

Atlantic Fleet Active Sonar Training Monitoring Plan January 2009

INTRODUCTION

This Monitoring Plan for Atlantic Fleet Active Sonar Training (AFAST) has been developed to provide required marine mammal and sea turtle monitoring as required under the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA).

In order to issue an Incidental Take Authorization (ITA) for an activity, Section 101(a) (5) (a) of the MMPA states that National Marine Fisheries Service (NOAA/NMFS) must set forth “requirements pertaining to the monitoring and reporting of such taking”. The MMPA implementing regulations at 50 CFR Section 216.104 (a) (13) note that requests for Letters of Authorization (LOAs) must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present (NOAA/NMFS, 2005).

While the Endangered Species Act does not have specific monitoring requirements, recent Biological Opinions issued by NOAA have included terms and conditions requiring the Navy to develop a monitoring program.

In addition to the AFAST monitoring plan, a number of other Navy range complex monitoring plans are being developed for protected marine species, primarily marine mammals and sea turtles, as part of the environmental planning and regulatory compliance process associated with a variety of training activities. Goals of these monitoring plans are to assess the impacts of training activities on marine species and effectiveness of the Navy’s current mitigation practices.

Navy-wide Integrated Comprehensive Monitoring Program (ICMP):

The Integrated Comprehensive Monitoring Program(ICMP) is Navy-wide and will provide the overarching structure and coordination that compiles data from range specific monitoring plans. The AFAST plan is one component of the ICMP and many studies outlined here will also be implemented in other range complexes (Figure 1). The overall objective of the ICMP is to assimilate relevant data collected across Navy range complexes in order to answer questions pertaining to the impact of mid-frequency active sonar (MFAS) and explosives on marine mammals and sea turtles.

The primary objectives of the ICMP are to:

- Coordinate monitoring of Navy training events, particularly those involving mid-frequency active sonar (MFAS) and underwater detonations (explosives), for compliance with the terms and conditions of ESA Section 7 consultations or MMPA authorizations;

Atlantic Fleet Active Sonar Training Monitoring Plan – January 2009

- Coordinate data collection to support estimating the number of individual marine mammals and sea turtles exposed to sound levels above current regulatory thresholds;
- Assess the efficacy of the Navy’s current marine species mitigation;
- Add to the knowledge base on potential behavioral and physiological effects to marine species from mid-frequency active sonar and underwater detonations; and
- Assess the practicality and effectiveness of a number of mitigation tools and techniques (some not yet in use).

Additional Navy funded research and development (R&D) studies and ancillary research collaborations with academia and other institutions will be integrated as possible to enhance the data pool, and will be used in part to address objectives of the ICMP. Lastly, as an adaptive management strategy, the AFAST monitoring plan will integrate elements from Navy-wide marine mammal research into the regional monitoring and data analysis proposed in this plan when new technologies and techniques become available.

AFAST Monitoring Plan:

The AFAST Monitoring has been designed as a collection of focused “studies” to gather data that will allow us to address the following questions which are described fully in the following sections:

1. Are marine mammals and sea turtles exposed to mid-frequency active sonar (MFAS), especially at levels associated with adverse effects (i.e., based on NMFS’ criteria for behavioral harassment, TTS, or PTS)? If so, at what levels are they exposed?
2. If marine mammals and sea turtles are exposed to MFAS in the Northwestern Atlantic or Gulf of Mexico (or “AFAST study area”), do they redistribute geographically as a result of continued exposure? If so, how long does the redistribution last?
3. If marine mammals and sea turtles are exposed to MFAS, what are their behavioral responses to various levels?
4. Is the Navy’s suite of mitigation measures for MFAS (e.g., PMAP, major exercise measures agreed to by the Navy through permitting) effective at avoiding TTS, injury, and mortality of marine mammals and sea turtles?

Marine Species within the AFAST study area:

There are forty-three species of marine mammals that may be observed either seasonally or year-round in the AFAST study area; seven are endangered (Reviewed in DoN, 2005 and 2007a, b, c and d). The list of species range from the endangered North Atlantic right whale (*Eubalaena glacialis*), to six species of threatened and endangered sea turtles, and other species of non-listed cetaceans such as bottlenose dolphins and beaked whales.

This monitoring plan has been designed to gather data on all species of marine mammals and sea turtles that are observed in the AFAST study area. The Plan recognizes that deep diving and

Atlantic Fleet Active Sonar Training Monitoring Plan – January 2009

cryptic species of marine mammals such as beaked whales and, have low probability of detection (Barlow and Gisiner, 2006). Therefore, methods will be utilized to attempt to address this issue (e.g., passive acoustic monitoring).

North Atlantic right whales will also be given particular attention during monitoring in the AFAST study area; although monitoring methods will be the same for all species. Within the AFAST study area, the Northwestern Atlantic provides unique breeding and calving habitat for North Atlantic right whales, and as a result, critical habitat has been designated for one calving ground (off Georgia and northern Florida) and two feeding areas (Cape Cod Bay and the Great South Channel). North Atlantic right whales will be given particular attention in the form of focal follows (e.g. collect behavioral data using the big eyes, and observe the behavior of any animals that are seen) when observed.

Data will be collected by qualified, professional marine mammal and sea turtle biologists that are experts in their field. Researchers will provide annual reports to the Navy, however, this is expected to be an ongoing process with data collected, analyzed and interpreted over many years. It is not likely that firm conclusions can be drawn on most questions within a single year of monitoring effort due to the difficulty in achieving sufficient sample sizes for statistical analysis. The Navy will provide annual reports to NMFS HQ in fulfillment of the MMPA Letter of Authorization (LOA) requirements. The report will provide information on the amount and spatial/temporal distribution of monitoring effort as well as summaries of data collected and any preliminary results that may be available from analysis.

MONITORING PLAN

The monitoring methods proposed for use during training events in the AFAST study area are:

- Contracted vessel and aerial surveys
- Passive acoustics
- Marine mammal observers on Navy ships

Due to the number and spatial extent of vessels and aircraft involved, major exercises such as COMPTUEX and JTFEX are not always the most appropriate option for the simultaneous use of commercial aircraft or vessels for marine mammal monitoring. However, the requirements to conduct this study are: 1) one or more surface combatants conducting ASW during a regularly scheduled training event; 2) the ability to conduct aerial or shipboard surveys close to the Navy vessel (for Study 1); and 3) training events that occur close enough to shore that re-fueling does not become an issue with the aerial survey team. The Navy has identified three types of training events that will meet the requirements of the following studies and also provide the highest likelihood of success.

Based upon the Sonar Positional Reporting System (SPORTS) and knowledge of training events in the AFAST study area, Navy operators determined that three types of training events are appropriate for Study 1 - South Eastern Integrated Training Initiative (SEASWITI), shallow water portions of Composite Training Unit Exercise (COMPTUEX), and unit level training (ULT). SEASWITIs occur 4 times per year off the coast of Florida, and may occur in the LIMA and MIKE training ranges 2-3 times per year. The remaining 1-2 SEASWITIs per year occur very far offshore (>100 nm) where safety and logistics involved with monitoring are not feasible. The goal of this monitoring plan is to try and coordinate monitoring with two SEASWITI exercises per year. COMPTUEXs with shallow water training occur two times per year within the Cherry

Atlantic Fleet Active Sonar Training Monitoring Plan – January 2009

Point, Charleston, or Jacksonville Operating Areas. The goal of this monitoring plan is to try and coordinate monitoring with two shallow water COMPTUEXs per year. ULT events occur regularly throughout the AFAST study area and typically involve one or more ships. The rest of the monitoring hours would come from ULT events. The proposed hours for conducting this monitoring plan are shown in Table 1. The hours shown are actual study hours when active sonar is being used (e.g. aerial survey in conjunction with training event), with darkness and non-ASW hours removed. They represent the most realistic number of hours available per year; more may become available and less may be feasible due to weather or scheduling conflicts.

Data collection will begin after January 2009, after the LOA is issued and the monitoring plan is finalized (See Table 1 for year by year implementation schedule). Data will also be collected from the SOCAL and HRC range complexes and compiled in order to compare and analyze data from all the individual Navy monitoring efforts.

Study 1

Are marine mammals and sea turtles exposed to mid-frequency active sonar (MFAS)? If so, at what levels are they exposed?

In order to address this question, there is a need to detect marine mammals and sea turtles not only at the surface, but to the extent possible in the water column. Shipboard surveys, either from Navy vessels or contracted research vessels, will not enable the observers to see animals much below the surface. While shipboard surveys are preferable in many ways (slow speed, offshore survey ability and duration, close approaches), they do not allow for observation of animals that are below the ocean surface as do aerial surveys. Therefore, for this study, a combination of aerial surveys and marine mammal observers aboard Navy vessels will be used.

Methods

A combination of aerial surveys and marine mammal observers will be used, in conjunction with regularly scheduled Naval training events. Aerial surveys are preferred for this type of monitoring as they provide the ability to observe animals that are below the surface (Slooten et al., 2004). This is particularly true in sea states of Beaufort 3 or less where water conditions are relatively calm therefore, the Navy will make every effort to conduct monitoring in sea states of Beaufort 3 or less.

Aerial survey:

An aerial survey team will fly pre-determined zigzag transects relative to a Navy surface combatant which is transmitting MFA sonar. The Navy will collect detailed ship track, speed and sonar use data for comparison with the survey data. The aerial survey team will collect both visual sightings (to be used to help calculate densities) and behavioral observations. These transects will allow for the gathering of movement relative to ship and behavioral responses of marine mammals at different received levels. The same altitude above water will be used for all aerial surveys. The surveys will be conducted both during and outside of sonar transmissions to allow for comparative data of densities and behaviors, which will complement the hours shown in Table 1.

The aerial survey team will collect: 1) species identification and group size; 2) location and relative distance from the Navy ship(s); 3) the behavior of marine mammals and sea turtles

Atlantic Fleet Active Sonar Training Monitoring Plan – January 2009

including date; 4) time and visual conditions associated; 5) direction of travel relative to Navy vessel; and 6) duration of the observation.

Animal sightings and relative distance from the ship will be used post-survey to estimate received levels for active transmission periods. This data will be used, post-survey, to estimate the number of marine mammals and sea turtles exposed to different received levels and their corresponding behavior. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Marine mammal observers on Navy vessels:

Marine mammal observers (MMOs) will be placed on Navy vessels involved in the study. Qualifications must include expertise in species identification of regional marine mammal and sea turtle 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 vessels. MMOs will not be placed aboard Navy vessels for every Navy training event or major exercise, but during specifically identified opportunities deemed appropriate for data collection efforts. Additionally, the events selected for MMO participation will take into account safety, logistics, and operational concerns.

MMOs will observe from the same height above water as the lookouts. Of note, these 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.

The MMOs will collect species identification, behavior, direction of travel relative to Navy vessel, and distance first observed. All MMO sighting will be conducted according to a standard operating procedure (SOP). The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Study 2

If marine mammals and sea turtles are exposed to MFAS in the AFAST study area, do they redistribute geographically as a result of continued exposure? If so, how long does the redistribution last?

Line-transect shipboard surveys are regularly conducted by NOAA/NMFS in the AFAST study area to assess long-term trends in abundance (e.g., NMFS-NEFSC, 2004; NMFS-SEFSC, 1999). While funding dependent, it is assumed that data collection will continue. These NOAA surveys are partially funded by the Navy and serve to address this question on longer term trends in abundance. However, those surveys will not detect short term shifts in distribution, therefore, detection of redistribution on the order of days will be addressed by Study 2.

Geographically-fixed monitoring sites off the coasts of North Carolina and Florida have been established to support the establishment of the Undersea Warfare Training Range (USWTR). The

Atlantic Fleet Active Sonar Training Monitoring Plan – January 2009

consistent ongoing visual shipboard and aerial surveys, as well as passive acoustic monitoring at these locations provides a great benefit to overall Atlantic Fleet monitoring needs by establishing a baseline of visual and acoustic observation data. These sites can be utilized for focused exercise monitoring efforts in order to leverage the existing resources and data being generated. This will allow the Atlantic Fleet to execute intensive focused exercise monitoring and potentially make inferences that otherwise would not be possible without a well-established baseline and temporally longitudinal datasets. Until the construction of USWTR and eventual training, these fixed monitoring sites directly support monitoring related to AFAST exercises.

When feasible, marine mammal densities will be calculated from survey data conducted immediately before and after training events. Additionally, autonomous recording devices will be used to gather additional data on movements of animals through the AFAST study area, providing a baseline and data on animals not detected by the aerial survey.

Methods

Aerial surveys:

Systematic line-transect aerial surveys will be conducted on the two days before and a variation of 1-5 days after a Navy training exercise to collect relative density data in the exercise area for marine mammals in the area. In addition, the data gathered from the USWTR monitoring locations will aid in the overall trend analysis of distribution when exercises are not taking place. 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 active sonar. If any distressed, injured or stranded animals are observed, an assessment of the animal's disposition (alive, injured, dead, and decayed) will be immediately reported to USFF for appropriate action (e.g., notification of the NMFS Regional Stranding Coordinator).

Standard distance sampling methodology and techniques, as described in Buckland et al. (2001) and Kinsey et al. (2002), shall be used. Surveys will be conducted from a twin-engine aircraft, with two experienced NOAA trained or certified observers.

The survey will be flown at a speed of 100 knots and an altitude of 800 ft (244m). Two observers will spot marine mammals during the surveys and report data to a recorder. Information recorded will include species sighted, numbers of individuals, presence, or absence of a calf, behavior, angle to the sighting and any apparent reaction to the aircraft. It is important to note any unusual behavior or species associations. Additionally, GPS locations and altitude will be automatically recorded at 30-sec intervals, as well as manually whenever a sighting is made. Environmental data (sea-state, glare and visibility) will be manually recorded at the start of each transect leg and whenever conditions change. When appropriate, the aircraft may go off effort (off the trackline) for behavioral observations or for species identification. Digital photographs will be taken as conditions permit. In the event that a given flight date is canceled, due to weather conditions or mechanical problems, the survey will be flown on the next available good weather date. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Vessel surveys:

The primary purpose of the surveys will be to document data on distribution of marine mammals and sea turtles in areas where Navy exercises occur. The vessel will conduct systematic line transect surveys in a survey box designated by the Navy (currently the USWTR Onslow and JAX

Atlantic Fleet Active Sonar Training Monitoring Plan – January 2009

sites), to assess marine mammal distribution and abundance. Data will be logged using NOLDUS software, which is specifically designed to facilitate collection of behavioral data. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Passive Acoustics:

Four high-frequency acoustic recording packages (HARPs) that record in the frequency range of 1kHz – 100kHz, will be deployed (two off the coast of North Carolina and two off the coast of Florida) in the AFAST study area in order to detect, locate and track vocalizing marine mammals. Pop-up buoys (or similar buoys) will be used to monitor specific areas for periods of time before, during and after training events in conjunction with other monitoring efforts when possible. When gliders with oceanographic sensors are used during training events to record oceanographic data, the Navy will take advantage of collecting this data and analyzing it concurrently with acoustic data collected by any autonomous acoustic recorders used in the same area. The buoys will be distributed in an array to facilitate data collection on geographical movements, however, the exact placement of the buoys each year will be determined using operational guidance to maximize the likelihood of capturing data during training events. These buoys will be left in place for a long enough duration that data are collected both during and outside of training events. All passive acoustic recording packages will be set on a duty cycle to provide appropriate sampling coverage and maximize battery power and data storage space.

HARPS and pop-up buoys will be retrieved as required for maintenance and downloading of data. HARPs will provide long term, daily information on the presence and absence of marine mammals in each area and their movements through the area. Pop-up buoys that are distributed throughout a training area will provide short term, daily information on the species present and their movements when an exercise occurs in that area (Mellinger and Barlow, 2003; Oswald et al., 2003). Acoustic data will be collected according to standard and accepted passive acoustic monitoring protocols (NMFS 2008 Passive Acoustic guidelines).

Study 3

If marine mammals and sea turtles are exposed to MFAS, what are their behavioral responses to various levels?

Note: the methods used in Study 3 are the same as those used for Study 1, with the addition of vessel surveys. Vessel surveys are used here specifically for their ability to collect behavioral data and focal follows.

In order to address this question, there is a need to assess whether marine mammals and sea turtles are not only at the surface, but in the water column. Observers aboard either Navy vessels or contracted research vessels will have difficulty observing animals below the surface. While shipboard surveys are preferable in many ways (slow speed, offshore survey ability and duration, close approaches), they do not allow for observation of animals that are below the surface as do aerial surveys. Therefore, a combination of aerial surveys, vessel surveys, and marine mammal observers aboard Navy vessels will be used for this study.

Methods

A combination of aerial surveys, vessel surveys and marine mammal observers will be used in conjunction with training events. Aerial surveys are preferred for this type of monitoring as they

Atlantic Fleet Active Sonar Training Monitoring Plan – January 2009

provide the ability to observe animals that are below the surface. This is particularly true in sea states of Beaufort 3 or less.

Aerial survey:

During specified training events, an aerial survey team will fly pre-determined zigzag transects relative to a Navy warship which is transmitting sonar. The aerial survey team will collect both visual sightings (to be used for densities) and behavioral observations from observed animals. These transects will allow for gathering information regarding movement of a species relative to the ship and behavioral responses of marine mammals at different received levels. The same altitude above water will be used for all surveys. The surveys will be conducted both during and outside of sonar transmissions to allow for comparative densities and behaviors.

The aerial survey team will collect: 1) species identification and group size; 2) location and relative distance from the Navy ship(s); 3) the behavior of marine mammals and sea turtles including date; 4) time and associated sighting conditions; 5) direction of travel relative to Navy vessel (s); and, 6) duration of the observation.

Animal sightings and relative distance from the ship will be used post-survey to determine received levels for active transmission periods. This data will be used, post-survey, to estimate the number of marine mammals and sea turtles exposed to different received levels and their corresponding behavior. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Vessel surveys:

The primary purpose of the survey will be to document and monitor potential effects of the planned exercise on marine mammals and sea turtles. As such, parameters to be monitored for potential effects are changes in the occurrence, distribution, numbers, surface behavior, and/or disposition (injured or dead) of marine mammal and sea turtle species before, during and after the training event. While challenging, the vessel surveys will attempt to conduct focal follows on animals with Navy vessels in view. Particular attention will be given to obtaining focal follows on North Atlantic right whales and beaked whales.

The vessel will conduct systematic line transect surveys in a survey box designated by the Navy (based upon training event distribution), to assess marine mammal distribution and abundance. Behavioral data will also be collected from all species. Specifically, the survey should deviate from transect protocol to collect behavioral data if a Navy vessel is visible on the horizon or closer. At this point, they will approach within three nautical miles of the vessel(s), if weather and conditions allow, and will work in “Focal Follow Mode” (e.g. collect behavioral data using the big eyes, and observe the behavior of any animals that are seen). The team will go off effort for photo-id, video and close approach “Focal Animal Follows” as feasible, and when marine animal encounters occur in proximity to the vessel. While in Focal Follow Mode, observers will gather detailed behavioral data from the animals, for as long as the animal allows. Analysis of behavioral observations will be made after the exercise or training activity (Altman, 1974; Martin and Bateson, 1993). While the Navy vessels are within view, attempts will be made to position the dedicated survey vessel in the best possible way to obtain focal follow data in the presence of the Navy exercise. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Atlantic Fleet Active Sonar Training Monitoring Plan – January 2009

Data will be logged using NOLDUS software, which is specifically designed to facilitate collection of behavioral data. This program will be specifically tailored to the needs of the AFAST Monitoring Plan and Navy's overall monitoring efforts throughout all the range complexes..

Marine mammal observers on Navy vessels:

Marine mammal observers (MMOs) will be placed on Navy vessels involved in the study. Qualifications must include expertise in species identification of regional marine mammal and sea turtle species and experience collecting behavioral data. Experience as 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 vessels. As noted above, MMOs will not be placed aboard Navy vessels for every Navy training event or major exercise, but during specifically identified opportunities deemed appropriate for data collection efforts. Additionally, the events selected for MMO participation will take into account safety, logistics, and operational concerns. Marine mammal observers will observe from the same height above water as the Navy lookouts. Of note, these 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.

The MMOs will collect species identification, behavior, direction of travel relative to Navy vessel, and distance first observed. All MMO sighting effort will be conducted according to a standard operating procedure (SOP) to allow for consolidation of data amongst all the range complex monitoring programs. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Study 4

Is the Navy's suite of mitigation measures effective at avoiding injury and mortality of marine mammals and sea turtles?

It is the Navy's position that the suites of mitigation measures for sonar are effective at avoiding exposures of marine mammals to levels of energy from sonar that would result in harm or mortality of marine mammals. Through several methods, this study will provide the scientific data needed to support that position. The Navy will: 1) conduct aerial surveys before and after two major exercises per year to determine whether animals have been injured in the exercise area; and 2) conduct a comparison of professional marine mammal observers and Navy lookouts.

Methods

Lookout comparison:

Navy lookouts are provided with extensive training to detect anything in the water 360 degrees around Navy vessels. This includes marine mammals. The Navy feels strongly that despite the fact that lookouts are not biologists trained to identify marine animals to species, that Navy lookouts have the skills to detect all marine mammals and sea turtles that are visible at the surface. In order to provide the scientific data to support this position, the Navy will initiate a side-by-side comparison of Navy lookouts ability to detect marine mammals at sea with sightings

Atlantic Fleet Active Sonar Training Monitoring Plan – January 2009

made by professional marine mammal observers. It is assumed that the abilities of Navy lookouts and professional marine mammal observers will vary; therefore, it is important that data be collected from many locations, in many environmental conditions, with many different lookouts and MMOs. Therefore, as part of the overall Navy monitoring effort, some of the hours of comparison data will be collected within the AFAST study area.

Marine mammal observers (MMOs) will be placed on Navy vessels during regularly scheduled training events in the AFAST study area. MMOs qualifications must include expertise in species identification of regional marine mammal and sea turtle 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 vessels. As noted above, MMOs will not be placed aboard Navy vessels for every Navy training event or major exercise, but during specifically identified opportunities deemed appropriate for data collection efforts. Additionally, the events selected for MMO participation will take into account safety, logistics, and operational concerns associated with such an endeavor. Navy lookouts will not be specially chosen.

Marine mammal observers will observe from the same height above water as the lookouts. Navy lookouts will officially be on duty and have the same responsibilities that they always do on duty (no more, no less). 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.

To the extent practicable, the MMO and lookouts will avoid cueing each other when they observe a marine mammal. The MMOs will collect species identification, behavior, direction of travel relative to Navy vessel, and distance first observed. All MMO sighting will be conducted according to a standard operating procedure (SOP). Two marine mammal observers will be aboard, and work on rotating two hour shifts to avoid fatigue.

Comparisons of the following will be made between experienced observers and the lookouts 1) Rate of detection: Comparison of the number of animals sighted per hour (or other appropriate sighting period), 2) Distance of sighting: Comparison of the distance where the sighting was first made, 3) Distance estimation: Consistency of sighting distance estimates, 4) Animal size estimation: Comparison of animal size estimation (either by actual length or by grouping – small or dolphin size, medium and large), 5) Direction of travel relative to the ship or by compass bearing, 6) Behavior categorization: Comparison of the categorized behaviors. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Aerial surveys:

Systematic line-transect aerial surveys will be conducted on the two days before and a variation of 1-5 days after a Navy training exercise. These aerial surveys will be the same as those conducted for other AFAST monitoring studies. However, for this study in particular, survey data will include identification of any distressed, injured or stranded animals in the training event area. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

IMPLEMENTATION – ANALYSIS – REPORTING

For all field monitoring conducted in support of this plan, it will be the responsibility of the contracted researchers to obtain and maintain the appropriate permits.

Table 1 provides detail on how the AFAST Monitoring Plan will be implemented from fiscal year 2008 to fiscal year 2013. The implementation of this monitoring plan will not officially commence until January 2009, after the issuance of the Letter of Authorization. However, the Navy plans to continue methods used in 2007 and 2008 (pre and post surveys, aerial and vessel surveys) as funding is available.

The monitoring plan will be implemented gradually in FY09, with full ramp up in 2010 as contracts are issued, permits for surveys and tagging are secured, Standard Operating Procedures (SOPs) are developed, and statisticians are consulted for input on sample size and analysis.

Worldwide, a suite of visual and acoustic monitoring techniques has been used to assess the effects of anthropogenic sound on marine mammals (Barlow and Gisiner, 2006). For example, for more than a decade, studies on low-frequency active (LFA) sonar on marine mammals have been conducted (Aburto et al., 1997; Croll et al., 2001; Fristrup et al., 2003; Clark and Altman, 2006). Similar monitoring techniques were used during low-frequency sound emissions that were conducted for the Acoustic Thermometry of Ocean Climate (ATOC) (Au et al., 1997; NRC, 2000; Frankel and Clark, 1998 and 2000; 2002, Costa et al., 2003) and ATOC's continuation project, the North Pacific Acoustic Laboratory (NPAL) (Office of Naval Research, 2001; Mobley, 2006).

The AFAST monitoring plan proposes monitoring goals that are unique with regard to their breadth as well as their focus on potential impacts of MFAS on marine mammals and sea turtles. To accomplish these goals, the Navy will use similar methods of implementation and data analysis which have demonstrated success in comparable monitoring programs studying the effects of anthropogenic sound on marine animals.

AFAST Plan Implementation and Analysis

Table 1 provides an overview of how the AFAST Plan will be implemented from 2009 to 2013. Monitoring surveys were conducted in 2007 and 2008 on vessel and aerial platforms, before and after training exercises. After the issuance of the Letter of Authorization (LOA), implementation of this monitoring plan will commence in 2009 at which time monitoring will begin gradually and then ramp up in 2010. Many of the study hours may overlap when implemented, allowing for data to be collected for more than one study simultaneously. Therefore, the hours in Table 1 represent those spent on each study, but are not necessarily an additive number of hours per method, per year. Collecting data concurrently for more than one study will only be initiated if doing so does not compromise the data integrity. .

The Navy will be investing significant funding and resources towards this monitoring program and intends to conduct the research in a scientifically valid and robust manner. The Navy is committed to conducting research until these questions have been addressed to the satisfaction of both NMFS and Navy. Therefore, it is in the best interest of the

Navy to choose studies wisely in each range complex that are the most likely to collect large data sets, and will enable the Navy and NMFS to answer the required questions. Some field methods may be applied throughout Navy ranges, while other methodologies may be specially selected for one or two ranges that are most likely to produce the best quality data. For example, in Hawaii, there are some baseline data on odontocetes from previous tagging (Baird et al., 2006), which can be used to provide a context for any tagging data collected during training events.

Using the ATOC and SURTASS monitoring programs as a guideline for success it is clear that the key to the success of the plan's execution and analysis is using scientific professionals that are the top of their field. It is the Navy's intention that the AFAST plan be implemented by a team of qualified, professional marine mammal and sea turtle biologists who are experts in their field. This team of experts will include statistical analysts to analyze data and make recommendations as to when they are beginning to see a pattern in the data and/or when the study designs need to be slightly altered for more robust data collection. This adaptive management process will provide a critical feedback loop to allow for adapting to new methods and evolving methodology. The process will be transparent to the public in the sense of yearly reporting to NMFS under the MMPA permit as well as encouraging the scientific team to publish results as they become available.

New technology and techniques will be incorporated as part of the Navy's adaptive management strategy. Adaptive measures and feedback from the experts will allow flexibility within a given year and/or within years so as to best achieve monitoring plan goals and take into consideration shifting demands, inclement weather and other unforeseen events. For example, flexibility is built in to monitor an alternate but equal training exercise within the year and/or in a following year in the instance an operational schedule changes, is delayed or cancelled. This flexibility ensures monitoring will occur under the best of circumstances and conditions.

Integrated Comprehensive Monitoring Program (ICMP):

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

Due to the complexity of the ICMP and large number of U.S. Navy Range Complexes and training events, the Navy is considering the dedication of a Program Manager to oversee the ICMP. Specific qualifications, roles and responsibilities are yet to be

Atlantic Fleet Active Sonar Training Monitoring Plan – January 2009

determined but may include the oversight and coordination of all range-complex monitoring plans.

Reporting:

The Navy will provide monitoring reports to NMFS HQ in fulfillment of the MMPA Letter of Authorization (LOA) requirements. The reports will provide information on the amount and spatial/temporal distribution of monitoring effort as well as summaries of data collected and any preliminary results that may be available from analysis. All subsequent analysis shall be completed in time for Navy’s five year report to NMFS.

Data collected from the AFAST monitoring plan will be added to a Navy wide analysis of monitoring from other permitted Navy range complexes via the ICMP. All available data will be included in Navy’s annual report and individual exercise reports for the AFAST as detailed in the requirements specified in the NMFS MMPA LOA. All subsequent analysis shall be completed in time for Navy’s five year report to NMFS. The Navy’s reports will provide information on the amount and spatial/temporal distribution of monitoring effort as well as summaries of data collected and any preliminary results that may be available from analysis. This also includes an evaluation of the effectiveness of any given element within the AFAST monitoring program. All data will be considered pre-decisional during the course of the research studies to protect from premature conclusions being drawn. While data will be prepared and analyzed over the course of the five years of the LOA, under no circumstances will conclusions be represented before the studies are completed. Final conclusions cannot be published nor information released outside of their organization without the written consent of the Secretary of the Navy or their designee.

Table 1. Summary of studies planned each year.

STUDY 1 and 3 (exposures and behavioral responses)	FY08	FY09	FY10	FY11	FY12	FY13
Aerial surveys	Award monitoring contract, develop SOP, obtain permits	SEASWITI, shallow COMPTUEX, or ULT - 30 hours of active sonar	SEASWITI, shallow COMPTUEX, or ULT - 30 hours of active sonar	SEASWITI, shallow COMPTUEX, or ULT - 30 hours of active sonar	SEASWITI, shallow COMPTUEX, or ULT - 30 hours of active sonar	SEASWITI, shallow COMPTUEX, or ULT - 30 hours of active sonar
Marine Mammal Observers	Opportunistic as staff and SOP developed	SEASWITI or ULT - 60 hours	SEASWITI or ULT - 60 hours	SEASWITI or ULT - 60 hours	SEASWITI or ULT - 60 hours	SEASWITI or ULT - 60 hours
Vessel surveys (study 3 only)	Award monitoring contract, develop SOP	SEASWITI, shallow COMPTUEX, or ULT- 100 hours	SEASWITI, shallow COMPTUEX, or ULT- 100 hours	SEASWITI, shallow COMPTUEX, or ULT- 100 hours	SEASWITI, shallow COMPTUEX, or ULT- 100 hours	SEASWITI, shallow COMPTUEX, or ULT - 100 hours

Atlantic Fleet Active Sonar Training Monitoring Plan – January 2009

STUDY 2 (geographic redistribution)	FY08	FY09	FY10	FY11	FY12	FY13
Aerial surveys before and after training events	SEASWITI, shallow COMPTUEX, or ULT- 24 hours	SEASWITI, shallow COMPTUEX, or ULT- 40 hours	SEASWITI, shallow COMPTUEX, or ULT- 40 hours	SEASWITI, shallow COMPTUEX, or ULT- 40 hours	SEASWITI, shallow COMPTUEX, or ULT- 40 hours	SEASWITI, shallow COMPTUEX, or ULT- 40 hours
Onslow Bay Aerial surveys	100 hours	100 hours	100 hours	100 hours	100 hours	100 hours
Onslow Bay Shipboard surveys	125 hours	125 hours	125 hours	125 hours	125 hours	125 hours
Jacksonville Aerial surveys		100 hours	100 hours	100 hours	100 hours	100 hours
Jacksonville Shipboard surveys		125 hours	125 hours	125 hours	125 hours	125 hours
Passive Acoustics	Award monitoring contract 1 HARP in place and use of pop-up buoys for exercise monitoring Begin recording	Installation of remaining 3 HARPS (4 total) and use of pop-up buoys for exercise monitoring Begin recording and data analysis	Continue recording and data analysis	Continue recording and data analysis	Continue recording and data analysis	Continue recording and data analysis
Study 4 (mitigation effectiveness)	FY08	FY09	FY10	FY11	FY12	FY13
Marine mammal observers/lookout comparison	SEASWITI or ULT- 24 hours	SEASWITI or ULT- 40 hours	SEASWITI or ULT- 40 hours	SEASWITI or ULT- 40 hours	SEASWITI or ULT- 40 hours	SEASWITI or ULT- 40 hours
Aerial surveys before and after training events	SEASWITI, shallow COMPTUEX, or ULT- 40 hours	SEASWITI, shallow COMPTUEX, or ULT- 40 hours	SEASWITI, shallow COMPTUEX, or ULT- 40 hours	SEASWITI, shallow COMPTUEX, or ULT- 40 hours	SEASWITI, shallow COMPTUEX, or ULT- 40 hours	SEASWITI, shallow COMPTUEX, or ULT- 40 hours

Figure 1. Integrated Comprehensive Monitoring Plan – Navy-wide Map of Ranges where data collection is expected to occur. Details to be determined as compliance documents are finalized.

Atlantic Fleet Active Sonar Training Monitoring Plan – January 2009



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