

## CHAPTER 5 :MITIGATION MEASURES

### 5.1 INTRODUCTION

Effective training in the Cherry Point 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 actions have the potential to impact some marine resources 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 document, 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 5.2 describes the Navy's overall mitigation approach. The Navy's Monitoring and Reporting Requirements are presented in Section 5.3 and research efforts are presented in Section 5.4. Mitigation measures performed by Navy personnel on a regular and routine basis are discussed in Section 5.5 and are known as "Standard Operating Procedures." Section 5.6 presents special mitigation measures associated with vessel transit during North Atlantic right whale migration. Section 5.7 presents measures for specific training events. Section 5.8 presents coordination and reporting requirements. Section 5.9 provides alternative mitigation that was considered but eliminated. Section 5.10 discusses the effectiveness of visual observation including the detection probability and efficacy of mitigation measures. Measures for activities that are part of the proposed action, but are analyzed in separate environmental documents that are incorporated by reference are not necessarily included in this chapter. Mitigation measures specific to sonar use are addressed fully in the AFAST EIS/OEIS (DoN, 2008a) and are presented in sections 5.7.14 and 5.7.15.

### 5.2 APPROACH

Mitigation of impacts is defined in the Council on Environmental Quality (CEQ) regulations (40 CFR 1508.20) to include 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 Navy Cherry Point 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. Those 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 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 Record of Decision as well as in documents that result from other regulatory processes (*e.g.*, ESA Biological Opinion).

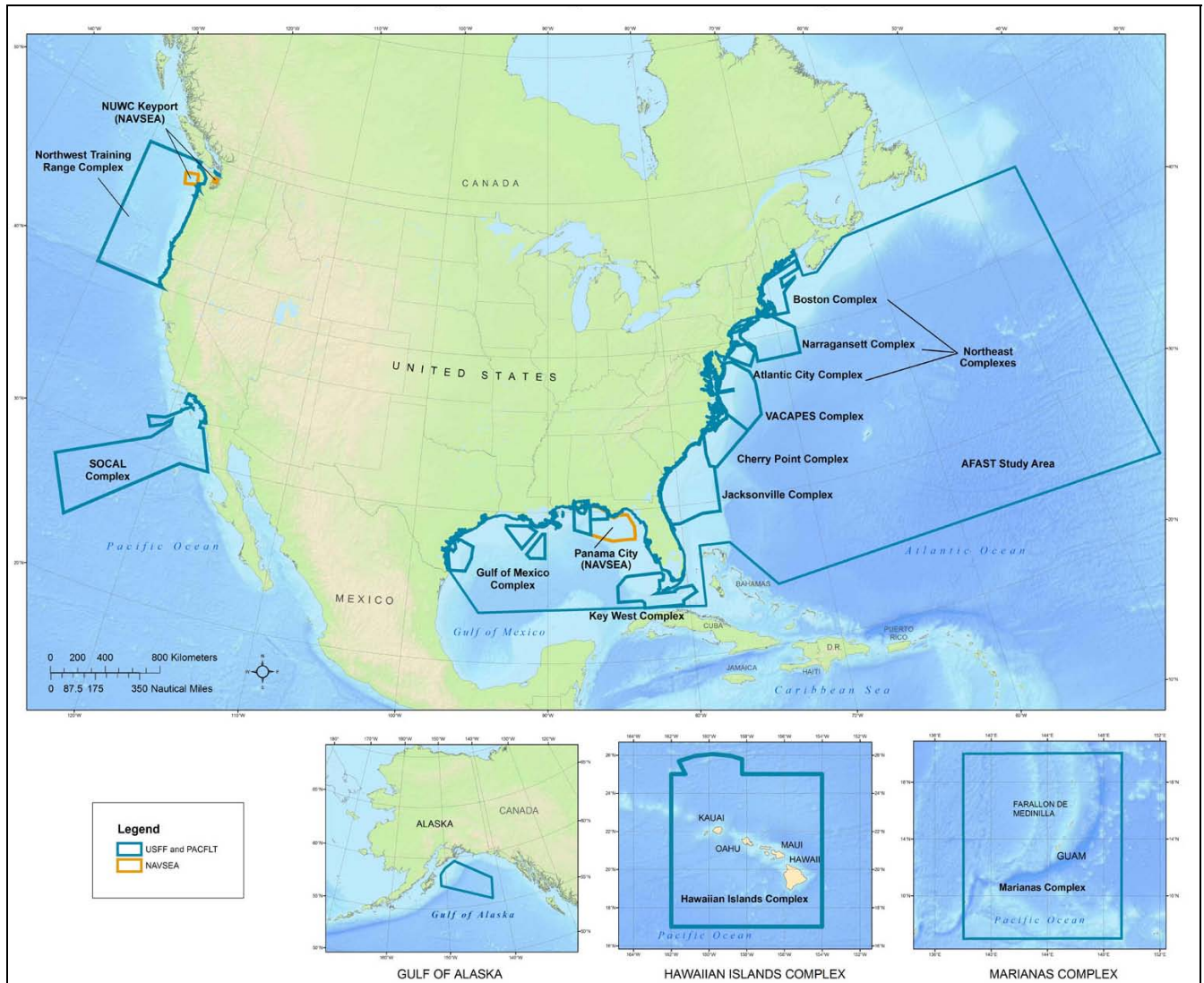
The final suite of measures developed in Navy's application for a Marine Mammal Protection Act (MMPA) Letter of Authorization (LOA) is analyzed in this final EIS/OEIS. In addition to the National Environmental Policy Act (NEPA) process, the public had an opportunity to provide input to NMFS through the 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 this Final EIS/OEIS. If additional mitigation or monitoring measures are required, they will be included in the Record of Decision.

### **5.3 MONITORING AND REPORTING MEASURES**

#### **5.3.1 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 (see Figure 5.3-1). Although the ICMP is intended to apply to all Navy training, use of MFA Sonar in training and research, development, testing, and evaluation (RDT&E) will comprise a major component of the overall program.

The ICMP will establish the overarching structure and coordination that will facilitate the collection and synthesis of monitoring data from Navy training and research and development projects. The Program will compile data from range-specific monitoring efforts as well as research and development (R&D) studies that are fully or partially Navy-funded. Monitoring methods across the ranges will include methods such as vessel and aerial surveys, tagging, and passive acoustic monitoring.



**Figure 5.3-1 Navy-Wide Area Map of Areas Where Data Collection is Expected to Occur**

The primary objectives of the ICMF are to:

- Monitor Navy training exercises, particularly those involving active sonar and underwater detonations, for compliance with the terms and conditions of ESA Section 7 consultations and/or MMPA authorizations;
- Minimize exposure of protected species to sound levels from active sonar or sound pressure levels from underwater detonations currently considered to result in harassment;
- Collect data to support estimating the number of individuals exposed to sound levels above current regulatory thresholds;
- Assess the efficacy of the Navy’s current marine species mitigation;
- Assess the practicality and effectiveness of potential future mitigation tools and techniques;
- Document trends in species distribution and abundance in Navy training areas through focused longitudinal monitoring efforts; and
- Add to the knowledge base on potential behavioral and physiological effects to marine species from active sonar and underwater detonations.

The ICMP will provide a comprehensive structure and serve as the basis for establishing monitoring plans for individual range complexes and specific training activities as well as geographically based longitudinal monitoring programs at select locations. Specific training exercise plans will focus on short-term monitoring and mitigation for individual training activities. Each training event will be evaluated to determine if it represents an appropriate monitoring opportunity within the ICMP framework. Due to the scale (spatial, temporal, and operational) of various training activities, not every event will present optimum opportunity for concentrated monitoring and, as a result, various levels of effort and resources will be associated with individual exercises. The overall approach of the ICMP is to target the majority of available monitoring resources on a limited number of opportunities with best potential for high quality data collection rather than attempting to apply a thin blanket of monitoring over the entirety of Navy training.

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.

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 ICMP will evaluate the range of potential monitoring techniques that can be tailored to any Navy range or exercise and the appropriate species of concern. 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 (AUTECE) 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.

Because data concerning physiological and behavioral effects, as well as long-term modifications of habitat use, are extremely limited at this time, the ICMP will also incorporate several geographically fixed longitudinal monitoring sites to assess potential effects to marine mammals, both at the individual and population level. One example of this geographically fixed monitoring approach is the program recently initiated for the proposed Undersea Warfare Training Range (USWTR) in the Atlantic. The Navy contracted with a consortium of researchers from Duke University, the University of North Carolina at Wilmington, the University of St. Andrews, and the NMFS Northeast Fisheries Science Center to conduct a pilot study analysis and subsequently develop a survey and monitoring plan that prescribes the recommended approach for data collection, including surveys (aerial/shipboard, frequency, spatial extent, *etc.*), passive acoustic monitoring, photo identification and data analysis (standard line-transect, spatial modeling, *etc.*) necessary to establish a fine-scale seasonal baseline of protected species distribution and abundance.

This baseline study will provide the foundation for establishing a monitoring program designed to provide meaningful data on potential long term effects to marine species that may be chronically exposed to training activities on the USWTR. The baseline data collection portion of the program began in June 2007 at the Onslow Bay alternative site and includes coordinated aerial, shipboard, and passive acoustic surveys as well as deployment of HARPs to supplement the traditional visual surveys. A similar program is currently being initiated at the Jacksonville preferred site. Similar efforts may be developed for other Navy ranges to support the overall ICMP objectives.

In addition to the specific monitoring initiative outlined above, the ICMP framework proposes to continue or initiate studies of behavioral response, abundance, distribution, habitat utilization, *etc.* for species of concern using a variety of methods, which may include visual surveys, passive and acoustic monitoring, radar, and data logging tags (to record data on acoustics, diving and foraging behavior, and movements). This work will help to build the collective knowledgebase on the geographic and temporal extent of key habitats and provide baseline information to account for natural perturbations such as El Niño or La Niña events as well as establish baseline information to determine the spatial and temporal extent of reactions to Navy operations, or indirect effects from changes in prey availability and distribution. Both the Office of Naval Research and Chief of Naval Operations are heavily involved in supporting a variety of ongoing research efforts (summarized below), including the recent BRS-07 conducted at AUTECH during the summer of 2007.

The Navy will coordinate with the local NMFS Stranding Coordinator for any unusual marine mammal behavior and any stranding, beached live/dead, or floating marine mammals that may occur at any time during or within 24 hours after completion of explosive training activities.

### 5.3.2 Monitoring Summary

The monitoring methods proposed for use during training events in the Navy Cherry Point Range Complex include a combination of individual elements designed to allow a comprehensive assessment include:

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- (1) Vessel and aerial surveys
    - (i) Visual surveillance of 1 event per year. If possible, the event surveyed will be one involving multiple detonations. Due to the limited number of events conducted in the Cherry Point Range Complex, there is a potential that it may be impossible to coordinate required surveys to take place during the limited opportunities presented. In any case, any missed annual survey requirement will roll into the subsequent year ensuring that the appropriate number of surveys occurs over the 5-year period of effectiveness of the MMPA regulation. Likewise, additional surveys may be scheduled in any year where additional opportunities arise, with the number of surveys during the 5-year regulations not to exceed 5.
    - (ii) For surveyed training events, aerial or vessel surveys will be used 1– 2 days prior to, during if reasonably safe, and 1–5 days post detonation. The variation in the number of days after allows for the detection of animals that gradually return to an area, if they indeed do change their distribution in response to underwater detonation events.
    - (iii) Surveys will include any specified exclusion zone around a particular detonation point plus 2000 yards beyond the exclusion zone. For vessel-based surveys a passive acoustic system (hydrophone or towed array) could be used to determine if marine mammals are in the area before and/or after a detonation event. Depending on animals sighted, it may be possible to conduct focal surveys of animals outside of the exclusion zone (detonations could be delayed if marine mammals are observed within the exclusion zone) to record behavioral responses to the detonations.
    - (iv) When conducting a particular survey, the survey team will collect:
      - (A) species identification and group size;
      - (B) location and relative distance from the detonation site;
      - (C) the behavior of marine mammals including standard environmental and oceanographic parameters;
      - (D) date, time and visual conditions associated with each observation;
      - (E) direction of travel relative to the detonation site; and
      - (F) duration of the observation.
  - (2) Passive acoustic monitoring
    - (i) When practicable, a towed hydrophone array should be used whenever shipboard surveys are being conducted. The towed array would be deployed during daylight hours for each of the days the ship is at sea.
    - (ii) A towed hydrophone array is towed from the boat and can detect and localize marine mammals that vocalize and would be used to supplement the ship-based systematic line-transect surveys (particularly for species such as beaked whales that are rarely seen).
    - (iii) The array would need to detect low frequency vocalizations (< 1,000 Hz) for baleen whales and relatively high frequency vocalizations (up to 30 kHz) for odontocetes such as sperm whales. The use of two simultaneously deployed arrays can also allow more accurate localization and determination of diving patterns.
  - (3) Marine mammal observers on Navy platforms as follows:

- (i) To the extent practicable, marine mammal observers (MMOs) will be placed on a Navy platform.
- (ii) Qualifications must include expertise in species identification of regional marine mammal species and experience collecting behavioral data. Experience as a NMFS marine mammal observer is preferred, but not required. Navy biologists and contracted biologists will be used; contracted MMOs must have appropriate security clearance to board Navy platforms.
- (iii) MMOs will not be placed aboard Navy platforms for every Navy training event or major exercise, but during specifically identified opportunities deemed appropriate for data collection efforts. The events selected for MMO participation will take into account safety, logistics, and operational concerns.
- (iv) MMOs will observe from the same height above water as the lookouts.
- (v) The MMOs will not be part of the Navy's formal reporting chain of command during their data collection efforts; Navy lookouts will continue to serve as the primary reporting means within the Navy chain of command for marine mammal sightings. The only exception is that if an animal is observed within the shutdown zone that has not been observed by the lookout, the MMO will inform the lookout of the sighting for the lookout to take the appropriate action through the chain of command.
- (vi) The MMOs will collect species identification, behavior, direction of travel relative to the Navy platform, and distance first observed. All MMO sighting will be conducted according to a standard operating procedure.

The Navy would submit a report annually on September 1 describing the implementation and results (through June 1 of the same year) of the monitoring required above. Standard marine species sighting forms would be provided by the Navy and data collection methods will be standardized across ranges to allow for comparison in different geographic locations.

Navy Cherry Point Range Complex Comprehensive Report – The Navy will submit to NMFS a draft report that summarizes all of the marine mammal observations and data gathered during explosive exercises through June 1, 2012. This report will be submitted to NMFS at the end of the fourth year of the rule (November 2012).

The Navy will respond to NMFS comments on the draft comprehensive report if submitted within 3 months of receipt. The report will be considered final after the Navy has addressed NMFS' comments, or three months after the submittal of the draft if NMFS does not comment by then.

To implement the aforementioned monitoring measures, the Navy is developing an ICMP for marine species in order 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. Although the ICMP is intended to apply to all Navy training, use of MFA sonar in training, testing, and RDT&E will comprise a major component of the overall program.

The ICMP will establish the overarching structure and coordination that will facilitate the collection and synthesis of monitoring data from Navy training and research and development projects. The Program will compile data from range-specific monitoring efforts as well as R&D studies that are fully or partially Navy funded. Monitoring methods across the ranges will include methods such as vessel and aerial surveys, tagging, and passive acoustic monitoring. The Navy will coordinate with the local NMFS Stranding Coordinator for any unusual marine mammal behavior and any stranding, beached live/dead,

or floating marine mammals that may occur at any time during or within 24 hours after completion of explosives training activities.

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 monitoring pursuant to the Navy Cherry Point Range Complex rule as well as monitoring results from other Navy rules and LOAs. The Monitoring Workshop participants would provide their individual 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.

### 5.3.3 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 Navy Cherry Point Monitoring Plan Report*

The Navy will submit a report annually on September 1 describing the implementation and results (through June 1 of the same year) of the Navy Cherry Point Monitoring Plan, described above. Data collection methods will be standardized across range complexes to allow for comparison in different geographic locations. Although additional information will also be gathered, the MMOs collecting marine mammal data pursuant to the Navy Cherry Point Monitoring Plan shall, at a minimum, provide the same marine mammal observation data required in the MFAS/HFAS major Training Exercises section of the Annual Navy Cherry Point Exercise Report referenced below. The Navy Cherry Point Monitoring Plan Report may be provided to NMFS within a larger report that includes the required Monitoring Plan Reports from multiple Range Complexes.

#### *Annual Navy Cherry Point Exercise Report*

The Navy will submit an Annual Navy Cherry Point Exercise Report on September 1 of every year. This report 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 Navy Cherry Point 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.
  - (xiii) Mitigation Implementation—whether operation of sonar sensor was delayed, or sonar was powered or shut down, and how long the delay was.
  - (xiv) 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)
  - (xv) 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.

#### **5.3.4 Adaptive Management**

The regulations under which the Navy's LOA 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 the mitigation 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.

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 monitoring pursuant to the Navy Cherry Point Range Complex rule as well as monitoring results from other Navy rules and LOAs. The Monitoring Workshop participants would provide their individual 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.

#### **5.4 RESEARCH EFFORTS**

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, 2008b). In FY08, the Navy spent over \$26 million and the DoD almost \$1 million towards this effort (DoN, 2008b). 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, 2008b). 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 and the Navy OPAREA Density Estimates (NODE) reports (DoN, 2007b). Furthermore, research cruises by the 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.

Recently, a workshop was held to discuss the research required to understand the impact of tactical mid-frequency sonar transmission on fish, fisheries and fisheries habitat. Workshop participants included personnel from the Navy, academic universities, and NOAA Fisheries Service, who were selected based on their expertise in acoustics, fish hearing and fisheries biology. The objective of the workshop was to describe the range of scientific concerns regarding the effects of Navy training activities using tactical mid-frequency active sonar on fish and fisheries resources and to distill these concerns into a long-term research and development plan. The priorities of the workshop included larval fish effects, hearing capabilities, small pelagic and soniferous fish behavior and potential effects to fisheries.

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, through literature for research and development efforts; and future research as described previously.

## **5.5 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.”

### **5.5.1 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.

For the past few years, the Navy has implemented marine mammal spotter training for its bridge lookout personnel on ships and submarines. This training has been revamped and updated as the Marine Species Awareness Training (MSAT) and is provided to all applicable units. The lookout training program incorporates MSAT, which addresses the lookout’s role in environmental protection, laws governing the protection of marine species, Navy stewardship commitments, and general observation information, including more detailed information for spotting 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 lookout 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 lookout. 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.

### 5.5.2 Operating Procedures and Collision Avoidance

1. Prior to major exercises, a Letter of Instruction, Naval 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 Eyes" (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 1,500 ft (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.

## 5.6 MITIGATION MEASURES APPLICABLE TO VESSEL TRANSIT DURING NORTH ATLANTIC RIGHT WHALE MIGRATION

The mid-Atlantic is defined broadly to include ports south and east of Block Island Sound southward to South Carolina. The procedure described below would be established as mitigation measures for Navy vessel transits during North Atlantic right whale migratory seasons near ports located off the western North Atlantic, offshore of the eastern United States. The mitigation measures would apply to all Navy vessel transits, including those vessels that would transit to and from East Coast ports and operating areas (OPAREAs). Seasonal migration of North Atlantic right whales is generally described by NMFS as occurring from October 15th through April 30th, when right whales migrate between feeding grounds farther north and calving grounds farther south. The Navy mitigation measures have been established in accordance with rolling dates identified by NMFS consistent with these seasonal patterns.

NMFS has identified ports located in the western Atlantic Ocean, offshore of the southeastern United States, where vessel transit during North Atlantic right whale migration is of highest concern for potential ship strike. Navy vessels are required to use extreme caution and operate at a slow, safe speed consistent with mission and safety during the months indicated in Table 5.6-1 and within a 20 nm (37 km) arc (except as noted) of the specified reference points.

During the indicated months, Navy vessels would practice increased vigilance with respect to avoidance of vessel-whale interactions along the mid-Atlantic coast, including transits to and from any mid-Atlantic ports not specifically identified above. All surface(d) units transiting within 56 km (30 nm) of the coast in the mid-Atlantic would ensure at least two watchstanders are posted, including at least one lookout that has completed required MSAT training. Furthermore, Navy vessels would not knowingly approach any whale head on and would maneuver to keep at least 500 yards (457 m) away from any observed whale, consistent with vessel safety.

**Table 5.6-1  
North Atlantic Right Whale Migration Port References**

Region	Months	Port Reference Points
South and East of Block Island	Sep–Oct and Mar–Apr	20 nm seaward of line between 41-4.49N 071-51.15W and 41-18.58N 070-50.23W
New York / New Jersey	Sep–Oct and Feb–Apr	40-30.64N 073-57.76W
Delaware Bay (Philadelphia)	Oct–Dec and Feb–Mar	38-52.13N 075-1.93W
Chesapeake Bay (Hampton Roads and Baltimore)	Nov–Dec and Feb–Apr	37-1.11N 075-57.56W
North Carolina	Dec–Apr	34-41.54N 076-40.20W
South Carolina	Oct–Apr	33-11.84N 079-8.99W 32-43.39N 079-48.72W

## 5.7 MEASURES FOR SPECIFIC TRAINING EVENTS

These actions are protective measures that are currently in place and will be used as applicable to activities described under each alternative in Chapter 2.

### 5.7.1 Surface-to-Surface Gunnery (up to and including 5-inch explosive rounds)

1. Lookouts will visually survey for floating weeds, algal mats, and *Sargassum* rafts, which may be inhabited by immature sea turtles, in the target area. Intended target area shall not be within 600 yards (548 m) of known or observed floating weeds, algal mats, *Sargassum* rafts, or coral reefs.
2. If applicable, target-towing vessels shall maintain a trained lookout for marine mammals and sea turtles. If a marine mammal or sea turtle is sighted in the vicinity, the tow vessel will immediately notify the firing vessel, which will suspend the exercise until the area is clear.
3. A 600 yard (548 m) radius buffer zone will be established around the intended target.
4. From the intended firing position, trained lookouts will survey the buffer zone for marine mammals and sea turtles prior to commencement and during the exercise as long as practicable. Due to the distance between the firing position and the buffer zone, lookouts are only expected to visually detect breaching whales, whale blows, and large pods of dolphins and porpoises.
5. The exercise will be conducted only when the buffer zone is visible and marine mammals and sea turtles are not detected within the target area and the buffer zone.

### 5.7.2 Surface-to-Surface Gunnery (up to and including 5-inch non-explosive rounds)

1. Lookouts will visually survey for floating weeds, algal mats, and *Sargassum* rafts which may be inhabited by immature sea turtles in the target area. Intended target area shall not be within 200 yards (182 m) of known or observed floating weeds, algal mats, *Sargassum* rafts, or coral reefs.
2. A 200 yard (182 m) radius buffer zone will be established around the intended target.
3. From the intended firing position, trained lookouts will survey the buffer zone for marine mammals and sea turtles prior to commencement and during the exercise as long as practicable. Due to the distance between the firing position and the buffer zone, lookouts are only expected to visually detect breaching whales, whale blows, and large pods of dolphins and porpoises.
4. If applicable, target-towing vessels shall maintain a trained lookout for marine mammals and sea turtles. If a marine mammal or sea turtle is sighted in the vicinity, the tow vessel will immediately notify the firing vessel, which will suspend the exercise until the area is clear.
5. The exercise will be conducted only when the buffer zone is visible and marine mammals and sea turtles are not detected within the target area and the buffer zone.

### 5.7.3 Firing Exercise (FIREX) Using the Integrated Maritime Portable Acoustic Scoring System (IMPASS) (5-in. explosive rounds)

Note: This exercise is also known as Firing Exercise II (FIREX II) and Naval Surface Fire Support (NSFS).

1. FIREX using IMPASS will only be conducted in Areas 4, 5, 13 or 14 of the Navy Cherry Point Range Complex.
2. Pre-exercise monitoring of the target area will be conducted with “Big Eyes” prior to the event, during deployment of the IMPASS sonobuoy array, and during return to the firing position. Ships will maintain a lookout dedicated to visually searching for marine mammals and sea turtles 180° along the ship track line and 360° at each buoy drop-off location.
3. “Big Eyes” on the ship will be used to monitor a 600 yd (548 m) buffer zone around the target area for marine mammals/sea turtles during naval-gunfire events. Due to the distance between

the firing position and the buffer zone, lookouts are only expected to visually detect breaching whales, whale blows, and large pods of dolphins and porpoises.

4. Ships will not fire on the target if any marine mammals or sea turtles are detected within or approaching the 600 yd (548 m) buffer until the area is cleared. If marine mammals or sea turtles are present, operations would be suspended. Visual observation will occur for approximately 45 minutes, or until the animal has been observed to have cleared the area and is heading away from the buffer zone.
5. Post-exercise monitoring of the entire effect range will take place with “Big Eyes” and the naked eye during the retrieval of the IMPASS sonobuoy array following each firing exercise.
6. FIREX with IMPASS will take place during daylight hours only.
7. FIREX with IMPASS will only be used in Beaufort Sea State three (3)<sup>31</sup> or less due to equipment limitations.
8. The visibility must be such that the fall of shot is visible from the firing ship during the exercise.
9. No firing will occur if marine mammals are detected within 70 yd (64 m) of the vessel.

#### **5.7.4 Small Arms Training – (such as 9 mm, .45 cal pistol, 12GA Shotgun, 5.56 mm, 7.62 mm, and .50 cal)**

1. Lookouts will visually survey for floating weeds, algal mats, *Sargassum* rafts, marine mammals, and sea turtles. Weapons will not be fired in the direction of known or observed floating weeds, algal mats, *Sargassum* rafts, marine mammals, sea turtles or coral reefs.

#### **5.7.5 Air-to-Surface At-Sea Bombing Exercises (500-lbs to 2,000-lbs explosive bombs)**

1. This activity occurs in W-122, Area 18 in the Navy Cherry Point Range Complex.
2. Aircraft will visually survey the target and buffer zone for marine mammals and sea turtles prior to and during the exercise. The pre-exercise survey of the impact area will be made by flying at 1,500 ft 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.
3. A buffer zone of 5,100-yd (4,663 m) radius will be established around the intended target zone. The exercises will be conducted only if the buffer zone is clear of sighted marine mammals and sea turtles.
4. If surface vessels are involved, lookouts will survey for *Sargassum* rafts. Ordnance shall not be targeted to impact within 5,100 yards (4663 m) of known or observed *Sargassum* rafts or coral reefs.
5. At-sea BOMBEXs using live ordnance will occur during daylight hours only.

#### **5.7.6 Air-to-Surface At-Sea Bombing Exercises (non-explosive munitions)**

1. If surface vessels are involved, trained lookouts will survey for *Sargassum* rafts, which may be inhabited by immature sea turtles, and for sea turtles and marine mammals. Ordnance shall not be targeted to impact within 1,000 yds (914 m) of known or observed *Sargassum* Rafts, sea turtles, marine mammals or coral reefs.

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<sup>31</sup> The Beaufort Scale of Wind Force was developed as a means for sailors to gauge wind speeds through visual observations of the sea state. The scale runs from 0 for calm to force 12 for Hurricane. In addition, this specific measure results from technological limitations of the sonobuoy array in higher sea states and is not intended as a measure for minimizing potential effects on the marine environment.

2. A 1,000 yd (914 m) radius buffer zone will be established around the intended target.
3. Aircraft will visually survey the target and buffer zone for marine mammals and sea turtles prior to and during the exercise. The pre-exercise survey of the impact area will be made by flying at 1,500 feet 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.
4. The exercise will be conducted only if marine mammals and sea turtles are not visible within the buffer zone.

#### **5.7.7 Air-to-Surface Gunnery (such as .50 cal, 20 mm and 25 mm explosive or non-explosive rounds)**

1. If surface vessels are involved, lookouts will visually survey for *Sargassum* rafts, which may be inhabited by immature sea turtles, in the target area. Impact should not occur within 200 yds (182 m) of known or observed floating weeds, algal mats, *Sargassum* rafts, or coral reefs.
2. A 200 yd (182 m) radius buffer zone will be established around the intended target.
3. If surface vessels are involved, lookout(s) will visually survey the buffer zone for marine mammals and sea turtles prior to and during the exercise.
4. Aerial surveillance of the buffer zone for marine mammals and sea turtles will be conducted prior to commencement of the exercise. Aerial surveillance altitude of 500 feet to 1,500 feet is optimum. Aircraft crew/pilot will maintain visual watch during exercises. Firing through cloud cover is prohibited; aircraft must be able to actually see ordnance impact areas.
5. The exercise will be conducted only if marine mammals and sea turtles are not visible within the buffer zone.
6. If applicable, target towing control craft shall maintain a lookout. If a marine mammal or sea turtle is sighted in the vicinity of the exercise, the towing control craft will immediately notify the firing vessel in order to stop gunnery firing until the area is clear.

#### **5.7.8 Air-to-Surface Missile Exercises (explosive)**

1. Ordnance shall not be targeted to impact within 1,800 yd (1,646 m) of known or observed *Sargassum* rafts, which may be inhabited by immature sea turtles, or coral reefs.
2. Aircraft will visually survey the target area for marine mammals and sea turtles. Visual inspection of the target area will be made by flying at 1,500 ft altitude or lower, if safe to do so, and at slowest safe speed. Firing or range clearance aircraft must be able to actually see ordnance impact areas. Explosive ordnance shall not be targeted to impact within 1,800 yd (1,646 m) of sighted marine mammals and sea turtles.
3. Aircraft may only conduct this exercise in Air 16 and 17 of W-122.

#### **5.7.9 Air-to-Air Missile Exercises (explosive and non-explosive)**

1. The geometry of missile exercises will be oriented in order to minimize the potential for debris to fall within 1,000 yards (914 m) of sighted marine mammals, sea turtles, algal mats, *Sargassum* rafts, and coral reefs.

#### **5.7.10 Mine Neutralization Training Involving Underwater Detonations (up to and including 20-lbs NEW charges)**

Mine neutralization involving underwater detonations occurs in shallow water (0-120 ft or 0-36 m) and is executed by divers using scuba. NMFS issued a Biological Opinion in 2002 for underwater detonations of up to and including 20-lb explosive charges related to MINEX training (NMFS, 2002). These exercises utilize small boats that deploy from shore-based facilities. Often times these small boats are rigid-hulled inflatable boats (RHIBs) which are designed for shallow water and have limited

seaworthiness necessitating a nearshore location. The exercise is a one-day event that occurs only during daylight hours therefore the distance from shore is limited.

1. Observers will survey the buffer zone, a 700 yd (640 m) radius from detonation location, for marine mammals and sea turtles from all participating vessels during the entire operation. A survey of the buffer zone (minimum of 3 parallel tracklines 219 yd [200 m] apart) using support craft will be conducted at the detonation location 30 minutes prior through 30 minutes post detonation. During late July through October, an additional surface observer will be added to more carefully look for hatchling turtles in the buffer zone. Aerial survey support will be utilized whenever assets are available.
2. Detonation operations will be conducted during daylight hours.
3. If a sea turtle or marine mammal is sighted within the buffer zone, the animal will be allowed to leave of its own volition. The Navy will suspend detonation exercises and ensure the area is clear for a full 30 minutes prior to detonation.
4. Divers placing the charges on mines and dive support vessel personnel will survey the area for sea turtles and marine mammals and will report any sightings to the surface observers. These animals will be allowed to leave of their own volition and the buffer zone will be clear for 30 minutes prior to detonation.
5. No detonations will take place within 3.2 nm of an estuarine inlet.
6. No detonations will take place within 1.6 nm of shoreline.
7. No detonations will take place within 1,000 ft of any known artificial reef, shipwreck, or live hard-bottom community.
8. Personnel will record any protected species observations during the exercise as well as measures taken if species are detected within the buffer zone.
9. Divers may only conduct underwater detonations (UNDET) in the designated UNDET Area within Area 15 of the Cherry Point OPAREA.

#### **5.7.11 Mine Countermeasures – Minesweeping Using Equipment Towed by Helicopters**

1. Use trained lookouts to survey for *Sargassum* rafts, sea turtles and marine mammals prior to and during the exercise.
2. Establish a 250 yd (229 m) buffer zone around the towed equipment. Exercise will not be conducted if marine mammals or sea turtles are detected within the buffer zone.

#### **5.7.12 Inert Mine Shape Deployment**

1. Known shipwrecks will be avoided when deploying inert mine shapes.
2. Known artificial and oyster reefs will be avoided when deploying inert mine shapes.

#### **5.7.13 Anchorage of Ships**

1. These requirements are not applicable if going to an assigned anchorage.
2. Avoid *Sargassum* rafts.
3. Ships will not anchor in the vicinity of coral reefs, except in designated anchorages or for safety of ship: vicinity is defined as the anchor swing circle encompassing a portion of a coral reef.
4. Ships will not anchor in areas of known shipwrecks.

#### **5.7.14 Mitigation Measures Related to Acoustic Effects (Taken From the AFAST FEIS)**

The AFAST Record of Decision, dated 23 Jan 2009, provides detailed discussion of mitigation measures to be employed during activities analyzed in the AFAST FEIS/OEIS. As discussed in the NMFS MMPA regulations for AFAST active sonar activities, ESA Biological opinion, and the AFAST

Record of Decision dated 23 Jan 2009, the Navy would implement various mitigation measures to maximize the ability of operators to recognize instances when marine mammals are in the vicinity. These measures include the following:

1. Training personnel in lookout/watchstander duties;
2. Stationing at least three people on watch with binoculars at all times;
3. Stationing at least two additional people on watch during ASW exercises when MFA sonar is being used;
4. Requiring all personnel engaged in passive acoustic sonar operation to monitor for marine mammal vocalizations;
5. Using all available sensor and optical systems, such as night vision goggles during MFA and HFA active sonar activities;
6. Using only passive capability of sonobuoys when marine mammals are detected within 183 meters (200 yards);
7. Limiting ship or submarine active transmission levels to at least 6 dB below normal operating levels when marine mammals are detected by any means within 914 meters (1,000 yards) of the sonar dome (the bow);
8. Limiting ship or submarine active transmission levels to at least 10 dB below normal operating levels when marine mammals are detected by any means within 457 meters (500 yards) of the sonar dome, or ceasing ship or submarine active transmissions when a marine mammal is detected by any means within 183 meters (200 yards) of the sonar dome;
9. If the need for such power-down arises, following power-down requirements as though the system is operating at 235 dB, the normal operating level (i.e., power-down would be to 229 dB);
10. Operating sonar at the lowest practicable level, not to exceed 235 dB, except as required to meet tactical training objectives;
11. Requiring helicopters to observe or survey the vicinity of an ASW activity for ten minutes before first deployment of active (dipping) sonar in the water; prohibiting dipping sonar within 183 meters (200 yd) of a marine mammal and ceasing pinging if a marine mammal closes to within 183 meters (200 yd) after pinging has begun;
12. Coordinating with the local NMFS Stranding Coordinator; and submitting a report containing a discussion of the nature of any observed effects based on both modeled results of real-time events and sightings of marine mammals.

#### ***Special Conditions Applicable for Bow-Riding Dolphins***

If, after conducting an initial maneuver to avoid close quarters with dolphins, the ship concludes that dolphins are deliberately closing in on the ship to ride the vessel's bow wave, no further mitigation actions would be necessary because dolphins are out of the main transmission axis of the active sonar while in the shallow-wave area of the vessel bow.

The Navy and NMFS worked together to identify additional practicable and effective mitigation measures to address the following three issues of concern:

- (1) general minimization of marine mammal impacts;
- (2) minimization of impacts within the southeastern North Atlantic right whales critical habitat; and

- (3) the potential relationship between the operation of mid and/or high-frequency active sonar and marine mammal strandings.

Any mitigation measure(s) prescribed by NMFS should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the following general goals:

- avoidance or minimization of injury or death of marine mammals wherever possible;
- a reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to received levels of mid- or high-frequency active sonar, underwater detonations, or other activities expected to result in the take of marine mammals (this goal may contribute to the first goal above, or by reducing harassment takes only);
- a reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to received levels of mid- or high-frequency active sonar, underwater detonations, or other activities expected to result in the take of marine mammals (this goal may contribute to the first goal listed above or by reducing harassment takes only);
- a reduction in the intensity of exposures (either total number or number at biologically important time or location) to received levels of MFA or HFA sonar, underwater detonations, or other activities expected to result in the take of marine mammals (this goal may contribute to (1), above, or to reducing the severity of harassment takes only);
- a reduction in adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time;
- and for monitoring directly related to mitigation, an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation (shut-down zone, etc.).

NMFS and the Navy had extensive discussions regarding mitigation as part of consultation on the proposed and final rules, in which several mitigation options and their respective practicability were explored. Ultimately, NMFS and the Navy developed the following measures which the Navy and NMFS believe supports (or contributes) to the goals mentioned above:

**Planning Awareness Areas (PAAs):** The Navy has designated several Planning Awareness Areas (PAAs) based on areas of high productivity that have been correlated with high concentrations of marine mammals (such as persistent oceanographic features like upwellings associated with the Gulf Stream front where it is deflected off the east coast near the Outer Banks), and areas of steep bathymetric contours that are frequented by deep diving marine mammals such as beaked whales and sperm whales. In developing the PAAs, USFF was able to consider these factors because of geographic flexibility in conducting ASW training. USFF is not tied to a specific range support structure for the majority of the training for AFAST.

Additionally, the topography and bathymetry along the East Coast and in the Gulf of Mexico is unique in that there is a wide continental shelf leading to the shelf break, affording a wider range of training opportunities. The Navy will avoid planning major exercises in the specified PAAs where feasible. Should national security require the conduct of more than four major exercises (COMPTUEX, JTFEX, SEASWITI, or similar scale event) in these areas (meaning all or a portion of the exercise) per year, the Navy will provide NMFS with prior notification and include the information in any associated after-action or monitoring reports. To the extent operationally feasible, the Navy plans to conduct no more than one of the four major exercises (COMPTUEX, JTFEX, SEASWITI, or similar scale event) per year in the Gulf of Mexico. Based on operational requirements, the exercise area for this one exercise may include the De Soto Canyon. If national security needs require more than one major exercise to be conducted in the PAAs, which includes portions of the DeSoto Canyon, the Navy would provide NMFS with prior notification and include the information in any associated after-action or monitoring reports.

The PAAs will be included in the Navy's Protective Measures Assessment Protocol (PMAP) (implemented by the Navy for use in the protection of the marine environment) for unit level situational awareness (i.e., exercises other than COMPTUEX, JTFEX, or SEASWITI). The goal of PMAP is to raise awareness in the fleet and ensure common sense and informed oversight is injected into planning processes for testing and training evolutions.

**Helicopter Dipping Sonar in North Atlantic right whale Critical Habitat:** Helicopter Dipping Sonar is one of the two activity types that have been identified as planned to occur in the southern North Atlantic right whale critical habitat. Historically, only maintenance of helicopter dipping sonars occurs within a portion of the North Atlantic right whale critical habitat. Tactical training with helicopter dipping sonar does not typically occur in the North Atlantic right whale critical habitat area at any time of the year. The critical habitat area is used on occasion for post maintenance operational checks and equipment testing due to its proximity to shore. Unless otherwise dictated by national security needs, the Navy will minimize helicopter dipping sonar maintenance within the southeast North Atlantic right whale critical habitat from November 15 to April 15.

**Object Detection Exercises in North Atlantic Right Whale Critical Habitat:** Object detection training requirements are another type of activity that has been identified as planned to occur in the southern North Atlantic right whale critical habitat. The Navy recognizes the significance of the North Atlantic right whale calving area and has explored ways of affecting the least practicable impact (which includes a consideration of practicality of implementation and impacts to training fidelity) to right whales. Navy units will incorporate data from the Early Warning System (EWS) into exercise pre-planning efforts. USFF contributes more than \$150,000 annually for aerial surveys that support the EWS, a communication network that assists afloat commands to avoid interactions with right whales. Fleet Air Control Surveillance Facility (FACSFAC) JAX houses the Whale Fusion Center, which disseminates the latest right whale sighting information to Navy ships, submarines, and aircraft. Through the Fusion Center, FACSFAC JAX coordinates ship and aircraft movement into the right whale critical habitat and the surrounding operating areas based on season, water temperature, weather conditions, and frequency of whale sightings and provides right whale reports to ships, submarines and aircraft, including coast guard vessels and civilian shipping. The Navy proposes:

- To reduce the time spent conducting object detection exercises in the North Atlantic right whale critical habitat during the time of November 15 to April 15; and
- Prior to conducting surface ship object detection exercises in the southeast North Atlantic right whale critical habitat during the time of November 15 to April 15, ships will contact the FACSFAC JAX to obtain the latest right whale sighting information. FACSFAC JAX will advise ships of all reported whale sightings in the vicinity of the critical habitat and Associated Area of Concern. To the extent operationally feasible, ships will avoid conducting training in the vicinity of recently sighted right whales. Ships will maneuver to maintain at least 457 meters (500 yards) separation from any observed whale, consistent with the safety of the ship.

#### **5.7.15 Mitigation Measures Related to Explosive Source Sonobuoys (AN/SSQ-110A) (Taken from the AFAST FEIS)**

As discussed in the NMFS MMPA regulations for AFAST active sonar activities, ESA Biological Opinion, and the AFAST Record of Decision dated 23 Jan 2009, the Navy would implement the following mitigation measures for explosive source sonobuoys (AN/SSQ-110A) as well as for the follow on Advanced Extended Echo Ranging (AEER) system:

1. Crews will conduct visual reconnaissance of the drop area prior to laying their intended sonobuoy pattern;

2. Crews will conduct a minimum of 30 minutes of visual and aural monitoring of the search area prior to commanding the first post (source/receiver sonobuoy pair) detonation;
3. If a post (source/receiver sonobuoy pair) will be deployed within 914 meters (1,000 yards) of observed marine mammal activity, crews will deploy the receiver only and monitor while conducting a visual search;
4. When operationally feasible, crews will conduct continuous visual and aural monitoring of marine mammal activity, including monitoring of their aircraft sensors from first sensor placement to checking off-station and of radio frequency range of these sensors; aural detection of marine mammal cues the aircrew to increase the diligence of their visual surveillance;
5. If marine mammals are visually detected within 914 meter (1,000 yards) of the explosive source sonobuoy (AN/SSQ-110A) intended for use, then that payload shall not be detonated;
6. Aircrews will ensure a 914-meter (1,000-yard) safety zone, visually clear of marine mammals, is maintained;
7. Aircrews shall only leave posts with unexploded charges in the event of a sonobuoy malfunction, an aircraft system malfunction, or when an aircraft must immediately depart the area due to issues such as fuel constraints, inclement weather, and in-flight emergencies;
8. Aircrews will ensure all payloads are accounted for;
9. Marine mammal monitoring shall continue until out of their aircraft sensor range.

#### **5.7.16 Amphibious Operations**

1. Range-specific standard operating procedures (e.g., directives that flora and fauna will not be needlessly damaged or destroyed) will be utilized during conduct of training to minimize damage to vegetation, wetlands, wildlife, and threatened or endangered species.
2. Prescribed routes to and from the ocean to the mainland at MCB Camp Lejeune and/or Eglin AFB during an amphibious landing will be followed.

#### **5.7.17 Standing Operating Procedures for Range Control for Marine Corps Base Camp Lejeune (Areas N-1/BT3)**

The following procedures were extracted from Range and Training Regulations (BO P3570.1B), *Standard Operating Procedures for Range Control*, Range Control Division, Training and Operations, Marine Corps Base, Camp Lejeune, North Carolina dated October 17, 2006. These actions are standard operating procedures that are currently in place and will be used in the future for all activities being analyzed in this EIS/OEIS.

1. Exercise play will incorporate and abide by the restriction presented in Base Order P3570.1B, *Standing Operating Procedures for Range Control*. Particular attention should be paid to Chapter 6, Environmental Procedures within the Range Control Standard Operating Procedures. All participating units will appoint an environmental coordinator who will attend a mandatory environmental briefing conducted by the host station. The environmental coordinator will be responsible for obtaining a copy of Base Order P3570.1B and all relevant environmental instruction, directives, and orders/handbook; ensure that all relevant environmental information is disseminated to participating troops; and ensure that all relevant environmental restrictions and/or guidance is followed.
2. The use of live ammunition is prohibited except at authorized target range complexes. Blank small arms ammunition will be issued and used. The use of chemical and riot agents is prohibited.

3. All ranges and training maneuver areas must be scheduled and approved in the Range Facility Management Support System (RFMSS) prior to use. Ranges that are close to the Atlantic Intracoastal Waterway (AIWW) or use the N-1/VT3 Impact Area and training or operations in the Atlantic Ocean Sector, to include Onslow Bay, must be scheduled at least 45 days prior to use to allow publication of a Notice to Mariners (NOTAM), coordination with external agencies, and scheduling of aircraft to perform an aerial sweep of the AIWW and Atlantic Ocean Sector prior to live firing, per the Code of Federal Regulations.
  - Training practice projectiles will not be fired to impact within 200 m of the AIWW.
  - HE bombs are not authorized.
  - Observation Posts, Bear Tower, and Onslow Beach North Tower, serve N-1/BT-3 and Brown's Island.
  - No class 3B and 4 Lasers are authorized.
  - Safety Restrictions: AIWW must be closed during firing.
  - Bear Tower and Onslow Beach North Tower must be scheduled in RFMSS, signed for, and manned prior to firing.
  - An aerial sweep of this area must include a sweep for people, small boats, and marine mammals in the AIWW. It must be conducted before live firing.
  - Night use is authorized after another aerial sweep.
4. While conducting Shore Bombardment, if marine mammals are observed within a 100-foot radius of the ship, operations will be suspended until the area has been cleared of marine mammals.
5. Flora and fauna will not be needlessly damaged or destroyed.
6. Hazardous Materials and Spills. Spills of hazardous materials, fuels, and POLs of any quantity on land and water must be reported promptly to the Base Fire Department by telephoning 911. After reporting the spill, the unit responsible will follow guidance received from the Base Fire Department or senior on-site Environmental Management Division representative and assist in clean up of the spill and management of the recovered product/contaminated soil.
7. Hovercrafts are required to follow prescribed routes to and from the ocean and mainland.
8. The AIWW may need to be closed for a maximum of three hours to facilitate moving exercise equipment from Onslow Beach to designated training areas. An existing crossing site normally used for such operations will be used. The crossing will be coordinated with, and approved by, the U.S. Army Corps of Engineers, and a NOTAM published to inform mariners of the closing times and dates. Most likely, equipment will be lightered (i.e., barged) across the Atlantic Intracoastal Waterway. Lightering support equipment across the waterway will allow the waterway to remain open with minimal delays to civilian/commercial boat traffic.
9. In accordance with Camp Lejeune Standard Operating Procedures, any fuel spill on land or any spill that produces a visible sheen on the water surface will be reported to the unit command to ensure implementation of the designated spill prevention control and countermeasure plan/spill contingency plan. The spilling unit will immediately report the spill to the Camp Lejeune Fire Department at extension 911 and Blackburn on the 38.60 FM, or telephone (910) 451-3064. The unit will follow clean-up and disposal instruction provided by the Fire Department or the Environmental Compliance Branch.
10. Camp Lejeune is known to be home to eight federally listed threatened or endangered species. The waters off Camp Lejeune provide seasonal habitat for seven listed marine mammal species,

including the West Indian manatee and North Atlantic right whale. Guidelines for boating and use of the N1/BT-3 impact area are given in the following sections.

- Unit Commanders, Officers-in-Charge, and Non-commissioned Officers-in-Charge will ensure strict compliance with applicable regulations regarding these protected species, as listed in Base Order 5090.11.
  - Manatees. Manatees have occasionally been sighted in the waters adjacent to Camp Lejeune, including Mile Hammock Bay and the AIWW. Manatees can grow to 15 feet in length and are uniformly gray or gray-brown in color. They are very slow moving mammals; boat collisions are a significant source of manatee mortality, both from impact and propeller damage. Everyone conducting waterborne operations should be alert for possible manatee encounters. If a manatee is sighted, immediately slow to a no-wake speed. Allow sufficient room for the manatee and maneuver cautiously away from the encounter area. Do not approach the manatee. Report all sightings to the Camp Lejeune Fish and Wildlife Branch at 451-5063.
  - Whales. The northward migration of the North Atlantic right whale, an endangered species, occurs from November 1 to April 30 every year. Females and calves can migrate as close as one-quarter mile off Onslow Beach.
    - a. Prior to commencing live fire exercises in the N-1/BT-3 impact area, an air sweep must be conducted to ensure there are no whales in the impact area. Flyovers will be flown at 750 feet and consist of at least two survey lines 2 nm apart and parallel to the coast, with the first line 1-2 miles off the beach, and the second 3-4 miles off the beach. If a whale is spotted in the N-1/BT-3 impact area, the Environmental Management Division must be notified; firing cannot commence until the whale clears the impact area.
    - b. If a whale is spotted, all live fire operations into coastal waters (N1/BT-3 Impact Area) shall be halted and Environmental Management Division notified at 451-5063. Live fire will not resume until an air sweep confirms the N1/BT-3 Impact Area is again clear.
    - c. To further protect North Atlantic right whales, Range Control issues a daily warning order to trainers from November 1 through April 30 when North Atlantic right whales are present along the North Carolina coast. The warning order states:

ENDANGERED NORTH ATLANTIC RIGHT WHALES MIGRATE ALONG THE NORTH CAROLINA COAST ENROUTE TO AND FROM NEW ENGLAND AREAS USED PRIMARILY SPRING THROUGH FALL, AND GEORGIA/FLORIDA CALVING AREAS USED DURING WINTER. RIGHT WHALES, INCLUDING MOTHER/CALF PAIRS, CAN BE FOUND ¼ MILE OR MORE OFF ONSLOW BEACH FROM 1 NOVEMBER TO 30 APRIL. RANGE CONTROL REQUIRES RANGE SWEEPS DURING THIS PERIOD IN CONJUNCTION WITH LIVE FIRING EXERCISE INTO THE BT-3/N1 IMPACT AREA.
    - d. All whale sightings (live or dead) must be reported to the Environmental Management Division, 451-5063. Environmental Management Division will distribute a Critical Sightings Program guide to all training crews operating offshore of Camp Lejeune.
11. Display warning signals from the Onslow Beach North and Bear Range Tower flag poles before firing until the range is cleared cold. Scarlet streamers will be flown during daylight and flashing red lights will be used from sunset to sunrise.

12. Position range guards with radio and binoculars (Night Vision Goggles for night firing) at least one half hour prior to the aerial search to serve as air/water sentries in Bear Range and Onslow Beach North Tower. Guards are to promptly notify the range officer in charge or Forward Air Controller (FAC) before a vessel or aircraft not engaged in the exercise penetrates the surface danger zone. Sectors of observation are: Bear Creek Tower 58 degrees to 223 degrees magnetic, and Onslow Beach North Tower 35 degrees to 235 degrees magnetic.
13. Firing will cease if streamers or flashing lights are lowered or extinguished for any reason.
14. Projectiles will not be fired to impact within 200 meters of the AIWW.
15. The using unit will ensure that a visual search has been made of the target complex, AIWW, inlets, marshes, dunes, and that the guard boats are in position half an hour prior to firing to ensure that the area is safe. The FAC may use aircraft as appropriate in conducting aerial search immediately prior to aircraft firing exercises.
16. The Range Safety Officer (RSO) is required to have positive and continuous communications with tower guards, the Range Officer in Charge (ROIC), guard boats, and the Range Control Duty Officer (RCDO) (BLACKBURN).
17. Air Operations.
  - Unless specifically authorized by the ROIC, the ordnance release point will be south of the AIWW.
  - A line 800 m from the seaward shore of the AIWW is designated as a permanent bomb line, beyond which aircraft ordnance may not be impacted.
  - Close air support operations will be under positive control of a FAC or the Air Support Radar Team (ASRT). The FAC/ASRT must inform aircraft performing missions of gun positions, ranges, and training areas adjacent to N-1/BT-3 that are occupied.
  - During nighttime close air support operations, when weather conditions are below a 2,000-foot ceiling and less than 5 miles visibility, or when range guards visually observe waterborne traffic in the AIWW or seaward for 1,000 m, aircraft firing or bombing exercises will not be permitted without continuous lighting by flares (or other measures approved by the Base Range Control Officer to ensure no vessels enter the surface danger zone.
18. For MCB Camp Lejeune, North Carolina, the Base Public Affairs Office will be designated to receive inquiries and/or comments from the public during the exercise period. Public Affairs Office Telephone Number is (910) 451-5655/7440.
19. Commander, Naval Air Force, Atlantic shall ensure that information in the preceding paragraphs is promulgated to all participating exercise units and all shipcrew, aircrew, and bridge watchstanders are familiar with its contents.

#### **5.7.17.1 Expeditionary Fighting Vehicle (EFV)**

In the USFWS response to the Biological Assessment (DoN, 2008c), *Testing of the Expeditionary Fighting Vehicle Prototypes, Effects on Terrestrial Species at Marine Corps Base, Camp Lejeune, North Carolina* dated August 7, 2008, the USFWS validated that EFV testing on Onslow Beach, the Base terrestrial training areas, "G" and "K" live fire ranges, Atlantic Intercoastal Water Way and New River would adhere to all stipulations of the SOP for Range Control contained in Base Order P3570.1B as seen in the previous section (USFWS, 2008).

#### **5.7.17.2 Manatee Protection Measures**

In the USFWS response to the Biological Assessment (DoN, 2008c), *Testing of the Expeditionary Fighting Vehicle Prototypes, Effects on Terrestrial Species at Marine Corps Base, Camp Lejeune, North*

*Carolina*” dated August 7, 2008 (DoN, 2008d), the USFWS directed that all water-based exercises would observe North Carolina Division of Marine Fisheries manatee protection measures (NCDMF, 2007) as follows:

If a manatee is seen within 300 ft of the active vessel movement, all appropriate precautions shall be implemented to ensure protection of the manatee. The precautions shall include the operation of all moving vessels no closer than 50 ft of a manatee. Operation of any vessels closer than 50 ft to a manatee shall necessitate immediately placing any motors in neutral or shutting them off. Activities will not resume until the manatee has departed the project area on its own volition. Manatees should not be herded away or harassed into leaving.

### **5.7.17.3 MCB Camp Lejeune Range Operations, Environmental Assessment**

The EA addresses the proposed action, which is the preferred alternative, and the No Action Alternative. The No Action Alternative consists of continuing current training and range operations within the MCB Camp Lejeune Complex, at the current temp and intensity. Under the proposed action, the types of training operations at the MCB Camp Lejeune Range Complex will remain the same as those conducted today; however, certain components of training will increase. These increases include the following:

- 20 percent in small arms training; except .50 caliber arms;
- 33 percent in CH-53 rotary-winged helicopter sorties;
- 100 percent in AH-1 and UH-1 rotary-winged helicopter sorties;
- 10 percent MK-19 40-mm grenade rounds;
- 5 percent artillery, mortar, and other large arms;
- 39 percent tank rounds; and
- 33 percent tactical vehicle operations.

MCB Camp Lejeune has previously implemented extensive environmental protection measures for current range and training operations. These include policies and procedures that conserve and protect environmental resources: avoidance and minimization measures outlined in current Standard Operating Procedures; Best Management Practices, or actions already implemented as part of the Integrated Natural Resources Management Plan; Range and Training Regulations; Standing Operating Procedures for Range Control (Base Order P3570.1B [see Section 5.7.17]);, and the Environmental Handbook for Trainers. The proposed action will have no effects left unaddressed by these procedures and practices; thus, no new mitigation measures are required (DoN, 2009b).

### **5.7.17.4 MCAS Cherry Point Range Operations, Environmental Assessment**

The MCAS Cherry Point EA proposed action would provide a training environment within the MCAS Cherry Point Range Complex with the capacity and capability to fully support required training tasks for operational units, military schools, and other users. The proposed action would accommodate future increases in the operational training tempo at the MCAS Cherry Point Range Complex; support existing warfare missions at the range complex; and maintain the long-term viability of the complex while protecting the environment. The proposed action (the preferred alternative) would require increases in training operations at existing ranges with the addition of an intermittently used, new water restricted area around BT-11, Piney Island. These training operations would be conducted within special use airspace and on land and water ranges within the existing range complex.

Under the proposed action, increased sorties and munitions expenditures associated with rotary-wing aircraft squadrons will take place in water restricted areas that are currently within a prohibited or restricted area of Pamlico Sound. An increase in .50 caliber weapons firing from helicopters and small boats will occur within a new, intermittent water restricted area, which currently has commercial, recreational, and state sponsored fisheries activities. The intermittent use of this area (estimated to be

five weekdays per month, for seven hours per day between 4 p.m. and 11 p.m., during each of approximately 10 months of the year; February through November) will result in periodic commercial and recreational fishing prohibitions for a maximum duration of 50 seven-hour periods (350 hours per calendar year). MCAS is planning to establish a phone number the public can call to find out whether the intermittent water restricted area is open or closed to further minimize the impacts to public use. The new intermittent water restricted area must go through the U.S. Army Corps of Engineers process for inclusion in the Code of Federal Regulations before these proposed actions can begin.

Continual monitoring of the ranges under the Range Environmental Vulnerability Assessment Program at MCAS Cherry Point will ensure that increased munitions usage under the proposed action will not have adverse impacts to water quality or pose a risk to human health and the environment. MCAS Cherry Point will employ several management approaches and protection measures that will minimize impacts to wetlands and floodplains. These measures include keeping vehicles on existing roads, prohibiting new road creation during exercises, and no authorization of extensive digging throughout the range complex.

The relatively low number of actual and predicted bird/wildlife aircraft strikes within the MCAS Cherry Point airspace indicates that the aircraft strike avoidance procedures already in place have been successful in the past and are expected to continue to be utilized under the proposed action. Laser usage would increase in training exercises under the proposed action and there is a potential for public mishaps; however, existing precautions to maintain public safety will be utilized. The public is notified of hazardous activities through the use of Notice to Airmen and Notice to Mariners. Prior public notification of Marine Corps training activities, use of known training areas, avoidance of non-military aircraft and civilians, and the remoteness of the training areas from coastal population centers reduces the potential for interaction between the public and military aircraft. To date, these strategies have been successful in maintaining public safety and are anticipated to continue to do so.

There are no identified mitigation measures for the proposed action alternative beyond the current Standard Operating Procedures, Best Management Practices, or actions already planned for in the Integrated Natural Resources Management Plan or other Air Station Orders and programs (DoN, 2009a).

## **5.8 COORDINATION AND REPORTING REQUIREMENTS**

The Navy will coordinate with the local NMFS Stranding Coordinator for any unusual marine mammal behavior and any stranding, beached live/dead, or floating marine mammals that may occur at any time during or within 24 hours after completion of training activities. Additionally, the Navy will follow internal chain of command reporting procedures as promulgated through Navy instructions and orders.

## **5.9 MEASURES CONSIDERED BUT ELIMINATED**

As described in Chapter 3, the vast 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 have achieved 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 already 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 they might encounter during deployment and in combat, and be in a state of readiness that allow 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 certain seasons and for specific training events in all East Coast Range Complexes where feasible. For example, the Navy considered seasonal training restrictions related to North Atlantic right whale calving season and migration (December to April), particularly for Unit Level Training events involving explosive ordnance. However, these limitations would interfere with training missions and goals and would not provide the necessary exposure of personnel to the full spectrum of environmental conditions they may encounter during deployment and combat.

**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 the Navy conducts in order 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 in order to man the observation decks or aircraft during that timeframe. There are severe space limitations onboard ships for berthing third-party crews, and there are no additional seats in aircraft that are involved in exercises. Overnight berthing of contractors and visitors are 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 are instead 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 vessels and slow, low-flying civilian aircraft operating in the same seaspace 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.

**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 and MK-48s), the distance to the isopleth 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. 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.

## 5.10 DETECTION PROBABILITY AND MITIGATION EFFICACY

### 5.10.1 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 5.10-1 provides a range of values for  $g(0)$  for cetacean species in the Navy Cherry Point 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.

### 5.10.1.1 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 East Coast Range Complexes 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.

#### Cetaceans

##### Large Whales

Species of large whales found in the Navy Cherry Point Study Area include all the baleen whales and the sperm whale. Baleen whales are generally large (adult size ranging from 9 to 27 m [30 to 89 ft]), often making them immediately detectable. Many species of baleen whales have a prominent blow ranging from 3 m (10 ft) to as much as 12 m (39 ft) above the surface. However, there are at least two species (Bryde's whale and common minke whale) that often have no visible blow. Baleen whales tend to travel singly or in small groups ranging from pairs to groups of five; the exception to this is the fin whale, which is known to travel in pods of seven or more individuals. However, all species of baleen whales are known to form larger-scale aggregations in areas of high localized productivity or on breeding grounds. Baleen whales may or may not fluke at the surface before they dive; some species fluke regularly (humpback whale, North Atlantic right whale), some fluke variably (blue whale, fin whale) and some rarely fluke (sei whale, common minke whale, and Bryde's whale). Baleen whales may remain at the surface for extended periods of time as they forage or socialize. North Atlantic right whales are known to form surface-active groups (SAG) and humpback whales to corral prey at the surface. Dive behavior varies amongst species, as well. Many species will dive and remain at depth for as long as 30 minutes. Some will adjust their diving behavior according to the presence of vessels (North Atlantic right whale, humpback whale, fin whale). Sei whales are known to sink just below the surface and remain there between breaths. Baleen whales have  $g(0)$  values ranging from 0.11 to 1.00 (Table 5.10-1).

**Table 5.10-1 Range of Estimates for g(0) for Marine Mammal Species Found on the Atlantic Coast**

<b>g(0)<sup>1</sup></b>	<b>Location</b>	<b>Platform</b>	<b>Source</b>
<b>Threatened/Endangered Cetacean Species</b>			
<b>Right whale (<i>Eubalaena</i> spp.)</b>			
0.29-1.00	U.S. Atlantic Coast	Shipboard	(Palka, 2006)
0.11-0.71	U.S. Atlantic Coast	Aerial	(Hain <i>et al.</i> , 1999)
0.19-0.29	U.S. Atlantic Coast	Aerial	(Palka, 2005b)
0.95	U.S. West Coast	Aerial	(Forney <i>et al.</i> , 1995)
<b>Humpback (<i>Megaptera novaeangliae</i>)</b>			
0.19-0.21	U.S. Atlantic Coast	Shipboard	(Palka, 2005a)
0.90-1.00	U.S. West Coast	Shipboard	(Barlow, 1995; Calambokidis and Barlow, 2004)
0.95	U.S. West Coast	Aerial	(Forney <i>et al.</i> , 1995)
0.26	Hawaii	Aerial	(Mobley <i>et al.</i> , 2001)
<b>Blue whale (<i>Balaenoptera musculus</i>)</b>			
0.41	U.S. West Coast	Aerial	(Barlow <i>et al.</i> , 1997; Carretta, <i>et al.</i> , 2000)
0.9-1.00	U.S. West Coast	Shipboard	(Barlow and Taylor, 2001)
0.92	U.S. West Coast	Shipboard	(Barlow and Forney, 2007; Forney, 2007)
<b>Sei whale (<i>Balaenoptera borealis</i>)</b>			
0.92	U.S. West Coast	Shipboard	(Barlow and Forney, 2007; Forney, 2007)
<b>Fin whale (<i>Balaenoptera physalus</i>)</b>			
0.32-0.94	U.S. Atlantic Coast	Shipboard	(Blaylock <i>et al.</i> , 1995; Palka, 2006)
0.19-0.29	U.S. Atlantic Coast	Aerial	(Palka, 2005b)
0.90-1.00	U.S. West Coast	Shipboard	(Barlow, 1995, 2003a)
0.95-0.98	U.S. West Coast	Aerial	(Forney and Barlow, 1993; Forney <i>et al.</i> 1995)
0.90-1.00	Hawaii	Shipboard	(Barlow, 2003b)
<b>Sperm whale (<i>Physeter macrocephalus</i>)</b>			
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 <i>et al.</i> , 1995)
0.87	Hawaii	Shipboard	(Barlow, 2003b, 2006)
0.32	Antarctic	Shipboard	(Kasamatsu and Joyce, 1995)

**Table 5.10-1 Range of Estimates for g(0) for Marine Mammal Species Found on the Atlantic Coast (Continued)**

<b>g(0)<sup>1</sup></b>	<b>Location</b>	<b>Platform</b>	<b>Source</b>
<b>Non-Threatened/Non-Endangered Cetacean Species</b>			
<b>Minke whale (<i>Balaenoptera acutorostrata</i>)</b>			
0.31-0.70	U.S. Atlantic Coast	Shipboard	(Blaylock <i>et al.</i> , 1995; Palka, 2006)
0.19-0.29	U.S. Atlantic Coast	Aerial	(Palka, 2005b)
0.25-0.90	Eastern North Atlantic	Shipboard	(Butterworth and Borchers, 1988; Øien, 1990; Schweder <i>et al.</i> , 1991; Schweder and Høst, 1992; Schweder <i>et al.</i> , 1992; Schweder <i>et al.</i> , 1997; Skaug and Schweder, 1999; Skaug <i>et al.</i> , 2004)
0.84	U.S. West Coast	Shipboard	(Barlow, 1995, 2003a)
0.95-0.98	U.S. West Coast	Aerial	(Forney and Barlow, 1993; Forney <i>et al.</i> , 1995)
0.63-0.83	Antarctic	Shipboard	(Doi <i>et al.</i> , 1982; IWC, 1982, 1983)
<b>Bryde's whale (<i>Balaenoptera edeni</i>)</b>			
0.90-1.00	U.S. West Coast	Shipboard	(Barlow, 1995, 2003a)
0.90	Hawaii	Shipboard	(Barlow, 2003b, 2006)
<b>Beluga (<i>Delphinapterus leucas</i>)</b>			
None available.			
<b><i>Kogia</i> spp.</b>			
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)
<b>Ziphiidae (Beaked Whales)</b>			
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 <i>et al.</i> , 2001; Barlow, 2003a; Barlow, <i>et al.</i> 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 <i>et al.</i> , 1995)

**Table 5.10-1 Range of Estimates for g(0) for Marine Mammal Species Found on the Atlantic Coast (Continued)**

<b>g(0)<sup>1</sup></b>	<b>Location</b>	<b>Platform</b>	<b>Source</b>
<b>Bottlenose dolphin (<i>Tursiops truncatus</i>)</b>			
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 <i>et al.</i> , 1995)
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
<b>Spinner dolphin (<i>Stenella longirostris</i>)</b>			
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)
<b>Clymene dolphin (<i>Stenella clymene</i>)</b>			
None available.			
<b>Pantropical spotted dolphin (<i>Stenella attenuate</i>)</b>			
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)
<b>Atlantic spotted dolphin (<i>Stenella frontalis</i>)</b>			
0.37-0.94	U.S. Atlantic Coast	Shipboard	(Palka, 2006)**
<b>Striped dolphin (<i>Stenella coeruleoalba</i>)</b>			
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)
<b>Common dolphin (<i>Delphinus delphis</i>)</b>			
0.52-0.95	U.S. Atlantic Coast	Shipboard	(Palka, 2005a; Palka, 2006)
0.58-0.77	U.S. Atlantic Coast	Aerial	(Palka, 2005b)
0.79-0.81	Eastern North Atlantic	Shipboard	(Cañadas <i>et al.</i> , 2004)
0.77-1.0	U.S. West Coast	Shipboard	(Barlow, 1995, 2003a)
0.67-0.96	U.S. West Coast	Aerial	(Forney and Barlow, 1993; Forney <i>et al.</i> , 1995)
<b>Rough-toothed dolphin (<i>Steno bredanensis</i>)</b>			
0.74-1.00	U.S. West Coast	Shipboard	(Barlow, 2003a)
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
<b>Fraser's dolphin (<i>Lagenodelphis hosei</i>)</b>			
0.76-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)

**Table 5.10-1 Range of Estimates for g(0) for Marine Mammal Species Found on the Atlantic Coast (Continued)**

<b>g(0)<sup>1</sup></b>	<b>Location</b>	<b>Platform</b>	<b>Source</b>
<b>White-sided dolphin (<i>Lagenorhynchus acutus</i> and <i>L. obliquidens</i>)</b>			
0.27-0.38	U.S. Atlantic Coast	Shipboard	(Palka, 2006)
0.58-0.77	U.S. Atlantic Coast	Aerial	(Palka, 2005b)
0.77-1.00	U.S. West Coast	Shipboard	(Barlow, 1995, 2003a)
0.67-0.96	U.S. West Coast	Aerial	(Forney and Barlow, 1993; Forney <i>et al.</i> , 1995)
<b>White-beaked dolphin (<i>Lagenorhynchus albirostris</i>)</b>			
None available.			
<b>Risso's dolphin (<i>Grampus griseus</i>)</b>			
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 <i>et al.</i> , 1995)
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
<b>False killer whale (<i>Pseudorca crassidens</i>)</b>			
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
<b>Pygmy killer whale (<i>Feresa attenuata</i>)</b>			
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
<b>Killer whale (<i>Orcinus orca</i>)</b>			
0.90	U.S. West Coast	Shipboard	(Barlow, 2003a)
0.95-0.98	U.S. West Coast	Aerial	(Forney <i>et al.</i> , 1995)
0.90	Hawaii	Shipboard	(Barlow, 2003b, 2006)
0.96	Antarctic	Shipboard	(Kasamatsu and Joyce, 1995)
<b>Melon-headed whale (<i>Peponocephala electra</i>)</b>			
0.74-1.00	Hawaii	Shipboard	(Barlow, 2003b, 2006)
<b>Pilot whale (<i>Globicephala</i> spp.)</b>			
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)
<b>Harbor porpoise (<i>Phocoena phocoena</i>)</b>			
0.35-0.73	U.S. Atlantic Coast	Shipboard	(Palka, 1995; Palka, 1996; Palka, 2006)
0.24-0.49	U.S. Atlantic Coast	Aerial	(Palka, 2005b)

**Table 5.10-1 Range of Estimates for  $g(0)$  for Marine Mammal Species Found on the Atlantic Coast (Continued)**

$g(0)$ <sup>1</sup>	Location	Platform	Source
0.41-0.71	Eastern North Atlantic	Aerial	(Grünkorn <i>et al.</i> 2005)
0.08-0.85	U.S. West Coast	Aerial	(Barlow <i>et al.</i> , 1988; Calambokidis <i>et al.</i> , 1993a; Forney <i>et al.</i> 1995; Laake <i>et al.</i> , 1997; Carretta <i>et al.</i> , 2001; Carretta <i>et al.</i> , 2007)
0.54-0.79	U.S. West Coast	Shipboard	(Calambokidis <i>et al.</i> , 1993b; Barlow 1995; Carretta <i>et al.</i> , 2001)
<b>Non-Threatened/Non-Endangered Pinniped Species</b>			
<b>Harbor seal (<i>Phoca vitulina</i>)</b>			
.28	U.S. West Coast	Aerial	(Barlow <i>et al.</i> , 1997; Carretta <i>et al.</i> 2000)

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

<sup>1</sup> 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.

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 5.10-1).

### 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), dwarf and pygmy sperm whales (*Kogia* spp.), and harbor porpoises.

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 East Coast 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'Amico, 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 5.10-1).

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 5.10-1).

Harbor porpoises are better known than beaked whales and *Kogia* spp., but are considered to be cryptic because they are difficult to detect in all but the best of conditions (i.e., no swell, no whitecaps). Harbor porpoises travel singly or in small groups (less than six individuals), but may aggregate into groups of several hundred. They are inconspicuous at the surface, rarely lifting their heads above the surface and often lying motionless. They are small and may actively avoid vessels. Harbor porpoises have  $g(0)$  values ranging from 0.08 to 0.85 (Table 5.10-1).

### Delphinids

There are 18 species of the family Delphinidae that may occur in the East Coast 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, white-beaked dolphins, white-sided dolphins, bottlenose dolphins, Stenellid dolphins, common dolphins, and Fraser's dolphins are known to either actively approach and investigate vessels, or bow ride along moving vessels. Fraser's dolphins and common 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, pantropical spotted dolphins, common 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 5.10-1).

### Miscellaneous

Beluga whales may occur in the East Coast Range Complexes and would probably be detected by observers. Belugas have an extremely conspicuous coloration (all white) and reach up to 5 m (16 ft) in total length. They travel in groups ranging from 15 individuals to thousands. They dive for lengths of up to 25 minutes, but are one of the most vocal cetaceans and would likely be detected acoustically. There are no  $g(0)$  values available for beluga whales.

### **Pinnipeds**

There are no sea lions in North Atlantic waters. Seals are more difficult to detect at sea than cetaceans. They are much smaller, often solitary and generally do not engage in conspicuous surface behavior. There is not a lot of information regarding seal behavior at sea. Some species, such as harbor seals, are known to approach and observe human activities on land or on stationary vessels. Harbor seals and gray seals are solitary at sea. Harp seals appear to be an exception, traveling in large groups at the surface and churning up whitewater like dolphins. Gray seals are known to rest vertically at the surface with only the head exposed. Pinnipeds may be long divers; gray seals may dive for as long as 30 minutes and hooded seals for up to 60 minutes. The only  $g(0)$  values available for pinnipeds occurring in the East Coast Range Complexes are for the harbor seal. They have a  $g(0)$  value of 0.28 (Table 5.10-1).

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).

Most information on pinnipeds is gleaned from studies done while individuals are hauled-out on land or on ice. Systematic at-sea sightings information is limited, so a  $g(0)$  value is available only for harbor seal (Carretta *et al.*, 2000). Pinnipeds have a low profile, no dorsal appendage and small body size in comparison with most cetaceans, limiting accurate visual detection to sea states of less than Beaufort 2 (Carretta *et al.*, 2000).

#### **5.10.1.2 Sea Turtles**

The detection probability of sea turtles is generally lower than that of cetaceans. Sea turtles often spend over 90 percent of their time underwater (e.g., Byles, 1988; Renaud and Carpenter, 1994; Mansfield and Musick, 2003) and are not visible more than one or two meters below the surface (Mansfield and Musick, 2006). Shoop and Kenney (1992) postulated that, due to the dive behavior of sea turtles, marine surveys underestimate the total number of animals in a given area by as much as an order of magnitude. This suggests that standard visual observation efforts may be less effective in detecting sea turtles than they are in detecting cetaceans. Sea turtles also are much smaller than cetaceans, so the effective distance from which they can be seen (from both surface and aerial platforms) is smaller (300 m [984 ft] for turtles versus over a kilometer for large whales or gregarious delphinids; Musick *et al.*, 1984). Shipboard surveys designed for sighting marine mammals are adequate for detecting large sea turtles (e.g., adult leatherbacks), but usually not the smaller-sized turtles (e.g., juveniles, *Lepidochelys* spp.). Pelagic juveniles may be especially difficult to detect. Aerial detection may be more effective in spotting sea turtles on the surface, particularly in calm seas and clear water, but it is possible that the smallest age classes are not detected even in good conditions (Marsh and Saalfeld, 1989). Visual detection of sea turtles, especially small turtles, is further complicated by their startle behavior in the presence of ships. Turtles on the surface may react to the presence of a vessel (dive) before it is detected by shipboard or aerial observers (Kenney, 2005). However, sea turtle reaction time is reduced in proportion to increasing vessel speeds (Hazel *et al.*, 2007).

There have been few dedicated surveys for sea turtles. There is no information available on specific  $g(0)$  values for turtles. Most of these studies have used mathematical models to calculate the proportion of surfaced turtles to submerged turtles based on the proportion of time sea turtles are expected to spend at the surface (obtained from tracking or tagging data). Byles (1988) found that for every loggerhead observed on the surface in Chesapeake Bay, approximately 19 were present, but unobservable. Mansfield and Musick (2006) found that sea turtles spent more time at the surface during the spring than during the summer within the Chesapeake Bay. Therefore, the 1:19 (at surface/ under the surface) ratio

would change depending on the season. However, sea turtles only spend a portion of the year in Chesapeake Bay and their surfacing behavior may be different than that of year-round residents in other locations. Not only are there no specific estimates of  $g(t)$  for turtles, but it is likely that the value shifts significantly depending on species, age class, season and geographic region.

Visual mitigation efforts for sea turtles will probably detect only those individuals that are very large or that spend a significant portion of their time at the surface. Sea turtles will not be detected acoustically.