ADDENDUM
TO
REQUEST FOR LETTER OF AUTHORIZATION
UNDER SECTION 101(A)(5)(A) OF THE MARINE MAMMAL PROTECTION ACT
FOR THE INCIDENTAL HARASSMENT OF MARINE MAMMALS RESULTING
FROM NAVY TRAINING OPERATIONS CONDUCTED WITHIN THE
GOMEX RANGE COMPLEX
APR 2009

Section 1.1 Surface Warfare

On page 1-2 GUNNERY EXERCISE (Surface-to-Surface) [GUNEX (S-S)] BOAT section is replaced with the following:

SMALL ARMS TRAINING (EXPLOSIVE HAND GRENADES)

Small arms training is a part of quarterly reservist training and operational activities for the Mobile Expeditionary Security Group (MESG) that operates out of Corpus Christi Naval Air Station (NAS) (**Table 2**). The MESG trains with MK3A2 (0.5-lb NEW) anti-swimmer concussion grenades. The MK3A2 grenades are small and contain high explosives in an inert metal or plastic shell. They detonate at about 3 meters (m) under the water's surface within 4 to 5 seconds (s) of being deployed. The detonation depth may be shallower depending upon the speed of the boat at the time the grenade is deployed.

Table 2 Details of Small Arms training operations involving explosive ordnance use in the GOMEX Study Area.

Operations	Platform	System/Ordnance	Event Duration	Number of Events
Small Arms Training	Maritime Expeditionary Support Group (Various Small Boats)	MK3A2 anti-swimmer grenades (8-oz HE grenade) 0.5 lb NEW	1-2 hours	6 events* (20 live grenades)

*An individual event can include detonation of up to 10 live grenades, but no more than 20 live grenades will be used per year.

A number of different types of boats are used depending on the unit using the boat and their mission. Boats are mostly used by naval special warfare (NSW) teams and Navy Expeditionary Combat Command (NECC) units (Naval Coastal Warfare, Inshore Boat Units, Mobile Security Detachments, Explosive Ordnance Disposal, and Riverine Forces). These units are used to protect ships in harbors and high value units, such as aircraft carriers, nuclear submarines, liquid natural gas tankers, etc., while entering and leaving ports, as well as to conduct riverine operations, insertion and extractions, and various NSW operations.

The boats used by these units include: Small Unit River Craft (SURC), Combat Rubber Raiding Craft (CRRC), Rigid Hull Inflatable Boats (RHIB), Patrol Craft, and many other versions of

these types of boats. These boats use inboard or outboard, diesel or gasoline engines with either propeller or water jet propulsion.

Navy Boats with M3A2 Anti-swimmer Concussion Grenades
This exercise is usually a live-fire exercise, but at times blanks may be used so boat crews can practice their ship-handling skills for the employment of weapons without being concerned with the safety requirements involved with HE weapons.

Basic Phase (Unit Level Training) Scenario
Boat crews may use high or low speeds to approach and engage targets simulating swimmers with anti-swimmer concussion grenades.

Integrated and Sustainment Phase Training Scenarios
Typically do not differ from the Basic Phase Scenario, except for additional command and control coordination involved.

Training Considerations
The purpose of this exercise is to develop marksmanship skills and small boat ship-handling tactics skills required to employ these weapons. Training usually lasts 1-2 hours.

Section 2.2 Levels and Locations of Explosive Operations

Table 4 on page 2-4 is revised by updating the second row of the table to read:

Small Arms Training	Maritime Expeditionary Support Group (Various Small Boats)	MK3A2 anti-swimmer grenades (8-oz HE grenade) 0.5 lb NEW	6 events* (20 grenades /year)	UNDET Area E3

*An individual event can include detonation of up to 10 live grenades, but no more than 20 live grenades will be used per year.

Section 3.2 Estimated Marine Mammal Densities

The entire Section 3.2 is replaced with the following:

The density estimates that were used in previous Navy environmental documents have been recently updated to provide a compilation of the most recent data and information on the occurrence, distribution, and density of marine mammals. The updated density estimates presented in this LOA application are derived from the *Navy OPAREA Density Estimates (NODEs) for the GOMEX OPAREA* report (DoN, 2007b).

Density estimates for cetaceans were either modeled using available line-transect survey data or derived using cetacean abundance estimates found in the 2006 NOAA stock assessment reports (SARs) (Waring *et al.*, 2007). The abundance estimates in the stock assessment reports are from Mullin and Fulling (2004).

For the model-based approach, density estimates were calculated for each species within areas containing survey effort. A relationship between these density estimates and the associated environmental parameters such as depth, slope, distance from the shelf break, sea surface temperature (SST), and chlorophyll *a* (chl *a*) concentration was formulated using generalized additive models (GAMs). This relationship was then used to generate a two-dimensional density surface for the region by predicting densities in areas where no survey data exist.

The analyses for cetaceans were based on sighting data collected through shipboard surveys conducted by NMFS-SEFSC between 1996 and 2004. Species-specific density estimates derived through spatial modeling were compared with abundance estimates found in the 2006 NOAA SARs to ensure consistency. All spatial models and density estimates were reviewed by and coordinated with NMFS Science Center technical staff and scientists with the University of St. Andrews, Scotland, Centre for Environmental and Ecological Modeling (CREEM). For a more detailed description of the methods involved in calculating the density estimates provided in this LOA request, please refer to the *NODE report for the GOMEX OPAREA* (DoN, 2007b).

The following shows how density estimates were modeled or derived for species analyzed in this LOA request:

Model-Derived Density Estimates - Line Transect Survey Data

- Sperm whale (*Physeter macrocephalus*)
- Dwarf and pygmy sperm whales (*Kogia* spp.)
- Beaked whales (Family Ziphiidae)
- Rough-toothed dolphin (*Steno bredanensis*)
- Bottlenose dolphin (*Tursiops truncatus*)
- Pantropical spotted dolphin (*Stenella attenuata*)
- Atlantic spotted dolphin (*Stenella frontalis*)
- Striped dolphin (*Stenella coeruleoalba*)
- Spinner dolphin (*Stenella longirostris)*
- Risso's dolphin (*Grampus griseus)*

Stock Assessment Report or Literature-Derived Density Estimates

- Bryde's whale (Balaenoptera *brydei*)
- Clymene dolphin (*Stenella clymene*)
- Fraser's dolphin (*Lagenodelphis hosei*)
- Killer whale (*Orcinus orca*)
- False killer whale (*Pseudorca crassidens*)
- Pygmy killer whale (*Feresa attenuata*)
- Melon-headed whale (*Peponocephala electra*)
- Short-finned pilot whale (*Globicephala macrorhynchus*)

Table 5A shows the density estimates by species for training areas where explosive ordnance use may occur in the GOMEX Range Complex.

TABLE 5A
SEASONAL DENSITY ESTIMATES FOR MARINE MAMMALS IN THE GOMEX RANGE COMPLEX TRAINING AREAS WHERE EXPLOSIVE ORDNANCE MAY OCCUR

Species and Training Area	Density (animals/km^2)			
	Winter (Dec-Feb)	**Spring** (Mar-May)	**Summer** (June-Aug)	**Fall** (Sept-Nov)
Threatened or Endangered Marine Mammal Species				
Blue Whale	Insufficient data to estimate density.			
Fin Whale	Insufficient data to estimate density.			
Humpback Whale	Insufficient data to estimate density.			
North Atlantic Right Whale	Insufficient data to estimate density.			
Sei Whale	Insufficient data to estimate density.			
Sperm Whale				
Hotbox	0.00152	0.00086	0.00152	0.00152
UNDET Area E3	<0.00001	0.00000	<0.00001	<0.00001
West Indian Manatee	Insufficient data to estimate density.			
Non-Threatened or Endangered Marine Mammal Species				
Atlantic Spotted Dolphin				
Hotbox	0.02188	0.02188	0.02188	0.02188
UNDET Area E3	0.02178	0.02178	0.02178	0.02178
Beaked Whales				
Hotbox	<0.00001	<0.00001	<0.00001	<0.00001
UNDET Area E3	<0.00001	<0.00001	<0.00001	<0.00001
Bottlenose Dolphin				
Hotbox	0.12408	0.12408	0.02658	0.12408
UNDET Area E3	0.67494	0.67494	0.62439	0.67494
Bryde's Whale				
Hotbox	0.00009	0.00009	0.00009	0.00009
UNDET Area E3	0.00000	0.00000	0.00000	0.00000
Clymene Dolphin				
Hotbox	0.04020	0.04020	0.04020	0.04020
UNDET Area E3	0.00000	0.00000	0.00000	0.00000
False Killer Whale				
Hotbox	0.00240	0.00240	0.00240	0.00240
UNDET Area E3	0.00000	0.00000	0.00000	0.00000
Fraser's Dolphin				
Hotbox	0.00168	0.00168	0.00168	0.00168
UNDET Area E3	0.00000	0.00000	0.00000	0.00000
Killer Whale				
Hotbox	0.00031	0.00031	0.00031	0.00031
UNDET Area E3	0.00000	0.00000	0.00000	0.00000
Melon-headed Whale				
Hotbox	0.00799	0.00799	0.00799	0.00799

TABLE 5A
SEASONAL DENSITY ESTIMATES FOR MARINE MAMMALS IN THE GOMEX RANGE COMPLEX TRAINING AREAS WHERE EXPLOSIVE ORDNANCE MAY OCCUR

Species and Training Area	Density (animals/km^2)			
	Winter (Dec-Feb)	**Spring** (Mar-May)	**Summer** (June-Aug)	**Fall** (Sept-Nov)
UNDET Area E3	0.00000	0.00000	0.00000	0.00000
Minke Whale	Insufficient data to estimate density.			
Pantropical Spotted Dolphin				
Hotbox	0.23178	0.06431	0.23178	0.23178
UNDET Area E3	0.00016	0.00025	0.00016	0.00016
Pygmy and Dwarf Sperm Whales				
Hotbox	0.00268	0.00333	0.00268	0.00268
UNDET Area E3	0.00000	0.00000	0.00000	0.00000
Pygmy Killer Whale				
Hotbox	0.00095	0.00095	0.00095	0.00095
UNDET Area E3	0.00000	0.00000	0.00000	0.00000
Risso's Dolphin				
Hotbox	0.01207	0.01207	0.01207	0.01207
UNDET Area E3	<0.00001	<0.00001	<0.00001	<0.00001
Rough-toothed Dolphin				
Hotbox	0.00009	0.00009	0.00009	0.00009
UNDET Area E3	0.01613	0.01613	0.01613	0.01613
Short-finned Pilot Whale				
Hotbox	0.00553	0.00553	0.00553	0.00553
UNDET Area E3	0.00000	0.00000	0.00000	0.00000
Spinner Dolphin				
Hotbox	0.20251	0.20251	0.20251	0.20251
UNDET Area E3	0.00000	0.00000	0.00000	0.00000
Striped Dolphin				
Hotbox	0.06161	0.06161	0.06161	0.06161
UNDET Area E3	<0.00001	<0.00001	<0.00001	<0.00001

Source: (DoN, 2007b)

Density estimates could not be calculated for all species due to the limited available data. Occurrence of these species (with the exception of the West Indian manatee) in the GOMEX Range Complex is considered rare.

Species for Which Density Estimates Are Not Available

- Fin whale (*Balaenoptera physalus*)
- North Atlantic Right Whale (*Eubalaena glacialis*)
- Humpback whale (*Megaptera novaeangliae*)
- Blue whale (*Balaenoptera musculus*)
- Sei whale (*Balaenoptera borealis*)
- Minke whale (*Balaenoptera acutorostrata)*

- West Indian manatee (*Trichechus manatus*)

Chapter 5 Take Authorization Requested

The last 3 paragraphs on page 5-1 are replaced with the following:

Modeling results from the analysis predict no mortality for marine mammals from the use of explosive ordnance associated with BOMBEX or Small Arms training events. Modeling results for use of explosive ordnance associated with BOMBEX events predict that one Pantropical spotted dolphin and one spinner dolphin may be exposed at levels that could result in permanent threshold shift (PTS), or Level A injurious physiological effects. No Level A exposures were predicted for the use of explosive ordnance associated with Small Arms training events.

Modeling results for the use of explosive ordnance associated with BOMBEX events predict that 1 Atlantic spotted dolphin, 6 bottlenose dolphins, 3 Clymene dolphins, 1 melon-headed whale, 12 Pantropical spotted dolphins, 1 Risso's dolphin, 13 spinner dolphins, and 4 striped dolphins may be exposed at levels that could result in temporary threshold shift (TTS), or Level B non-injurious physiological effects. For explosive ordnance use associated with Small Arms training events, the modeling results predict that 3 bottlenose dolphins may be exposed at levels that could result in temporary threshold shift (TTS), or Level B non-injurious physiological effects.

Modeling results for the use of explosive ordnance associated with BOMBEX events predict that 1 Atlantic spotted dolphin, 6 bottlenose dolphins, 3 Clymene dolphins, 1 melon-headed whale, 14 Pantropical spotted dolphins, 1 Risso's dolphin, 14 spinner dolphins, and 4 striped dolphins may be exposed at levels that could result in behavioral disturbance, or Level B non-injurious behavioral effects. For explosive ordnance use associated with Small Arms training events, the modeling results predict that 4 bottlenose dolphins may be exposed at levels that could result in behavioral disturbance, or Level B non-injurious behavioral effects.

These modeling results do not take into account the mitigation measures (detailed in **Chapter 11**) that lower the potential for exposures to occur given standard clearance procedures and the likelihood that most species that travel in large groups can be detected due to their gregarious nature and active surface behavior. Given the implementation of the mitigation measures, the actual exposures would likely be lower than the predicted amount.

Although exposure of marine mammals based on the Navy's modeling shows that only eight marine mammal species and very few individuals would be taken by Level A and Level B harassment, because of the relatively high abundance of several species (Bryde's whales, Atlantic spotted dolphins, bottlenose dolphins, Clymene dolphins, false killer whales, Fraser's dolphins, killer whales, Kogia sp., melon-headed whales, pygmy killer whales, Risso's dolphins, rough-toothed dolphins, short-finned pilot whales, striped dolphins, and several species of beaked whales) in the proposed action area (Waring et al., 2007) and the fact that some of these species aggregate in relatively large groups, Navy considers that additional takes of these species by Level B behavioral harassment are possible. Therefore, Navy requests authorization of additional takes of these species and individuals over the course of the 5-year regulations. Table

23A summarizes the total number of takes requested, including both takes modeled and additional takes described above.

TABLE 23A. SUMMARY OF TAKES REQUESTED FROM EXPLOSIVE ORDNANCE (PER YEAR) FOR MARINE MAMMALS IN THE GOMEX RANGE COMPLEX

Species	Level B harassment	Level A harassment	Mortality
Sperm whale	0	0	0
Bryde's whale	2	0	0
Atlantic spotted dolphin	20	0	0
Beaked whales	20	0	0
Bottlenose dolphin	30	0	0
Clymene dolphin	20	0	0
False killer whale	10	0	0
Fraser's dolphin	20	0	0
Killer whale	10	0	0
Kogia sp.	20	0	0
Melon-headed whale	20	0	0
Pantropical spotted dolphin	26	1	0
Pygmy killer whale	10	0	0
Risso's dolphin	30	0	0
Rough-toothed dolphin	20	0	0
Short-finned pilot whale	20	0	0
Spinner dolphin	27	1	0
Striped dolphin	20	0	0

Section 6.3 Explosive Ordnance Exposure Analysis

The following footnote is added to Table 24 referring to the 6 MK3A2 grenade events:

** *An individual event can include detonation of up to 10 live grenades, but no more than 20 live grenades will be used per year. For modeling purposes, and to account for the highest number of live grenades that would potentially be used during an individual event, it was assumed that there would be 2 events of 10 live grenades each, to account for the total of 20 live grenades.*

Section 6.3.4 Acoustic Effects Analysis

On page 6-15, the second sentence in section 6.3.4 is deleted: "There was no acoustic modeling conducted for GUNEX."

The GUNEX section is re-titled to "Small Arms Training" and the text in this section on pages 6-15 to 6-16 is replaced with the following:

Modeling was completed for the MK3A2 explosive anti-swimmer grenades, which assumed a 6 ft detonation depth. The NEW used in simulations of the MK3A2 grenade is 0.5 lb.

Determining the ZOI for the thresholds in terms of total energy flux density (EFD), impulse, peak pressure and 1/3-octave bands EFD must treat the sequential explosions differently than the single detonations. For the MK3A2, two factors are involved for the sequential explosives that deal with the spatial and temporal distribution of the detonations as well as the effective accumulation of the resultant acoustics. In view of the ZOI determinations, the sequential detonations are model as a single point event with only the EFD summed incoherently:

$$Total\ EFD\ db = 10\log_{10}\sum_{i=1}^{n} 10^{(EFD_i/10)}$$

The multiple explosion energy criterion was used to determine the ZOI for the non-injurious behavioral (without TTS) exposure analysis.

Table 26A shows the ZOI results of the model estimation. The ZOI, when multiplied by the animal densities (see **Chapter 4**) and total number of events, provides the exposure estimates for that animal species. Grenade use is restricted to one location (UNDET Area E3) (see **Figure 2**). In addition to other mitigation measures (see **Chapter 11**), lookouts will visually survey the target area for marine mammals and sea turtles. The exercise will not be conducted until the area is clear and will suspend the exercise if any enter the buffer area. Implementation of mitigation measures like these reduce the likelihood of exposure and potential effects in the ZOI.

Table 26 on page 6-16 is replaced with the following updated table and the new Table 26A is added:

TABLE 26
ESTIMATED ZOIS (KM^2) USED IN EXPOSURE CALCULATIONS FOR BOMBEX IN THE GOMEX RANGE COMPLEX

Area	Ordnance	Estimated ZOI @ 177 dB re 1 μPa^2-sec (multiple detonations only)				Estimated ZOI @ 182 dB re 1 μPa^2-sec or 23 psi				Estimated ZOI @ 205 dB re 1 μPa^2-sec or 13 psi				Mortality ZOI @ 30.5 psi			
		Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall
GOMEX																	
BOMBEX Hotbox	MK-83 (415.8 lbs NEW)	98.93	115.93	161.39	173.27	55.53	76.82	137.33	158.07	4.84	4.84	4.84	4.98	<0.01	<0.01	<0.01	<0.01

Note: ZOIs for the MK-83 bombs are modeled as multiple detonations (4 bombs dropped in succession at same location).

TABLE 26A
ESTIMATED ZOIS (KM^2) USED IN EXPOSURE CALCULATIONS FOR SMALL ARMS TRAINING IN THE GOMEX RANGE COMPLEX

Area	Ordnance	Estimated ZOI @ 177 dB re 1 μPa^2-sec (multiple detonations only)				Estimated ZOI @ 182 dB re 1 μPa^2-sec or 23 psi				Estimated ZOI @ 205 dB re 1 μPa^2-sec or 13 psi				Mortality ZOI @ 30.5 psi			
		Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall
GOMEX																	
UNDET Area E3	MK3A2 grenade	4.94	5.45	4.71	5.81	1.80	2.18	1.96	3.27	0.09	0.09	0.09	0.10	<0.01	<0.01	<0.01	<0.01

Note: ZOIs for the MK3A2 grenades are modeled as multiple detonations (10 grenades being used during each event).

Section 6.3.5 Summary of Potential Exposures from Explosive Ordnance Use

The entire section 6.3.5 is replaced with the following revised text and table:

Explosions that occur in the GOMEX Study Area with the potential to impact marine mammals are associated with training during BOMBEX and small arms training events. Explosive ordnance use is limited to specific training areas. Within the GOMEX Study Area, explosive use associated with BOMBEX events occur in the BOMBEX Hotbox. The use of MK3A2 anti-swimmer grenades is associated with small arms training events, which are limited to the UNDET Area E3 box.

An explosive analysis was conducted to estimate the number of marine mammals that could be exposed to impacts from explosive ordnance use associated with BOMBEX and small arms training. **Table 27** provides a summary of the explosive analysis modeling results.

Exposure estimates could not be calculated for several species (blue whale, fin whale, humpback whale, North Atlantic right whale, sei whale, and minke whale) because density data could not be calculated for the GOMEX Study Area due to the limited available data for these species; however, the likelihood of exposure for species not expected to occur in the GOMEX Study Area should be even lower than for the species with occurrence frequent enough for densities to be calculated. In addition to the low likelihood of exposure, the mitigation measures presented in **Chapter 11** will be implemented prior to release of ordnance. Since the fin, North Atlantic right, humpback, blue, sei, and minke whale are considered rare in the GOMEX Range Complex, no exposures are expected for these species. In addition, the West Indian manatee is not expected to occur where explosive ordnance is used; therefore no exposures are expected for this species.

Lookouts will monitor the area before ordnance is used. Sperm whales will have high detection rates at the surface because of their large body size and pronounced blows; however, sperm whales are long, deep divers and may be submerged, and thus not visually detectable, for over an hour. It is likely that lookouts would detect Atlantic spotted dolphins, bottlenose dolphins, Clymene dolphins, pantropical spotted dolphins, Risso's dolphins, spinner dolphins and striped dolphins due to their gregarious nature and active surface behavior. Implementation of mitigation measures will reduce the likelihood of exposure and potential effects.

Table 27 Summary of Modeling Results for Potential Exposures from Explosive Ordnance Use (per year) for Marine Mammals in the GOMEX Study Area

Species/Training Operation	Potential Exposures @ 177 dB re: 1 μPa^2-s (multiple detonations only)	Potential Exposures @ 182 dB re: 1 μPa^2-s or 23 psi-ms	Potential Exposures @ 205 dB re: 1 μPa^2-s or 13 psi-ms	Potential Exposures @ 30.5 psi-ms

Sperm whale				
BOMBEX training	0	0	0	0
Small Arms training	0	0	0	0
Total Exposures	0	0	0	0
Atlantic spotted dolphin				
BOMBEX training	1	1	0	0
Small Arms training	0	0	0	0
Total Exposures	1	1	0	0
Beaked whales				
BOMBEX training	0	0	0	0
Small Arms training	0	0	0	0
Total Exposures	0	0	0	0
Bottlenose dolphin				
BOMBEX training	6	6	0	0
Small Arms training	4	3	0	0
Total Exposures	10	9	0	0
Bryde's whale				
BOMBEX training	0	0	0	0
Small Arms training	0	0	0	0
Total Exposures	0	0	0	0
Clymene dolphin				
BOMBEX training	3	3	0	0
Small Arms training	0	0	0	0
Total Exposures	3	3	0	0
False killer whale				
BOMBEX training	0	0	0	0
Small Arms training	0	0	0	0
Total Exposures	0	0	0	0
Fraser's dolphin				
BOMBEX training	0	0	0	0
Small Arms training	0	0	0	0
Total Exposures	0	0	0	0
Killer whale				
BOMBEX training	0	0	0	0
Small Arms training	0	0	0	0
Total Exposures	0	0	0	0
Kogia spp.				
BOMBEX training	0	0	0	0
Small Arms training	0	0	0	0
Total Exposures	0	0	0	0
Melon-headed whale				

BOMBEX training	1	1	0	0
Small Arms training	0	0	0	0
Total Exposures	1	1	0	0
Pantropical spotted dolphin				
BOMBEX training	14	12	1	0
Small Arms training	0	0	0	0
Total Exposures	14	12	1	0
Pygmy killer whale				
BOMBEX training	0	0	0	0
Small Arms training	0	0	0	0
Total Exposures	0	0	0	0
Risso's dolphin				
BOMBEX training	1	1	0	0
Small Arms training	0	0	0	0
Total Exposures	1	1	0	0
Rough-toothed dolphin				
BOMBEX training	0	0	0	0
Small Arms training	0	0	0	0
Total Exposures	0	0	0	0
Short-finned pilot whale				
BOMBEX training	0	0	0	0
Small Arms training	0	0	0	0
Total Exposures	0	0	0	0
Spinner dolphin				
BOMBEX training	14	13	1	0
Small Arms training	0	0	0	0
Total Exposures	14	13	1	0
Striped dolphin				
BOMBEX training	4	4	0	0
Small Arms training	0	0	0	0
Total Exposures	4	4	0	0

Chapter 7 Impacts to Marine Mammal Species or Stocks

The second and third paragraphs are replaced with the following revised text:

The Navy concludes that Atlantic Fleet training in the GOMEX Study Area would result in no exposures to the following marine mammal species:

- Sperm whale

The Navy concludes that exposures to the following marine mammal species due to Atlantic Fleet training in the GOMEX Study Area would result in only short-term effects to most individuals exposed and would likely not affect annual rates of recruitment or survival:

- Bryde's whales
- Atlantic spotted dolphins
- Beaked whales
- Bottlenose dolphins
- Clymene dolphins
- False killer whales
- Fraser's dolphins
- Killer whales
- *Kogia* sp.
- Melon-headed whales
- Pantropical spotted dolphins
- Pygmy killer whales
- Risso's dolphins
- Rough-toothed dolphins
- Short-finned pilot whales
- Spinner dolphins
- Striped dolphins

Chapter 11 Mitigation Measures

The entire Chapter 11 is replaced with the following revised text:

11.1 Introduction

Effective training in the GOMEX Range Complex dictates that ship, submarine, and aircraft participants utilize their sensors and exercise weapons to their optimum capabilities as required by the mission. As discussed in Chapter 3, the Navy recognizes that the proposed action has the potential to impact some marine mammals and sea turtles in the vicinity of training. This chapter describes the Navy's overall mitigation approach as well as specific mitigation measures that would be implemented to protect marine mammals, sea turtles, and other resources during training activities. Some of these measures are generally applicable and others are designed to apply to certain geographic areas and/or for specific types of Navy training. Due to the nature of the proposed action analyzed in this LOA request, mitigation measures for many elements of the action have been established through previous environmental analyses, consultation, and/or permitting processes.

As noted above, this chapter describes the overall approach to mitigation for the proposed action as well as specific mitigation measures to be implemented. Section 11.2 describes the Navy's overall mitigation approach. Mitigation measures implemented by Navy personnel on a regular and routine basis are discussed in Section 11.3 and are known as "Standard Operating Procedures". Section 11.4 presents those measures that would be taken *in addition to* standard naval operating procedures for specific at-sea training events. Section 11.5 describes alternative

mitigation that was considered but eliminated. A discussion of detection probability and mitigation efficacy can be found in Section 11.6.

11.2 Approach

Mitigation of impacts is defined in the Council on Environmental Quality (CEQ) regulations (40 CFR 1508.20) as including avoidance, minimization, rectification, reduction/elimination over time, and compensation. Given the nature of the proposed action and alternatives and potential impacts analyzed here, the Navy believes that a comprehensive approach to mitigation for the GOMEX Range Complex requires focus on: (1) mitigation by avoidance, in which adverse impacts are avoided altogether by altering the location, design, or other aspect of an activity, and (2) minimization of impacts when avoidance is not feasible. An important complement to the *avoidance* and *minimization* of impacts is *monitoring* to track compliance with take authorizations, impacts on protected resources, and effectiveness of mitigation measures. Taken together, these three elements – avoidance, minimization, and monitoring - comprise the Navy's integrated approach to addressing potential environmental impacts.

Avoidance. Avoidance of geographic areas of particular sensitivity has been integrated into the proposed action and alternatives where feasible. Mitigation measures discussed later in this chapter involve avoidance of sensitive areas. Planning for training activities takes into consideration whether and how training locations could be planned to avoid sensitive areas (*e.g.*, those known to have a high density of protected species or the presence of a protected species of particular concern). Consideration is also given to avoiding smaller scale habitats (*e.g.*, *Sargassum* rafts, a known sea turtle habitat) as they are encountered during an activity. Avoidance measures that require an ongoing evaluation of conditions or awareness during an activity are listed later in this chapter.

Minimization. In some cases avoiding environmentally sensitive locations altogether is not possible. In these instances, mitigation measures have been designed to minimize the potential for impact on the resources of concern. These minimization measures are also listed in this chapter.

Monitoring. A well-designed monitoring program can provide important feedback for validating assumptions made in analyses and allow for adaptive management. Since monitoring will be a requirement for compliance with the final rule issued for this proposed action under the Marine Mammal Protection Act (MMPA), details of the monitoring program will be developed in coordination with National Marine Fisheries Service (NMFS) through those regulatory processes. A description of the monitoring program framework is provided in Section 5.3.

It is important to note that discussions with resource agencies as part of consultation and permitting processes may result in changes to the mitigation as described in this document. Such changes will be reflected in the Final Rule as well as in documents that result from other regulatory processes (*e.g.*, Endangered Species Act [ESA] Biological Opinion).

It should be noted that several of these mitigation measures align with mitigation measures for unit-level training that the Navy has had in place since 2004. In addition, the Navy coordinated with the NMFS to further develop measures for protection of marine mammals as part of the National Defense Exemption. The National Defense Exemption from Requirements of the

MMPA for Certain DoD Military Readiness Activities That Employ Mid-Frequency Active Sonar or Improved Extended Echo Ranging Sonobuoys is dated January 23, 2007. This exemption is pursuant to Title 16, Section 1371 (f) of the United States Code. This exemption was applicable to mid-frequency active (MFA) sonar systems or Improved Extended Echo Ranging (IEER) sonobuoys operating within the frequency range of 1 kHz to 10 kHz. The exemption was in effect for a period of two years from the date of enactment (January 23, 2007) and was authorized until "the Department of Navy is granted authorization under the MMPA for one or both of these categories of actions as associated with a specified proposed activity, whichever is earliest" (DoN, 2007).

The final suite of measures developed in the Navy's application for a MMPA Letter of Authorization (LOA) are analyzed here. In addition to the NEPA process, the public had an opportunity to provide input to NMFS through the MMPA process, both during the comment period following NMFS' Notice of Receipt of the application for a MMPA LOA, and during the comment period following NMFS' publication of the proposed rule. In order to make the findings necessary to issue the MMPA authorization, it may be necessary for NMFS to require additional mitigation or monitoring measures beyond those addressed in the Biological Evaluation (BE). These could include measures yet to be developed. If additional mitigation or monitoring measures are required, they will be included in the Record of Decision.

11.3 STANDARD OPERATING PROCEDURES (GENERAL MARITIME MEASURES)

The mitigation measures presented below are performed by Navy personnel on a regular and routine basis. These are routine measures and are considered "Standard Operating Procedures."

11.3.1 Personnel Training – Lookouts

The use of shipboard lookouts is a critical component of all Navy standard operating procedures. Navy shipboard lookouts (also referred to as "watchstanders") 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 (OOD) (*e.g.*, trash, a periscope, marine mammals, sea turtles) 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.

All personnel serving as lookouts on Navy ships and submarines are required to complete Marine Species Awareness Training (MSAT) as part of the lookout training program. MSAT includes instruction on the lookout's role in environmental protection, laws governing the protection of marine species, Navy stewardship commitments, general observation at sea, and detecting/identifying marine mammals. MSAT has been reviewed by NMFS and acknowledged as suitable training.

1. All bridge personnel, Commanding Officers, Executive Officers, officers standing watch on the bridge, maritime patrol aircraft aircrews, and Mine Warfare (MIW) helicopter crews will complete MSAT.
2. Navy lookouts will undertake extensive training to qualify as a watchstander in accordance with the Lookout Training Handbook (NAVEDTRA 12968-D).
3. Lookout training will include on-the-job instruction under the supervision of a qualified, experienced watchstander. Following successful completion of this supervised training

period, lookouts will complete the Personal Qualification Standard Program, certifying that they have demonstrated the necessary skills (such as detection and reporting of partially submerged objects).

4. Lookouts will be trained in the most effective means to ensure quick and effective communication within the command structure to facilitate implementation of protective measures if marine species are spotted.
5. Surface lookouts would scan the water from the ship to the horizon and be responsible for all contacts in their sector. In searching the assigned sector, the lookout would always start at the forward part of the sector and search aft (toward the back). To search and scan, the lookout would hold the binoculars steady so the horizon is in the top third of the field of vision and direct the eyes just below the horizon. The lookout would scan for approximately five seconds in as many small steps as possible across the field seen through the binoculars. They would search the entire sector in approximately five-degree steps, pausing between steps for approximately five seconds to scan the field of view. At the end of the sector search, the glasses would be lowered to allow the eyes to rest for a few seconds, and then the lookout would search back across the sector with the naked eye.
6. At night, to increase effectiveness, lookouts would not continuously sweep the horizon with their eyes. Instead, lookouts would scan the horizon in a series of movements that would allow their eyes to come to periodic rests as they scan the sector. When visually searching at night, they would look a little to one side and out of the corners of their eyes, paying attention to the things on the outer edges of their field of vision. Lookouts will also have night vision devices available for use.

11.3.2 Operating Procedures and Collision Avoidance

1. Prior to major exercises, a Letter of Instruction, Mitigation Measures Message or Environmental Annex to the Operational Order will be issued to further disseminate the personnel training requirement and general marine species mitigation measures.
2. Commanding Officers will make use of marine species detection cues and information to limit interaction with marine species to the maximum extent possible consistent with safety of the ship.
3. While underway, surface vessels will have at least two lookouts with binoculars; surfaced submarines will have at least one lookout with binoculars. Lookouts already posted for safety of navigation and man-overboard precautions may be used to fill this requirement. As part of their regular duties, lookouts will watch for and report to the OOD the presence of marine mammals and sea turtles.
4. On surface vessels equipped with a mid-frequency active sonar, pedestal mounted “Big Eye” (20x110) binoculars will be properly installed and in good working order to assist in the detection of marine mammals and sea turtles in the vicinity of the vessel.
5. Personnel on lookout will employ visual search procedures employing a scanning method in accordance with the Lookout Training Handbook (NAVEDTRA 12968-D).
6. After sunset and prior to sunrise, lookouts will employ Night Lookouts Techniques in accordance with the Lookout Training Handbook (NAVEDTRA 12968-D).
7. While in transit, naval vessels will be alert at all times, use extreme caution, and proceed at a “safe speed” so that the vessel can take proper and effective action to avoid a collision with any marine animal and can be stopped within a distance appropriate to the prevailing circumstances and conditions.
8. When whales have been sighted in the area, Navy vessels will increase vigilance and take reasonable and practicable actions to avoid collisions and activities that might result in close interaction of naval assets and marine mammals. Actions may include changing

speed and/or direction and are dictated by environmental and other conditions (*e.g.*, safety, weather).

9. Naval vessels will maneuver to keep at least 500-yd (460 m) away from any observed whale and avoid approaching whales head-on. This requirement does not apply if a vessel's safety is threatened, such as when change of course will create an imminent and serious threat to a person, vessel, or aircraft, and to the extent vessels are restricted in their ability to maneuver. Restricted maneuverability includes, but is not limited to, situations when vessels are engaged in dredging, submerged operations, launching and recovering aircraft or landing craft, minesweeping operations, replenishment while underway and towing operations that severely restrict a vessel's ability to deviate course. Vessels will take reasonable steps to alert other vessels in the vicinity of the whale.
10. Where feasible and consistent with mission and safety, vessels will avoid closing to within 200-yd (183 m) of sea turtles and marine mammals other than whales (whales addressed above).
11. Floating weeds, algal mats, *Sargassum* rafts, clusters of seabirds, and jellyfish are good indicators of sea turtles and marine mammals. Therefore, increased vigilance in watching for sea turtles and marine mammals will be taken where these are present.
12. Navy aircraft participating in exercises at sea will conduct and maintain, when operationally feasible and safe, surveillance for marine species of concern as long as it does not violate safety constraints or interfere with the accomplishment of primary operational duties. Marine mammal detections will be immediately reported to assigned Aircraft Control Unit for further dissemination to ships in the vicinity of the marine species as appropriate where it is reasonable to conclude that the course of the ship will likely result in a closing of the distance to the detected marine mammal.
13. All vessels will maintain logs and records documenting training operations should they be required for event reconstruction purposes. Logs and records will be kept for a period of 30 days following completion of a major training exercise.

11.4 MITIGATION MEASURES FOR SPECIFIC AT-SEA TRAINING EVENTS

These actions are standard operating procedures that are in place currently and will be used in the future for all activities being analyzed in this LOA request.

11.4.1 Small Arms Training – Explosive Hand Grenades (such as MK3A2 grenades)

1. Lookouts visually survey for floating weeds, algal mats, *Sargassum* rafts, marine mammals, and sea turtles.
2. A 200-yard radius buffer zone will be established around the intended target. The exercises will be conducted only if the buffer is clear of sighted marine mammals and sea turtles.

11.4.2 Air-to-Surface At-Sea Bombing Exercises (500-lb to 2,000-lb explosive bombs)

This activity occurs in W-155A/B (hot box) area of the GOMEX Study Area. The location was established to be within 150 nm from shore-based facilities (the established flight distance restriction for F-A18 jets during unit level training events).

1. Aircraft would visually survey the target and buffer zone for marine mammals and sea turtles prior to and during the exercise. The survey of the impact area would be made by flying at 1,500 feet altitude or lower, if safe to do so, and at the slowest safe speed.

Release of ordnance through cloud cover is prohibited; aircraft must be able to actually see ordnance impact areas. Survey aircraft should employ most effective search tactics and capabilities.

2. A buffer zone of a 5,100-yard radius would be established around the intended target zone. The exercises would be conducted only if the buffer zone is clear of sighted marine mammals and sea turtles.
3. If surface vessels are involved, lookouts would survey for *Sargassum* rafts, which may be inhabited by immature sea turtles. Ordnance would not be targeted to impact within 5,100 yards of known or observed *Sargassum* rafts or coral reefs.
4. At-sea BOMBEXs using live ordnance will occur during daylight hours only.

11.5 MEASURES CONSIDERED BUT ELIMINATED

As described in Chapter 7, the majority of estimated exposures to marine mammals during proposed activities would not cause injury. Potential effects on marine mammals would be further reduced with the implementation of mitigation measures described above. Therefore, the Navy concludes the proposed action and mitigation measures would achieve the least practicable adverse impact on species or stocks of marine mammals. A determination of "least practicable adverse impacts" includes consideration, in consultation with NMFS, of personnel safety, practicality of implementation, and impact of the effectiveness of the military training activity. Therefore, the following additional mitigation measures were analyzed and eliminated from further consideration because:

- they would result in impacts to training effectiveness, which would ultimately degrade military readiness;
- they present personnel safety concerns; or
- they are impractical and provide no known protective benefit.

Reduction in training. The requirements for training have been developed iteratively over many years to ensure sailors achieve levels of readiness that ensure they are prepared to properly respond to the many contingencies that may occur during deployment and actual combat. These training requirements are designed to provide the experience needed to ensure sailors are properly trained and proficient for operational success. There is not extra training built into the training plan, as this would not be an efficient use of resources (*e.g.*, fuel, time). Therefore, any reduction of training would not allow sailors to achieve satisfactory levels of readiness needed to accomplish their mission.

Establish and implement a set vessel speed. Navy personnel are required to use extreme caution and operate at a slow, safe speed consistent with mission and safety. Further, during periods of North Atlantic right whale migration, ships exercise heightened lookout vigilance and adjust speeds as necessary as an added measure to avoid this critically endangered species. Ships and submarines need to be able to react to changing tactical situations during training as they would in actual combat. Placing arbitrary speed restrictions would not allow them to properly react to these situations. By training differently than what would be needed in an actual combat scenario, there would be a decrease in training effectiveness and a reduction in crew's abilities.

Restrict training to certain geographic areas, during certain seasons, and during certain conditions (*e.g.*, low visibility, nighttime). Implementation of blanket restrictions on training as mitigation measures would dramatically reduce the realism of training with potentially severe national security consequences and would afford, at best, only highly speculative benefits to marine species populations. Personnel must train under the full range of conditions that might be encountered during deployment and in combat, and be in a state of readiness that allows them to identify and respond to changing environmental conditions 24-hours per day. On-the-job training in combat is the worst possible way of training personnel and places personnel and the success of the military mission at significant risk. Nonetheless, the Navy has considered limitations during of certain specific training events in the GOMEX Range Complex, particularly Unit Level Training (ULT) events involving explosive ordnance, where feasible, when such limitations would not interfere with training missions and goals, and when other related training events provide the necessary exposure of personnel to the full spectrum of environmental conditions they may encounter during deployment and combat.

Expansion of Exclusion Area Delineated for Use with Explosive Detonations. Currently, the Navy uses certain exclusion zones for different explosive types, which means that an area of a certain size around an explosive must be clear of marine mammals for a certain amount of time prior to the detonation of that explosive. For a few of the larger charges (MK-84s), the distance to the isopleths within which NMFS expects TTS would likely occur is larger than the distance that the Navy must ensure is clear prior to the initiation of some of the exercise types that utilize those larger charges (*i.e.*, an animal could be within the distance from a source where TTS may occur, but outside of the distance that the Navy is required to 'clear' prior to detonation. NMFS considered requiring an enlarged exclusion zone for use with these larger charges.

Monitoring of Explosive Exclusion Area During Exercises. For some explosive detonations, the Navy's current mitigation requires clearance of an area prior to the initiation of an explosive exercise, but does not require continued monitoring of the area throughout the exercise (see Section 5.7). Under this measure, NMFS considered a requirement for Navy to continue monitoring the exclusion zone throughout the exercise and to take appropriate mitigation measures during the exercise should a marine mammal be spotted within that zone.

Visual monitoring using third-party observers from aircraft and vessels in addition to existing Navy-trained lookouts. Under the Integrated Comprehensive Monitoring Program for Marine Mammals described in Section 5.3, third-party lookouts would be used during exercises selected for data sampling. However, using third-party lookouts for all training events conducted by the Navy to supplement Navy lookout observations and/or provide a "check" of Navy-trained lookouts, would present logistical and security problems for the Navy.

- **Security.** Security clearances would need to be obtained for a large number of observers in order to cover all training events, since the exact time and location of all Navy training events is classified as SECRET.
- **Space.** Some training events span one or more 24-hour periods, with operations that are occurring underway continuously in that timeframe; therefore, enough third-party personnel would be needed to man the observation decks or aircraft during that timeframe. There is also severe space limitations onboard ship for berthing third-party crews, and there are no additional seats on aircraft involved in exercises. Overnight

berthing of contractors and visitors onboard ships is currently accomplished only after significant planning and juggling of bunks, space, and Navy crew work shifts.

- **Scheduling.** Scheduling civilian vessels and/or aircraft to coincide with all training events would impact training effectiveness since exercise event timetables cannot be precisely fixed and, instead, are based on the free-flow development of tactical situations. Waiting for civilian aircraft or vessels to complete surveys, refuel, or be on station would slow the unceasing progress of the exercise and impact the effectiveness of the training activity.
- **Safety.** Surveying during training events also raises safety concerns with multiple, slow and low-flying civilian vessels and aircraft operating in the same sea space and airspace as military vessels and aircraft engaged in combat training activities. In addition, most of the training events take place far from land, limiting both the time available for civilian aircraft to be in the exercise area and presenting a concern should aircraft mechanical problems arise.

11.6 DETECTION PROBABILITY AND MITIGATION EFFICACY

11.6.1 Factors Affecting Detection Probability

The probability of visually detecting a marine animal is dependent upon two things. First, the animal and the observer must be in the same place at the same time. If the animal is not present, it cannot be seen (availability bias) (Marsh and Sinclair, 1989). Second, when the animal is in a position to be detected by an observer and the observer in a position to detect the animal, the observer must perceive the animal (perception bias) (Marsh and Sinclair, 1989). The factors affecting the detection of the animal may be probabilistically quantified as *g(0)*. That is, *g(0)* represents the chance that the animal will be available for detection (i.e., on the surface and in the observer's field of view) and that the observer will perceive the animal. A *g(0)* value of 1 indicates that 100 percent of the animals are detected; it is rare that this assumption holds true, as both perception and availability bias impact the overall value of *g(0)* for any given species.

Various factors are involved in estimating *g(0)*, including: sightability/detectability of the animal (species-specific behavior and appearance, school size, blow characteristics, dive characteristics, and dive interval); viewing conditions (sea state, wind speed, wind direction, sea swell, and glare); and observer (experience, fatigue, and concentration) and platform characteristics (pitch, roll, yaw, speed, and height above water). Thomsen et al. (2005) provide a complete and recent discussion of *g(0)*, factors that affect the detectability of the animals, and ideas on how to account for detection bias. Table 28 provides a range of values for *g(0)* for cetacean species in the GOMEX Study Area. It is important to note that *g(0)* as it is used here does not relate to the ability to identify an animal on any order, only that the animal will be detected.

Marine Mammals

There are many variables that play into how easily a marine mammal may be detected by an observer at the surface [i.e., the g(*0*) value for that species]. As discussed previously, some of these variables affect (or are affected by) the observer, the platform, and the conditions under which the observations are being made. Many of the variables, however, are directly related to the animal, its external appearance, its behavior and its life history. The size of the animal, its surface behavior, its dive behavior, and the overall gregariousness of the species all impact the ability of the observer to detect an individual at the surface.

The following is a much generalized discussion of the behavior and external appearance of the marine mammals with the potential to occur in the GOMEX Range Complex as these characters relate to the detectability of each species. The species are grouped loosely based on either taxonomic relatedness or commonalities in size and behavior (or both). Not all statements may hold true for all species in a grouping and outstanding exceptions are mentioned where applicable. The information presented in this section may be found in Jefferson et al. (2008) and sources within unless otherwise noted.

In general, large whales are fairly easy to detect due to their large size and prominent blow (Taylor et al., 2007). Also relatively easy to detect are large groups of individuals, particularly gregarious delphinids that may be visible from a great distance due to the disturbance they make when moving across the surface of the water. Less easy to detect are marine mammals that spend a great deal of time at depth or whose presence on the surface is solitary and inconspicuous (Taylor et al., 2007).

Large Whales

Species of large whales commonly found in the study area include the Bryde's whale and the sperm whale. Bryde's whales are generally large (adults can be up to 15.5 m) , often making them immediately detectable. However, Bryde's whales often have no visible blow and rarely fluke. Bryde's whales tend to travel singly or in small groups ranging from pairs to groups of ten; Dive behavior varies, but Bryde's whales may dive as long as 20 min. Bryde's whales have *g(0)* values ranging from 0.90 to 1.00 (Table 28).

Sperm whales also belong to the large whales, with adult males reaching as much as 18 m (50 ft) in total length. Sperm whales at the surface would likely be easy to detect. They are large, have a prominent, 5 m (16 ft) blow, and may remain at the surface for long periods of time. They are known to raft (i.e., loll at the surface) and to form SAGs when socializing. Sperm whales may travel or congregate in large groups of as many as 50 individuals. They also engage in conspicuous surface behavior such as fluking, breaching and tail-slapping. However, sperm whales are long, deep divers and may remain submerged for over an hour. Sperm whales vocalize frequently (Teloni, 2005) and would probably be detected acoustically. Sperm whales have *g(0)* values ranging from 0.19 to 1.00 (Table 28).

Cryptic Species

Cryptic cetacean species are those that are known to be difficult to detect on the surface or that actively avoid vessels. These include beaked whales (family Ziphiidae), and dwarf and pygmy sperm whales (*Kogia* spp.).

Beaked whales are notoriously difficult to detect at sea. Beaked whales may occur in a variety of group sizes, ranging from single individuals to groups of as many as 100 (MacLeod and D'Amico, 2006). For beaked whale species occurring in the GOMEX Range Complexes, group sizes may range from 1 to 22 individuals. Beaked whale diving behavior in general consists of long, deep dives that may last for nearly 90 minutes followed by a series of shallower dives and intermittent surfacings (Tyack et al., 2006; Baird et al., 2007). However, individuals may remain at the surface for an extended period of time (perhaps an hour or more) or make shorter dives

(MacLeod and D'Amico, 2006). Detection of beaked whales is further complicated because beaked whales often dive and surface in a synchronous pattern (MacLeod and D'Amcio, 2006) and they travel below the surface of the water. Beaked whales are odontocetes and use acoustic signals for communication and foraging. They are known to produce sounds ranging from low to high frequency (MacLeod and D'Amico, 2006). However, many of the sounds that have been recorded for beaked whales fall at or outside the upper range of human hearing (greater than 20 kHz), making acoustic detection less likely for these species than for species with a lower peak frequency. Beaked whales have *g(0)* values ranging from 0.13 to 1.00 (Table 28).

Dwarf and pygmy sperm whales (referred to broadly as *Kogia* spp.) are small cetaceans (3 to 4 m [10 to 13 ft] adult length) that are not seen commonly at sea. *Kogia* spp. are some of the most commonly stranded species in some areas, which suggests that sightings are not indicative of their overall abundance. This supports the idea that they are cryptic, perhaps engaging in inconspicuous surface behavior or actively avoiding vessels. When *Kogia* spp. are sighted, they are seen in groups of no more than five to six individuals. They have no visible blow, do not fluke when they dive, and are known to log (i.e., lie motionless) at the surface. When they do dive, they often will sink out of sight with no prominent behavioral display. There is little acoustic information on *Kogia* spp.; what is available suggests that *Kogia* spp. emit ultrasonic clicks with a peak frequency of 125 kHz (Marten, 2000), well outside of what is audible to the human ear. *Kogia* spp. are not likely to be detected acoustically. *Kogia* spp. have *g(0)* values ranging from 0.19 to 0.79 (Table 28).

Delphinids

There are 14 species of the family Delphinidae that may occur in the GOMEX Range Complexes. There are a variety of factors that make these species some of the most likely to be detected at sea by observers. Many species of delphinids engage in very conspicuous surface behavior, including leaping, spinning, bow riding, and traveling along the surface in large groups. Delphinid group sizes may range from 10 to 10,000 individuals, depending upon the species and the geographic region. Species such as pilot whales, rough-toothed dolphins, bottlenose dolphins, Stenellid dolphins, and Fraser's dolphins are known to either actively approach and investigate vessels, or bow ride along moving vessels. Fraser's dolphins form huge groups that travel quickly along the surface, churning up the water and making them visible from a great distance. Delphinids may dive for as little as a minute to over thirty minutes, depending upon the species. Some species of delphinids are very vocal and may be easily detected acoustically if they are foraging or socializing. There are records of some species of Delphinids (spinner dolphins and pantropical spotted dolphins) actively avoiding vessels in the Eastern Tropical Pacific (ETP). This behavior is probably a response to the high levels of mortality associated with tuna fisheries in the ETP and has not been noted elsewhere in the world. Delphinids have *g(0)* values ranging from 0.19 to 1.00, with many species having much higher values.

TABLE 28 RANGE OF ESTIMATES FOR G(0) FOR MARINE MAMMAL SPECIES FOUND IN THE GULF OF MEXICO

g(0)[1]	Location	Platform	Source

Threatened/Endangered Cetacean Species			
Sperm whale (*Physeter macrocephalus*)			
0.28-0.57	U.S. Atlantic Coast	Shipboard	(Palka, 2005a; Palka, 2006)
0.19-0.29	U.S. Atlantic Coast	Aerial	(Palka, 2005b)
0.53-1.00	U.S. West Coast	Shipboard	(Barlow, 1995; Barlow and Gerrodette, 1996; Barlow and Sexton, 1996; Barlow, 2003a; Barlow and Taylor, 2005)
0.95-0.98	U.S. West Coast	Aerial	(Forney and Barlow, 1993; Forney et al., 1995)
0.87	Hawaii	Shipboard	(Barlow, 2003b, 2006)
0.32	Antarctic	Shipboard	(Kasamatsu and Joyce, 1995)
Non-Threatened/Non-Endangered Cetacean Species			
Bryde's whale (*Balaenoptera edeni*)			
0.90-1.00	U.S. West Coast	Shipboard	(Barlow, 1995, 2003a)
0.90	Hawaii	Shipboard	(Barlow, 2003b, 2006)
***Kogia* spp.**			
0.29-0.55	U.S. Atlantic Coast	Shipboard	(Palka, 2006)
0.19-0.79	U.S. West Coast	Shipboard	(Barlow, 1995; Barlow and Sexton, 1996; Barlow, 1999, 2003a)
0.35	Hawaii	Shipboard	(Barlow, 2003b, 2006)
Ziphiidae (Beaked Whales)			
0.46-0.51	U.S. Atlantic Coast	Shipboard	(Palka, 2005a; Palka 2006)
0.19-0.21	U.S. Atlantic Coast	Aerial	(Palka, 2005b)
0.13-1.00	U.S. West Coast	Shipboard	(Barlow, 1995; Barlow and Sexton, 1996; Barlow, 1999; Carretta et al., 2001; Barlow, 2003a; Barlow, et al. 2006)
0.23-0.45	Hawaii	Shipboard	(Barlow, 2003b, 2006)*
0.27	Antarctic	Shipboard	(Kasamatsu and Joyce, 1995)
0.95-0.98	U.S. West Coast	Aerial	(Forney and Barlow, 1993; Forney et al., 1995)
Bottlenose dolphin (*Tursiops truncatus*)			
0.62-0.99	U.S. Atlantic Coast	Shipboard	(Palka, 2005a; Palka,

			2006)
0.58-0.77	U.S. Atlantic Coast	Aerial	(Palka, 2005b)
0.74-1.00	U.S. West Coast	Shipboard	(Barlow, 1995, 2003a)
0.67-0.96	U.S. West Coast	Aerial	(Forney and Barlow, 1993; Forney et al., 1995)
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
Spinner dolphin (*Stenella longirostris*)			
0.61-0.76	U.S. Atlantic Coast	Shipboard	(Palka, 2006)
0.77-1.0	U.S. West Coast	Shipboard	(Barlow, 2003a)
0.77-1.0	Hawaii	Shipboard	(Barlow, 2003b, 2006)
Clymene dolphin (*Stenella clymene*)			
None available.			
Pantropical spotted dolphin (*Stenella attenuate*)			
0.37-0.94	U.S. Atlantic Coast	Shipboard	(Palka, 2006)*
0.77-1.00	U.S. West Coast	Shipboard	(Barlow, 2003a)
0.76-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
Atlantic spotted dolphin (*Stenella frontalis*			
0.37-0.94	U.S. Atlantic Coast	Shipboard	(Palka, 2006)**
Striped dolphin (*Stenella coeruleoalba*)			
0.61-0.77	U.S. Atlantic Coast	Shipboard	(Palka, 2005a; Palka, 2006)
0.77-1.00	U.S. West Coast	Shipboard	(Barlow, 1995, 2003a)
0.76-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
Rough-toothed dolphin (*Steno bredanensis*)			
0.74-1.00	U.S. West Coast	Shipboard	(Barlow, 2003a)
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
Fraser's dolphin (*Lagenodelphis hosei*)			
0.76-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
Risso's dolphin (*Grampus griseus*)			
0.51-0.84	U.S. Atlantic Coast	Shipboard	(Palka, 2005a; Palka 2006)
0.58-0.77	U.S. Atlantic Coast	Aerial	(Palka, 2005b)
0.74-1.00	U.S. West Coast	Shipboard	(Barlow, 1995, 2003a)
0.67-0.96	U.S. West Coast	Aerial	(Forney and Barlow, 1993; Forney et al., 1995)
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
False killer whale (*Pseudorca crassidens*)			
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
Pygmy killer whale (*Feresa attenuata*)			
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
Killer whale (*Orcinus orca*)			
0.90	U.S. West Coast	Shipboard	(Barlow, 2003a)

0.95-0.98	U.S. West Coast	Aerial	(Forney et al., 1995)
0.90	Hawaii	Shipboard	(Barlow, 2003b, 2006)
0.96	Antarctic	Shipboard	(Kasamatsu and Joyce, 1995)
Melon-headed whale (*Peponocephala electra*)			
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
Pilot whale (*Globicephala* spp.)			
0.48-0.67	U.S. Atlantic Coast	Shipboard	(Palka, 2005a; Palka 2006)
0.19-0.29	U.S. Atlantic Coast	Aerial	(Palka, 2005b)
0.74-1.00	U.S. West Coast	Shipboard	(Barlow, 2003a)
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
0.93	Antarctic	Shipboard	(Kasamatsu and Joyce, 1995)

*These numbers were either determined by the source or applied by the source for abundance/density estimation analyses in the particular geographic location.

[1] A *g(0)* value of 1.00 indicates that 100 percent of the animals are detected; it is rare that this assumption holds true. Departures of *g(0)* from 1.00 can be attributed to either perception bias or availability bias.

Chapter 13 Monitoring and Reporting

The entire Chapter 13 is replaced with the following revised text:

13.1 Integrated Comprehensive Monitoring Plan

The Navy is committed to demonstrating environmental stewardship while executing its National Defense mission and is responsible for compliance with a suite of federal environmental and natural resources laws and regulations that apply to the marine environment. As part of those responsibilities, an assessment of the long-term and/or population-level effects of Navy training activities, as well as the efficacy of mitigation measures, is necessary. To address this need, the Navy is developing an Integrated Comprehensive Monitoring Plan (ICMP) for marine species to assess the effects of training activities on marine species and investigate population-level trends in marine species distribution, abundance, and habitat use in various range complexes and geographic locations where Navy training occurs (Figure 6). Although the ICMP is intended to apply to all Navy training, use of MFA Sonar and explosives in training and RDT&E will comprise a major component of the overall program.

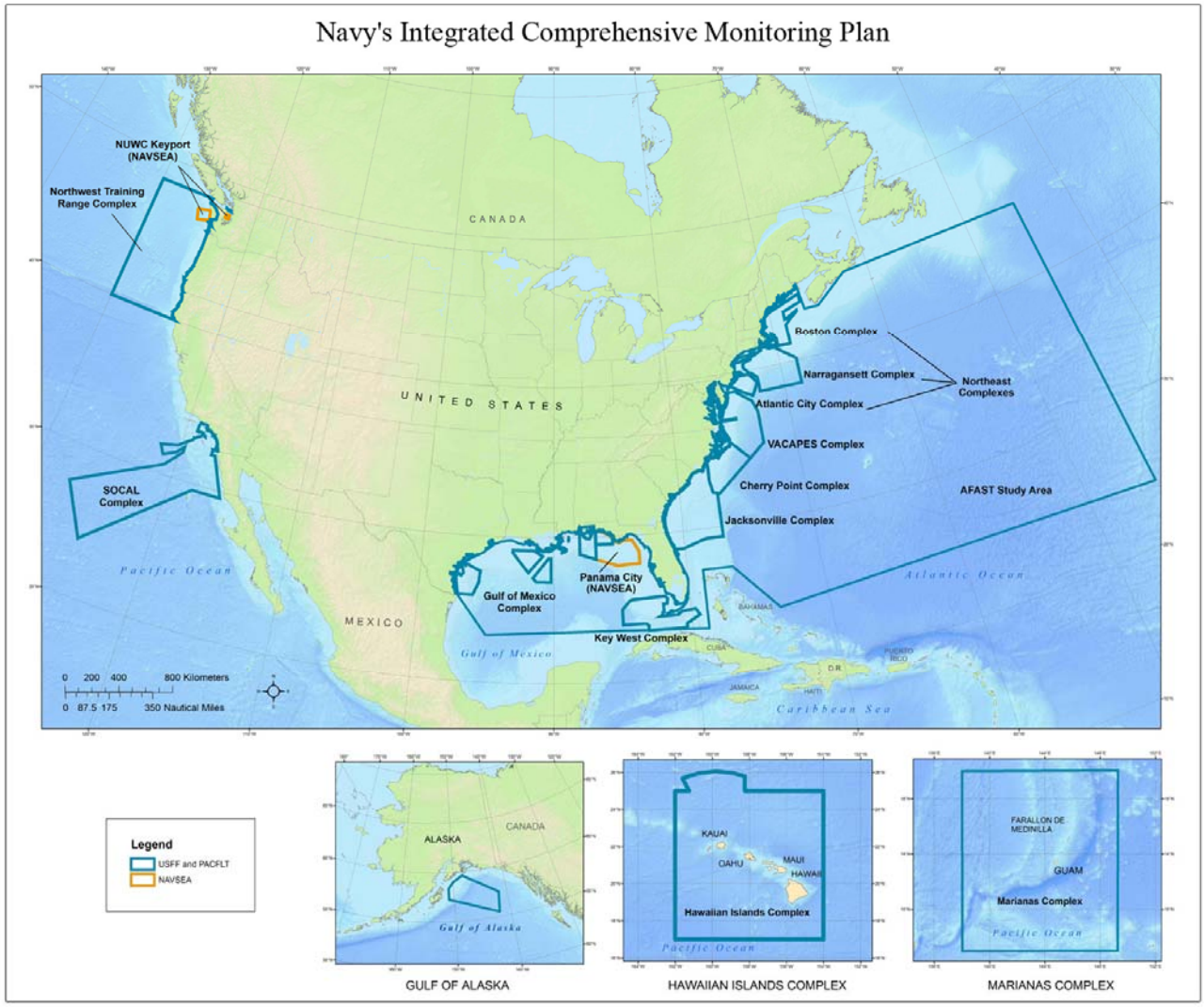

Figure 6. Navy-Wide Map of Areas Where Data Collection is Expected to Occur

The ICMP is currently in development, with Chief of Naval Operations Environmental Readiness Division (CNO-N45) having the lead. The program does not duplicate the monitoring plans for individual areas (e.g. AFAST, HRC, SOCAL, CHPT); instead it is intended to provide the overarching coordination that will support compilation of data from both range-specific monitoring plans as well as Navy funded research and development (R&D) studies. The ICMP will coordinate the monitoring programs progress towards meeting its goals and develop a data management plan. A program review board is also being considered to provide additional guidance. The ICMP will be evaluated annually to provide a matrix for progress and goals for the following year, and will make recommendations on adaptive management for refinement and analysis of the monitoring methods.

The primary objectives of the ICMP are to:

- Coordinate monitoring of Navy training events, particularly those involving mid-frequency active sonar (MFAS) and underwater detonations (explosives), for compliance with the terms and conditions of ESA Section 7 consultations or MMPA authorizations;
- Coordinate data collection to support estimating the number of individual marine mammals and sea turtles exposed to sound levels above current regulatory thresholds;
- Assess the efficacy of the Navy's current marine species mitigation;
- Add to the knowledge base on potential behavioral and physiological effects to marine species from mid-frequency active sonar and underwater detonations; and
- Assess the practicality and effectiveness of a number of mitigation tools and techniques (some not yet in use).

Data collection methods will be standardized across the program to the extent possible to provide the best opportunity for pooling data from multiple regions. Some methods may be universally applicable; however, some may be utilized only in specific locations where conditions are most appropriate. For example, in Hawaii, there is significant baseline data on odontocetes from tagging, which can be used to provide context for tagging data collected during training events. The Navy's overall monitoring approach will seek to leverage and build on existing research efforts whenever possible. Additional Navy-funded research and development (R&D) studies and collaborations with academia and other institutions will be integrated as appropriate to enhance the data pool, and will be used in part to address objectives of the ICMP.

The Navy will be investing significant funding and resources towards monitoring programs and intends to conduct the research in a scientifically valid and robust manner. The Navy is committed to conducting research until these questions have been addressed to the satisfaction of both NMFS and Navy. Therefore, it is in the best interest of the Navy to choose studies wisely in each range complex that are the most likely to collect large data sets, and will enable the Navy and NMFS to answer the required questions. Some field methods may be applied throughout Navy ranges, while other methodologies may be specially selected for one or two ranges that are most likely to produce the best quality data. For example, in Hawaii, there are some baseline data on odontocetes from previous tagging (Baird et al., 2006), which can be used to provide a context for any tagging data collected during training events. By using a combination of monitoring techniques or tools appropriate for the species of concern, the type of training activities conducted, sea state conditions, and the appropriate spatial extent, the detection, localization, and observation of marine species can be optimized, and return on the monitoring investment can be maximized in terms of data collection and mitigation effectiveness evaluation.

The primary tools available for monitoring generally include the following:

- Visual Observations – Surface vessel and aerial survey platforms can provide data on both long term population trends (abundance and distribution) as well as occurrence immediately before, during, and after training events. In addition, visual observation has

the potential to collect information related to behavioral response of marine species to Navy training activities. Both Navy personnel (lookouts) and independent visual observers (Navy biologists) will be used from a variety of platforms (both Navy and third-party) for monitoring as appropriate and when logistically feasible.

- Passive Acoustic Monitoring – Autonomous Acoustic Recorders (moored buoys), High Frequency Acoustic Recording Packages (HARPS), sonobuoys, passive acoustic towed arrays, shipboard passive sonar, and Navy Instrumented Acoustic Ranges can provide data on presence/absence as well as localization, identification, and tracking in some cases. Passive acoustic observations are particularly important for species that are difficult to detect visually or when conditions limit the effectiveness of visual monitoring. Instrumented Navy ranges present a unique opportunity to take advantage of infrastructure that would otherwise not be available for monitoring such a large area. The Marine Mammal Monitoring on Navy Ranges (M3R) program takes advantage of this opportunity and may support long-term data collection at specific fixed sites.
- Tagging is an important tool for examining the movement patterns and diving behavior of cetaceans. Sensors can be used that measure location, swim velocity, orientation, vocalizations, as well as record received sound levels. Tagging with sophisticated digital acoustic recording tags (D-tags) may also allow direct monitoring of behaviors not readily apparent to surface observers. D-tags were recently deployed as part of a behavioral response study (BRS-07) initiated at the Atlantic Undersea Test and Evaluation Center (AUTEC) range in the Bahamas to begin identifying behavioral mechanisms related to anthropogenic sound exposure.
- Photo identification and tagging of animals – Photo identification contributes to understanding of movement patterns and stock structure that is important to determine how potential effects may relate to individual stocks or populations.
- Oceanographic and environmental data collection – Physical and environmental data related to habitat parameters are necessary for analyzing distribution patterns, developing predictive habitat and density models, and better understanding habitat use.

13.2 Reporting

In order to issue an Incidental Take Authorization (ITA) for an activity, Section 101(a)(5)(A) of the MMPA states that NMFS must set forth ‘‘requirements pertaining to the monitoring and reporting of such taking’’. Effective reporting is critical to ensure compliance with the terms and conditions of an LOA, and to provide NMFS and the Navy with data of the highest quality based on the required monitoring. As NMFS noted in its proposed rule, additional detail has been added to the reporting requirements since they were outlined in the proposed rule. The updated reporting requirements are all included below. A subset of the information provided in the monitoring reports may be classified and not releasable to the public. NMFS will work with the Navy to develop tables that allow for efficient submission of the information required below.

General Notification of Injured or Dead Marine Mammals

Navy personnel will ensure that NMFS (regional stranding coordinator) is notified immediately (or as soon as operational security allows) if an injured or dead marine mammal is found during or shortly after, and in the vicinity of, any Navy training exercise utilizing Mid-frequency Active Sonar (MFAS), High Frequency Active Sonar (HFAS), or underwater explosive detonations. The Navy will provide NMFS with species or description of the animal(s), the

condition of the animal(s) (including carcass condition if the animal is dead), location, time of first discovery, observed behaviors (if alive), and photo or video (if available).

Annual Monitoring Plan Report

Data collected from the GOMEX Range Complex monitoring plan will be added to a Navy wide analysis of monitoring from other permitted Navy range complexes via the ICMP framework. The Navy will provide an annual monitoring report to NMFS HQ in fulfillment of the MMPA Letter of Authorization (LOA) requirements. The report will provide information on the amount and spatial/temporal distribution of monitoring effort as well as summaries of data collected and any preliminary results that may be available from analysis. All subsequent analysis shall be completed in time for Navy's five-year report to NMFS in support of the MMPA permit process. All data will be considered pre-decisional during the course of the research studies to protect from premature conclusions being drawn.

Annual Exercise Report

The Navy will submit an Annual GOMEX Exercise Report which shall contain the subsections and information indicated below.

Major Training Exercises

This section shall contain the following information for Major Training Exercises (MTE) conducted in the
GOMEX Range Complex:

(a) Exercise Information (for each MTE):
- (i) Exercise designator.
- (ii) Date that exercise began and ended.
- (iii) Location.
- (iv) Number and types of active sources used in the exercise.
- (v) Number and types of passive acoustic sources used in exercise.
- (vi) Number and types of vessels, aircraft, etc., participating in exercise.
- (vii) Total hours of observation by lookouts (watchstanders).
- (viii) Total hours of all active sonar source operation.
- (ix) Total hours of each active sonar source (along with explanation of how hours are calculated
for sources typically quantified in alternate way (buoys, torpedoes, etc.)).
- (x) Wave height (high, low, and average during exercise).

(b) Individual marine mammal sighting information (for each sighting in each MTE).
- (i) Location of sighting.
- (ii) Species (if not possible—indication of whale/dolphin/pinniped).
- (iii) Number of individuals.
- (iv) Calves observed (y/n).
- (v) Initial Detection Sensor.
- (vi) Indication of specific type of platform observation made from (including, for example, what type of surface vessel, *i.e.*, FFG, DDG, or CG)

(vii) Length of time observers maintained visual contact with marine mammal(s).
(viii) Wave height (in feet).
(ix) Visibility.
(x) Sonar source in use (y/n).
(xi) Indication of whether animal is <200yd, 200–500yd, 500–1000yd, 1000–2000yd, or >2000yd from sonar source in (x) above.
(xii) Mitigation Implementation—whether operation of sonar sensor was delayed, or sonar was powered or shut down, and how long the delay was.
(xiii) If source in use (x) is hull-mounted, true bearing of animal from ship, true direction of ship's travel, and estimation of animal's motion relative to ship (opening, closing, parallel)
(xiv) Observed behavior—Lookouts (Watchstanders) shall report, in plain language and without trying to categorize in any way, the observed behavior of the animals (such as animal closing to bow ride, paralleling course/ speed, floating on surface and not swimming, etc.)

(c) An evaluation (based on data gathered during all of the MTEs) of the effectiveness of mitigation measures designed to avoid exposing marine mammals to mid-frequency sonar. This evaluation shall identify the specific observations that support any conclusions the Navy reaches about the effectiveness of the mitigation.

13.3 Adaptive Management

The regulations under which the Navy's LOAs are issued will contain an adaptive management component (NMFS, 2009). This gives NMFS the ability to consider the results of the previous years' monitoring, research, and/or the results of stranding investigations when prescribing mitigation or monitoring requirements in subsequent years. In the event that NMFS concludes that there is a high likelihood that MFAS or explosive detonations were a cause of a Uncommon Stranding Event ([USE] as defined in 50 CFR § 216.291), NMFS will review the analysis of the environmental and operational circumstances surrounding the USE. In subsequent LOAs, based on this review and through the adaptive management component of the regulations, NMFS may require mitigation and monitoring measures be modified or supplemented if the new data suggest that modifications would either have a reasonable likelihood of reducing the chance of future USEs resulting from a similar confluence of events or would increase the effectiveness of the stranding investigations. Further based on this review and the adaptive management component of the regulations, NMFS may modify or add to the existing monitoring requirements if the data suggest that the addition of a particular measure would likely fill a specifically important data or management gap.

Monitoring Workshop

The Navy, with guidance and support from NMFS, will convene a Monitoring Workshop, including marine mammal and acoustic experts as well as other interested parties, in 2011. The Monitoring Workshop participants will review the monitoring results from the previous two years of Navy-wide monitoring and provide recommendations to the Navy and NMFS on the monitoring plan(s) after also considering the current science (including Navy research and development) and working within the framework of available resources and feasibility of implementation. NMFS and the Navy would then analyze the input from the Monitoring

Workshop participants and determine the best way forward from a national perspective. Subsequent to the Monitoring Workshop, modifications would be applied to monitoring plans as appropriate.

Chapter 14 Research Efforts

The entire section Chapter 14 is replaced with the following revised text:

The Navy provides a significant amount of funding and support to marine research through a variety of organizations. From FY04 to FY08, the Navy provided over $94 million to universities, research institutions, federal laboratories, private companies, and independent researchers around the world for marine life research. During this same time period, the DoD contributed nearly $6 million for a total of $100 million in marine life research projects. These projects include basic science efforts, such as baseline surveys, and do not include monitoring surveys or environmental planning document preparation (DoN, 2008c). In FY08 alone, the Navy will spend over $26 million and the DoD almost $1 million towards this effort (DoN, 2008c). Currently, the Navy has budgeted nearly $22 million and the DoD has budgeted a half a million dollars for continued marine mammal research in FY09 (DoN, 2008c). Major topics of Navy-supported research include the following:

- Better understanding of marine species distribution and important habitat areas,
- Developing methods to detect and monitor marine species before and during training,
- Understanding the effects of sound on marine mammals, sea turtles, fish, and birds, and
- Developing tools to model and estimate potential effects of sound.

This research is directly applicable to Atlantic Fleet training activities, particularly with respect to the investigations of the potential effects of underwater noise sources on marine mammals and other protected species. Proposed training activities employ sonar and underwater explosives, which introduce sound into the marine environment.

The Marine Life Sciences Division of the Office of Naval Research currently coordinates six programs that examine the marine environment and are devoted solely to studying the effects of noise and/or the implementation of technology tools that will assist the Navy in studying and tracking marine mammals. The six programs are as follows:

1. Environmental Consequences of Underwater Sound,
2. Non-Auditory Biological Effects of Sound on Marine Mammals,
3. Effects of Sound on the Marine Environment,
4. Sensors and Models for Marine Environmental Monitoring,
5. Effects of Sound on Hearing of Marine Animals, and
6. Passive Acoustic Detection, Classification, and Tracking of Marine Mammals.

The Navy has also developed the technical reports referenced within this document, which include the Marine Resource Assessments (MRAs) (DoN, 2007a) and the Navy OPAREA Density Estimates (NODE) reports (DoN, 2007b). Furthermore, research cruises by the National Marine Fisheries Service (NMFS) and by academic institutions have received funding from the U.S. Navy. For instance, the ONR contributed financially to the Sperm Whale Seismic Survey (SWSS) in the Gulf of Mexico, coordinated by Texas A&M. The goals of the SWSS are to examine effects of the oil and gas industry on sperm whales and what mitigations would be employed to minimize adverse effects to the species. All of this research helps in understanding the marine environment and the effects that may arise from the use of underwater noise in the Gulf of Mexico and western North Atlantic Ocean.

The Navy has sponsored several workshops to evaluate the current state of knowledge and potential for future acoustic monitoring of marine mammals. The workshops brought together acoustic experts and marine biologists from the Navy and other research organizations to present data and information on current acoustic monitoring research efforts and to evaluate the potential for incorporating similar technology and methods on instrumented ranges. However, acoustic detection, identification, localization, and tracking of individual animals still requires a significant amount of research effort to be considered a reliable method for marine mammal monitoring. The Navy supports research efforts on acoustic monitoring and will continue to investigate the feasibility of passive acoustics as a potential mitigation and monitoring tool.

Overall, the Navy will continue to fund ongoing research, and is planning to coordinate long term monitoring/studies of marine mammals on various established ranges and operating areas. The Navy will continue to research and contribute to university/external research to improve the state of the science regarding marine species biology and acoustic effects. These efforts include mitigation and monitoring programs; data sharing with NMFS and via the literature for research and development efforts; and future research as described previously.