

**MARINE SPECIES MONITORING**  
**for the**  
**U.S. Navy's**  
**Hawaii Range Complex**  
**and**  
**Southern California Range Complex**

Department Of The Navy

2011 ANNUAL REPORT

October 1, 2011



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FOR THE  
U.S. NAVY'S  
HAWAII RANGE COMPLEX  
AND  
SOUTHERN CALIFORNIA RANGE COMPLEX  
2011 ANNUAL REPORT**

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*Prepared by*

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2011 Annual Range Complex Monitoring Report for Hawaii and Southern California

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## EXECUTIVE SUMMARY

This report presents the U.S. Navy's Year Three level of effort, regulatory compliance, scientific accomplishments, and preliminary data obtained from marine mammal monitoring in the Hawaii Range Complex (HRC) and Southern California (SOCAL) Range Complex.

Year Three encompassed the period from 02 August 2010 to 01 August 2011. As outlined in the HRC and SOCAL Range Complex sections within this report, significant accomplishments were achieved from visual surveys; deployments of passive acoustic monitoring devices; marine mammal tagging, use of marine mammal observers; and leveraging of additional field efforts from several projects funded by multiple Department of the Navy organizations. Substantial data was collected, most of which is still undergoing analysis for use in a future 2012 or 2013 multi-year synthesis of results.

In general, the U.S. Navy met or exceeded its monitoring goals as stated in the Range Complex-specific Monitoring Plans modified through the 01 October 2010 HRC-SOCAL Monitoring Report to the National Marine Fisheries Service.

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## LIST OF ACRONYMS

|          |   |                 |   |
|----------|---|-----------------|---|
| AMR      | Adaptive Management Review                                      | MMRC            | Marine Mammal Research Consultants                        |
| ASW      | anti-submarine warfare  | MTE             | Major Training Exercise                                   |
| Bf       | Beaufort  | nm              | nautical mile(s)  |
| C2X      | Composite Training Unit Exercise                                | nm <sup>2</sup> | square nautical mile(s)                                   |
| CalCOFI  | California Cooperative Oceanic Fisheries Investigation          | NMFS            | National Marine Fisheries Service                         |
| CRC      | Cascadia Research Collective                                    | NOAA            | National Oceanographic and Atmospheric Administration     |
| CREEM    | Centre for Research into Ecological and Environmental Modelling | NPAL            | North Pacific Acoustics Laboratory                        |
| dB       | decibel   | NUWC            | Naval Undersea Warfare Center                             |
| DoN      | Department of the Navy  | OEIS            | overseas environmental impact statement                   |
| EAR      | Ecological Acoustic Recorder                                    | ONR             | Office of Naval Research                                  |
| EIS      | environmental impact statement                                  | PAM             | passive acoustic monitoring                               |
| ESA      | Endangered Species Act  | PIFSC           | Pacific Islands Fisheries Science Center                  |
| ft       | feet  | PMAP            | Protective Measures Assessment Protocol                   |
| GPS      | global positioning system                                       | PMRF            | Pacific Missile Range Facility                            |
| GUNEX    | Gunnery Exercise, Surface-to-Surface                            | PTS             | permanent threshold shift                                 |
| HARP     | high-frequency acoustic recording package                       | R/V             | research vessel   |
| HRC      | Hawaii Range Complex  | RHIB            | Rigid hull inflatable boat                                |
| hrs      | hours   | RIMPAC          | Rim of the Pacific Exercise                               |
| IAC      | Integrated Anti-submarine Warfare Course                        | SCC             | Submarine Commanders Course                               |
| ICMP     | Integrated Comprehensive Monitoring Program                     | SES             | Smultea Environmental Sciences                            |
| JTFEX    | Joint Task Force Exercise                                       | SINKEX          | Sinking Exercise  |
| kHz      | kilohertz   | SIO             | Scripps Institution of Oceanography                       |
| km       | kilometer(s)  | SOAR            | Southern California Offshore Anti-submarine warfare Range |
| LOA      | Letter of Authorization   | SOCAL           | Southern California                                       |
| m        | meter(s)  | SSC PAC         | Space and Naval Warfare Systems Center Pacific            |
| M3R      | Marine Mammal Monitoring on Navy Ranges                         | SUSTEX          | Sustainment Exercise                                      |
| MDSU     | Mobile Diving and Salvage Unit-1                                | SWFSC           | Southwest Fisheries Science Center                        |
| MFAS     | mid-frequency active sonar                                      | TTS             | temporary threshold shift                                 |
| MISSILEX | Missile Exercise, Surface-to-Surface                            | UNDET           | Underwater Detonation                                     |
| MMC      | Marine Mammal Commission  | USWEX           | Undersea Warfare Exercise                                 |
| MMO      | marine mammal observer  |                 |   |
| MMPA     | Marine Mammal Protection Act                                    |                 |   |

# INTRODUCTION

## Background

The U.S. Navy developed Range Complex-specific Monitoring Plans to provide marine mammal and sea turtle monitoring as required under the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA) of 1973.

This report continues to provide range complex specific monitoring results for Year Three (02 August 2010 to 01 August 2011) within the Navy's Hawaii Range Complex (HRC) and Southern California (SOCAL) Range Complex.

The Range Complex Monitoring Plans were designed as a collection of focused "studies" to gather data that will attempt to address the following National Marine Fisheries Service (NMFS) questions which are described more fully in the previous NMFS' Letters of Authorizations (LOAs) and Navy Monitoring Plans:

1. Are marine mammals and sea turtles exposed to mid-frequency active sonar, especially at levels associated with adverse effects (i.e., based on NMFS' criteria for behavioral harassment, temporary threshold shift, or permanent threshold shift)? If so, at what levels are they exposed?
2. If marine mammals and sea turtles are exposed to mid-frequency active sonar, 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 mid-frequency active sonar, what are their behavioral responses to various levels?
4. What are the behavioral responses of marine mammals and sea turtles that are exposed to explosives at specific levels?
5. Is the Navy's suite of mitigation measures for mid-frequency active sonar and explosives (e.g., Protective Measures Assessment Protocol and major exercise measures agreed to by the Navy through permitting) effective at avoiding temporary threshold shift, injury, or mortality of marine mammals and sea turtles?

Monitoring methods used for the Range Complex Monitoring Plans include a combination of research elements designed to support both Range Complex specific monitoring, and contribute information to a larger Navy-wide science-based program. The primary research elements include visual surveys from vessel or airplanes, passive acoustic monitoring (PAM), marine mammal observers (MMO), and marine mammal tagging. Each monitoring technique has advantages and disadvantages that vary temporally and spatially, as well as support one particular study objective better than another (e.g., DoN 2010a). The Navy uses a combination of techniques so that detection and observation of marine animals is maximized, and meaningful information can be derived to answer the research questions proposed above. Secondary techniques, such as photo-ID have been used on an increasing basis.

In addition to Fleet-funded Monitoring Plans described above, the Chief of Naval Operations Energy and Environmental Readiness Division (OPNAV N45) and the Office of Naval Research (ONR) have developed a coordinated Science & Technology and Research & Development program focused on marine mammals and sound. Total investment in this program has been greater than \$150M over the past eight years. Several significant projects relative to Navy operational impact or lack of impact to marine mammals are currently funded and ongoing within the HRC and SOCAL Range Complexes. For example, in the SOCAL Range Complex, to leverage scientific expertise and funding availability, both U.S. Pacific Fleet and OPNAV N45 programs integrated certain elements of their programs to address the requirements as stated in the SOCAL Range Complex Monitoring Plan (see **Appendix A of SOCAL Range Complex section**).

### **Integrated Comprehensive Monitoring Program**

The Integrated Comprehensive Monitoring Program (ICMP) provides the overarching framework for coordination of the U.S. Navy monitoring program (U.S. Navy 2010). 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. Official ICMP updates are provided to NMFS by 31 December annually (e.g., U.S. Navy 2010).

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 currently prescribed in the 2010 ICMP update (U.S. Navy, 2010):

- (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 Objectives**

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 original 2008 Range Complex Monitoring Plans 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:

1. Present data and results from the Navy-funded marine mammal and sea turtle monitoring conducted in the HRC and SOCAL Range Complex from 02 August 2010 to 01 August 2011.

Included in this assessment are reportable metrics of monitoring as requested by the NMFS. This Year Three 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 on the two Range Complexes.

2. 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 SOCAL Range Complex and HRC 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.

## HAWAII RANGE COMPLEX

### Monitoring in the Hawaii Range Complex

This section reports accomplishments from the Navy's marine species field monitoring efforts in the HRC. The HRC consists of 235,000 square nautical miles (nm<sup>2</sup>) of surface and subsurface ocean areas and special use airspace for military training and research, development, testing and evaluation (RDT&E) activities. The HRC includes the Pacific Missile Range Facility (PMRF) on Kauai which is both a Fleet training range and a Fleet and Department of Defense (DoD) RDT&E range. The PMRF includes an instrumented range covering 1,020 nm<sup>2</sup> of ocean area at depths between 1,800 feet (ft) and 15,000 ft. Various subcomponents of the range complex are more fully described in the *Hawaii Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement* (HRC EIS/OEIS; DoN 2008). Monitoring efforts are divided into two major categories – those field efforts implemented by the U.S. Pacific Fleet as part of the HRC compliance monitoring, and those funded by the ONR and the Chief of Naval Operations Environmental Readiness Division. Reporting will primarily focus on the U.S. Pacific Fleet's compliance monitoring required under the Fleet's MMPA permit (LOA) and ESA consultation; however, highlights from the Navy's research monitoring are presented in Part III of this Section.

In the HRC Monitoring Plan, the Navy proposed to implement a diversity of field methods to gather field data from marine mammals and sea turtles in conjunction with training events. Studies were specifically designed to meet the questions outlined in the Introduction section of this document. Metrics (e.g., hours or events) were agreed to by the Navy and the NMFS and used as a goal for implementation.

During Study Year Three (02 August 2010 to 01 August 2011), U.S. Pacific Fleet implemented aerial and vessel surveys; embarked MMOs on Navy platforms; tagged a variety of cetaceans and pinnipeds; and deployed PAM devices. This work builds upon U.S. Pacific Fleet-funded fieldwork that has occurred in the Hawaiian Islands since the Rim of the Pacific (RIMPAC) Exercise in 2006.

## HRC YEAR THREE (02 AUG 2010 TO 01 AUGUST 2011) MONITORING OBJECTIVES

The goal of the HRC Monitoring Plan as revised (DoN 2010a) is to implement field methods chosen to address the long-term monitoring objectives outlined in the Introduction. **Table H-1** from the final HRC Monitoring Plan shows the FY 2011 monitoring objectives agreed upon by the NMFS and the Navy.

The U.S. Pacific Fleet began conducting aerial and vessel surveys in conjunction with major exercises in 2006. Most aerial and vessel surveys from 2006 to 2008 were conducted only before and after, however, some vessel surveys were conducted during the event as well. These early surveys not only provided data points that will be used in future analysis, but they also provided proof-of-concept data for determining the feasibility of using diverse field methods in the HRC. Based upon lessons learned from those surveys and input from the NMFS, the Navy shaped the studies in the HRC Monitoring Plan with proven field methods that would provide visual and acoustic data to support scientific assessment on the potential effects from Navy training on marine species.

In the HRC Monitoring Plan, the Navy committed to use visual surveys (aerial and vessel) and marine mammal observers aboard Navy vessels during anti-submarine warfare (ASW) and explosive events to meet its goals. Navy also proposed to deploy and analyze data from passive acoustic monitoring devices in 2010 and to purchase and deploy tagging devices.

**Table H-1. Year Three monitoring commitments  
for the Hawaii Range Complex (DoN 2010a).**

| Monitoring Technique                                    | Implementation   |   |
|---|--|---|
| Visual Surveys (aerial or vessel) STUDIES 1, 2, 3, 4, 5 | 120-160 hours before, during and after anti-submarine warfare (ASW) and/or explosives training events  | Adaptive Management Review (AMR) for FY12 |
| Marine Mammal Observers (MMO) STUDIES 1, 2, 3, 4, 5     | MMO team aboard Navy surface platforms during 2 ASW and 6 explosive events   |   |
| Tagging STUDIES 1, 2, 3                                 | Tag a goal of 15 individual marine mammals   |   |
| Passive Acoustic Monitoring (PAM) STUDIES 1, 2, 3       | <ul style="list-style-type: none"> <li>• 4 PAM devices deployed through the year. Begin data analysis. Continue collaboration of data collection and analysis from additional N45/ONR-funded autonomous PAM devices.</li> <li>• Continue use of the Pacific Missile Research Facility instrumented range hydrophones to gather and analyze marine mammal acoustic data.</li> </ul> |   |



## HAWAII YEAR THREE MAJOR TRAINING EXERCISE SUMMARY

Given the focus on monitoring around Navy at-sea training events, a list of major training events (MTEs), which occurred in the HRC between 02 August 2010 and 01 August 2011, is provided in **Table H-2**. Marine mammal sightings during MTEs are a form of compliance monitoring and represent substantial numbers of sightings. For the HRC, MTEs may include RIMPAC exercises, Undersea Warfare Exercises (USWEX), and Multi Strike Group Exercises.

**Table H-2. Hawaii Range Complex major training events from 02 August 2010 to 01 August 2011.**

| MTE Type       | Dates          | # of Days | # of Ships Involved | # of Sea Turtle Sightings | # of Sea Turtles | # of Marine Mammal Sightings | # of Marine Mammals |
|----------------|----------------|-----------|---------------------|---------------------------|------------------|------------------------------|---------------------|
| Koa Kai        | 12-17 Nov 2010 | 5         | 5                   | 0                         | 0                | 10*                          | 41                  |
| USWEX          | 15-22 Feb 2011 | 8         | 6                   | 0                         | 0                | 19*                          | 46                  |
| <b>Totals:</b> |                | <b>13</b> | <b>11</b>           | <b>0</b>                  | <b>0</b>         | <b>29</b>                    | <b>87</b>           |

\* One acoustic detection with no visual sighting

There were two MTEs in the HRC between 2 August 2010 and 1 August 2011 – one Koa Kai (similar in composition to a USWEX) and one USWEX. During transits and training events during those MTEs, Navy lookouts reported 29 marine mammal sightings for an estimated 87 marine mammals (**Table H-3**). There were 4 marine mammal sightings reported at a range less than 1000 yards (914 meters [m]) concurrent with mid-frequency active sonar (MFAS) use (**Table H-4**).

**Table H-3. Total number of marine mammal and sea turtle sightings observed from Navy platforms during Hawaii Range Complex major training events from 02 August 2010 to 01 August 2011.**

| Species Type         | # of sightings | % of total sightings | # of sea turtles or marine mammals | % of total number of sea turtles or marine mammals |
|----------------------|----------------|----------------------|------------------------------------|--|
| Dolphins             | 4              | 13                   | 36                                 | 43   |
| Whales               | 22             | 71                   | 43                                 | 51   |
| Pinnipeds            | 0              | 0                    | 0                                  | 0  |
| Sea Turtles          | 0              | 0                    | 0                                  | 0  |
| Species not reported | 5              | 16                   | 5                                  | 6  |
| <b>Totals:</b>       | <b>31</b>      | <b>100</b>           | <b>84</b>                          | <b>100</b>   |

**Table H-4. Number of marine mammal sightings at ranges less than 1,000 yards observed from Navy platforms during major training events concurrent with MFAS mitigation from 02 August 2010 to 01 August 2011 in the Hawaii Range Complex.**

| Mitigation Range | # of Sightings | Total Number of Marine Mammals | Breakdown by Species Type |             |                  |
|------------------|----------------|--------------------------------|---------------------------|-------------|------------------|
|                  |                |                                | # of Dolphins             | # of Whales | # of Sea Turtles |
| < 200 yards      | 0              | 0                              | 0                         | 0           | 0                |
| 200-500 yards    | 1              | 1                              | 0                         | 1           | 0                |
| 500-1000 yards   | 3              | 32                             | 30                        | 2           | 0                |
| <b>Totals:</b>   | <b>4</b>       | <b>33</b>                      | <b>30</b>                 | <b>3</b>    | <b>0</b>         |

\* Note that many mitigation ranges were not reported by the ships, so these numbers may be an under-representation of the totals in each category.

Ranges associated with potential NMFS criteria levels of permanent threshold shift (PTS) and temporary threshold shift (TTS) (215 and 195 dB re 1  $\mu$ Pa<sub>2-s</sub>, respectively) are much shorter than 200 yards (183 m). During the HRC MTEs this reporting period, there were no reported sightings of marine mammals or sea turtles at less than 200 yards (183 m) concurrent with MFAS use.

The three categories of mitigation measures (Personnel Training, Lookout and Watchstander Responsibilities, and Operating Procedures) outlined in the HRC EIS/OEIS (DoN 2008) and approved by the NMFS (NMFS 2010, 2011) were effective in detecting and appropriately mitigating exposures of marine mammals to MFAS. Fleet commanders and ship watch teams continue to improve individual awareness and enhance reporting practices. Additionally, a lookout effectiveness study was conducted by the Navy and provided data to demonstrate the effectiveness of the Navy's suite of mitigation measures.

## HAWAII YEAR THREE MONITORING ACCOMPLISHMENTS

Marine species monitoring in conjunction with training events has been funded by U.S. Pacific Fleet since 2006. From 2006-2008, surveys focused on visual line transect surveys conducted before and after training events, collecting visual sighting data, photographs, video and behavioral observations. Aerial and vessel surveys were conducted during RIMPAC 2006 (Mobley 2006), USWEX (Cetos 2007, Mobley 2007, Mobley 2008a,b), and RIMPAC 2008 (Mobley 2008c, Smultea and Mobley 2008).

Monitoring during 2009 and 2010 expanded after the finalization of the HRC Monitoring Plan in early 2009. Novel approaches for conducting aerial surveys in close proximity to Navy training events were successfully implemented in 2009 and 2010, providing valuable behavioral observations while ASW was occurring. Additionally, data was collected by embarking marine mammal observers on Navy platforms; tagging Hawaiian monk seals; deploying PAM devices; and conducting aerial and vessel visual surveys (see DoN 2009, 2010b).

During 2011, U.S. Pacific Fleet implemented aerial and vessel surveys; embarked MMOs on Navy platforms; tagged pinnipeds and a variety of cetaceans; and deployed PAM devices. **Table H-5** presents a summary of Navy funded marine mammal monitoring within the HRC during Year Three.

## Major Accomplishments from U.S. Pacific Fleet's Year Three Compliance Monitoring in the HRC:

- Visual (Vessel) Survey
  - A small vessel survey during November 11-23, 2010, covered an area of approximately 8,000 nm<sup>2</sup>, in an area 80 nm south of Oahu, and 60 nm west of the Big Island (Hawaii). Marine species monitoring occurred before, during, and after the Koa Kai (a USWEX) 11-1 training event. The survey's purpose included investigating the occurrence, distribution, and behavior of target species (marine mammals and sea turtles) using vessel-based line-transect survey in waters adjacent to the area where the Navy exercise was occurring. See **Appendix B: HDR EOC 2011**.
  - A small vessel survey using the *M/V Searcher* was conducted during February 16-20, 2011 to Ka'ula and off the north shore of Kauai during and after SCC 11-1 which took place on the PMRF near Kauai. The primary goals of the survey were to study the presence of marine mammals, including Hawaiian monk seals, at Ka'ula, as well as to deploy satellite tags in order to contribute knowledge regarding how odontocetes are using the range complex and whether they are exposed to MFAS (see *Tagging accomplishments* section). Additionally, sightings of seabirds and marine mammals were recorded (no sea turtles were sighted). See **Appendix C: Richie and Fujimoto 2011**.
  - A small vessel survey was conducted on June 30, 2011 using the *M/V Searcher* to record sightings of seabirds and marine mammals offshore of Ka'ula Island and in the waters between Niihau and Kauai, including the PMRF areas W-186 and W-187. Objectives were to: (1) obtain cetacean dorsal fin photographs for individual identification purposes; (2) deploy a PAM device offshore to the east of the island; and (3) examine the NW shore of the island where Hawaiian monk seals had been sighted. A total of six marine mammal groups were sighted; three groups of bottlenose dolphins, one group of rough-toothed dolphins; one group of spinner dolphins, and two hauled-out Hawaiian monk seals on a short stretch of shoreline. No sea turtles were sighted. See **Appendix D: Uyeyama et al. , 2011**.
  - A small vessel survey during 20 July-8 August was cooperatively funded with the Naval Postgraduate School and N45, and was conducted by Cascadia Research Collective on and near the instrumented range at PMRF offshore Kauai in conjunction with the July SCC. The primary goals were to validate species identifications of acoustic detections by the M3R hydrophone array, as well as to deploy satellite tags in order to contribute knowledge regarding how odontocetes are using the range complex and whether they are exposed to MFAS (see *Tagging accomplishments* section).
- Visual (Aerial) Survey
  - Aerial surveys of the shorelines of the Hawaiian Islands and islets within the vicinity of the November 2010 Koa Kai-11 training event were performed on November 18 and 22, 2010. The objective of the aerial-based monitoring was to conduct coastline and pelagic surveys during and after training events in search of otherwise-undetected strandings. See **Appendix B: HDR EOC 2011**.

- Aerial surveys were conducted in conjunction with two training events during the period February 16 to March 5, 2011: (a) U.S. Navy Submarine Commander's Course (SCC) 11-1 naval training event on the PMRF instrumented range between Kauai and Niihau, Hawaii; and (b) Undersea Warfare Exercise (USWEX) training event south of Oahu and Molokai (**Appendix E**: Mobley 2011). These surveys also coincided with the Ka'ula vessel survey (see *Vessel Survey accomplishments* above) and the Marine Mammal Observers embarked upon a participating U.S. Navy Destroyer (see *Marine mammal observers accomplishments* below). Overall survey effort was divided into four parts as summarized below:
  - Ship follows, SCC event (February 16–18, 2011): involved flying elliptical orbits in front of the guided-missile destroyer (DDG) with the goal of finding target species in the vicinity of the DDG and observing and recording their behavior using focal follow methods.
  - Tagging-support transect surveys (February 19, 2011): to search for marine mammals in support of tagging effort by the Cascadia research group and Ka'ula vessel survey. This effort continued to demonstrate that during certain training events, contracted civilian aircraft may be used as a method for conducting behavioral monitoring of submerged and at-surface marine mammals.
  - Coastline surveys, post-SCC event (February 24 and 26, 2011): following the SCC event, the aircraft flew along the coastlines of Kauai, Niihau, and Ka'ula islands in search of otherwise-undetected marine mammal strandings.
  - Coastline surveys, post-USWEX event (February 28 and March 5, 2011): following the USWEX training event, the aircraft flew along the coastlines of Oahu, the Four Island Region (Maui, Molokai, Lanai, and Kahoolawe), and the Kona coast of the island of Hawaii.
- Passive Acoustic Monitoring
  - Four PAM devices were deployed in areas of the HRC where underwater detonations or anti-submarine warfare exercises may occur nearby.
  - As part of the June 30, 2011 monitoring effort off Ka'ula (see Visual (Vessel) Surveys above), an Ecological Acoustic Recorder (EAR) was deployed at a depth of 537 m east of Ka'ula Island. See **Appendix D**: Uyeyama et al. 2011. Three other EARs were deployed July 26, 2011 nearby, offshore the North, Southwest, and Eastern shores of Niihau at approximately 800 m.
  - Analysis of marine mammal acoustic data collected during FY10. An EAR deployed on July 17, 2010 (during marine species monitoring associated with RIMPAC 2010) at a depth of 800 m off the northwest coast of the island of Ni'ihau was recovered on December 21, 2010 (it had ceased recording on October 22). Beaked whales were detected daily. Most (approximately 87 percent) of the detections occurred at night, which is likely a reflection of the behavior of beaked whales responding to prey movements. Other species detected included the pilot whale, Risso's dolphin, sperm whale, and dolphins in the genus *Stenella*. Pilot whales had the highest number of detections, while beaked whales had the least number of detections. Of note was that the Risso's dolphin was the second most-detected toothed whale

species, while not consistently sighted in Hawaiian waters. See **Appendix F: HDR/EOC and Au 2011**.

- Marine Mammal Observers (MMO)
  - Three ASW training events were monitored: Koa Kai, SCC, and USWEX.
    - A four-person observer team (three Navy civilian MMO and one Navy contractor MMO) conducted the lookout effectiveness study during three ASW training events in the Hawaii Range Complex, Koa Kai 11-1 from 12-16 November 2010 (see **Appendix G: Farak et al. 2011a**), and two consecutive events, SCC and USWEX from 15-22 February, 2011 (see **Appendix H: Farak et al. 2011b**). These MMOs were stationed aboard a U.S. Navy cruiser (CG-A) for Koa Kai, and a U.S. Navy destroyer (DDG-D) for SCC and USWEX. In addition to collection of lookout sighting data, detailed sighting data was collected including species identification, surfacings, and behavior.
    - Four explosive events (underwater detonations: UNDETs) were monitored: Two UNDETs each day during the 26-27 April training event conducted by Mobile Dive and Salvage Unit-1 (MDSU-1) in the Pu‘uloa Underwater Training Range. MMOs observed for marine mammals and sea turtles as well as implementation of mitigation measures (**Appendix I: Uyeyama and Richie 2011**).
- Tagging
  - From February 16-20, 2011, CRC conducted research off the island of Kauai (see *Vessel Survey accomplishments* section) (See **Appendix J: Baird et al. 2011; Appendix D: Richie and Fujimoto 2011**). The three goals were: (1) photo-identification; (2) biopsy sampling; and (3) tagging to examine habitat use and movement patterns. *The R/V Searcher* and a rigid-hulled inflatable boat (RHIB) were used. Three individual short-finned pilot whales were satellite-tagged. Overall ranging patterns of the whales differed, with one individual moving to Oahu and back, while another moved further west.
  - Ten Hawaiian monk seals were instrumented with “cell phone” tags on Oahu, Kauai and Molokai continuing effort that began with eleven animals tagged in 2010. Of those tags, tracks were obtained from 13 animals – some are still deployed. Data are currently being analyzed to identify home ranges and core areas of use. (**Appendix M: Wilson and Littnan, 2011**.)
- Integration of historical monitoring data
  - The total of visual survey effort conducted for the marine species monitoring program in the HRC was integrated and summed as part of the initial phase of analyzing all years of the monitoring program. Aerial and vessel surveys on civilian and Navy assets from 2007-2011 were included, and the data incorporated into a geo-referenced database. Results included figures representing the layered sum of all survey tracklines as well as sightings by species. See **Appendix L: Uyeyama 2011**.

- **Navy Lookout Effectiveness Study**

The U.S. Navy undertakes monitoring of marine mammals during Navy exercises and has mitigation procedures designed to minimize risk to these animals. One key component of this monitoring and mitigation is the shipboard lookouts (LOs, also known as watchstanders), who are part of the standard operating procedure that ships use to detect objects (including marine mammals) within a specific area around the ship during events. The watchstanders are an element of monitoring requirements specified by NMFS in the MMPA Letters of Authorization. The goal is to detect mammals entering ranges of 200, 500 and 1000 yards around the vessel, which correspond to distances at which various mitigation actions should be performed. In addition to the lookouts, officers on the bridge search visually and SONAR operators listen for vocalizations during anti-submarine warfare training. We refer to all of these observers together as the “observation team” (OT). The aim of this study is to determine the OT effectiveness in terms of detecting and identifying marine mammals. Of particular interest is the probability of an animal getting within a defined range of the vessel without being observed by the OT, as well as determining the accuracy of the OT (primarily the LO) in determining species group (whale, dolphin, etc.) group size and position. In order to achieve this, experienced MMOs search and collect information on marine mammals that both they and the OT detect.

Work was previously conducted to design and test a protocol for determining the effectiveness of the LOs in visually detecting marine mammals. The field protocol for the experiments was developed in consultation with members of the Naval Undersea Warfare Center Division, Newport (NUWCDIVNPT); U.S. Fleet Forces Command; NAVFAC; Commander, U.S. Pacific Fleet; and NMFS. The basic concept is that trained Marine Mammal Observers (MMOs) are situated on board a vessel during daylight at-sea exercises, in locations where they can watch for marine mammals and communicate with one another, but not cue the LO. The MMOs then work to set up opportunistic trials, where they detect a surfacing of a marine mammal at a measured location, and record whether that surfacing was also detected (a successful trial) or not (an unsuccessful trial) by the LO.

It was found to be necessary to have an additional “liaison” MMO (LMMO) stationed with the LO, and in communication with the other MMOs, to help report when and where LOs detected surfacings. It was also necessary to have an additional team member tasked solely with data recording. In addition to recording surfacing events, MMOs attempted to keep track of which surfacings belonged to the same school or animals. The revised protocol (Burt and Thomas 2010) was applied to one further at-sea exercise (off Southern California), making four datasets in total.

In parallel with field protocol development, methods are being developed for using the data generated during these experiments to estimate the probability of animals entering the stand-off range undetected. An analysis method to allow for intermittent availability is also being developed, since many marine mammal species remain on (or close to) the surface for significant periods between dives, and so are “intermittently available” for detection. The extended methods currently only use information about the location of LO detections, but could conceivably be extended further to use information from the MMO LO trials. As a proof of concept both the instantaneous

and intermittent availability models to data collected in the at-sea experiments will be applied.

Recommendations for future data collection efforts focus on a single vessel type and an area where the number of trials per cruise is likely to be maximized. Resources would be devoted to extending the intermittent availability models so that they use both the locations of observed animals and the outcomes of the MMO trials, thereby unifying the models developed to date for instantaneous and intermittent availability.

Major accomplishments related to this project to date include initial development of data collection protocols and analytic methods, data collection trials, completed a proof of concept for detection functions, consultation with NMFS technical staff for input on analysis methods, and investment in continued refinement of the analytic methods and focus on additional data collection in 2011/2012.

Navy Fleet training organizations are currently evaluating the preliminary results from the proof of concept phase to determine if improvements in lookout training programs are warranted. Initial steps in progress include evaluating incorporation of marine mammal survey techniques into watchstander training and revision of Marine Species Awareness Training. As more data becomes available other options for improving lookout training will be evaluated as appropriate.

- **Use of Instrumented Underwater Range Phones for PAM at Pacific Missile Range Facility**

Analysis was conducted for a focused period during the February 2011 Submarine Commanders Course exercise (SCC) at Pacific Missile Range Facility (PMRF) (Marint and Kok, **Appendix N**). The focus period is between 05:58 and 07:39 HST on 17 February 2011 corresponds with a visual sighting made by marine mammal observers aboard the transmitting ship. This period covers mid frequency active sonar (MFAS) activity in the event termed miniwar III which involved one submarine participant, a U.S. Navy destroyer (DDG) equipped with the AN/SQS-53C sonar system, and two additional surface ships with other sonar systems. This focus period represents the first exposure analysis at PMRF for marine mammals during a SCC. Analysis is ongoing for other detections.

Animal locations were obtained both from a visual sighting for a small group of unidentified whales and processing of passive acoustic data for one minke whale and one humpback whale. Positions, and estimated headings, of the DDG were obtained from PMRF exercise products. Full report (**Appendix N**) provides additional details of the exposure analysis, such as the equations used for the calculations, along with more in depth passive acoustic analysis for minke and beaked whales.

The use of passive acoustics for monitoring during U.S. Navy training with MFAS activity shows promise in estimating exposure levels during exercises on instrumented ranges and can provide position data better than tags. Repeated localizations, such as the minke whale in this case, allows investigation of both spatial updates of the animals location with respect to the MFAS ship (swim speed, direction of travel) and details of the animals calls with MFAS activity nearby in space and time (e.g. call rates, types of calls, differences in call characteristics re. MFAS activity).



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**Table H-5. U.S. Navy-funded marine mammal monitoring accomplishments within the Hawaii Range Complex from 02 August 2010 to 01 August 2011.**

| Study Type                                  | U.S. Navy EIS/LOA monitoring  | Associated event type  | U.S. Navy R&D funded monitoring  | Associated event type | MMPA/ESA requirement   | Total accomplished  |
|---|---|--|--|-----------------------|--|---|
| Visual surveys (Studies 1,2,3,4,5)          | 1) 95.2 hrs – 11-23 Nov 2010 (vessel)<br>2) 14.1 hrs – 18-22 Nov 2010 (aerial)<br>3) 46.1 hrs – 16 Feb – 5 Mar 2011 (aerial)<br>4) 60.2 hrs 15-20 Feb (vessel)<br>5) 11.5 hrs Ka’ula survey 30 June<br>6) 72.7 hrs PMRF pre-SCC July/Aug (vessel) | 1) Koa Kai (ASW)<br>2) Koa Kai (ASW)<br>3) SCC & USWEX (ASW)<br>4) SCC (ASW)<br>5) n/a<br>6) SCC (ASW) | Use of M3R array at PMRF for validation of species ID, animal localization February (baseline and during SCC) and July 2011. | SCC                   | 120- 160 hours before, during and after ASW and/or explosives training events  | 299.8 hours of aerial and vessel surveys  |
| Marine Mammal Observers (Studies 1,2,3,4,5) | 1) 140.5 hrs - 12-17 Nov 2010<br>2) 118.0 hrs - 15-18 Feb 2011<br>3) 124.0 hrs - 19-22 Feb 2011<br>4) 11 hrs - 26-27 Apr 2011   | 1) Koa Kai (ASW)<br>2) SCC (ASW)<br>3) USWEX (ASW)<br>4) Underwater detonations                        | n/a  | n/a                   | MMO team aboard Navy surface platforms during 2 ASW and 6 explosive events.<br>(make up for FY10 shortfall of 1 ASW event) | 3 ASW events and 4 explosive events.<br>(Note: extra ASW event covers shortfall from next year.)<br><i>Note: Lookout effectiveness for 2 explosive events with MDSU-1 originally planned for July 2011 rescheduled and accomplished 10 Aug 2011</i> |
| Tagging (Studies 1,2, 3)                    | 1) 10 Hawaiian monk seals tagged<br>2) 3 cetaceans tagged (pre-SCC Cascadia Research Collective effort off Kauai; 16-20 Feb)<br>3) 2 tag deployed in conjunction with M3R Jul -Aug 2011 (one successful)  | 1) ULT (ASW)<br>2) SCC (ASW)<br>3) USWEX (ASW)   | Use of M3R array at PMRF for validation of species ID, animal localization February (baseline and during SCC) and July 2011. | SCC                   | Tag a goal of 15 individual marine mammals (make up for FY10 shortfall of 4 tags)  | 10 Hawaiian monk seals tagged);<br>4 cetaceans tagged (additional one deployed but fell off)<br>Continuing analyses of tag data from FY 10 monitoring   |

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| Study Type                                    | U.S. Navy EIS/LOA monitoring  | Associated event type | U.S. Navy R&D funded monitoring  | Associated event type | MMPA/ESA requirement  | Total accomplished   |
|---|---|-----------------------|--|-----------------------|---|--|
| Passive Acoustic Monitoring (Studies 1, 2, 3) | 1) 1 EAR deployed at Ka'ula; 30 June<br>2) 3 EAR deployments in vicinity of Kauai and Niihau, 26 July<br>3) Continue use of PMRF hydrophones to gather and analyze marine mammal acoustic data in conjunction w/ SCC. | SCC (ASW)             | Use of M3R array at PMRF for validation of species ID, animal localization February (baseline and during SCC) and July 2011. | SCC                   | 4 PAM devices deployed through the year. Begin data analysis. Continue collaboration of data collection and analysis from additional N45/ONR-funded autonomous PAM devices. Continue use of the Pacific Missile Range Facility (PMRF) instrumented range hydrophones to gather and analyze marine mammal acoustic data. | Deployment of 1 EAR near Ka'ula ;<br>Deployment of 3 EARS near Kauai/Niihau<br>Analysis of 2 EARS from near Niihau, 4 near Oahu (historical) and 2 near Kauai (historical)<br>Use of PMRF hydrophones to gather and analyze marine mammal acoustic data in conjunction w/ SCC. |

### **Metrics Met or Exceeded**

*Visual Surveys:* Over 213 hours of visual surveys (vessel and aircraft platforms) were conducted in conjunction with trainin events . This exceeded by more than 50 percent, the 120-160 hours of survey effort before, during, and after ASW and/or explosive events committed to in the HRC monitoring plan covering the period of 02 August thru 01 August 2011.

*Marine Mammal Observers:* The HRC Monitoring Plan for FY 2011 and the HRC LOA for 2011 calls for an MMO team aboard Navy surface platforms during 2 ASW events. An MMO team embarked during 3 ASW events, the extra event compensating for the shortfall of 1 ASW event in FY 2010.

*Tagging:* Fifteen individual marine mammals were tagged from 02 August thru 01 August 2011.

### **Metric Shortfalls**

*Marine Mammal Observers:* The HRC Monitoring Plan for FY 2011 and the HRC LOA for 2011 calls for an MMO team aboard Navy surface platforms during 6 explosive events. Due to an event cancellation, MMO teams embarked during only 4 underwater detonations by the July 31 cutoff, for a shortfall of 2. These two additional events were monitored by an MMO team a few weeks later on August 10, 2011. Therefore this shortfall will be satisfied by the August 10 effort when these events are tabulated for FY12.

*Tagging:* The Navy's goal was to tag a total of 19 marine mammals, 15 from the FY11 goals, as well as to compensate for a shortfall of 4 tags from FY10. However 15 tags were expended on attempted deployments, 14 successfully, therefore considering the shortfall from FY10, there was an overall shortfall of 4 tags in FY11. The 15 tags for FY11 include: 10 cell phone tags deployed on Hawaiian monk seals by NMFS, and 5 satellite tags (4 successful deployments) by Cascadia Research Collective on two separate field efforts in February and July 2011. The latter effort by CRC encountered unusually difficult summer weather conditions, and despite being vectored to animals by the M3R hydrophone array, more tags were not deployed by the July 31 deadline. However, CRC successfully deployed two additional tags after the deadline durng the same field effort, and these will be counted towards FY12 monitoring accomplishments.

## OTHER NAVY-FUNDED RESEARCH IN HAWAII

There were also additional marine protected species research efforts within the HRC that were funded by OPNAV N45 and ONR. ONR funded several projects in the HRC that are related to the U.S. Pacific Fleet's monitoring goals which are summarized below.

- 1) *Passive Acoustic Methods/Tracking* (Eva Nosal, Dept. of Ocean & Resources Engineering, University of Hawaii). Funded in part by ONR.

Passive Acoustic Methods for Tracking Marine Mammals Using Widely-Spaced Bottom-Mounted Hydrophones. (ONR Award N00014081142). The main objective of this project is to develop and implement methods to deal with two specific challenges associated with tracking marine mammals using widely-spaced bottom-mounted hydrophone arrays: (1) Multiple animals whose calls cannot be easily separated or associated, and (2) Insufficient receiver coverage, in which case standard time-of-arrival (TOA) tracking methods fail. The main effort is directed toward data collected at Navy Ranges (PMRF and AUTEK). The main species of interest in these datasets are sperm whales, beaked whales, minke whales, and humpback whales. *Ecological Acoustic Recorders* (Whitlow Au and Marc Lammers, Hawaii Institute of Marine Biology), Funded by ONR

EARs have been deployed from February 2009 to the present time around Oahu and from February 2009 until April 2011 around Kauai. The effort at Kauai has concentrated on deep-diving beaked whales. Since April 2011, EARs in the waters of Kauai have been deployed along the southern coast. With funding support from Pacific Fleet, acoustic data recorded by EARs deployed at various locations around Oahu and Kauai were analyzed for various type of sounds including ambient noise, boat sounds, mid-frequency sonar emissions, dolphins and whales. See **Appendix K**.

The project received an M3R node in late August 2010 which is currently being used to process the data from Kauai and for the EAR off Barbers Point, Oahu, which is at a depth of 581 m. The M3R system is designed to detect both Blainville's and Cuvier's beaked whales. Eventually all the EAR data will be analyzed with the M3R node. *Hearing and Echolocation of Odontocetes* (Paul Nachtigall et al., Hawaii Institute of Marine Biology), Funded by ONR.

Paul Nachtigall's team of researchers and students published results on the audiogram of a sub-adult Blainville's beaked whale that stranded on the island of Maui in August 2010. The team also worked to build a rugged field-ready portable battery-operated system to use to measure the hearing capabilities of marine mammals in the lab, on ships, on the beach or wherever the opportunity arises. Additional work included finalized publications on dolphin hearing during echolocation (which was referred to in the 2010 HRC monitoring report).

Related publications: Kloepper et al. 2010; Li et al. 2011; Pacini et al. 2011.

## **HRC ADAPTIVE MANAGEMENT AND 2012 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 in coordination with NMFS HQ and Marine Mammal Commission (MMC) input 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 HRC, the SAG recommended a broad suite of monitoring for this area including passive acoustic monitoring, and non-systematic surveys incorporating biopsy, tagging and photo-identification studies. It was noted that the fixed hydrophone array off Kauai allows for acoustic monitoring and would provide potential synergy with boat-based monitoring efforts. 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.

Results of recent meetings, recommendations from the SAG as well as success and challenges in the field are under review and will be further discussed with NMFS at the annual adaptive management meeting in October 2011. Results will be used to revise and improve the monitoring program in the coming years, while maintaining the same level of effort. Therefore, other than adding more flexible language to the PAM section, no changes are being recommended for the 2012-2014 LOA Renewal period at this time (see **Table H-6**). Once review of current monitoring methods and metrics are completed, they will be incorporated into revised monitoring plans.

**Table H-6. 2012-2014 Monitoring Commitments**

| Monitoring Technique              | Implementation   |   |
|-----------------------------------|--|---|
| Visual Surveys (aerial or vessel) | 120-160 hours before, during and after ASW and/or explosives training events   | Adaptive Management Review (AMR) for FY12 |
| Marine Mammal Observers (MMO)     | MMO team aboard Navy surface platforms during 2 ASW and 6 explosive events   |   |
| Tagging                           | Tag a goal of 15 individual marine mammals   |   |
| Passive Acoustic Monitoring (PAM) | <ul style="list-style-type: none"> <li>• Utilize a combination of autonomous recording devices, and/or sonobuoys and/or towed arrays to gather acoustic data. Continue collaboration of data collection and analysis from additional N45/ONR-funded autonomous PAM devices.</li> <li>• Continue use of the Pacific Missile Range Facility instrumented range hydrophones to gather and analyze marine mammal acoustic data.</li> </ul> |   |

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