Prepared for and Submitted to
National Marine Fisheries Service
Office of Protected Resources

Prepared by
Commander, U. S. Pacific Fleet Environmental Readiness Office
Department of the Navy
In accordance with Letter of Authorization, 12 August 2012

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

ANNUAL REPORT

11 April 2013

Citation for this report is as follows:

DoN 2013. Marine Species Monitoring for the U.S. Navy's Mariana Island Range Complex - Annual Report. 11 April 2013. Department of the Navy, Commander, U.S. Pacific Fleet. Author: Julie Rivers

Appendices were prepared by HDR/EOC and NMFS/Pacific Islands Fisheries Science Center

TABLE OF CONTENTS

LIST OF TABLES (not including Appendices)

LIST OF FIGURES (not including Appendices)

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 2012) from 12 Februrary 2012 through 12 February 2013.

The Navy uses the MIRC for at-sea training, as described in the MIRC Environmental Impact Statement (EIS) (DoN 2010a). In support of the continuation of training described in the MIRC EIS and the five-year Final Rule (NMFS 2010a), NMFS issued an Letter of Authorization (LOA) (NMFS 2012a) and a Biological Opinion (BO) (NMFS 2012b) to the Commander, U.S. Pacific Fleet (CPF) in August of 2012. The Final Rule, LOA and BO require the Navy to implement marine species monitoring as described in annual monitoring plans.

The data collection period for monitoring and reporting was not specifically stated in the MIRC Final Rule as it was for other 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.

Monitoring included visual surveys, photoidentification and deployment of passive acoustic monitoring devices. Surveys will continue throughout the remainder of the fiscal year along with the addition of biopsy and tagging as outlined in the Monitoring Plan. Monitoring for the next annual period will retain the same components and overall level of effort with a few clarifying edits to the 2014 and 2015 goals in the 2013-2015 Monitoring plan (**Table 3**).

INTRODUCTION

Report Objective

This report has two main objectives:

- Present data and results from the Navy-funded marine species monitoring conducted in the Mariana Islands Range Complex from 12 February 2012 to 12 February 2013.
- Provide any revisions to the Navy's 2013-2015 Monitoring Plan.

Background

The Navy developed the 2012-2015 Mariana Islands Range Complex (MIRC) Monitoring Plan (DoN 2012) to provide marine species monitoring as required under the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA) of 1973. 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 2009 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 2010 final MIRC Marine Species Monitoring Plan (DoN 2010b). 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.

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 implemented this last annual period.

Integrated Comprehensive Monitoring Program

The Integrated Comprehensive Monitoring Program (ICMP) provides the overarching framework for coordination of the U.S. Navy monitoring program. It has been discussed in detail within earlier MIRC annual marine species monitoring reports (DoN 2010b, 2011, 2012).

OPNAV (N45) is responsible for maintaining and updating the ICMP, as necessary, reflecting the results of future regulatory agency rulemaking, adaptive management reviews, 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. The last update was completed in December 2010 (DoN 2010c).

MONITORING IN THE MIRC

Prior monitoring efforts have been discussed in earlier reports and publications (DoN 2010b, 2011, 2012 and Fulling et al 2011). Field efforts increased considerably from 2010 to present after the completion of the MIRC EIS/OEIS (2010a) and issuance of the Letter of Authorization (LOA) and Biological Opinion (BiOp) (NMFS 2010b and c).

Monitoring Objectives

The 2012-2015 MIRC monitoring plan (DoN 2012) was designed for continuation of field efforts to augment the limited distribution and abundance data for marine mammal and sea turtles in the region. **Table 1** shows the monitoring goals established in 2012 for this reporting period (DoN 2012). Note that since the table is outlined by fiscal year, some of the FY13 commitments have been accomplished already and some will be completed during the rest of the fiscal year.

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

Table 1 – 2012-2015 Monitoring Commitments as outlined in DoN 2012 (note: FY13 partially complete)

	FY10	ADAPTIVE MANAGEMENT REVIEW (AMR)	FY11	AMR	FY12	AMR	FY13	AMR	FY14	AMR	FY15
Passive Acoustic Monitoring			- 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.		- 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		- 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 (in progress)		- 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		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 and/or - Analyze data from satellite tags.		- Purchase satellite tags to support tagging attempts during visual surveys and/or - 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

Monitoring Accomplishments

Accomplishments from February 2012 through February 2013 are summarized in narrative form below as well as in **Table 2**.

Vessel Surveys:

Small boat surveys were conducted in winter and summer with the goal of obtaining observations of seasonal migrants as well as year round odontocetes. Winter effort continued to be challenging due to high swells and high Beaufort sea states.

As in prior years, 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.

- Summer visual survey highlights (full report in Appendix A):

  - Survey teams conducted 31 days of non-systematic visual surveys from small boats for marine mammals and sea turtles around the islands of Guam, Rota, Saipan, Aguijan and Tinian. 1 day of survey was lost due to rough weather conditions. The surveys covered 3,492 km (1,886 nm) of trackline over 228 hours on-effort. **Figure 1** displays the distribution of depths surveyed and where cetaceans were observed.
  - 39 cetacean and 51 sea turtle sightings occurred. Sightings that were identified to species included green and hawksbill sea turtles, bottlenose, pan-tropical spotted, and spinner dolphins and short-finned pilot whales. Unidentified beaked whales (*Mesoplodon* and *Ziphiid*) were also observed.
  - CNMI: The sightings per unit effort (SPUE) was 1.01 sightings/100 km. The SPUE for Rota was 1.18 sightings/100 km. The SPUE rate for Saipan, Tinian, and Aguijan was 0.96 sightings/100 km of effort.
  - Guam: The SPUE was 1.28 sightings/100 km of effort.

- Winter visual survey highlights (full report in Appendix B)

  - Survey teams conducted 31 days of non-systematic visual surveys from small boats for marine mammals and sea turtles around the islands of Guam and Saipan. 3 days of survey were lost due to rough weather conditions. Over 70% of the survey was conducted in a Beaufort sea state of 4 to 5.
  - 21 hydrophone recordings were obtained.
  - The surveys covered 359 nm (664 km) of trackline over 80 hours on effort.
  - 10 cetacean and 6 sea turtle sightings occurred during the surveys. Sightings that were identified to species included green sea turtles, bottlenose, pan-tropical spotted, and spinner dolphins; melon-headed, sperm and short-finned pilot whales.
  - The SPUE was 13 sightings/100 hr or 2 sightings/100 km.

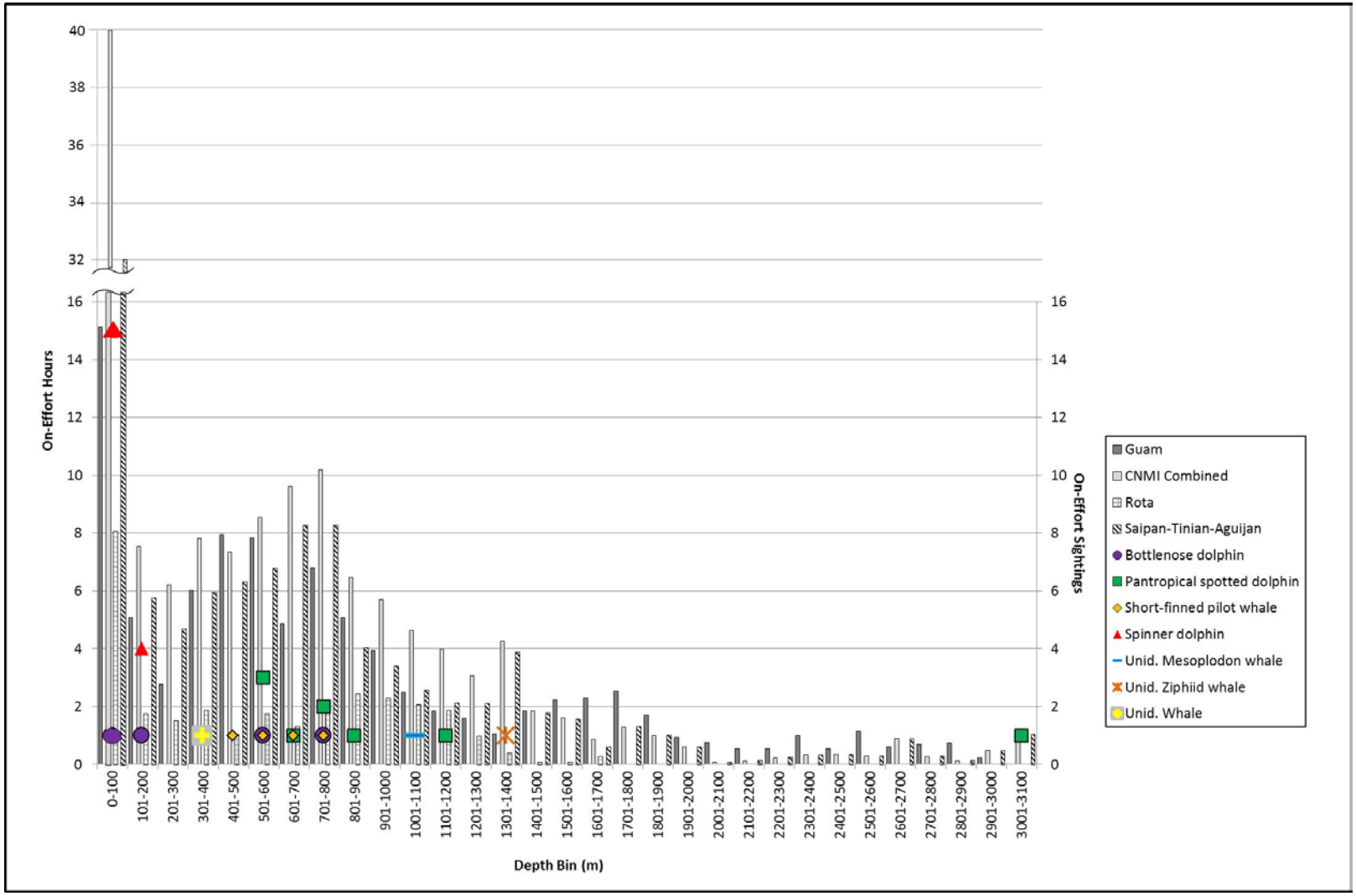

Figure 1. Distribution of the 2012 summer survey sightings and search effort across depth profiles divided into 100 m interval depth bins. Guam total on-effort hours = 90.82. CNMI total on-effort hours = 137.32. Rota total on-effort hours = 29.75. Saipan-Tinian-Aguijan total on-effort hours = 107.57. [Source: Hill et al 2013 (Appendix A)]

Photo identification (see Appendix A for additional information)

Photographs collected from marine mammals during the visual surveys can be used, over time, to build a catalog of individuals within a population. Individuals are identified by distinguishing features such as the pattern on the underside of the flukes (tail) or markings on the dorsal fins. Photo-identification (ID) mark-recapture studies represent the best opportunity for evaluating the abundance of small populations, as opposed to standard line-transect methods. Photo-ID and mark-recapture methodologies can be used to examine residency and movement of individuals and groups. It can also be used to generate "discovery curves" which can be used as a means for estimating abundance.

- Photo analysis of marine mammal photos taken by PIFSC and HDR from 2010-2012 began in June 2012 to create species-specific individual photo-ID catalogs.
- Photo-ID catalogs for short-finned pilot whales, spinner dolphins, and bottlenose dolphins have been created. **Figures 2, 3 and 4** demonstrate some of the initial output of the analysis.
- So far it is clear from the initial photo-ID analysis that individuals of the three cataloged species are moving between islands. With only a few years of photo data, it is unlikely that all of the distinct individuals have been cataloged for any of the three species in which catalogs have been created so far. Given the range of movements between the lower Mariana Islands, it is possible that individuals are moving farther up the chain of islands and that there is a larger population of individuals contributing to the groups encountered during these surveys.

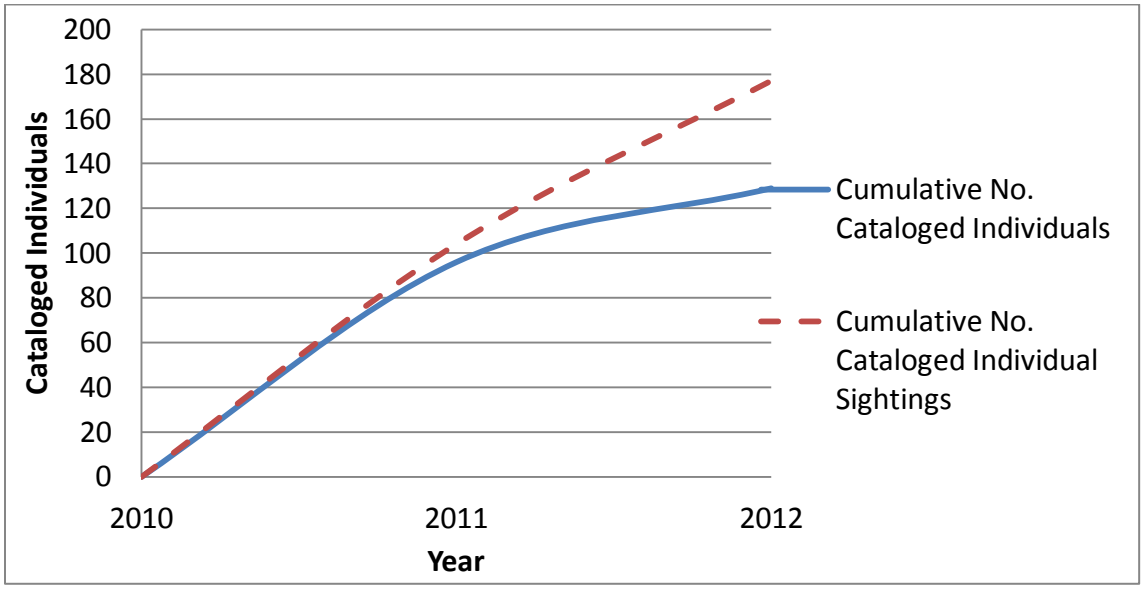

Figure 2. Discovery curve for cataloged pilot whales in the Marianas and the cumulative number of sightings of those individuals during the study period (2010-2012). [source: Hill et al 2012 (Appendix A)]

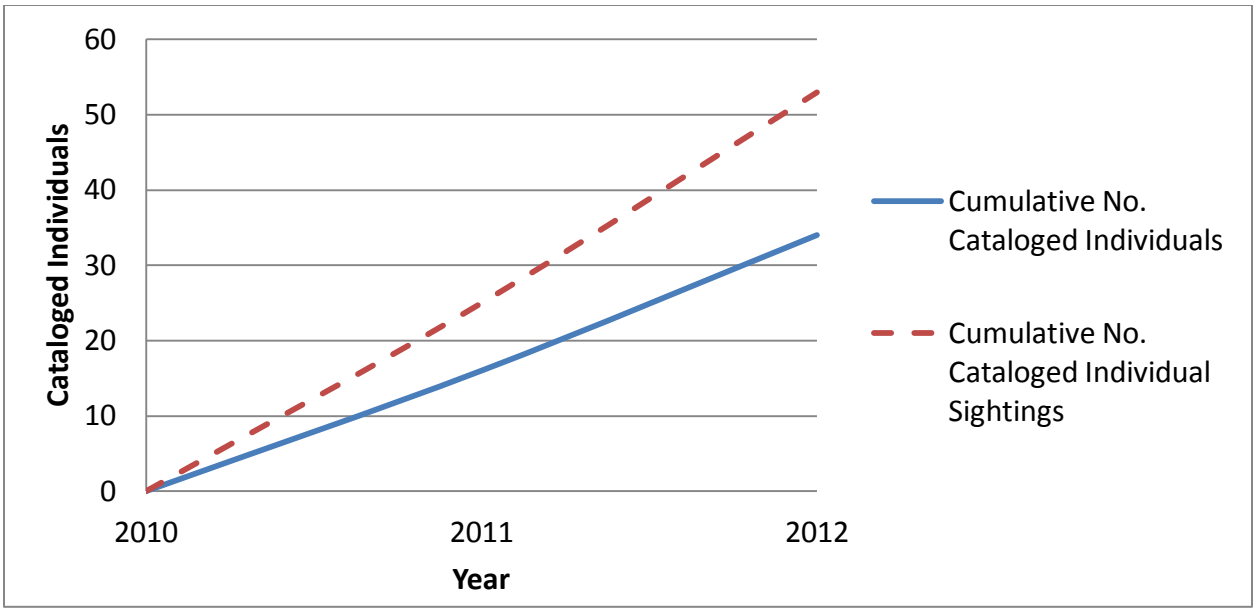

Figure 3. Discovery curve for cataloged bottlenose dolphins in the Marianas and the cumulative number of sightings of those individuals during the study period (2010-2012). [source: Hill et al 2012 (Appendix A)]

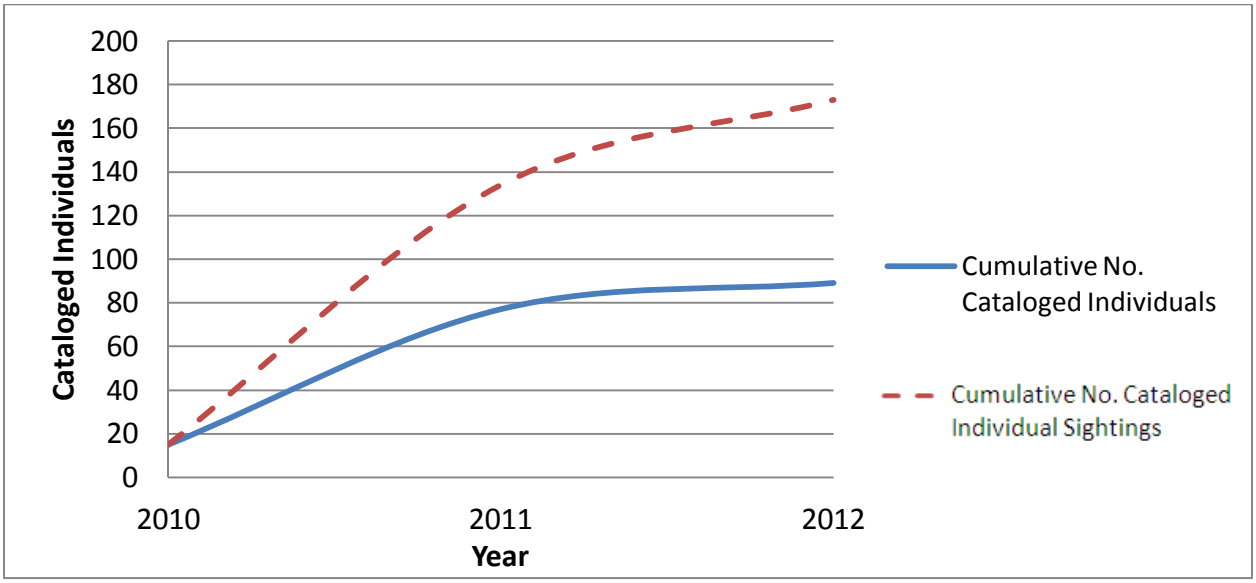

Figure 4. Discovery curve for cataloged spinner dolphins in CNMI and the cumulative number of sightings of those individuals during the study period (2010-2012). [source: Hill et al 2012 (Appendix A)]

Passive Acoustic Monitoring

Four Ecological Acoustic Recorded (EAR) buoys were re-deployed in April 2012 – two off Guam, one off Saipan and one off Tinian. One was lost but the remaining three were retrieved in January 2013. Devices were not redployed at this time as we are awaiting the data analysis results to inform future methods.

Table 2. U.S. Navy-funded marine mammal monitoring accomplishments within the Mariana Islands Range Complex through 12 February 2013

Field Method	Monitoring Commitment	Total accomplished
Passive Acoustic Monitoring	Deploy four passive acoustic monitoring devices around 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	Deploy four passive acoustic monitoring devices around the Mariana Islands that are capable of gathering data throughout the year. Opportunistically collected acoustic recordings with a dipping hydrophone during visual survey effort Derive strategy for PAM data analysis
Visual surveys	Conduct non-random, non-systematic visual survey or shore based surveys at any time of the year.	Conducted non-random, non-systematic visual survey or shore based surveys around Guam, Tinian, Rota, Aguijan and Saipan.
Biopsy	Purchase biopsy supplies to support biopsy attempts. Archive (preserve, extract DNA, sex) biopsy samples	NMFS is conducting the small boat surveys this year and already had enough biopsy supplies. Therefore, instead of purchasing more supplies, Navy funded collection of biopsy samples during visual surveys and analysis of archived samples.
Satellite tagging	Purchase satellite tags to support tagging attempts during visual surveys. Analyze data from satellite tags	Tags were purchased and will be used during summer survey. There is not any data to analyze yet.
Photo ID	n/a	Funded NMFS to catalog all photos collected from 2010 to present. Catalogs have been created for the three most commonly observed species.
Sea turtle distribution and density	Either line transect diving surveys or sea turtle tags along with analysis	Not accomplished as of this writing - will be done during the later part of FY13.

ADAPTIVE MANAGEMENT AND YEARLY MONITORING COMMITMENTS

MIRC ADAPTIVE MANAGEMENT AND 2013-15 MONITORING COMMITMENTS

Background was provided in prior year's annual reports (DoN 2010b, 2011, 2012) and the reader is encouraged to review thosedocuments for details.

Table 3 provides monitoring goals for late 2013 through 2015. Goals for 2014-2015 slightly revised as a result of lessons learned this reporting year.

Table 3 – Monitoring commitments for late 2013-2015, fiscal years 2014-2015 revised from DoN 2012

	FY10	ADAPTIVE MANAGEMENT REVIEW (AMR)	FY11	AMR	FY12	AMR	(Remainder of) FY13	AMR	FY14	AMR	FY15
Passive Acoustic Monitoring			- 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.		- 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		- Opportunistically collect acoustic recordings with a dipping hydrophone during visual survey effort. - Analyze acoustic data		- Collect acoustic data using PAM devices - Opportunistically collect acoustic recordings with a dipping hydrophone during visual survey effort. - Analyze data from PAM devices		- Opportunistically collect acoustic recordings with a dipping hydrophone during visual survey effort. - Continue to analyze and remaining acoustic data
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							Archive (preserve, extract DNA, sex) biopsy samples.		Combination of purchasing biopsy supplies, collecting biopsy samples, archiving them and analyzing them.		Combination of purchasing biopsy supplies, collecting biopsy samples, archiving them and analyzing them.
Satellite tagging							Purchase, deploy tags and analyze satellite tag data		Purchase, deploy and analyze satellite tag data		Purchase, deploy and analyze satellite tag data
Photo-ID and mark-recapture abundance estimates									Continue to catalog photographs obtained during visual surveys		Continue to catalog photographs obtained during visual surveys **and/or** conduct meta-analysis of survey data which may include mark-recapture abundance estimates or other analyses likely to result in significant results
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

REFERENCES

DoN 2007. Marine mammal and sea turtle survey and density estimates for Guam and the Commonwealth of the Northern Mariana Islands. Primary authors: Phil Thorson, Greg Fulling, Tom Norris, Candice Hall and Kerry Sawyer. Prepared under contract by Man-Tech SRS Technologies and Geo-Marine for the U.S. Navy, Pacific Fleet, Honolulu, Hawaii.

DoN 2012. Marine Species Monitoring for the U.S. Navy's Mariana Island Range Complex - Annual Report. 11 April 2012. Department of the Navy, Commander, U.S. Pacific Fleet.

DoN 2011. Marine Species Monitoring for the U.S. Navy's Mariana Island Range Complex - Annual Report. 15 April 2011. Department of the Navy, Commander, U.S. Pacific Fleet.

DoN 2010a. Mariana Islands Range Complex Final Environmental Impact Statement/Overseas Environmental Impact Statement. May 2010.

DoN 2010b. Marine Species Monitoring for the U.S. Navy's Mariana Island Range Complex - Annual Report. April 2010. Department of the Navy, Commander, U.S. Pacific Fleet.

DoN 2010c. U.S. Navy Integrated Comprehensive Monitoring Program. 20 December 2010 Update.

Fulling, G.L., P.H. Thorson, and J. Rivers. 2011. Distribution and abundance estimates for cetaceans in the waters off Guam and the Commonwealth of the Northern Mariana Islands. *Pacific Science*. Vol 65(3):321-343.

NMFS 2010a. Taking and Importing Marine Mammals; Military Training Activities and Research, Development, Testing and Evaluation Conducted Within the Mariana Islands Range Complex. Final Rule. Vol. 75, No. 148, pp. 45527-45556. 3 August 2010.

NMFS 2010b. Letter of Authorization for U.S. Navy training in the MIRC from August 2010 to August 2011.

NMFS 2010c. ESA Section 7 Consultation, Biological Opinion for U.S. Navy training in the MIRC from August 2010 to August 2011.

NMFS 2012a. Letter of Authorization for U.S. Navy training in the MIRC from August 2012 to August 2013.

NMFS 2012b. ESA Section 7 Consultation, Biological Opinion for U.S. Navy training in the MIRC from August 2012 to August 2013.