Prepared for

National Marine Fisheries Service
Office of Protected Resources

Prepared by

Department of the Navy

Gulf of Alaska
Temporary Maritime Activities Area
Monitoring Plan

FINAL

February 2, 2011

This Monitoring Plan is submitted to NMFS in support of the

Taking and Importing Marine Mammals; Request for Letter of Authorization for the Incidental Harassment of Marine Mammals Resulting from Navy Training Activities in the Gulf of Alaska Temporary Maritime Activities Area; Final Rule

AND

Biological Opinion on the U.S. Navy's training in the Gulf of Alaska Temporary Maritime Activities Area

ERRATA

Significant additions to the DRAFT FINAL Monitoring Plan of June 20, 2010 are indicated in this version by blue color font.

EXECUTIVE SUMMARY

The Gulf of Alaska Temporary Maritime Activities Area (TMAA) Monitoring Plan proposes monitoring goals for marine mammals that are unique with regard to their breadth as well as their focus on potential impacts or lack of impacts from Navy training activities on marine mammals. To accomplish these goals, the Navy will use similar methods of implementation and data analysis which have demonstrated success in comparable monitoring programs studying the effects of anthropogenic sound on marine animals.

To this end, the Navy in consultation with the National Marine Fisheries Service (NMFS) initially designed a series of focused "study questions" in 2008 to gather data in various combinations within the Navy's range complexes in the Atlantic and Pacific.

NMFS proposed a more general adaptation of the original 2008 goals in November 2010 to incorporate a broader spectrum of information in support of permittee-based monitoring. These goals derived from the comments of leading marine mammal scientific experts that met with the NMFS and the Navy in October 2010.

These new 2010 study goals include:

(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.

Given the larger scope of training events within other Navy range complexes as compared to the Gulf of Alaska, not every one of these original five study questions will be address within the TMAA (**Tables ES-1** and **ES-2**). Rather, data collected from the Gulf of Alaska TMAA monitoring will be used to supplement a consolidate range complex marine mammal monitoring report incorporating data from the Hawaii Range Complex, Marianas Island Range Complex, Northwest Training Range Complex, and Southern California Range Complex.

In April of 2009, the U.S. Pacific Fleet also provided approximately $250,000 in contributory funding to support a NMFS marine mammal density survey of the offshore waters in the Gulf of Alaska. This survey was the Gulf of Alaska Line-transect Survey (GOALS 2009), April 10-20 aboard the NOAA research ship, *Oscar Dyson* (Rone et al 2010).

Methods proposed in this monitoring plan for the Gulf of Alaska TMAA include initial use of long-term passive acoustic monitoring (PAM) to primarily focus on providing additional data for study questions 2 and 3 from the original 2008 study goal, and more recently item (a) from the 2010 goal revision (**Table ES-1**). This focus would assist in the efforts to increase the state of awareness on marine mammal occurrence and distribution within the offshore waters of the Gulf of Alaska.

Acknowledging future adaptive management considerations under the Navy's Integrated Comprehensive Monitoring Program, as well as future consultations and collaboration with various NMFS offices and regional science organizations, the Navy furthermore intends to conduct additional visual survey monitoring in the 2013 or 2014 time frame. An appropriate level of Navy funding will be available to meet some of the stated need for additional baseline data on the species, distributions and numbers of marine mammals in the Gulf of Alaska as recommended in the October 2010 external expert advice described above. The Navy is working with regional NMFS and other state and federal agencies to see if there are opportunities to support more collaborative survey work than Navy could fund alone. The partnership may therefore dictate how much shipboard or aerial survey effort is done as well as define the location and timing. If Navy finds that no such partnership opportunities exist by 2013-2014, the Navy will devise a plan that uses the best platforms for the size of area needing survey and the appropriate granularity of data for the entire survey area or sub-areas within the larger area.

Table ES-1. Summary Of Proposed Monitoring Studies And Level Of Effort In Support Of The Gulf of Alaska TMAA Monitoring Plan.

Monitoring Technique									
	Calendar Year 2011 Implementation	ADAPTIVE MANAGEMENT REASSESSMENT	Calendar Year 2012 Implementation	ADAPTIVE MANAGEMENT REASSESSMENT	2013	ADAPTIVE MANAGEMENT REASSESSMENT	2014	ADAPTIVE MANAGEMENT REASSESSMENT	2015
Passive Acoustics Monitoring (PAM) Goal (a)	Deploy two long-term PAM devices for annual coverage including during any Navy training event: deploy minimum of two (2) passive acoustic monitoring devices; conduct data analysis as		Maintain two long-term PAM devices for annual coverage including during any Navy training event: continue data		conduct alternative visual survey technique (NO PAM) Or deploy two long-term PAM		conduct alternative visual survey technique (if not done in 2013) Or deploy two long-term PAM		TBD pending AMR review
	Navy commitment : - Deploy minimum of two (2) passive acoustic monitoring devices, associated data analysis, and reporting		**Navy commitment:** - Maintain minimum of two (2) passive acoustic monitoring devices and continue associated data analysis and reporting		**Navy commitment:** -conduct alternative visual survey technique. PAM would NOT be deployed within Gulf of Alaska or analyzed in the same year as any alternative survey [IF not logistically achievable this year (ship, equipment, or researcher availability, etc.), then re-deploy two PAM]		**Navy commitment:** -conduct alternative visual survey technique (if not logistically achievable in 2013) OR -Re-deploy two long-term PAM		**Navy commitment:** To be determined pending Adaptive Management Review, OR -Continued two long-term PAM and associated analysis
2010 NMFS goal revision 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 [Significant parts of the remaining 2010 goals are being addressed by the $7M Navy funded Behavioral Response Study (BRS) currently being conducted in Southern California, as well as other monitoring techniques at more heavily used Navy range complexes in Hawaii and Southern California]									

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ICMP	Integrated Comprehensive Monitoring Program
NMFS	National Marine Fisheries Service
PAM	passive acoustic monitoring
TMAA	Temporary Maritime Activities Area

INTRODUCTION

The U.S. Navy has developed this Gulf of Alaska Temporary Maritime Activities Area (TMAA) (**Figures 1 and 2**) Monitoring Plan to provide marine mammal and sea turtle monitoring as required under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973.

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

While the Endangered Species Act does not have specific monitoring requirements, recent Biological Opinions issued by NMFS recommend the Navy develop a monitoring program to enhance scientific knowledge on Endangered Species Act marine species.

Additional Navy-funded research and development studies and ancillary research collaborations with academic and other institutions are being pursued to address objectives of a larger Navy-wide initiative discussed in this Plan. Lastly, as an adaptive management strategy, the Gulf of Alaska TMAA Monitoring Plan will integrate results from Navy-wide marine mammal research into the regional monitoring and data analysis proposed in this Plan when new technologies and techniques become available. Preliminary recommendations for siting of passive acoustic monitoring (PAM) devices were developed in May 2010 after talks with marine mammal PAM academic experts at Scripps Institute of Oceanography (**Figure 3**), and subsequently validated in consultation with NMFS scientists at the National Marine Mammal Laboratory of the Alaska Fisheries Science Center.

In April of 2009, U.S. Pacific Fleet provided approximately $250,000, combined with additional funding from Chief of Naval Operations and NOAA in-kind funding (vessel time and personnel) for a NMFS-led marine mammal survey within the Gulf of Alaska. The objective of this project was to conduct a rigorous scientific abundance and density survey in a region such as Gulf of Alaska that NMFS recognizes as having been under surveyed in the past. The goal of this project was to further advance the state of knowledge on marine mammal occurrence within the offshore waters of the Gulf of Alaska. The formal NMFS report for this survey effort was released in May 2010 (*see* Rone et al. 2010).

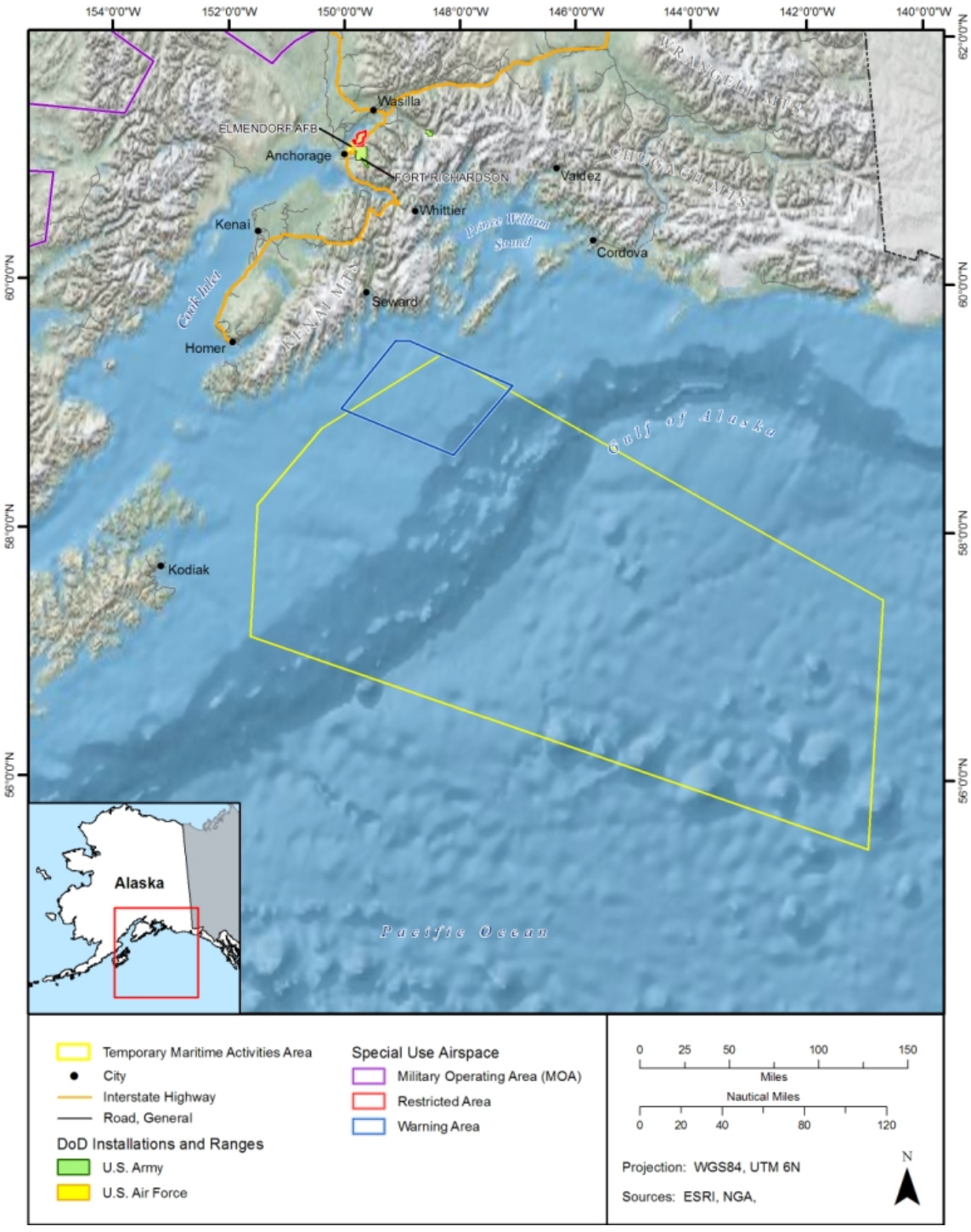

Figure 1. Gulf of Alaska Temporary Maritime Activities Area (From DoN 2009a).

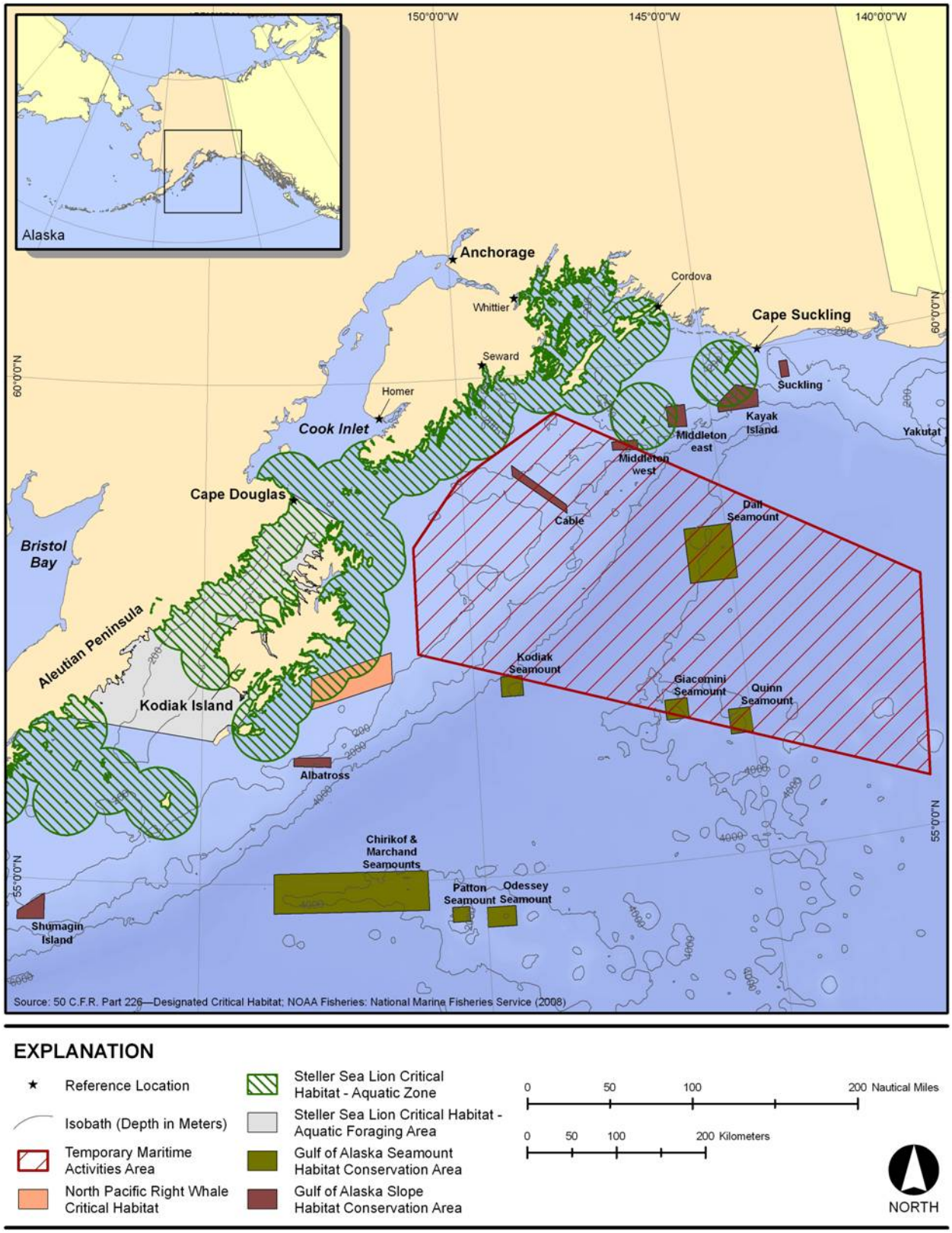

Figure 2. Critical Habitat and Habitat Conservation Areas in Vicinity of the Temporary Maritime Activities Area (from DoN 2009b).

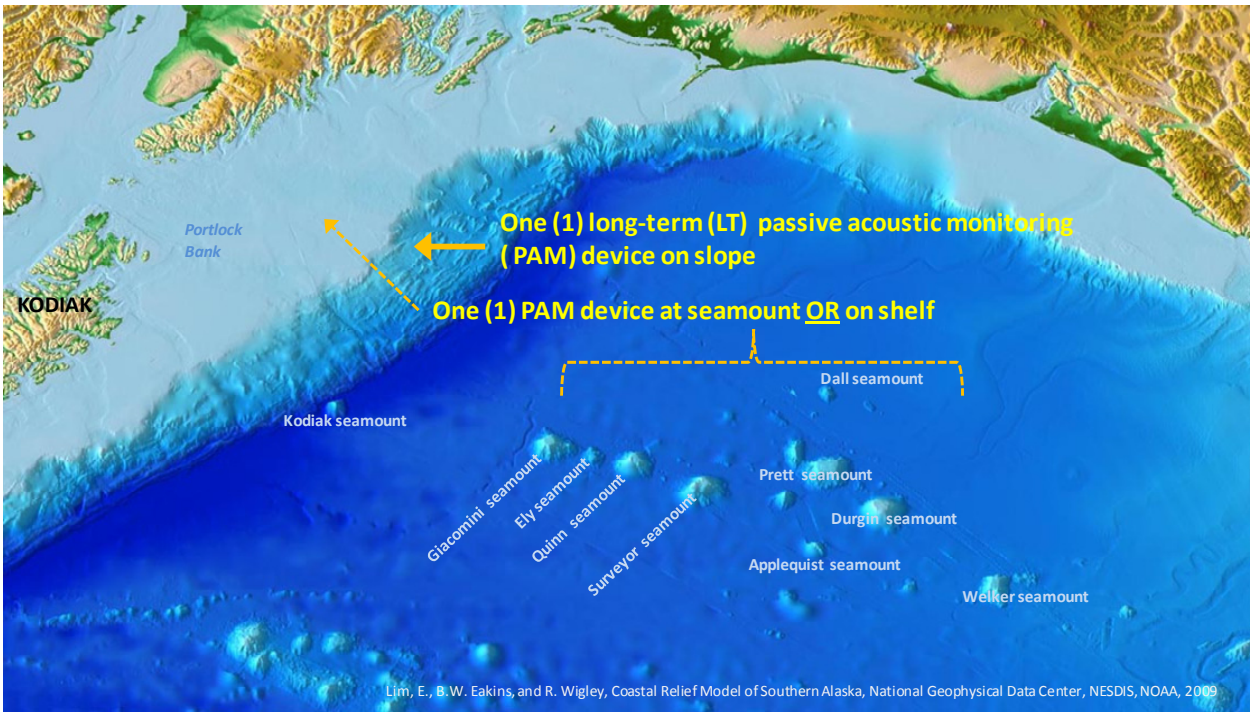

Figure 3. Potential underwater deployment sites for passive acoustic monitoring devices within the Gulf of Alaska Temporary Maritime Activities Area.

INTEGRATED COMPREHENSIVE MONITORING PROGRAM (ICMP)

The Integrated Comprehensive Monitoring Program (ICMP) is Navy-wide monitoring framework that will provide an overarching structure for coordination of effort and compilation of data across all Navy range-specific monitoring plans (**Figure 4**).

In addition to the Gulf of Alaska TMAA, a number of other Navy range complex monitoring plans are being developed for protected marine species, primarily marine mammals and sea turtles, as part of the environmental planning and regulatory compliance process associated with a variety of training actions in those regions. Goals of these monitoring plans are to assess the impacts of training activities on marine species and effectiveness of the Navy's current mitigation practices. Ranges within the Pacific Ocean with the largest amount of operations will be prioritized for monitoring, based on availability of both funding and scientific resources. These include the Hawaii Range Complex, Marianas Island Range Complex, Northwest Training Range Complex, and Southern California Range Complex.

The Gulf of Alaska TMAA Monitoring Plan is one component of the ICMP and the monitoring outlined here will also be implemented in various combinations within other range complexes. The overall objective of the ICMP is to assimilate relevant data acquired across Navy range complexes in order to answer questions pertaining to the impact of mid-frequency active sonar and underwater explosive detonation on marine mammals and sea turtles.

Monitoring measures prescribed in range/project-specific monitoring plans and Navy-funded research relating to the effects of anthropogenic sound on protected marine species should be designed to accomplish one or more of the following top-level goals as provided by an external expert review in October 2010, and revised by NMFS in November 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).

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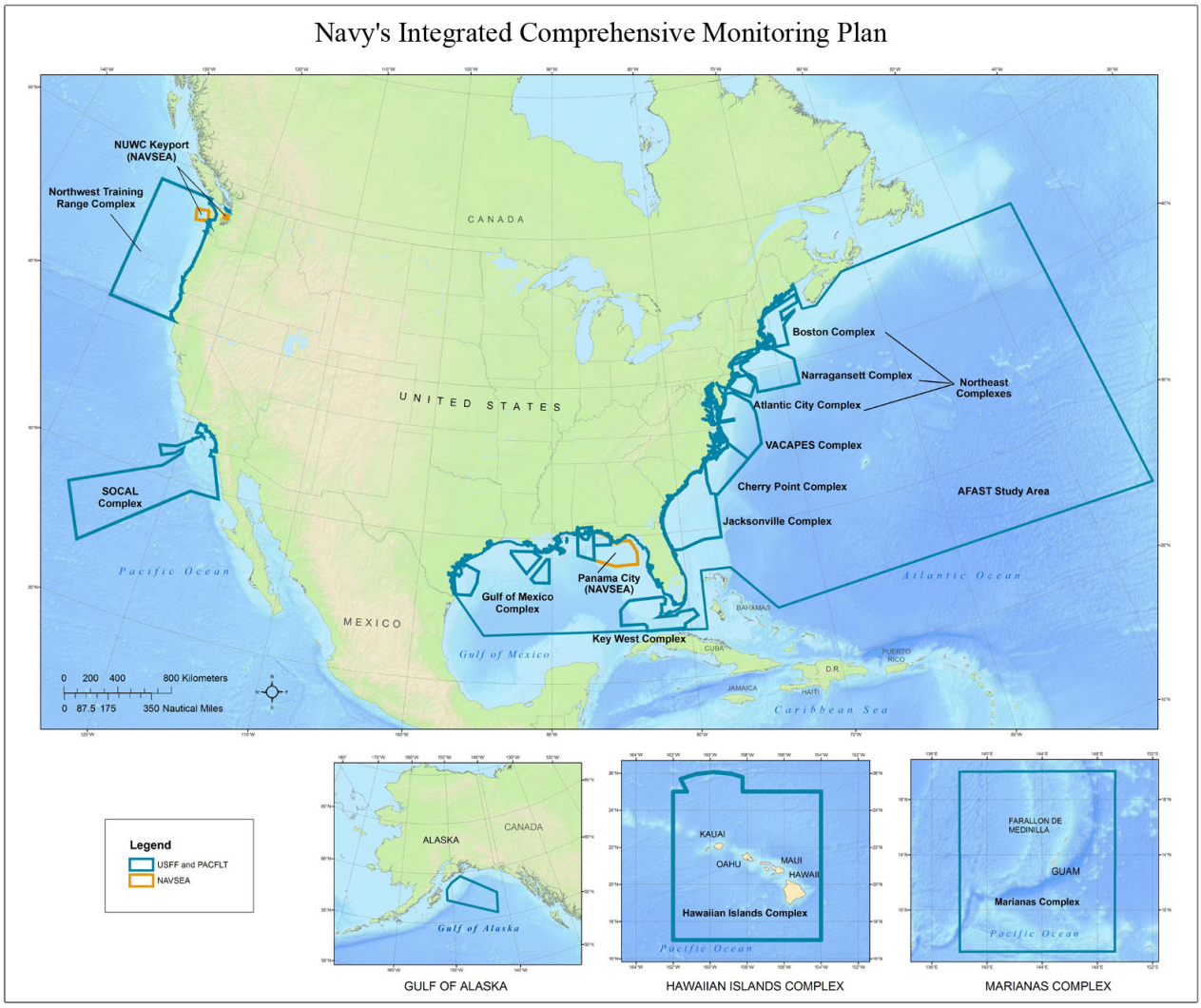

Figure 4. Integrated Comprehensive Monitoring Plan – Navy-wide Map of Ranges where data collection is expected to occur.

GOA TMAA MONITORING PLAN OBJECTIVES AND SPECIES

Monitoring Plan Objectives

The Gulf of Alaska TMAA Monitoring Plan proposes monitoring objectives that are unique with regard to their breadth as well as their focus on potential impacts of mid-frequency and high-frequency active sonar and underwater explosions on marine mammals and sea turtles.

Given the larger scope of training events within other Navy range complexes as compared to the Gulf of Alaska TMAA, and the logistics of weather and shore side support availability not every one of these 2010 NMFS monitoring goals questions will be addressed within the GOA TMAA (*see the ICMP section* and the Navy's commitment in **Table ES-1**). Rather, data collected from the TMAA monitoring will be used to supplement a consolidate range complex marine mammal monitoring report incorporating data from other Pacific Ocean range complexes (*see ICMP section*).

To this end, the Navy's monitoring techniques described in this Plan will be focused on supplementing the existing data on the distribution and occurrence of marine mammals in the offshore waters of the Gulf of Alaska.

Marine Species Under Consideration

There are 26 marine mammal species or separate stocks with possible or confirmed occurrence in the marine waters within the Gulf of Alaska, but not all species are expected within the TMAA. **Appendix A Table A-1** lists marine mammal species possibly occurring within the Gulf of Alaska TMAA (derived from DoN 2009a).

The beluga whale, false killer whale, harbor seal, northern right whale dolphin, Risso's dolphin, sea otter, and short-finned pilot whale are considered extralimital in the TMAA and not expected to be present given their documented habitat preferences.

There are several additional sources of information on Pacific marine mammals, including the NMFS Stock Assessment Reports for marine mammals. The NMFS U.S. Alaska Stock Assessment Reports are prepared annually and available at:

http://www.nmfs.noaa.gov/pr/sars/

The Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement\Draft Overseas Environmental Impact Statement contains a summary of the scientific literature on animal distribution and likely occurrence within the TMAA. In addition, DoN 2009a also summarized some of the general science on past studies of anthropogenic (i.e., human generated) noise on marine mammals. Other related references also include Cox et al. 2006, Deeck 2006, Nowacek et al. 2007, and Southall et al. 2008).

This Gulf of Alaska TMAA Monitoring Plan has been designed to gather data on all species of marine mammals and sea turtles observed in the study area. However, the Navy will prioritize monitoring efforts for Endangered Species Act listed species and beaked whale species.

Therefore, based on the requirements listed above, offshore species for study within the Gulf of Alaska TMAA Monitoring Plan that regularly occur within will be prioritized for research as follows:

- **Beaked whale species**

  (Baird's beaked whale, Cuvier's beaked whale, Stejneger's beaked whale)

- **ESA-listed cetacean species**

  (blue whale, fin whale, humpback whale, North Pacific right whale, sei whale, and sperm whale)

OVERVIEW OF Monitoring Plan Research Elements (2011-2012)

Each monitoring technique has advantages and disadvantages that vary temporally and spatially, as well as supporting one particular study objective better than another. Given potential sea states and ocean conditions during both winter and summer, and the relatively infrequent Navy presence in the Gulf of Alaska, passive acoustic monitoring represents the best long-term technique to employ.

Passive Acoustic Monitoring (PAM)- There are both benefits and limitations to passive acoustic monitoring as discussed in Mellinger and Barlow (2003) and Mellinger et al. (2007). Passive acoustic monitoring allows detection of marine mammals that may not be seen during a visual survey, and contributes to monitoring of vocalization/echolocation rates before, during, and after Navy training events. When interpreting data collected from passive acoustic monitoring, it should be noted that results must be viewed with caution because not all animals within a given population may be vocalizing, or may only vocalize only under certain conditions (Mellinger et al. 2007, Oleson et al. 2007a, 2007b, ONR 2007, NMFS 2008, Oleson et al. 2008, Mouy et al. 2009, Oleson et al. 2009, Southall and Nowacek 2009, Van Parijs et al. 2009). Deployable acoustic recording packages may offer the first immediately available tools (see Newcomb et al. 2002, Hildebrand 2005, Hildebrand 2007, Wiggins and Hildebrand 2007, Lammers et al. 2008, Oleson et al. 2008, Mouy et al. 2009, Whitehead 2009, Hirotsu et al. 2010). Other acoustic monitoring buoy types will also be considered for deployment as well (e.g., Lammers et al. 2005). At this stage of PAM technical development, no particular PAM technique is indicated. As the Plan progresses within the first year and experience gained within the Gulf of Alaska TMAA, either through direct measurement of results, review of technical PAM specifications, and from guidance of subject matter experts within the field, future Gulf of Alaska TMAA monitoring may include a different sub-set of PAM devices.

PAM in the Gulf of Alaska TMAA will be used to detect, locate, and potentially track vocalizing marine mammals, as well as provide seasonal estimates of presence/absence. PAM devices will be set on a duty cycle that maximizes battery power, data storage space and provides adequate sampling. PAM devices will be retrieved as required for maintenance and downloading of data. Autonomous acoustic recording buoys will provide long term, daily information on the presence and absence of marine mammals in each area and their movements through the area. These systems will also provide information on the species present and their movements when an exercise occurs in that area (Mellinger and Barlow 2003, Oswald et al. 2003, Melliger et al. 2007). In addition, by collecting marine mammal vocalization and echolocation data before, during, and after any Navy training event, information can be inferred as to whether the training event has an effect or no effect on observed vocalizations.

All acoustic data will be collected according to standard and accepted passive acoustic monitoring protocols (NMFS 2008 Passive Acoustic guidelines). **Figure 5** shows a representative example of annual vocalization plots obtained from Navy funded PAM in Southern California.

OTHER POTENTIAL MONITORING (2013 or 2014)

The previously discussed list of elements is based on initial identification of the research questions promulgated by NMFS and subsequent dialog on best immediate techniques to attempt at the outset of this Plan (>Spring 2011) based on past non-integrated monitoring and regional availability. Acknowledging future adaptive management considerations under the Navy's ICMP, as well as future consultations and collaboration with various NMFS offices and regional science organizations, the Navy furthermore intends to conduct additional visual survey monitoring in the 2013 or 2014 time frame. An appropriate level of Navy funding will be available to meet some of the stated need for additional baseline data on the species, distributions and numbers of marine mammals in the Gulf of Alaska as recommended in the October 2010 external expert advice described above. The Navy is working with regional NMFS and other state and federal agencies to see if there are opportunities to support more collaborative survey work than Navy could fund alone. The partnership may therefore dictate how much shipboard or aerial survey effort is done as well as define the location and timing. If Navy finds that no such partnership opportunities exist by 2013-2014, the Navy will devise a plan that uses the best platforms for the size of area needing survey and the appropriate granularity of data for the entire survey area or sub-areas within the larger area.

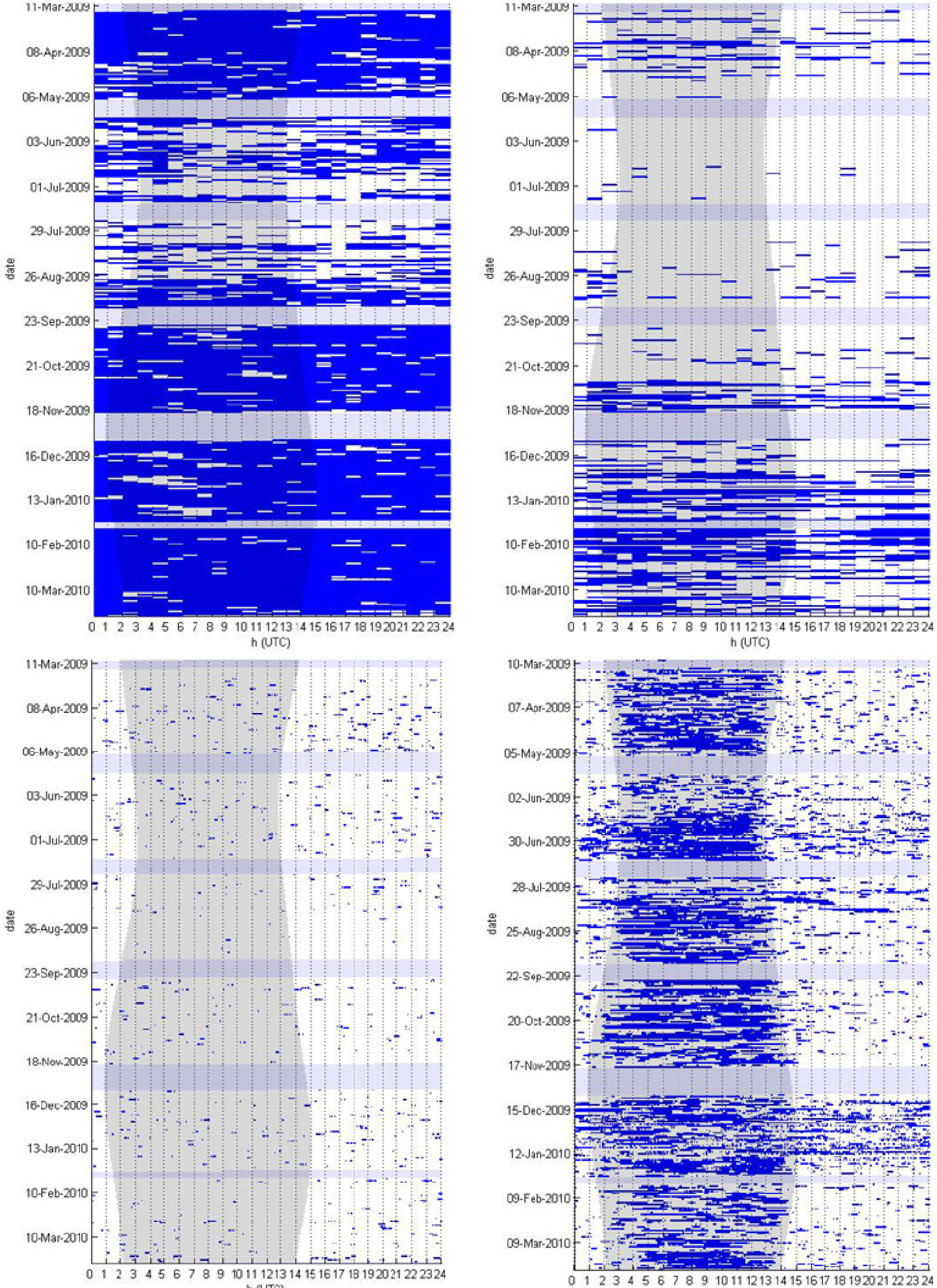

Figure 5. Example long-term plots showing marine mammal vocalizations and echolocation detections over time from Navy funded passive acoustic monitoring device.

[from 12-month deployment (March 2009 to March 2010) of PAM device in Southern California showing annual marine mammal vocalizations: **fin whale** (all call types) (*top left*), **humpback whale** (all call types) (*top right*), **beaked whale** echolocation clicks- Frequency-Modulated Clicks (20 kHz < Peak Frequency < 55 kHz) (*bottom left*), **odontocete** echolocation clicks (*bottom right*) ; vertical grey area represents local night time]

IMPLEMENTATION – ANALYSIS – REPORTING

Data will be collected by qualified, professional marine mammal biologists that are experts in their field. Researchers will provide annual reports to the Navy, however, this is expected to be an ongoing process with data collected, analyzed and interpreted over many years. It is not likely that firm conclusions can be drawn on most questions within a single year of monitoring effort due to the difficulty in achieving sufficient sample sizes for statistical analysis. The Navy will provide annual reports to NMFS in fulfillment of the Navy's reporting requirements under Marine Mammal Protection Action Letter of Authorization for the Gulf of Alaska TMAA. The reports will provide information on the amount and spatial/temporal distribution of monitoring effort as well as summaries of data collected and any preliminary results that may be available from analysis. **Table ES-1** provides detail about how the Gulf of Alaska TMAA Monitoring Plan will be implemented starting at the earliest field effort window in 2011. The Navy will be investing significant funding and personnel in this monitoring program and intends to conduct the research in a scientifically sound and robust manner. The Navy is committed to conducting research until the original program objectives have been answered to the satisfaction of both NMFS and Navy. Therefore, it is in the best interest of the Navy to choose studies in each range complex that are the most likely to collect large data sets, and will enable the Navy and NMFS to answer required questions. Some field methods may be applied throughout Navy ranges, while other methodologies may be specially selected for one or two ranges that are most likely to produce the best quality data.

Using previous large scale monitoring programs as a guideline for success, one thing becomes clear - the key to the success of any monitoring plan's execution and analysis is using scientific professionals that are the top of their field (Aburto et al. 1997, Au et al. 1997, Frankel and Clark 1998 and 2000, NRC 2000, 2003, 2005, Croll et al. 2001, ONR 2001, Costa et al. 2003, Mobley et al. 2001, Mobley 2005, Clark and Altman 2006). It's the Navy's intention that the Gulf of Alaska TMAA Monitoring Plan be implemented by a team of qualified, professional marine mammal biologists that are experts in their field. This team of experts will include statistical analysts to analyze data and make recommendations as to when they are beginning to see a pattern in the data and/or when the study designs need to be slightly altered for more robust data collection. This adaptive management process will provide a critical feedback loop to allow for adapting to new methods and evolving methodology. The process will be transparent to the public in the sense of yearly reporting to NMFS as well as encouraging the scientific team to publish results in the open, peer reviewed scientific literature. New technology and techniques will be incorporated as part of the Navy's adaptive management strategy. Adaptive measures and feedback from the experts will allow flexibility within a given year and/or within years so as to best achieve monitoring plan goals and take into consideration shifting demands, inclement weather and other unforeseen events. In addition to the studies conducted under the Gulf of Alaska TMAA Monitoring Plan, the Navy intends to collaborate with other researchers in Alaska that are conducting complimentary research on this topic. Those studies will not replace the Navy's obligation under this Plan, but could potentially augment the resources provided to the Plan's specific questions.

The Navy is currently working on the overarching structure and coordination (ICMP) that will, over time, compile data from both range-specific monitoring plans (e.g., Gulf of Alaska TMAA Monitoring Plan) as well as Navy funded research and development studies. Data collection methods will be standardized to allow for comparison from ranges in different geographic locations. A data management system will be developed to assure standardized, quality data are collected towards meeting of the goals. These reports will allow the Navy and NMFS to assess and adaptively manage the Navy's monitoring effort to more effectively answer the questions outlined above. Data collection is anticipated to begin by the spring of 2011, when the Gulf of Alaska TMAA authorization is issued by NMFS (See **Table ES-1** for year by year implementation schedule). Data collected from the Gulf of Alaska TMAA Monitoring Plan will be added to a Navy wide analysis of monitoring from other permitted Navy range complexes via the ICMP. All available data will be included in Navy's annual report for the Gulf of Alaska TMAA. The Navy's reports will provide information on the amount and spatial/temporal distribution of monitoring effort as well as summaries of data collected and any preliminary results that may be available from analysis. This also includes an evaluation of the effectiveness of any given PAM tool within the monitoring program. All subsequent analysis shall be completed in time for the Navy's five year consolidated report to NMFS.

ADAPTIVE MANAGEMENT

Background

NMFS, in consultation with the Navy, points out that information gained from the investigations associated with this Plan may be used in the adaptive management of mitigation or monitoring measures in subsequent NMFS authorizations, if appropriate.

Adaptive management is an iterative process of optimal decision making in the face of uncertainty, with an aim to reducing uncertainty over time via systematic 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 between managers, scientists, and other stakeholders who learn together how to create and maintain sustainable ecosystems (Williams el at. 2007). 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 (Williams et al. 2007). Further discussion of adaptive management in the natural resource community is available from the U.S. Department of Interior's Adaptive Management Guidelines:

http://www.doi.gov/initiatives/AdaptiveManagement/index.html

The Navy's adative management of the Gulf of Alaska TMAA Monitoring Plan involves close coordination with NMFS to align marine mammal monitoring with the Plan's overall objectives as stated within earlier sections of this Plan.

Implementation

Periodic exercise and annual reporting requirements are contained in the NMFS authorization associated with the Gulf of Alaska TMAA Letter of Authorization. Following the Navy's Annual Report to NMFS, the Navy will seek specific written dialog with NMFS about NMFS's assessment of the Plan's prior year results. The goal of this consultation and collaboration would be to determine if these research elements and associated results continue to meet the overall objectives of the Plan specific to the GOA TMAA. For instance, if a particular research element does not provide direct or indirect support to one of the objectives listed above, then resources for future instances of that element could be re-directed to other research elements that do provide more support.

The actual Adaptive Management Reassessment will be a multipart review. Initial accomplishments will be tabulated by Navy subject matter experts familiar with marine mammal monitoring. If available, collaboration with NMFS scientists, academic scientists, and other non-Navy subject matter experts will be obtained. As of this time, there is no formal mechanism by which to compensate a non-Navy "expert team", but this is a goal for the ICMP. The Navy will then consult with the NMFS possible options for the next year's sampling effort.

Proper application of the adaptive management concept will allow future adjustments to be made to the Gulf of Alaska TMAA Monitoring Plan that will enhance overall scientific conclusions, lead to better statistical approaches, integrate new technologices in marine mammal monitoring and detection, and provide a stronger foundation upon which to base mitigation and policy decisions. In addition, as part of the annual review, a more complete cost-benefit analysis can be presented based on actual monitoring cost by research element specific to the Gulf of Alaska.

APPENDIX A- COMMON MARINE MAMMAL SPECIES IN THE GULF OF ALASKA TMAA

Table A-1. Common Marine Mammal Species Likely To Occur In The Gulf of Alaska TMAA.

Common Name	Stock	Population Trend	Occurrence	Designated Critical Habitat in GOA TMAA
ESA Listed				
Blue whale	Eastern North Pacific	May be increasing	Rare	None
Fin whale	California, Oregon, Washington	May be increasing	Common	None
Humpback whale	Central and Western North Pacific	May be increasing	Common	None
North Pacific right whale	Eastern North Pacific	Unknown; may be decreasing	Very rarely sighted	None
Sei whale	Eastern North Pacific	May be increasing	Very rare	None
Sperm whale	California, Oregon, Washington	Unknown	Unknown	None
Stellar sea lion	Eastern U.S.	Increasing	Common	Yes—outside MAA
Stellar sea lion	Western U.S.	Decreasing	Common	Yes—outside MAA
Non-ESA Listed				
Baird's beaked whale	Alaska	Unknown	Rare	None
California sea lion	U.S.	Increasing	Very rare	None
Cuvier's beaked whale	Alaska	Unknown	Common	None
Dall's porpoise	California, Oregon, Washington	Unknown	Abundant	None
Gray whale	Eastern North Pacific	Increasing	Common	None
Harbor porpoise	Gulf of Alaska	Stable	Rare	None
Killer whale	Multiple stocks: ENP Alaska Resident and Northern Resident, Gulf of Alaska, Aleutian Island and Bering Sea, AT1, West Coast and Offshore	Increasing	Common	None
Minke whale	Alaska	Unknown	Rare	None
Northern elephant seal	California Breeding	Increasing	Common	None
Northern fur seal	Eastern Pacific	Increasing	Common	None
Pacific white-sided dolphin	North Pacific	Unknown	Common	None
Stejneger's beaked whale	Alaska	Unknown	Common	None

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