Marine Species Monitoring For The U.S. Navy's Mariana Islands Range Complex

ANNUAL REPORT

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EXECUTIVE SUMMARY

This report presents data gathered in support of the U. S. Navy's (Navy) Mariana Islands Range Complex (MIRC) Marine Species Monitoring Plan (DoN 2010a, as revised DoN 2011) from 12 Februrary 2011 through 12 February 2012.

The Navy uses the MIRC for at-sea training, as described in the MIRC Environmental Impact Statement (EIS) (DoN 2010b). In support of the MIRC EIS, the National Marine Fisheries Service (NMFS) issued a Biological Opinion (NMFS 2010a) and a five-year Final Rule (NMFS 2010b) for the taking of marine mammals under the Marine Mammal Protection Act (MMPA), with an associated Letter of Authorization (LOA) (NMFS 2010c) to the Commander, U.S. Pacific Fleet (CPF) in August of 2010. The Final Rule and accompanying LOA require the Navy to implement monitoring of marine species as described in annual monitoring plans.

The data collection period for monitoring and reporting is not specifically stated in the MIRC Final Rule as it was for previous range complexes. In order to provide enough time to collect, compile, and validate the range data prior to the 15 April annual report submission date, a data cutoff date of 12 February has been implemented by the Navy. This preparation time is consistent with other authorizations.

Monitoring in the MIRC this period included vessel surveys, deployment of passive acoustic monitoring devices and analysis of acoustic data from a 2007 line transect survey. All metrics committed to in the 2011 Monitoring Plan were met or exceeded.

Based upon lessons learned in the field and input from subject matter experts, monitoring for the next period will retain the overall level of effort but include some new components. The Monitoring Plan for 2012-2015 is included as Appendix E to this document.

LIST OF TABLES (not including Appendices)

INTRODUCTION

Background

The Navy developed the Mariana Islands Range Complex (MIRC) Monitoring Plan (DoN 2010a) to provide marine mammal as required under the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA) of 1973. In order to issue an Incidental Take Statement (ITS) for an activity, the National Marine Fisheries Service (NMFS) must set forth "requirements pertaining to the monitoring and reporting of such taking." 50 CFR §216.101(a)(5)(a). A request for a Letter of Authorization (LOA) 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 effects to populations of marine mammals that are expected to be present. While the ESA itself does not have a specific monitoring requirement, recent biological opinions issued by NMFS have included terms and conditions that require the Navy to implement a monitoring program.

The Draft MIRC Monitoring Plan (submitted to NMFS in September 2009) outlined study questions—similar to those in other range complex monitoring plans—directed at data gathering to determine if there are any adverse effects from Navy training. Field methods proposed in the plan were (1) passive acoustic monitoring, (2) marine mammal observers aboard Navy vessels, (3) near shore visual observers, and (4) collaboration with NMFS during an oceanographic survey. NMFS released the Draft MIRC Monitoring Plan to the public as part of the MMPA Proposed Rule review process; NMFS then provided verbal and e-mail feedback to the Navy based upon this review. NMFS' feedback suggested that although the Navy conducted a four month line-transect survey in 2007 (DoN 2007), the MIRC, unlike other range complexes, is a region where limited data from systematic surveys for marine mammals and sea turtles exist. Therefore, NMFS recommended that the Navy revise the monitoring plan to augment the limited distribution and abundance data for MIRC region.

The Navy incorporated recommendations from NMFS and the public into the Final MIRC Marine Species Monitoring Plan (DoN 2010a). The overall objective of the plan was revised from exercise monitoring to gathering field data that will enable the Navy and NMFS to better understand the distribution and abundance of marine mammals and sea turtles in the MIRC. Methods that were implemented from 2010 through 2012 were (1) analysis of the Mariana Islands Sea Turtle and Cetacean Survey (MISTCS) acoustic data, (2) passive acoustic monitoring and (3) visual surveys. This plan was updated in 2011 as part of the MIRC Annual Marine Species Monitoring Report (DoN 2011).

In 2011, the Navy convened a Scientific Advisory Group to assess the Navy's range complex monitoring plans and provide recommendations for improving them. Subsequently, the Navy solicited more range-specific input from researchers that have conducted field work in the Mariana Islands and Hawaii. This input was used by Navy biologists to build the revised 2012-15 Monitoring Plan (Appendix E)

Integrated Comprehensive Monitoring Program

The Integrated Comprehensive Monitoring Program (ICMP) provides the overarching framework for coordination of the U.S. Navy monitoring program (DoN 2010c). It has been developed in

direct response to Navy Range permitting requirements established in the various MMPA Final Rules, ESA Consultations, Biological Opinions, and applicable regulations. As a framework document, the ICMP applies by regulation to those activities on ranges and operating areas for which the Navy sought and received incidental take authorizations.

The ICMP is intended for use as a planning tool to focus Navy monitoring priorities pursuant to ESA and MMPA requirements. Top priority will always be given to satisfying the mandated legal requirements across all ranges. Once legal requirements are met, any additional monitoring-related research will be planned and prioritized using guidelines provided by the ICMP, consistent with availability of both funding and scientific resources. As a planning tool, the ICMP is a "living document." It will be routinely updated as the program matures. Initial areas of focus for maturing the document in 2010/2011 included further refinement of monitoring goals, adding a characterization of the unique attributes associated with each range complex / study area to aid in shaping future monitoring projects, as well as a broader description of the data management organization and access procedures.

The ICMP is evaluated annually through the Adaptive Management Review (AMR) process to: (1) assess progress, (2) provide a matrix of goals for the following year, and (3) make recommendations for refinement and analysis of the monitoring and mitigation techniques. This process includes conducting an annual AMR meeting at which the Navy and NMFS jointly consider the prior year goals, monitoring results, and related science advances to determine if modifications are needed to more effectively address monitoring program goals. Modifications to the ICMP that result from AMR discussions are incorporated by an addendum or revision to the ICMP as needed.

Under the ICMP, monitoring measures prescribed in range/project-specific monitoring plans and Navy-funded research relating to the effects of Navy training and testing activities on protected marine species should be designed to accomplish one or more of the following top-level goals as prescribed in the 2010 ICMP update (DoN, 2010a):

(a) An increase in our understanding of the likely occurrence of marine mammals and/or ESA-listed marine species in the vicinity of the action (i.e., presence, abundance, distribution, and/or density of species).

(b) An increase in our understanding of the nature, scope, or context of the likely exposure of marine mammals and/or ESA-listed species to any of the potential stressor(s) associated with the action (e.g., sound, explosive detonation, or expended materials), through better understanding of one or more of the following: 1) the nature of the action and its surrounding environment (e.g., sound source characterization, propagation, and ambient noise levels); 2) the affected species (e.g., life history or dive patterns); 3) the likely co-occurrence of marine mammals and/or ESA-listed marine species with the action (in whole or part); and/or; 4) the likely biological or behavioral context of exposure to the stressor for the marine mammal and/or ESA-listed marine species (e.g., age class of exposed animals or known pupping, calving or feeding areas).

(c) An increase in our understanding of how individual marine mammals or ESA-listed marine species respond (behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible, e.g., at what distance or received level).

(d) An increase in our understanding of how anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either: 1) the long-term fitness and survival of an individual; or 2) the population, species, or stock (e.g., through effects on annual rates of recruitment or survival).

(e) An increase in our understanding of the effectiveness of mitigation and monitoring measures, including increasing the probability of detecting marine mammals (through improved technology or methodology), both specifically within the safety zone (thus allowing for more effective implementation of the mitigation) and in general, to better achieve the above goals. Improved detection technology resulting from these goals will be rigorously and scientifically validated prior to being proposed for mitigation, and meet practicality considerations (engineering, logistic, fiscal).

(f) A better understanding and record of the manner in which the authorized entity complies with the incidental take authorization and incidental take statement.

OPNAV (N45) is responsible for maintaining and updating the ICMP, as necessary, reflecting the results of future regulatory agency rulemaking, AMRs, best available science, improved assessment methodologies, and more effective protective measures. This is done in consultation with Navy technical experts, Fleet Commanders, and Echelon II Commands as appropriate, and as part of the AMR process.

Report Objective

Design of the Range Complex Monitoring Plans represented part of a new Navy-wide assessment, and as with any new program, there are many coordinating, logistic, and technical details that continue to be refined. The scope of the first generation Range Complex Monitoring Plans in 2008 was to discuss the background for monitoring as well as define initial procedures to be used in meeting study objectives derived from the NMFS-Navy agreements. Monitoring results are presented each year to the NMFS and the next year's monitoring goals established based on the adaptive management process.

Overall, and in support of the above statement, this report has two main objectives:

- Present data and results from the Navy-funded marine mammal and sea turtle monitoring conducted in the Mariana Islands Range Complex from 12 February 2011 to 12 February 2012.

Included in this assessment are reportable metrics of monitoring as requested by NMFS. This Year Two report will focus mostly on summarizing collected data and providing a brief description of the major accomplishments from techniques used this year, while referring to the more technical discussions in various Appendices provided by the scientists who performed the monitoring work in the Range Complexes.

- Continue the adaptive management process by providing an overview of meetings and initiatives over the past year that support proposed revisions to the Navy's 2012 MIRC Monitoring Plans as well as presenting progress made towards development of a Strategic Plan for Navy Monitoring that has been facilitated by establishing a Scientific Advisory Group to review and provide recommendations on the Navy's monitoring program. Proposed changes primarily reflect

input received from the scientific community and other stake holders. An overview of the events that have prompted these most recent adaptive management actions is provided in the following sections.

MONITORING IN THE MIRC

Prior to 2007, little information was available on the abundance and density of marine mammals and sea turtles in the MIRC; most of that information came from short surveys (several days) and opportunistic sightings. Eldredge (1991) compiled the first list of published and unpublished records for the greater Micronesia area; that list catalogued 19 marine mammal species. In 2003, Eldredge revised this list from 19 to 13 cetacean species thought to occur around Guam (Eldredge 2003).

The first comprehensive marine mammal and sea turtle survey of the area, MISTCS, was funded by the U.S. Pacific Fleet from January to April 2007 (DoN 2007). The Navy proactively initiated the visual and acoustic survey to gather data to support an analysis of potential effects in the Mariana Islands Environmental Impact Statement (EIS) and associated MMPA and ESA consultations. MISTCS provided the first density estimates for several marine mammal species as well as confirming the presence of sei whales in the MIRC (DoN2007, Fulling et al 2011).

Field efforts increased considerably in 2010 after the completion of the MIRC EIS/OEIS and issuance of the Letter of Authorization (LOA) and Biological Opinion (BiOp). Vessel surveys have been conducted seasonally and passive acoustic monitoring devices have been deployed. Additionally, the acoustic data from MISTCS was more fully analyzed.

Monitoring Objectives

The 2010 and 2011 MIRC monitoring plans (DoN 2010a and 2011) were designed to collect field data to augment the limited distribution and abundance data for marine mammal and sea turtles in the region. Unlike other range complexes, monitoring in the MIRC is not yet focused on effects from Navy training. **Table 1** from the 2011 Monitoring Plan shows the 2011-12 monitoring commitments that were set as goals for this reporting period.

Results of the monitoring are helping to build the scientific baseline for this region as well as supporting the Navy's next phase of environmental compliance documents.

Table 1. FY11-12 monitoring commitments for the MIRC (from DoN 2011)

Monitoring Technique	Implementation	
Visual Surveys (aerial or vessel)	Conduct summer and winter visual surveys using a small boat and/or airplane around Guam, Tinian, Rota and Saipan in cooperation with NMFS and/or DAWR. Visual surveys would integrate methods such as photo ID that provide data that can be used for distribution and abundance. 45 days total.	Adaptive Management Review (AMR) for Year 3
Acoustic Data Analysis	Analyze existing acoustic data set, which was collected during Navy's 2007 MISTCS survey.	
Passive Acoustics Monitoring (PAM)	Continue recording from PAM devices and begin/conduct data analysis.	

Monitoring Accomplishments

The MIRC monitoring plan made commitments for late FY11 through early FY12. Accomplishments are summarized in **Table 2** and below.

Summary of Monitoring Conducted (February 2011 to February 2012)

- Visual Survey highlights (Full reports in Appendix A and B):

  - Survey teams were in the field for 45 days of non-systematic visual surveys from small boats were conducted for marine mammals and sea turtles around the islands of Rota, Guam, Saipan, Aguijan and Tinian. 6 days on the water were lost due to rough weather conditions.
  - The surveys covered 2,244 nmi of trackline over 276 hours on effort.
  - A total of 47 groups of cetaceans and 6 sea turtles were sighted. Sightings that were identified to species included green sea turtles, bottlenose, pan-tropical spotted, and spinner dolphins; sperm, short-finned pilot, pygmy killer and dwarf sperm whales.
  - 12,612 photographs taken during the surveys have been provided to PIFSC for their photo-identification catalog.

Vessel surveys were conducted in winter and summer with the goal of obtaining observations of seasonal migrants as well as year round odontocetes. Winter surveys proved very challenging with higher seas (winter Beaufort sea state (BSS) >4 - 66% of the time; summer > 4 BSS - 43%Guam, BSS>4 - 48% other islands) reducing survey distance offshore and on the windward sides of the islands. Surveys resulted in zero baleen whales observations, in contrast to the MISTCS results where baleen whales were observed regularly. This may be due to the difference in survey platforms (small vessel versus large vessel), the distance offshore that small vessels can safely survey or something anomalous (e.g. oceanographic conditions, sea surface temperature, etc) in 2007. The Navy is looking forward to the potential for the PAM data analysis to provide more insight into the occurrence of baleen whales.

- Mariana Island Sea Turtle and Cetacean Survey (MISTCS) acoustic data analysis highlights (Full report in Appendix C):

  - Estimate of minke whale abundance application of distance sampling methodology to towed array passive acoustic detections and line transect observations
  - Classification of delphinid whistles to four associated acoustic groups
  - Improved detection function for acoustic sperm whale encounters and quantification that the majority of recorded sperm whale codas were from the "normal dialect" or clan of sperm whales
  - Comparison of humpback whale song fragments to Hawaii humpback whale song of the same time period
  - Characterization of sei whale vocalizations

MISTCS used standard line-transect methodology and PAM using a towed hydrophone array system. The PAM component of the survey was effective in detecting some species humpback whale (*Megaptera novaeangliae)* and minke whale (*Balaenoptera acutorostrata)* that were infrequently (or never) visually detected, and for other species (e.g., sperm whale [*Physter macrocephalus*] and small groups of delphinids), increased detection rates when visual sighting conditions were poor. Recordings of minke whale, sperm whale, sei whale (*Balaenoptera borealis*), humpback whale, and several species of dolphins (including larger delphinids, such as the "blackfish") were analyzed in detail to provide more comprehensive information on the occurrence and aspects of these species' ecology and behavior. The main goals of these analyses were to: (1) provide acoustically-derived density estimates when feasible (e.g., minke whales); (2) estimate an acoustically-derived 'detection function' (e.g., sperm whales); (3) describe and compare acoustic signals for some species and populations for which limited information is available (e.g., sei whales and humpback whales); and (4) assess the success of automated classification algorithms for several species of delphinids.

- Passive Acoustic Monitoring highlights (Full report in Appendix D):

  - Four Ecological Acoustic Recorded (EAR) buoys were deployed in September 2011 – two off Guam, one off Saipan and one off Tinian. They will be retrieved during the winter 2012 visual survey and analysis will begin upon retrieval.

Table 2. U.S. Navy-funded marine mammal monitoring accomplishments within the Mariana Islands Range Complex in FY10 and through 12 February 2011.

Field Method	Monitoring Commitment	Total accomplished
Visual surveys	Conduct summer and winter visual surveys using a small boat and/or airplane around Guam, Tinian, Rota and Saipan. Visual surveys would integrate methods such as photo ID that provide data that can be used for distribution and abundance. 45 days total.	45 field days of summer and winter visual surveys using a small boat around Guam, Tinian, Rota, Aguijan and Saipan. 12,612 photographs were collected for use in photoidentification studies.
MISTCS data analysis	Analyze existing acoustic data set from 2007 MISTCS	Analyzed existing acoustic data set from 2007 MISTCS survey.
Passive Acoustic Monitoring	Deploy four passive acoustic monitoring devices around the Mariana Islands that are capable of gathering data throughout the year.	Deployed four passive acoustic monitoring devices around the Mariana Islands for one year.

ADAPTIVE MANAGEMENT AND YEARLY MONITORING COMMITMENTS

MIRC ADAPTIVE MANAGEMENT AND 2012-15 MONITORING PLAN

Adaptive management is an iterative process of optimal decision making in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring. Within the natural resource management community, adaptive management involves ongoing, real-time learning and knowledge creation, both in a substantive sense and in terms of the adaptive process itself. Adaptive management focuses on learning and adapting, through partnerships of managers, scientists, and other stakeholders who learn together how to create and maintain sustainable ecosystems. Adaptive management helps science managers maintain flexibility in their decisions, knowing that uncertainties exist and provides managers the latitude to change direction will improve understanding of ecological systems to achieve management objectives; and is about taking action to improve progress towards desired outcomes.

A 2010 Navy-sponsored monitoring meeting in Arlington, VA initiated a process to critically evaluate the current Navy monitoring plans and begin development of revisions/updates to both existing region-specific plans as well as the Integrated Comprehensive Monitoring Program (ICMP). Discussions at that meeting as well as the following Navy/NMFS annual adaptive management meeting (Oct 2010) established a way ahead for continued refinement of the Navy's monitoring program. This process included establishing a Scientific Advisory Group (SAG) of leading marine mammal scientists with the initial task of developing recommendations that would serve as the basis for a Strategic Plan for Navy monitoring. The Strategic Plan is intended to be a primary component of the ICMP and provide a "vision" for navy monitoring across geographic regions - serving as guidance for determining how to most efficiently and effectively invest the marine species monitoring resources to address ICMP top-level goals and satisfy MMPA Letter of Authorization regulatory requirements. The objective of the Strategic Plan is to continue the evolution of Navy marine species monitoring towards a single integrated program, incorporating SAG recommendations, and establishing a more transparent framework for soliciting, evaluation, and implementing monitoring work across the Fleet range complexes. The Strategic Plan is currently being developed and will establish the process for soliciting, reviewing, and selecting the most appropriate monitoring projects to invest in across the Navy. It is anticipated that some current efforts will continue but the level of effort and investment may be allocated differently across Navy Ranges.

Originally, five study questions were developed between NMFS and the Navy as guidance for developing monitoring plans (as presented in the Introduction), and all existing range-specific monitoring plans attempted to address each of these study questions. However, the state of knowledge for the various range complexes is not equal, and many factors including level of existing information, amount of training activity, accessibility, and available logistics resources, all contribute to the ability to perform particular monitoring activities. In addition, the Navy monitoring program has historically been compartmentalized by range-complex and focused on effort-based metrics (survey days, trackline covered, etc.).

Navy established the SAG in 2011 with the initial task of evaluating current Navy monitoring approaches under the ICMP and existing LOA's to develop objective scientific recommendations

that would form the basis for the Strategic Plan. While recommendations were fairly broad and not prescriptive from a range complex perspective, the SAG did provide specific programmatic recommendations that serve as guiding principles for the continued evolution of the Navy Marine Species Monitoring Program and provide a direction for the Strategic Plan development. The meeting resulted in refinement of the five study questions of the ICMP into six study goals, as earlier described in detail in the Background section of the Introduction of this report. The SAG also provided three general recommendations that apply broadly across the Navy's monitoring program:

- Transparency, collaboration, and data accessibility;
- Specific Programmatic recommendations in four key areas: (1) overall monitoring objectives and scope; (2) operational methodology; (3) data analysis and integration; and (4) procedural logistics.
- The importance of monitoring the effects of all types of training exercises, including low-frequency active sonar and explosives.

Specific to the MIRC, the SAG recommended a broad suite of monitoring for this area including passive acoustic monitoring, development of local expertise, and non-systematic surveys incorporating biopsy, tagging and photo-identification studies. In June 2011, the Navy hosted a Marine Mammal Monitoring Workshop with guidance and support from NMFS that included scientific experts and representatives of environmental non-governmental organizations (NGOs). The purpose of the workshop was to present a consolidated overview of monitoring activities accomplished in 2009 and 2010 pursuant to the Final Rules currently in place, including the SAG review, outcomes of selected monitoring-related research and lessons learned, and to seek feedback on future directions. A significant outcome of this workshop was to continue consolidating monitoring efforts from individual range complex plans and develop a single Strategic Plan for Navy Monitoring that will improve the return on investment by focusing specific objectives and projects where they can most efficiently and effectively be addressed throughout the Navy range complexes. The Strategic Plan is currently in development and will be incorporated as a primary component of the ICMP.

SAG results, subsequent input from local Hawaii and Marianas researchers and lessons learned from prior monitoring was used by Navy biologists to revise and improve monitoring for MIRC for the remainder of the LOA period while maintaining the same overall level of effort. See Appendix E for revised Monitoring Plan for 2012-15.

Table 3 – Summary of monitoring methods for FY10-15

	FY10		FY11		FY12		FY13		FY14		FY15
Passive Acoustic Monitoring		ADAPTIVE MANAGEMENT REVIEW (AMR)	- Deploy four passive acoustic monitoring devices around the Mariana Islands that are capable of gathering data throughout the year. - Analyze existing acoustic data set which was collected during Navy's 2007 MISTCS survey.	A M R	- Deploy four passive acoustic monitoring devices around the Mariana Islands that are capable of gathering data throughout the year. - Analyze data from 4 PAM devices deployed in FY12	A M R	- Deploy PAM devices in the Mariana Islands that are capable of gathering data throughout the year. - Opportunistically collect acoustic recordings with a dipping hydrophone during visual survey effort. - Analyze data from PAM devices	A M R	- Deploy PAM devices in the Mariana Islands that are capable of gathering data throughout the year. - Opportunistically collect acoustic recordings with a dipping hydrophone during visual survey effort. - Analyze data from PAM devices	A M R	Opportunistically collect acoustic recordings with a dipping hydrophone during visual survey effort.
Visual Surveys	- Small boat surveys around Guam, Tinian and Saipan. - Visual observations using marine species observers aboard NMFS/PIFSC oceanographic survey in the Region, as well as during transits between Hawaii and Guam.		Conduct summer and winter visual surveys using a small boat and/or airplane around Guam, Tinian, Rota and Saipan in cooperation with NMFS and/or DAWR. Visual surveys would integrate methods such as photo ID that provide data that can be used for distribution and abundance. 45 days total.		Conduct summer and winter visual surveys using a small boat and/or airplane around Guam, Tinian, Rota and Saipan in cooperation with NMFS and/or DAWR. Visual surveys would integrate methods such as photo ID that provide data that can be used for distribution and abundance. 45 days total.		Conduct non-random, non-systematic visual survey or shore based surveys at any time of the year.		Conduct non-random, non-systematic visual survey or shore-based surveys at any time of the year.		Conduct non–random, non-systematic visual survey or shore-based surveys at any time of the year.
Biopsy							Purchase biopsy supplies to support biopsy attempts. Archive (preserve, extract DNA, sex) biopsy samples.		Purchase biopsy supplies to support biopsy attempts. Archive (preserve, extract DNA, sex) biopsy samples.		Purchase biopsy supplies to support biopsy attempts. Archive (preserve, extract DNA, sex) biopsy samples.
Satellite tagging							- Purchase satellite tags to support tagging attempts during visual surveys. - Analyze data from satellite tags.		- Purchase satellite tags to support tagging attempts during visual surveys. - Analyze data from satellite tags.		- Purchase satellite tags to support tagging attempts during visual surveys. - Analyze data from satellite tags.
Photo-ID and mark-recapture abundance estimates											Mark-recapture abundance estimate analysis for species with the highest likelihood of generating a statistically significant result.
Sea turtle distribution and density							Either line transect diving surveys or sea turtle tags along with analysis		Either line transect diving surveys or sea turtle tags along with analysis		Either line transect diving surveys or sea turtle tags along with analysis

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