USS Boxer ESG-5

USWEX 06-04

19 - 21 September 2006

After Action Report

FINAL

Analysis of the Effectiveness of the Mitigation and Monitoring Measures as Required Under the National Defense Exemption from the Requirements of the Marine Mammal Protection Act (MMPA) for Mid-Frequency Active Sonar Mitigation Measures

INTRODUCTION

This report is presented to fulfill the requirements conditional to the 30 June 2006 National Defense Exemption (NDE) from the Requirements of the MMPA for Certain DoD Mid-Frequency Active Sonar Activities. The Navy is submitting this report to NMFS' Office of Protected Resources, consistent with the RIMPAC IHA, based on the requirement set forth in the MMPA NDE.

The following information for the USS Boxer Expeditionary Strike Group (ESG) Undersea Warfare Exercise (USWEX) 06-04 conducted from 19-21 September 2006 in the Hawaiian Range Complex. The types of ASW training conducted during USWEX 06-04 involved the use of ships, submarines, aircraft, non-explosive exercise weapons, and other training related devices. ASW events occurred within portions of the Hawaiian Range Complex. The following information is provided:

(1) Estimate of number of marine mammals affected by ASW exercises and discussion of nature of effects, if observed, based on results of real-time exercises and sightings of marine mammals;

(2) Assessment of effectiveness of mitigation and monitoring measures with recommendations on how to improve them;

(3) Results of marine species monitoring (real-time monitoring from all platforms) before, during, and after exercise;

(4) As much information (unclassified) as Navy can provide including, but not limited to, where and when sonar was used in relation to any measured received levels (such as sonobuoys), source levels, numbers of sources, and frequencies so it can be coordinated with observed cetacean behaviors.

This report, which contains only unclassified material, provides the necessary information and analyses, and thus fulfills these requirements. The report is organized by section following the order of the NDE mitigations.

Section 1 provides an estimated number of marine mammals affected by the USWEX 06-04 ASW events based on analysis of actual events and sightings of marine mammals, noting the nature of any observed effects where possible.

Section 2 assesses the effectiveness of the NDE mitigation and monitoring measures required during exercises with regard to minimizing the use of Mid-Frequency Active Sonar (MFAS) in the vicinity of marine mammals. This section also includes an assessment of the practicality of implementation of the mitigation measures, the impact some of the measures had on safety, and the effectiveness of the required military readiness activities.

Section 3 provides data on the location and hours of active MFAS used during USWEX 06-04 placed in context with observations of cetacean behaviors resulting from the aerial reconnaissance and exercise participants.

SECTION 1: Marine Mammals Observed

Section 1 provides estimated numbers of marine mammals observed in Hawaiian waters during USWEX 06-04 ASW exercises and vessel transits. This information is based on analysis of actual events and sightings of marine mammals noting the nature of any observed effects.

Participating ASW equipped units include five MFAS surface combatants (CG, DDG, FFG). During the three-day USWEX, there were **no** marine mammal sightings reported by the ESG. There were no sighting reports from aircraft platforms.

SECTION 2: Mitigation and Monitoring

As required under the RIMPAC IHA and adapted to the NDE, the report must contain "An assessment of the effectiveness of the mitigation and monitoring measures with recommendations on how to improve them". This section of the report, therefore, provides an assessment of the effectiveness of the mitigation and monitoring measures, and recommendations on how to improve them with regard to practicality of implementation, their impact on exercise safety, and their impact on the effectiveness of the military readiness training activity.

It must also be recognized that ASW proceeds slowly and requires careful development of a tactical frame of reference over time as data is integrated from a number of sources and sensors. Once MFAS is turned off for a period of time, simply turning it back on minutes later does not usually allow a Commander to simply continue from the last frame of reference. Thus, 15 minutes of lost MFAS time does not equate to only 15 minutes of lost exercise time but should be considered in the fuller context of its overall impact on the tempo and tactical development of a Common Operational Picture shared among exercise participants as they trained with the goal of interoperability and improvement of ASW skills in general.

USWEX 06-04 Assessment

USWEX are typically dedicated to ASW and other undersea warfare mission areas so MFAS use is likely over the entire time frame of the two-to-three day exercise. Given the relatively smaller number of days for USWEX vice typically longer JTFEX (5-7 days) and COMPTUEXs (14-21 days) in SOCAL, it is not unexpected that sighting frequency would be lower.

Although there was high-level emphasis placed upon marine mammal protection as mandated by Navy regulation and policy, during USWEX 06-04 there were no marine mammal sightings at any time during the exercise or during limited MFAS operation.

Therefore, further analysis based on observed effects, as mandated by the reporting requirement, was not warranted.

NDE Assessment

NDE measures adhered to and impact to operations is discussed below.

A subset of the additional measures required by the NDE was not applicable within the context of USWEX 06-04 due to the absence of the conditions described. This subset of mitigation measures is as follows:

- Requirements regarding "*strong surface ducting conditions*"
- Requirements regarding "*low visibility conditions*"
- Restrictions from operating MFAS in choke-points, constricted channels or canyon-like areas
- Restrictions from operating MFAS within 25 km of the 200 m isobath

The following protective measures, as mandated by NDE, were already Navy Standard Operating Procedures (SOP) as detailed in Navy lookout training, Protective Measures Assessment Protocol (PMAP) software, and Marine Species Awareness DVD Training. These measures will continue to be used in future exercises:

1. Personnel trained on marine mammal awareness and mitigation measures (Lookout Training Handbook NAVEDTRA 12968-B and U.S. Navy Marine Species DVD Version 1.1 June 2006).
2. Personnel on lookout with binoculars at all times when the vessel is moving through the water
3. Lookouts report sighting of any marine species, disturbance to the water's surface, or object in the water to Officer of the Deck, who is the Commanding Officer's direct representative on watch
4. Safety zone is established around an active sonar source and sonar power is reduced when marine mammals enter this zone
5. Submarine sonar operators review detection indicators of close-aboard marine mammals prior to commencement of ASW operations involving MFAS
6. Aerial surveillance for marine species occurs whenever possible and detections are reported to ships in the vicinity
7. Helicopters using active (dipping) sonar search for marine mammals prior to active sonar and employ a safety zone
8. Sonar always operated at lowest practicable level to meet tactical training objectives

Based on the following observations, Navy SOPs already in place were extremely effective in detecting marine mammals. In addition, the steps taken by individual ship commanding officers to avoid impacts to marine mammals were effective by default, although not applicable in this USWEX due to lack of sighting during use of MFAS.

Summary

- There were no sightings of marine mammals during the 3-day exercise
- There were no indications of any effects to any marine species throughout the exercise
- Mitigation measures required by the Navy, which were in addition to Navy SOP protective measures, did not provide any demonstrated increased protection to marine mammals. Administration of the additional mitigation measures distracted exercise participants, watchstanders, and exercise commanders at the headquarters level from their primary responsibility of exercise training and safety. While these personnel seemed to adequately absorb this increased workload, there were no indications the hypersensitivity the additional mitigation measures required provided any additional protection to marine mammals

To organize the assessment of each particular mitigation measure, they are listed below in the order and organization as presented in the NDE.

NDE Mitigation and Monitoring Requirements

Measures 1-2

Mitigation measures 1 and 2 detail training requirements for units participating in MFAS ASW exercises. All of the requirements within these two measures are redundant with the Marine Species Awareness Training (MSAT) that Navy lookouts and bridge personnel routinely receive as Navy SOP. This MSAT was developed in coordination with marine biology experts within the Navy, reviewed by National Marine Fisheries Service (NMFS), and incorporates effective marine species detection cues and information necessary to protect marine species. This material is part of the Navy Lookout watchstander qualification system, will soon be available as online interactive training, and can also be provided in a video format for large audience presentations. NMFS reviewed the MSAT training for purposes of RIMPAC 06 and this training continued to be used by Navy to meet the full intent of these first two NDE mitigation measures.

Measure 1. Personnel Training:

- *Navy shipboard lookouts shall be qualified watchstanders who have completed marine species awareness training.*
  - *Navy watchstanders will participate in marine mammal observer training approved by NMFS.*

Measure 2. Operating Procedures

- *Bridge personnel on ships and submarines - Ships and surfaced submarines shall have personnel on lookout with binoculars at all times when the vessel is moving through the water. Standard operating procedure requires these lookouts maintain surveillance of the area visible around their vessel and to report the sighting of any marine species, disturbance to the water's surface, or object (unknown or otherwise) to the Officer in Command.*
  - *Bridge lookout personnel shall have completed marine species awareness training as updated in 2005.*
  - *At least one individual who has received this training will be present, and on watch, at all times during operation of tactical mid-frequency sonar, on each vessel operating mid-frequency sonar.*

Navy Assessment:

Measures 1 and 2 are effectively the same, requiring marine species awareness training. Marine mammal lookout training for all units has been standard procedure for several years, and was updated with a new Marine Species Awareness Training (U.S. Navy Marine Species Awareness Training DVD, Version 1.1). Training has been established as and continues to be effective as a mitigation measure.

Operational Impact of this mitigation measure:

None.

Recommendation

None, these are effectively incorporated into Navy SOPs.

- *Aviation units - Aircraft participating in ASW events will conduct and maintain, whenever possible, surveillance for marine species prior to and during the event. The ability to effectively perform visual searches by participating aircraft crew will be heavily dependent upon the primary duties assigned as well as weather, visibility, and sea conditions. Sightings would be immediately reported to ships in the vicinity of the event as appropriate.*

Navy Assessment:
This measure documents what occurs in general, but has not been specifically described in a SOP.

Operational Impact of this mitigation measure:
None – this occurs routinely.

Recommendation
This mitigation measure should be retained and described in a SOP.

- *Sonar personnel on ships, submarines, and ASW aircraft -*
  - *Ship and submarine sonar operators will check for passive indications of close-aboard marine mammals prior to their commencement of ASW operations involving active mid-frequency sonar.*

Navy Assessment:
This measure documents what occurs for submarines as part of PMAP, and is used in general for surface ships, but has not been specifically described in a SOP.

Operational Impact of this mitigation measure:
None – this occurs routinely or is part of PMAP (for submarines).

Recommendation
This mitigation measure should be retained given that it details what occurs routinely, but has not been officially described in a SOP for surface ships or is part of PMAP for submarines. This measure should be added for surface units in the next version of PMAP.

- *Sonar levels (generally) - The Navy will operate sonar at the lowest practicable level, not to exceed 235 dB, except for occasional short periods of time to meet tactical training objectives. Use of MFA sonar at source levels above 235 dB will be logged and reported in accordance with section 3.*

Navy Assessment:
This measure had no observable benefit to conservation, due to operator shut down if mammals were observed, regardless of range, which will be discussed in further detail in following sections.

Operational Impact of this mitigation measure:
The impact of this measure is undeterminable at this time.

Recommendation
This measure may not be particularly applicable to conduct of training. Sonar usage is tailored to the environmental conditions of the day, which may preclude practicable levels below the maximum.

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i. *In major fleer exercises, operate mid-frequency active sonar within 12 nm of a coast, except for RIMPAC 2006 (which is covered above) and military readiness activities at the established ranges at San Clemente Island and PMRF.*

Navy Assessment:
This measure was adhered to for USWEX 06-04; there were no active sonar operations within 12 nm of a coast. This statement must be quantified in that due to the geographic distribution of suitable ocean area and underwater instrumented ranges in the Hawaiian Range Complex, MFAS operation is never planned for areas within 12 nm of the coast.

Operational Impact of this mitigation measure:
None.

Recommendation
Not applicable.

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ii. *Conduct sonar activities in constricted channels.*

Navy Assessment:
There are no naturally occurring bathymetrically constricted channels within the area used for USWEX 06-04.

Operational Impact of this mitigation measure:
None.

Recommendation
Not applicable.

- ***Safety zones*** *- When marine mammals are detected close aboard, all ships, submarines, and aircraft engaged in ASW would reduce mid-frequency active sonar power levels in accordance with the following specific actions:*
  - ***Helicopters*** *- Helicopters shall observe/survey the vicinity of an event location for 10 minutes before deploying active (dipping) sonar in the water. Helicopters shall not dip their sonar within 200 yards of a marine mammal and shall secure pinging if a marine mammal closes within 200 yards after pinging has begun.*

Navy Assessment:
This measure is fundamentally the same as the measure detailed in PMAP, with the addition of a specified 10 minute survey in advance of active sonar. PMAP prohibits active sonar use if there are animals within 200 yards of the dipping sonar transducer, and details the securing of sonar if an animal is detected within 200 yards or is closing on the source when active.
Operational Impact of this mitigation measure:
None.
Recommendation
The 10 minute survey prior to active sonar use is bounding the time in which survey would be done. As written in PMAP, the helicopter pilots must ensure there are no marine mammals in the 200 yard exclusion zone around the sonar transducer, regardless of time interval spent in searching. Since the searching of an area is dependent upon the environmental conditions of the day, bounding the survey timeframe may be unwarranted.

- ***Ships and submarines***

  i. ***#1,000 m -*** *When marine mammals are detected by any means (aircraft, lookout, or aurally) within 1000 m of the sonar dome (the bow), the ship or submarine will limit active transmission levels to at least 6 dB below the equipment's normal operating level for sector search modes. Ships and submarines would continue to limit maximum ping levels by this 6-dB factor until the animal has been seen to leave the area, has not been seen for 30 minutes, or the vessel has transited more than 2000 m beyond the location of the sighting.*

  ii. ***#500 m -*** *Should the marine mammal be detected within or closing to inside 500 m of the sonar dome, active sonar transmissions will be limited to at least 10 dB below the equipment's normal operating level for sector search modes. Ships and submarines would continue to limit maximum ping levels by this 10-dB factor until the animal has been seen to leave the area, has not been seen for 30 minutes, or the vessel has transited more than 1500 m beyond the location of the sighting.*

  iii. ***#200 m -*** *Should the marine mammal be detected within or closing to inside 200 m of the sonar dome, active sonar transmissions will cease. When a marine mammal or sea turtle is detected closing to inside approximately 200 m of the sonar dome, the principal risk becomes potential physical injury from collision. Accordingly, ships and submarines shall maneuver to avoid collision if the marine species closes within 200 m to the extent possible, with safety of the vessel being paramount. Sonar will not resume until the animal has been seen to leave the area, has not been seen for 30 minutes, or the vessel has transited more than 1200 m beyond the location of the sighting.*

Navy Assessment:
It is likely that this mitigation measure may be effective, but as drafted above it requires improvement. Similar protective measures were already Navy SOP for all units conducting MFAS training. The intent of this requirement was not tested during USWEX 06-04 since no marine mammal sightings occurred during MFAS operation.

Operational Impact of this mitigation measure:
Not determinable in the reactions of the participating units.

Recommendation
A "safety zone" mitigation measure was already SOP and this mitigation measure should be retained. A safety zone of 1000 m is thought to be based on the attenuation of sonar power level from a source of 235 dB to 173 dB under ideal conditions assuming direct path propagation with no reduction from other possible environmental factors. The criterion for the minimal threshold for marine species effect as required by NMFS for the IHA application in RIMPAC 06, and applied to USWEX 06-04, was a 173 dB accumulated energy level. This attempt to capture behavioral effects is a problematic metric and does not appear to provide a verifiable and scientifically defensible conservation benefit to a species.

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iv. ***Significant surface ducting conditions*** *- In significant surface ducting conditions, the Navy will enlarge the safety zones such that a 6-dB power-down will occur if a marine mammal enters the zone within a 2000 m radius around the source, a 10-dB power-down will occur if an animal enters the 1000 m zone, and shut down will occur when an animal closes within 500 m of the sound source.*

Navy Assessment:
There were no significant surface ducting conditions; however, as stated earlier, the intent of this requirement is not met in the reactions of the participating units.

Operational Impact of this mitigation measure:
Not determinable in the reactions of the participating units. Additionally, water conditions vary significantly over relatively short distances while operating in the littoral, which makes it unrealistic resulting in non-effectiveness trying to implement this measure.

Recommendation
This measure can not be effectively implemented, thus providing no additional protection and should be deleted.

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v. ***Low visibility conditions (i.e., whenever the entire safety zone cannot be effectively monitored due to nighttime, high sea state, or other factors)*** *- The Navy will use additional detection measures, such as infrared (IR) or enhanced passive acoustic detection. If detection of marine mammals is not possible out to the prescribed safety zone, the Navy will power down sonar as if marine mammals were present in the zones they cannot see (for example, at night, if night goggles allow detection out to 1000 m, power-down would not be necessary under normal conditions; however, in significant surface ducting conditions, the Navy would need to power down 6 dB, as they could not effectively detect mammals out to 2000 m, the prescribed safety zone).*

Navy Assessment:
This measure may not have been applicable; there were no days of poor visibility during the exercise, and no nighttime marine mammal sightings. Depending on vessel class and funding, some more advance IR, thermal, or other image enhancement technology may not be part of the ship's table of organic equipment (TOE) (i.e. equipment supplied a part of a unit's normal complement).

Operational Impact of this mitigation measure:
Not Applicable.

Recommendation
None, this measure was not effectively tested.

Measure 3. Stranding Response and Reporting

- *The Navy will coordinate with the NMFS Stranding Coordinator for any unusual marine mammal behavior, including stranding, beached live or dead cetacean(s), floating marine mammals, or out-of-habitat/milling live cetaceans that may occur at any time during or shortly after major exercises.*

Navy Assessment:
There were no observations of unusual marine mammal behavior during or subsequent to USWEX 06-04.

Operational Impact of this mitigation measure:
Not applicable.

Recommendation
None, this measure was not applicable for USWEX 06-04. There is existing Navy SOP outlined in OPNAVINST 5090.1B Change 4 and Chief of Naval Operations N45 Supplemental Environmental Planning Policy (23 September 2004).

- *The Navy will provide a report to NMFS after the completion of a major exercise that includes:*
  - *An assessment of the effectiveness of these mitigation and monitoring measures with recommendations of how to improve them.*

Navy Assessment:
The details of the effectiveness assessment are discussed within this report. In the circumstance that occurred during USWEX 06-04, no marine mammal sightings occurred concurrently with MFAS operation, so effectiveness of some mitigation measures could not be assessed.

Operational Impact of this mitigation measure:
Approximately 2 hours were expended between data collection and report writing. This does not include the time drafting the after action marine mammal sighting Naval messages generated by the command conducting the exercise.

Recommendation
Recommend this type of report be generated only if there is a demonstrated application of the mitigation measures that are significantly outside of standard procedures.

  - *Results of the marine species monitoring during the major exercise. As much unclassified information as the Navy can provide including, but not limited to, where and when sonar was used (including sources not considered in take estimates, such as submarine and aircraft sonars) in relation to any measured received levels, source levels, numbers of sources, and frequencies, so it can be coordinated with observed cetacean behaviors. If necessary, classified information may be provided to NMFS personnel with an appropriate security clearance and need to know.*

Navy Assessment:
There were no marine species sighted during USWEX 06-04 so this measure can not be discussed.

Operational Impact of this mitigation measure:
None

Recommendation
None

SECTION 3: Monitoring Results

The requirement from the NDE, "*Results of the marine species monitoring during the major exercise. As much unclassified information as the Navy can provide including, but not limited to, where and when sonar was used (including sources not considered in take estimates, such as submarine and aircraft sonars) in relation to any measured received levels, source levels, numbers of sources, and frequencies, so it can be coordinated with observed cetacean behaviors.*" is summarized in this section of the report.

This is a skewed sample since there were no attempts made to detect marine mammals by other means in areas not being used by exercise participants.

Typically, there are no measurements (calibrated or otherwise) of actual sound levels made during an exercise and none were made during USWEX 06-04. Source levels, numbers of sources, and frequencies are classified since that information would provide potential adversaries with important tactical data. Given that location planning and mitigation measures are designed to minimize interactions between Navy assets and marine mammals, the observations of marine mammals by Navy assets only occurred as infrequent and very brief encounters, the majority of which occurred when there was no MFAS in use.

Observations of marine species and their behaviors, as previously detailed, showed no unusual behaviors for coordination with MFAS use. There were no indications from the observations that the presence of exercise participants had any affect on any marine mammals.

The requirement to report where and when sonar was used so it can be coordinated with observed cetacean behaviors would provide no additional information since no animals were observed.

CONCLUSIONS

In summary, there were no sightings of marine mammals from surface vessels during USWEX 06-04. While standard NDE and Navy SOP measures were applied, no assessment of mitigation measures can be reported.