The modeling occurred in five broad steps, listed below.

Step 1. Perform a propagation analysis for the area ensonified using spherical spreading loss and the Navy's CASS/GRAB program, respectively.

Step 2. Convert the propagation data into a two-dimensional acoustic footprint for the acoustic sources engaged in each training event as they move through the six acoustic exposure model areas.

Step 3. Calculate the total energy flux density level for each ensonified area summing the accumulated energy of all received pings.

Step 4. Compare the total energy flux density to the thresholds and determine the area at or above the threshold to arrive at a predicted marine mammal exposure area.

Step 5. Multiply the exposure areas by the corresponding mammal population density estimates. Sum the products to produce species sound exposure rate. Analyze this rate based on the annual number of events for each exercise scenario to produce annual acoustic exposure estimates.

The modeled estimate indicates the potential for a total of 33,331 Level B harassment exposures across all marine mammal species.

The results of the model (estimated Level B Harassment takes (Level A Harassment for beaked whales)) are presented in Table 1. When analyzing the results of the acoustic exposure modeling to provide an estimate of effects, it is important to understand that there are limitations to the ecological data used in the model, and that the model results must be interpreted within the context of a given species' ecology and biology.

NMFS believes that the model take estimates are overestimates for the following reasons:

(1) The implementation of the extensive mitigation and monitoring that will be required by the IHA (Including large power-down/shut-down zones, geographic restrictions, and monitors that will almost certainly sight groups of animals, if not individuals, in time to avoid/minimize impacts) have not been taken into account.

(2) In the model the Navy used to estimate take, marine mammals remain stationary as the sound source passes by and their immediate area is ensonified. NMFS believes that some, if not the majority of animals, will move away from the sound to some degree, thus receiving a lower level of energy than estimated by the model.

(3) NMFS interprets the results of the Navy's model as the number of times marine mammals might be exposed to particular received levels of sound. However, NMFS believes it would be unrealistic, considering the fast-paced, multi-vessel nature of the exercise and the fact that the exercise continues over the course of a month in an area with resident populations of cetaceans, to assume that each exposure involves a different whale; some whales are likely to be exposed once, while others are likely to be exposed more than once.Some elements of the Navy's modeling, such as its calculation of received levels without regard to where animals occur in the water column, are conservative. Other elements, such as its evaluation of some but not all acoustic sources that would be used during the exercise, may not be conservative. With regard to RIMPAC 2006, it is NMFS initial view that an extensive set of mitigation and monitoring requirements like those set forth in this notice would ensure that impacts on species and stocks are negligible. This conclusion would not necessarily apply to other naval acoustic activities whose operational and environmental parameters may differ. Additional detailed information regarding potential effects on individual species may be viewed in the Navy's IHA application (see **ADDRESSES**).

Potential Effects on Habitat

The primary source of marine mammal habitat impact is acoustic exposures resulting from ASW activities. However, the exposures do not constitute a long term physical alteration of the water column or bottom topography, as the occurrences are of limited duration and are intermittent in time. Surface vessels associated with the activities are present in limited duration and are intermittent as well.

Potential Effects on Subsistence Harvest of Marine Mammals

There is no known legal subsistence hunting for marine mammals in or near the survey area, so the proposed activities will not have any impact on the availability of the species or stocks for subsistence users.

Mitigation, Monitoring, and Reporting

The Navy has requested an Incidental Harassment Authorization (IHA) from NMFS for the take, by harassment, of marine mammals incidental to RIMPAC ASW exercises in the OpArea. Section 101(a)(5)(D) of the MMPA, the section pursuant to which IHAs are issued, may not be used to authorize mortality or serious injury leading to mortality. The Navy's analysis of the RIMPAC ASW exercises concluded that no mortality or serious injury leading to mortality would result from the proposed activities. However, NMFS believes that some marine mammals may react to mid-frequency sonar, at received levels lower than those thought to cause direct physical harm, with behaviors that may lead to physiological harm, stranding, or, potentially, death. Therefore, in processing the Navy's IHA request, NMFS has required additional mitigation and monitoring than originally proposed in the Navy's application to ensure that mortality or serious injury leading to mortality does not result from the proposed activities.

In any IHA issued there is the requirement to supply the ''means of

effecting the least practicable [adverse] impact upon the affected species.'' NMFS' determination of ''the least practicable adverse impact on the affected species'' includes consideration of personnel safety, practicality of implementation, and impact on the effectiveness of military readiness activities. While NMFS' proposed mitigation and monitoring requirements discussed below are intended to effect the ''least practicable adverse impact'', they are also designed to ensure that no mortality or serious injury leading to mortality occurs, so that an IHA may be legally issued under the MMPA.

Standard Operating Procedures Proposed in Navy Application

Navy shipboard lookout(s) are highly qualified and experienced observers of the marine environment. Their duties require that they report all objects sighted in the water to the Officer of the Deck (e.g., trash, a periscope, a marine mammal) and all disturbances (e.g., surface disturbance, discoloration) that may be indicative of a threat to the vessel and its crew. There are personnel serving as lookouts on station at all times (day and night) when a ship or surfaced submarine is moving through the water.

Navy lookouts undergo extensive training in order to qualify as a watchstander. This training includes on-the-job instruction under the supervision of an experienced watchstander, followed by completion of the Personal Qualification Standard program, certifying that they have demonstrated the necessary skills (such as detection and reporting of partially submerged objects). In addition to these requirements, many Fleet lookouts periodically undergo a 2–day refresher training course.

The Navy includes marine species awareness as part of its training for its bridge lookout personnel on ships and submarines. Marine species awareness training was updated in 2005 and the additional training materials are now included as required training for Navy lookouts. This training addresses the lookout's role in environmental protection, laws governing the protection of marine species, Navy stewardship commitments, and general observation information to aid in avoiding interactions with marine species. Marine species awareness and training is reemphasized by the following means:

Bridge personnel on ships and submarines – Personnel utilize marine species awareness training techniques as standard operating procedure, they have available the ''whale wheel'' identification aid when marine mammals are sighted, and they receive updates to the current marine species awareness training as appropriate.

Aviation units – All pilots and aircrew personnel, whose airborne duties during ASW operations include searching for submarine periscopes, report the presence of marine species in the vicinity of exercise participants.

Sonar personnel on ships, submarines, and ASW aircraft – Both passive and active sonar operators on ships, submarines, and aircraft utilize protective measures relative to their platform.

The Environmental Annex to the RIMPAC Operational Order mandates specific actions to be taken if a marine mammal is detected and these actions are standard operating procedure throughout he exercise.

Implementation of these protective measures is a requirement and involves the chain of command with supervision of the activities and consequences for failing to follow orders. Activities undertaken on a Navy vessel or aircraft are highly controlled. Very few actions are undertaken on a Navy vessel or aircraft without oversight by and knowledge of the chain of command. Failure to follow the orders of one's superior in the chain of command can result in disciplinary action.

Operating Procedures

The following procedures are implemented to maximize the ability of operators to recognize instances when marine mammals are close aboard and avoid adverse effects to listed species:

Visual detection/ships and submarines – Ships and surfaced submarines have personnel on lookout with binoculars at all times when the vessel is moving through the water. Standard operating procedure requires these lookouts maintain surveillance of the area visible around their vessel and to report the sighting of any marine species, disturbance to the water's surface, or object (unknown or otherwise) to the Officer in Command.

Visual detection/aircraft – Aircraft participating in RIMPAC ASW events will conduct and maintain, whenever possible, surveillance for marine species prior to and during the event. The ability to effectively perform visual searches by participating aircraft crew will be heavily dependent upon the primary duties assigned as well as weather, visibility, and sea conditions. Sightings would be immediately reported to ships in the vicinity of the event as appropriate.

Passive detection for submarines – Submarine sonar operators will review detection indicators of close-aboard marine mammals prior to the commencement of ASW operations involving active mid-frequency sonar.

When marine mammals are detected close aboard, all ships, submarines, and aircraft engaged in ASW would reduce mid-frequency active sonar power levels in accordance with the following specific actions:

(1) Helicopters shall observe/survey the vicinity of an event location for 10 minutes before deploying active (dipping) sonar in the water. Helicopters shall not dip their sonar within 200 yards of a marine mammal and shall secure pinging if a marine mammal closes within 200 yards after pinging has begun.

(2) Note: Safety radii, power-down, and shut-down zones proposed by the Navy have been replaced with more conservative measures required by NMFS and are discussed in the next section.

The RIMPAC Operational Order Environmental Annex (Appendix A) includes these specific measures that are to be followed by all exercise participants.

The Navy proposes that training be provided to exercise participants and NOAA officials before and during the in port phase of RIMPAC (26–30 Jun 06). This will consist of exercise participants (CO/XO/Ops) reviewing the C3F Marine Mammal Brief, available OPNAV N45 video presentations, and a NOAA brief presented by C3F on marine mammal issues in the Hawaiian Islands. The Navy will also provide the following training for RIMPAC participants:

(1)NUWC will train observers on marine mammal identification observation techniques

(2)Third fleet will brief all participants on marine mammal mitigation requirements

(3)Participants will receive video training on marine mammal awareness

(4)Navy offers NOAA/NMFS opportunity to send a rep to the ashore portion of the exercise to address participants and/or observe training.

Conservation Measures (Research)

The Navy will continue to fund ongoing marine mammal research in the Hawaiian Islands. Results of conservation efforts by the Navy in other locations will also be used to support efforts in the Hawaiian Islands. The Navy is coordinating long term monitoring/ studies of marine mammals on various established ranges and operating areas:

(1) Coordinating with NMFS to conduct surveys within the selected

Hawaiian Islands Operating Area as part of a baseline monitoring program.

(2) Implementing a long-term monitoring program of marine mammal populations in the OpArea, including evaluation of trends.

(3) Continuing Navy research and Navy contribution to university/external research to improve the state of the science regarding marine species biology and acoustic effects.

(4) Sharing data with NMFS and the public, via the literature, for research and development efforts.

The Navy has contracted with a consortium of researchers from Duke University, University of North Carolina at Wilmington, University of St. Andrews, and the NMFS Northeast Fisheries Science Center to conduct a pilot study analysis and develop a survey and monitoring plan that lays out the recommended approach for surveys (aerial/shipboard, frequency, spatial extent, etc.) and data analysis (standard line-transect, spatial modeling, etc.) necessary to establish a baseline of protected species distribution and abundance and monitor for changes that might be attributed to ASW operations on the Atlantic Fleet Undersea Warfare Training Range. The Research Design for the project will be utilized in evaluating the potential for implementing similar programs in the Hawaiian Islands ASW operations areas. In addition, a Statement of Interest has been promulgated to initiate a similar research and monitoring project in the Hawaiian Islands and the remainder of the Pacific Fleet OPAREAs. The execution of funding to begin the resultant monitoring is planned for the fall of 2006.

Reporting

The RIMPAC Operational Order Environmental Annex (see example in Appendix A of the application) includes specific reporting requirements related to marine mammals.

Additional Proposed Mitigation, Monitoring, and Reporting Measures Required by NMFS

The following protective mitigation and monitoring measures are proposed to be implemented in addition to the standard operating procedures discussed in the previous section:

(1) The Navy will operate sonar at the lowest practicable level, not to exceed 235 dB, except for occasional short periods of time to meet tactical training objectives.

(2) Safety Zones – When marine mammals are detected by any means (aircraft, lookout, or aurally) within 1000 m of the sonar dome (the bow), the ship or submarine will limit active transmission levels to at least 6 dB below the equipment's normal operating level for sector search modes. Within the water depths encompassed by the proposed RIMPAC areas, a 6–dB reduction in ping levels would reduce the range of potential acoustic effects to about half of its original distance. This, in turn, would reduce the area of acoustic effects to about one quarter of its original size. Ships and submarines would continue to limit maximum ping levels by this 6–dB factor until the animal has been seen to leave the area, has not been seen for 30 minutes, or the vessel has transited more than 2000 m beyond the location of the sighting.

Should the marine mammal be detected within or closing to inside 500 m of the sonar dome, active sonar transmissions will be limited to at least 10 dB below the equipment's normal operating level for sector search modes. Ships and submarines would continue to limit maximum ping levels by this 10–dB factor until the animal has been seen to leave the area, has not been seen for 30 minutes, or the vessel has transited more than 1500 m beyond the location of the sighting.

Should the marine mammal be detected within or closing to inside 200 m of the sonar dome, active sonar transmissions will cease. When a marine mammal or sea turtle is detected closing to inside approximately 200 m of the sonar dome, the principal risk becomes potential physical injury from collision. Accordingly, ships and submarines shall maneuver to avoid collision if the marine species closes within 200 m to the extent possible, with safety of the vessel being paramount. Sonar will not resume until the animal has been seen to leave the area, has not been seen for 30 minutes, or the vessel has transited more than 1200 m beyond the location of the sighting.

(3) In strong surface ducting conditions, the Navy will enlarge the safety zones such that a 6–dB power-down will occur if a marine mammal enters the zone within a 2000 m radius around the source, a 10–dB power-down will occur if an animal enters the 1000 m zone, and shut down will occur when an animal closes within 500 m of the sound source.

(4) In low visibility conditions (i.e., whenever the entire safety zone cannot be effectively monitored due to nighttime, high sea state, or other factors), the Navy will use additional detection measures, such as infrared (IR) or enhanced passive acoustic detection. If detection of marine mammals is not possible out to the prescribed safety zone, the Navy will power down sonar as if marine mammals were present in the zones they cannot see (for example, at night, if night goggles allow detection out to 1000 m, power-down would not be necessary under normal conditions, however, in strong surface duct conditions, the Navy would need to power down 6 dB, as they could not effectively detect mammals out to 2000 m, the prescribed safety zone).

(5) With the exception of three specific choke-point exercises (special measures outlined in item 8), the Navy will not conduct sonar activities in constricted channels or canyon-like areas.

(6) With the exception of three specific choke-point exercises (special measures outlined below), the Navy will not operate mid-frequency sonar within 25 km of the 200 m isobath.

(7) Navy watchstanders, the individuals responsible for detecting marine mammals in the Navy's standard operating procedures, will participate in marine mammal observer training by a NMFS-approved instructor (NMFS will work with Navy to develop appropriate format, potentially to be presented to Navy personnel during the port phase of RIMPAC, June 26–30). Training will focus on identification cues and behaviors that will assist in the detection of marine mammals and the recognition of behaviors potentially indicative of injury or stranding. Training will also include information aiding in the avoidance of marine mammals and the safe navigation of the vessel, as well as species identification review (with a focus on beaked whales and other species likely to strand). At least one individual who has received this training will be present, and on watch, at all times during operation of tactical mid-frequency sonar, on each vessel operating mid-frequency sonar.

(8) The Navy will conduct no more than three choke-point exercises. These exercises will occur in the Kaulakahi Channel (between Kauai and Niihau) and the Alenuihaha Channel (between Maui and Hawaii). These exercises will not be conducted in a constricted channel like was present in the Bahamas, but will fall outside of the requirements listed above, i.e., to avoid canyon-like areas and to operate sonar farther than 25 km from the 200 m isobath. Therefore, NMFS has required additional mitigation and monitoring measures for these three exercises designed to avoid the possibility of mortality, or serious injury leading to mortality, of marine mammals. The additional measures for these three choke-point exercises below are as follows:

a. The Navy will provide NMFS (Stranding Coordinator and Protected Resources, Headquarters) and the Hawaii marine patrol with information regarding the time and place for the choke-point exercises in advance of the exercises.

b. The Navy will have at least one dedicated Navy observer that has received the training mentioned above, on board each ship and conducting observations during the operation of mid-frequency tactical sonar during the choke-point exercises. The Navy has also authorized the presence of two experienced marine mammal observers (non-Navy personnel) to embark on Navy ships for observation during the exercise.

c. The Navy will coordinate a focused monitoring effort around the choke-point exercises, to include pre-exercise monitoring (2 hours), during-exercise monitoring, and post-exercise monitoring (1–2 days). This monitoring effort will include at least one dedicated aircraft or one dedicated vessel for realtime monitoring from the pre- through post-monitoring time period, except at night. The vessel or airplane may be operated by either dedicated Navy personnel, or non-Navy scientists contracted by the Navy, who will be in regular communication with a Tactical Officer with the authority to shut-down, power-down, or delay the start-up of sonar operations. These monitors will communicate with this Officer to ensure the safety zones are clear prior to sonar start-up, to recommend power-down and shut-down during the exercise, and to extensively search for potentially injured or stranding animals in the area and down-current of the area post-exercise.

d. The Navy will further contract an experienced cetacean researchers to conduct systematic aerial reconnaissance surveys and observations before, during, and after the choke-point exercises with the intent of closely examining local populations of marine mammals during the RIMPAC exercise.

e. For the Kaulakahi Channel (between Kauai and Niihau), shoreline reconnaissance and nearshore observations will be undertaken by a team located at Kekaha (the approximate mid point of the Channel). One of these individuals was formerly employed by NOAA as a marine mammal observer and trained NOAA personnel in marine mammal observation techniques. Additional observations will be made on a daily basis by range vessels while enroute from Port Allen to the range at PMRF (a distance of approximately 16 nmi) and upon their return at the end of each day's activities. Finally, surveillance of the beach shoreline and nearshore waters bounding PMRF will occur randomly around the clock a minimum four times in each 24 hour period.

f. For the Alenuihaha Channel (between Maui and Hawaii), in addition to aerial reconnaissance as described previously, the Navy will undertake shoreline reconnaissance and nearshore observations by a team rotating between Mahukona and Lapakahi before, during, and after the exercise.

(9) NMFS and the Navy will continue coordination on the ''Communications and Response Protocol for Stranded Marine Mammal Events During Navy Operations in the Pacific Islands Region'' that is currently under preparation by NMFS PIRO to facilitate communication during RIMPAC. The Navy will coordinate with the NMFS Stranding Coordinator for any unusual marine mammal behavior, including stranding, beached live or dead cetacean(s), floating marine mammals, or out-of-habitat/milling live cetaceans that may occur at any time during or shortly after RIMPAC activities. After RIMPAC, NMFS and the Navy (CPF) will prepare a coordinated report on the practicality and effectiveness of the protocol that will be provided to Navy/NMFS leadership.

(10)The Navy will provide a report to NMFS after the completion of RIMPAC that includes:

a. An estimate of the number of marine mammals harassed based on both modeled sound and sightings of marine mammals.

b. An assessment of the effectiveness of the mitigation and monitoring measures with recommendations of how to improve them.

c. Results of the marine species monitoring during the RIMPAC exercise.

d. As much unclassified information as the Navy can provide including, but not limited to, where and when sonar was used (including sources not considered in take estimates, such as submarine and aircraft sonars) in relation to any measured received levels (such as at sonobuoys or on PMRF range), source levels, numbers of sources, and frequencies, so it can be coordinated with observed cetacean behaviors.

The mitigation and monitoring proposed in this IHA are intended to function adaptively, and NMFS fully expects to refine them for future authorizations based on the reporting input from the Navy.

Negligible Impact Determination and Avoidance of Mortality of Marine Mammals

Negligible impact is defined as ''...an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.'' Because NMFS does not expect any mortality or injury to result from these activities, NMFS believes the authorized takings, by harassment, can be reasonably expected to not adversely affect the species or stock through effects on annual rates of survival. NMFS acknowledges that Level B Harassment to large enough portions of a species or stock or over a long enough time could potentially adversely affect survival rates, however, due to the required mitigation and monitoring during this proposed activity (which reduce the numbers of animals exposed and the levels they are exposed to), as well as the duration and nature of the activities, NMFS does not believe RIMPAC will adversely affect survival.

As discussed earlier (see Stress Responses), some portion of the animals exposed to SELs greater than 173 dB during the RIMPAC exercises will undergo a physiological stress response. Relationships between stress responses and inhibition of reproduction (by suppression of pre-ovulatory luteinizing hormones, for example) have been well-documented. However, NMFS believes the manner in which individual animals respond to different stressors varies across a continuum that is normally distributed with hyper-sensitive and hypo-sensitive animals being on the tails of the curve. Therefore, NMFS does not believe that much more than a small portion of animals exposed to sound levels above 173 dB would respond in a manner that physiologically inhibits reproduction. Additionally, suppression of pre-ovulatory luteinizing hormones would only be of a concern to species whose period of reproductive activity overlaps in time and space with RIMPAC. NMFS also believes that due to the enhanced nature of the monitoring required in this authorization, combined with the shutdown zones, the likelihood of seeing and avoiding mother/calf pairs or animals engaged in social reproductive behaviors is high. Consequently, NMFS believes it is unlikely the authorized takings will adversely affect the species stocks through effects on annual rates of recruitment.

Table 3 summarizes the reasoning behind NMFS' preliminary negligible

impact determination, in terms of how mitigation measures contribute towards it and what other factors were considered. Several of the measures addressed have a visual monitoring component, which NMFS recognizes is most effective in reducing impacts to larger animals and species that travel in larger groups. However, NMFS has also included coastal and steep bathymetry restrictions, and extended power-down/shut-down zones, which will significantly reduce the numbers of animals taken, regardless of whether they are cryptic or easily seen, and will effectively avoid the likelihood of mortality, or serious injury, of marine mammals.

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Qualitative Assessment of Negligible Impact and Avoidance of Mortality and Serious Injury	
Measures that make the chances of a stranding highly unlikely	**Mechanisms**
1) No sonar operation in areas of steep bathymetry or constricted channels (except for 3 chokepoint exercises)	Measures 1, 2, 3, and 4 all reduce the chances of a confluence of 3 or more of the five factors believed to have contributed to the Bahamas stranding
2) Expanded power-/shut-down zone in strong surface-ducting conditions (2 km power-down, 500m shutdown)	Measure 3 also gives beaked whales (or other deep divers) that may potentially have been driven by sonar into a constricted channel or shallow disorienting circumstances, a wider berth around the sound source to escape to deeper water through
3) No sonar operation within 25 km of 200 m isobath (except for three chokepoint exercises)	Measure 4 (because of wider view and ability to cover larger area) specifically decreases the chances that animals will enter the safety zone without being seen and increases the chances that injured animals or animals exibiting abnormal behaviors (indicative of a potential stranding) are sighted, and sonar shut down
4) During chokepoint exercises, real-time aerial monitoring linked to sonar operation (to advise shut-down, etc.)	*All Measures in this section also reduce #s animals exposed and levels exposed to
Measures that further contribute to a negligible impact	
5) Expanded (beyond approximate injury threshold isopleth) power-down zones during normal conditions	In Measure 5 (versus the power-/shutdown at injury threshold required in previous authorizations), power-down will occur if an animal gets within 1000 m (which NMFS believes will typically be at a distance ensonified to a lower level than that thought to induce injury) and again at 500 m, which will both reduce the numbers of animals exposed and the levels to which they are exposed.
6) NMFS-trained lookouts will visually monitor around all ships operating mid-frequency sonar	
7) Though most are not dedicated observers, all RIMPAC participants (many with good opportunity) are required to report marine mammal sightings to the Officer in Command (lookouts, pilots, passive acoustic monitors)	In Measures 4, 6, and 7, real-time monitoring, in combination with power- and shut-down zones, decreases both the number of animals potentially exposed to sound, and the sound level to which they are exposed
Further considerations in the negligble impact determination for this specific activity	
A) Because this proposed authorization does not anticipate mortality for any species and does not authorize Level A Harassment for the majority of the affected species, the chance of the authorized take adversely affecting the affected species through annual survival rates is low.	
B) The number of individuals harassed, in relation to the abundance of the species or stock, factors into the negligible impact determination. The numbers produced by the model do not take into account how any of the above measures reduce the the number of exposures. Additionally, for both spinner dolphins and false killer whales (high estimates of exposure related to the estimated abundance), the stock assessment has underestimated the abundance.	
C) The Navy's model produced estimates of the number of exposures to sound levels > than 173 dB for each species. However, because of the nature, duration, and location of the exercise, NMFS does not believe that each exposure involves a different whale. To quantitatively address that, NMFS used a normal distribution (see text) to estimate that approximately 16% fewer animals are exposed than exposures were modeled.	

Table 3. A summary of the Measures that avoid strandings and contribute to the negligible impact determination.

As mentioned in Table 3, the number of individuals harassed, in relation to the abundance of the species or stock, factors into the negligible impact determination. The raw modeled exposure numbers produced by the model do not take into account how any of the mitigation or monitoring measures may reduce the number of exposures. Though no particular numeric reduction of the estimated take numbers as a result of the mitigation measures can be justified, they are qualitatively addressed in Table 3 and NMFS believes the numbers of animals that may be harassed are significantly lower than the number of modeled exposures.

Additionally, when further analyzing the effects of these takes on the affected species and stocks, NMFS believes it would be unrealistic, considering the fast-paced, multi-vessel nature of the exercise and the fact that the exercise continues over the course of a month in an area with resident populations of cetaceans, to assume that each exposure involves a different whale. Some whales are likely to be exposed once, while others are likely to be exposed more than once. One way to numerically address this concept is to assume that the exposure events would be distributed normally, with the exposures that each affect a different whale falling within one standard deviation (68.26 percent), the exposures assumed to affect different whales each twice within 2 standard deviations (27.18 percent), the exposures assumed to affect different whales each 3 times within 3 standard deviations (4.28 percent), and so on, if the populations are larger. If this relationship is applied to estimated numbers of exposures produced by the Navy's model, the calculated number of affected animals is approximately 16 percent less than the estimated number of exposures for any given species. NMFS acknowledges the lack of specific sonar/marine mammal data to support this approach, however, NMFS believes that this approach will help us more closely approximate the number of animals potentially taken than an assumption that each sonar ping affects a different cetacean.

To examine the number of individuals harassed in relation to the species or stock, NMFS divided the raw modeled exposures for each species by the estimated abundances to see which species may have relatively large numbers of individuals potentially taken, compared to the population size (Table 1). Per this calculation, all but two species may potentially sustain Level B Harassment of up to a maximum of 38 percent, or less, of the estimated population. Spinner dolphins and false killer whales were calculated to potentially have Level B Harassment of up to 103 percent and 51 percent of the population, respectively. For the reasons stated above, NMFS believes all of the actual percentages will be significantly less. Also, for the spinner dolphins and false killer whales in particular, these percentages are incorrect (too high) because of the following:

Spinner dolphins – The estimated abundance of 2,805 animals was derived from one line-transect survey of the Hawaiian Islands EEZ conducted in 2002. The NMFS stock assessment states that the estimate may be negatively biased because relatively little survey effort occurred in the nearshore areas where these dolphins are abundant in the day light hours when the survey was conducted.

False killer whales – The estimated abundance of false killer whales is based on 12 aerial surveys conducted within 25 nm of the shore between 1993 and 1998. The NMFS stock assessment report states that the study underestimates the number of false killer whales within the Hawaiian EEZ because areas around the Northwestern Hawaiian Islands and areas beyond 25 nm were not surveyed, and because the data were uncorrected for the portion of diving animals missed from the survey aircraft.

To reiterate, NMFS believes that the actual percentages of the stocks affected by this activity are significantly lower than those suggested by the modeled exposures.

NMFS has preliminarily determined that with the full implementation of the all of the proposed mitigation and monitoring measures (especially the additional measures required by NMFS), the RIMPAC ASW exercises are highly unlikely to result in the serious injury or death of a marine mammal. In the unanticipated event that any cases of marine mammal injury or mortality are judged by NMFS or Navy to result from these activities, the Navy will cease operating sonar immediately.

NMFS has further preliminarily determined that, based on the nature and duration of the proposed activities, and dependent upon the full implementation of the proposed mitigation and monitoring measures, the RIMPAC ASW exercises will result in no more than the Level B Harassment of the species addressed here. The Level B Harassment will consist primarily of temporary behavioral modifications, in the form of temporary displacement from feeding or sheltering areas, low-level physiological stress responses, and, to a lesser extent, TTS. NMFS has further determined that these takings, by harassment, will result in no more than a negligible impact to the affected species or stocks. To be conservative, NMFS and the Navy initially used the approach of treating beaked whales exposed to sound levels thought to induce Level B Harassment as if they would receive Level A Harassment. However, due to the extensive mitigation and monitoring levels, NMFS has preliminarily determined that beaked whales will not experience Level A Harrassment as a result of these exercises.

Endangered Species Act (ESA)

There are seven marine mammal species and five sea turtle species that are listed as endangered under the ESA with confirmed or possible occurrence in the study area: humpback whale, North Pacific right whale, sei whale, fin whale, blue whale, sperm whale, and Hawaiian monk seal, loggerhead sea turtle, the green sea turtle, hawksbill sea turtle, leatherback sea turtle, and olive ridley sea turtle. Most of the cetacean species and the Hawaiian monk seal are expected to occur in the OpArea during the RIMPAC exercises. As mentioned previously, humpback whales are not believed to be present in the July timeframe. Because definitive information on sei and fin whales is lacking, their possible presence during the July timeframe was assumed, although it is unlikely.

Under section 7 of the ESA, the Navy has begun consultation with NMFS on the proposed RIMPAC ASW exercises. NMFS will also consult internally on the issuance of an IHA under section 101(a)(5)(D) of the MMPA for this activity. Consultation will be concluded prior to a determination on the issuance of an IHA.

National Environmental Policy Act (NEPA)

In April, 2006, the Navy prepared a revised 2006 Supplement on the 2002 Programmatic Environmental Assessment on RIMPAC. This revised EA has been posted on the Navy website (see **ADDRESSES**) concurrently with the publication of this proposed IHA and public comments have been solicited. Comments on the EA should be addressed to the Navy as outlined in their **Federal Register** notice announcing the EA's availability for comment. NMFS will review the revised EA and the public comments received and subsequently either adopt it or prepare its own NEPA document before making a determination on the issuance of an IHA.

Preliminary Conclusions

A determination of negligible impact is required for NMFS to authorize incidental take of marine mammals. By regulation, an activity has a ''negligible impact'' on a species or stock when it is determined that the total taking is not likely to reduce annual rates of adult survival or recruitment (i.e., offspring survival, birth rates). Based on each species' life history information, the expected behavioral patterns of the animals in the RIMPAC locations, the duration of the activity, the anticipated implementation of the required mitigation and monitoring measures, and an analysis of the behavioral disturbance levels in comparison to the overall populations, an analysis of the potential impacts of the Proposed Action on species recruitment or survival support the conclusion that proposed RIMPAC ASW training events would have no more than a negligible impact on the affected species or stocks. NMFS has also determined that the issuance of the IHA would not have an unmitigable adverse impact on the availability of the affected species or stocks for subsistence use. Additionally, NMFS has set forth in this proposed IHA the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings.

Proposed Authorization

NMFS proposes to issue an IHA to the Navy for conducting ASW exercises, using tactical mid-frequency sonar in the OpArea, provided the previously mentioned mitigation, monitoring, and reporting requirements are incorporated. NMFS has preliminarily determined that the proposed activity would result in only the harassment of marine mammals; would have no more than a negligible impact on the affected marine mammal stocks; and would not have an unmitigable adverse impact on the availability of species or stocks for subsistence uses.

Dated: April 18, 2006.

James H. Lecky,

Director, Office of Protected Resources, National Marine Fisheries Service.

[FR Doc. 06–3831 Filed 4–21–06; 8:45 am]

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[I.D. 041806C]

Pacific Fishery Management Council; Public Meeting

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Notice of public meeting.

SUMMARY: The Pacific Fishery Management Council's (Council) Model Evaluation Workgroup (MEW) will hold a work session to develop and review documentation for the Chinook and Coho Fishery Regulation Assessment Models (FRAMs). The meeting is open to the public.

DATES: The work session will be held Wednesday, May 10, 2006, from 9 a.m. to 4 p.m.

ADDRESSES: The work session will be held at the Northwest Indian Fisheries Commission Conference Room, 6730 Martin Way East, Olympia, WA 98516; telephone: (360) 438–1180.

Council address: Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 200, Portland, OR 97220–1384.

FOR FURTHER INFORMATION CONTACT: Mr. Chuck Tracy, Salmon Management Staff Officer, Pacific Fishery Management Council, (503) 820–2280.

SUPPLEMENTARY INFORMATION: The purpose of the work session is to further develop documentation for the Chinook and Coho FRAM.

Although non-emergency issues not contained in the meeting agendas may come before the MEW for discussion, those issues may not be the subject of formal action during these meetings. Action will be restricted to those issues specifically listed in this notice and any issues arising after publication of this notice that require emergency action under Section 305(c) of the Magnuson-Stevens Fishery Conservation and Management Act, provided the public has been notified of the intent to take final action to address the emergency.

Special Accommodations

This meeting is physically accessible to people with disabilities. Requests for sign language interpretation or other auxiliary aids should be directed to Ms. Carolyn Porter at (503) 820–2280 at least 5 days prior to the meeting date.

Dated: April 19, 2006.

Tracey L. Thompson,

Acting Director, Office of Sustainable Fisheries, National Marine Fisheries Service.

[FR Doc. E6–6046 Filed 4–21–06; 8:45 am]

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COMMODITY FUTURES TRADING COMMISSION

Corrections to the Notice of Revision of Commission Policy Regarding the Listing of New Futures and Option Contracts by Foreign Boards of Trade That Have Received Staff No-Action Relief To Provide Direct Access to Their Automated Trading Systems From Locations in the United States

AGENCY: Commodity Futures Trading Commission.

ACTION: Notice.

SUMMARY: The Commodity Futures Trading Commission is making technical corrections to Footnotes 5 and 6 which were published in the **Federal Register** on April 18, 2006 (71 FR 19877). The footnotes are revised as follows:

Footnote 5: The Statement of Policy did not apply to broad-based stock index futures and option contracts that are now covered by Section 2(a)(1)(C) of the Commodity Exchange Act. Foreign boards of trade were (and presently are) required to seek and receive written supplemental no-action relief from Commission staff prior to offering or selling such contracts through U.S.-located trading systems.

Footnote 6: This notice of revision will not alter a foreign board of trade's obligation to seek and receive written supplemental no-action relief from Commission staff prior to offering or selling broad-based securities index futures and option contracts through U.S.-located trading systems.

Issued in Washington, DC on April 19, 2006.

Jean A. Webb,

Secretary of the Commission.

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