Prepared for
National Marine Fisheries Service
Office of Protected Resources

Prepared by
Department of the Navy

In accordance with
National Defense Exemption 30 June 2006

USS Boxer ESG-5

COMPOSITE TRAINING UNIT EXERCISE (C2X 06-03)

July 2006

and

JOINT TASK FORCE EXERCISE 06-04 (JTFEX 06-04)

10-17 Aug 2006

After Action Report

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 for Certain DoD Mid-Frequency Active Sonar Activities

INTRODUCTION

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

The following information is for the USS Boxer Expeditionary Strike Group (ESG) Composite Training Unit Exercise (C2X) 06-03 conducted in July 2006 and Joint Task Force Exercise (JTFEX) 06-04 conducted from 10-17 August 2006 in Southern California (SOCAL). The types of ASW training conducted during C2X 06-03 and JTFEX 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 Southern California Offshore Range (SCORE) and the Southern California Offshore ASW Range west of San Clemente Island. 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 as follows:

Section 1 provides an estimated number of marine mammals observed during the C2X 06-03 and JTFEX 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 impact of the measures on the military readiness activities.

Section 3 provides data on the location and hours of active MFAS used during JTFEX 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 Southern California waters during JTFEX 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. Note: No marine mammal sighting data were reported from C2X 06-03 due in part to the recent NDE promulgation and insufficient time in which to distribute reporting requirements. While marine mammals were present during C2X 06-03, there were no instances of required sonar shut downs due to close proximity of marine mammals to sonar sources.

All detections were made by standard Navy surface ship lookout marine mammal detection and reporting procedures. There were no sighting reports from aircraft platforms. Participating U.S. Navy Mid-Frequency Active Sonar (MFAS) equipped units included three P-3C maritime patrol aircraft and four SH-60B helicopters equipped with sonobuoys, two submarines, and surface vessels (two cruisers, two destroyers, and one frigate.

Table 1 provides a detailed timeline of marine mammal observations made by Navy exercise participants.

During JTFEX 06-04, there were 11 marine mammal sightings for a total of 230 animals Table 1 and **Figure 1**). Two of the 11 sightings included a total of 220 “dolphins” which comprised over 96% of total animal seen during JTFEX 96-04. This observation is consistent with science-based reports that dolphins, and in particular, the short-beaked common dolphin (*Delphinus delphis*), comprise as much as 85-95% of the marine mammal abundance within Southern California.

Table 1. Marine mammal sightings and actions by exercise participants JTFEX 06-04.

Date-Time	Description of Actions Taken	#
08/11- 1000	Surface ship sights 1 "unidentified large whale" transiting at 800 yards. MFAS NOT in use. No action taken.	1
08/11- 1100	Surface ship sights 1 "unidentified large whale" transiting at 1000 yards. MFAS NOT in use. No action taken.	1
08/11- 1600	Surface ship sights "pod of approximately 100 dolphins" traveling in group at 1000 yards. MFAS NOT in use. No action taken.	100
08/12- 1130	Surface ship sights 1 "unidentified large whale" transiting at 1200 yards. MFAS NOT in use. No action taken.	1
08/13- 0930	Surface ship sights 1 "unidentified large whale" transiting at 3500 yards. MFAS NOT in use. No action taken.	1
08/14- 1030	Surface ship sights 1 "unidentified large whale" transiting at 800 yards. Ship has no MFAS. No action taken.	1
08/14- 1400	Surface ship sights "pod of approximately 120 dolphins" traveling in group at 1000 yards. MFAS NOT in use. No action taken.	120
08/14- 1700	Surface ship sights 2 "unidentified large whales" transiting at 1600 yards. MFAS NOT in use. No action taken.	2
08/14- 1400	Surface ship sights dead seal carcass at 150 yards. Carcass was decomposed and moving with current. Seal had clearly died some time previously. MFAS NOT in use. No action taken.	1

08/15- 1100	Surface ship sights 1 "unidentified large whale" at 300 yards. MFAS NOT in use. Vessel stopped for two minutes to allow whale to cross bow at safe distance.	1
08/17- 0800	Surface ship sights 1 "unidentified large whale" at 1200 yards. Ship has no MFAS.	1
11	= total number of sightings Total number of animals=	**230**

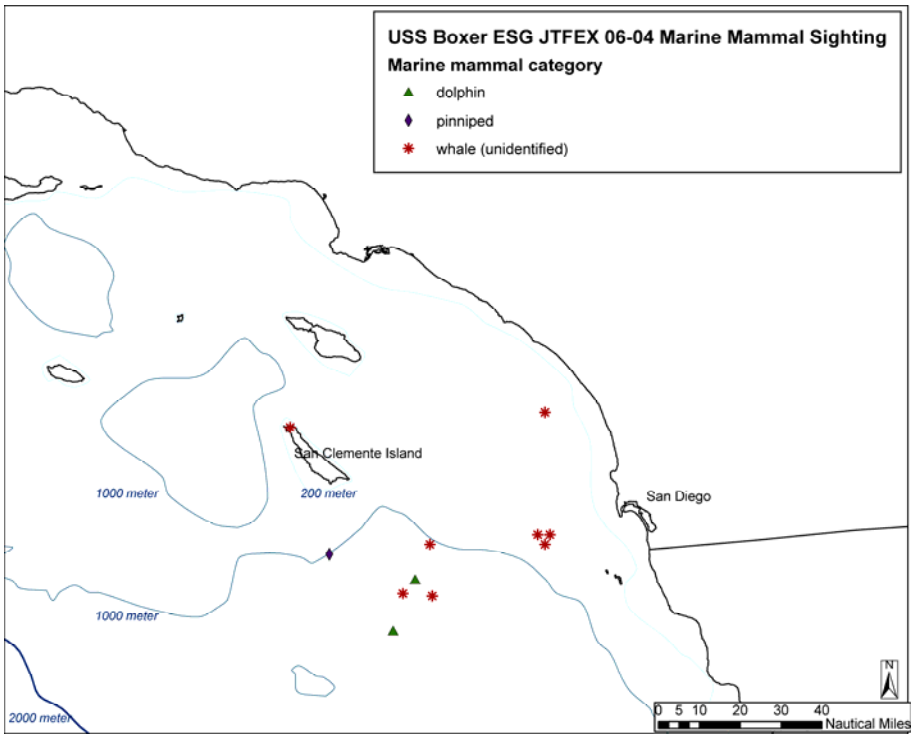


Figure 1. Marine mammal sightings during JTFEX 06-04 (10-17 Aug 2006). No sightings were made concurrent with MFAS use.

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.

C2X 06-03 Assessment and JTFEX 06-04 Assessment

MFAS sonar is only used during carefully reviewed scenarios and for only a small sub-set of any given exercise time frame. Therefore, as expected in JTFEX, a majority of these mammals were sighted during periods when MFAS was not in use.

There was high-level emphasis placed upon marine mammal protection as mandated by Navy regulation and policy, and, during C2X 06-03 and JTFEX 06-04, there were no marine mammal sightings during limited MFAS operation.

The reports from exercise participants contained nothing that could be construed as abnormal or "observed effects" of MFAS, or other vessel operations. There were no instances where marine mammals behaved in an erratic, unusual, or anything other than normal manner. 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 are discussed below.

A subset of the additional measures required by the NDE was not applicable within the context of C2X 06-03 and JTFEX 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*"
- Requirements specific to operating MFAS in choke-points
- Restrictions from operating MFAS in constricted channels

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), 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 effective in detecting marine mammals. In addition, the steps taken by individual ship commanding officers to avoid impacts to marine mammals were effective, although not applicable in the JTFEX due to lack of sighting during use of MFAS.

Summary

- Marine mammals were sighted 11 times by exercise participants during JTFEX 06-04. In each of these cases, the marine mammals were detected by Navy watchstanders operating in accordance with Navy standard operational procedures and as reiterated by some NDE mitigation measures
- Of the 11 instances where marine mammals were detected during JTFEX 06-04, and during C2X 06-03, MFAS was not operating and there were no mandated sonar shut downs
- There were no indications of any effects to any marine species throughout the exercise

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

ASSESSMENT OF MITIGATION AND MONITORING MEASURES

The three categories of mitigation and monitoring measures required by the June 30, 2006 NDE are assessed in this section. For ease of reference, the text of the measures is provided in italics, followed by an assessment, an analysis of operational impact and a recommendation on any improvements to each measure.

Measures 1-2

Mitigation measures 1 and 2 detail training requirements and operating procedures for units participating in MFAS ASW exercises. All of the training requirements within these two measures reflect 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 a National Marine Fisheries Service (NMFS) regional office, 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 require 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 DVD (U.S. Navy Marine Species Awareness Training DVD, Version 1.1). Training has been established and continues to be effective as a mitigation measure.

Operational Impact of these mitigation measures:

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. The measure has not been officially described in a SOP for surface ships. The measure 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, as shut down and power down procedures are followed if mammals are observed within designated safety zones.

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.

---

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 JTFEX 06-04; for this major exercise there were no active sonar operations within 12 nm of a coast except those on the established instrumented ranges near San Clemente Island.

Operational Impact of this mitigation measure:
None.

Recommendation
Not applicable.

---

ii. *Conduct sonar activities in constricted channels.*

Navy Assessment:
There are no naturally occurring bathymetrically constricted channels within the SOCAL area used for JTFEX 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 JTFEX 06-04 since no marine mammal sightings occurred during MFAS operation.

Operational Impact of this mitigation measure:

None during these particular exercises.

Recommendation

A “safety zone” mitigation measure was already SOP and this mitigation measure should be retained. A safety zone of 1000 m is based on the attenuation of sonar power level from a source of 235 dB to a received level of 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 behavioral effect as required by

NMFS for the IHA application in RIMPAC 06, and applied to JTFEX 06-04 and COMPTUEX 06-03 was a 173 dB accumulated energy level.

---

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.

Operational Impact of this mitigation measure:
Not determinable for these exercises. Additionally, water conditions vary significantly over relatively short distances while operating in the littoral, which makes implementation of this measures unrealistic, and therefore the measure is considered ineffective.

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

---

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 exercises, and no nighttime marine mammal sightings (Table 1). 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 occurrences of unusual marine mammal behavior during or subsequent to JTFEX 06-04.

Operational Impact of this mitigation measure:
Not applicable.

Recommendation
None, this measure was not applicable for JTFEX 06-04 or COMPTUEX 06-03. There are existing Navy SOPs 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 JTFEX 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:
Manpower time for data collection, analysis, report writing and drafting the after action marine mammal sighting Naval messages is required.

Recommendation
None at this time.

  - *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:
The details of the marine species monitoring are contained within Table 1 and Section 3 of this report.

Operational Impact of this mitigation measure:
None.

Recommendation
None at this time.

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.

Note that the marine mammal observations reported in Section 1 represent 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 JTFEX 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 animals observed were behaving within the confines of apparent normal behavior. Information presented previously in Table 1 provides a list of instances when marine mammals were observed.

CONCLUSIONS

In summary, there were 11 sightings of 230 marine mammals from surface vessels during JTFEX 06-04 (Table 1, Figure 1), while no sightings were reported for C2X 06-03. All behaviors described in the after action report were within the range of apparently normal behaviors. The results of these monitoring efforts provided no evidence indicating there were any effects on the detected marine mammals as a result of the ASW exercises taking place.

Prepared for
National Marine Fisheries Service
Office of Protected Resources

Prepared by
Department of the Navy

In accordance with
National Defense Exemption 30 June 2006

USS Nimitz CSG

COMPOSITE TRAINING UNIT EXERCISE 07-01

(C2X 07-01)

19 Nov- 19 Dec 2006

After Action Report

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 for Certain DoD Mid-Frequency Active Sonar Activities

INTRODUCTION

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

The following information is for the USS Nimitz Carrier Strike Group (CSG) Composite Training Unit Exercise (C2X) 07-01 conducted from 19 Nov - 19 Dec 2006 in Southern California (SOCAL). The types of ASW training conducted during C2X 07-01 involved the use of ships, submarines, aircraft, non-explosive exercise weapons, and other training related devices. ASW events occurred within portions of the Southern California Offshore Range (SCORE) and the Southern California Offshore ASW Range west of San Clemente Island. 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 as follows:

Section 1 provides an estimated number of marine mammals observed during the C2X 07-01 ASW events based on analysis of 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 impact of the measures on the military readiness activities.

Section 3 provides data on the hours of active MFAS used during C2X 06-2 placed in context with observations of cetacean behaviors resulting from the ship based reports and exercise participants.

SECTION 1: Marine Mammals Observed

Section 1 provides estimated numbers of marine mammals observed in Southern California waters during C2X 07-01 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.

All detections were made by standard Navy surface ship lookout marine mammal detection and reporting procedures. There were no sighting reports from aircraft platforms.

Table 1 provides a detailed timeline of marine mammal observations made by Navy exercise participants.

During C2X 07-01, there were **48** marine mammal sightings for a total of **376** animals Table 1 and **Figure 1**).

Twenty-one of the 48 sightings included a total of 304 “dolphins” which comprised 44% of the sightings and 81% of total animals seen during C2X 07-01. This observation is consistent with science-based reports that dolphins comprise as much as 85-95% of the marine mammal abundance within Southern California.

Unspecified whale sightings comprised 44% of the total sightings (n=21 sighting totaling 26 animals). There were no small whale sightings, or at least no designation of distinction reported between small and large whales with the exception of one humpback whale sighting (n=1 animal). Pinnipeds (seals or sea lions) sighting comprised 4% of the total sightings (n=2 sighting totaling 45 animals).

Table 1. Marine mammal sightings and actions by exercise participants during C2X 07-01. Text in red **Bold** indicates events when MFAS was in use and secured dueto marine mammal mitigation. Red text in *Italics* indicates when MFAS was in use, but mitigation other than securing sonar was enacted.

Date-Time	Description of Actions Taken	# of animals	Animal Type
11/30- 1310	Surface ship sights 1 "whale" traveling at 6000 yards. MFAS in use. **MFAS in use. Sonar secured.**	1	whale
12/02- 1045	Surface ship sights 1 "whale" jumping at 2000 yards. *MFAS in use. Ship changes course AND reduces output 6 dB*	1	whale
12/02- 1500	Surface ship sights 50 "dolphins" feeding at 100 yards. MFAS NOT in use. No action taken.	50	dolphin
12/02- 1400	Suface ship sights 10 "seal or sea lions" feeding at 100 yards. MFAS NOT in use. No action taken.	10	pinniped
12/03- 1705	Surface ships sights 1 "whale" traveling at 4000 yards. *MFAS in use. No action taken.*	1	whale
12/03- 0644	Surface ship sights 30 "dolphins" traveling at 250 yards. MFAS NOT in use. No action taken.	30	dolphin
12/03- 0742	Surface ship sights 1 "humpback whale" spouting at 4000 yards. MFAS NOT in use. No action taken.	1	large whale
12/03- 0919	Surface ships sights 1 "whale" traveling at 1500 yards. *MFAS in use. No action taken.*	1	whale
12/03- 1528	Surface ship sights 10 "dolphins" at 2000 yards who closed to bow ride. MFAS NOT in use. Ship slows speed.	10	dolphin
12/03- 1529	Surface ship sights 10 "dolphins" traveling at 2000 yards. MFAS NOT in use. No action taken.	10	dolphin
12/03- 1528	Surface ship sights 1 "whale" traveling at 4000 yards. MFAS NOT in use. No action taken.	1	whale
12/04- 1623	Surface ship sights 2 "whales" traveling at 1700 yards. *MFAS in use. No action taken.*	2	whale
12/04- 1633	Surface ship sights 2 "whales" traveling at 1500 yards. *MFAS in use. No action taken.*	2	whale
12/04- 0928	Surface ship sights 10 "dolphins" traveling at 8000 yards. MFAS NOT in use. No action taken.	10	dolphin
12/04- 0917	Surface ship sights 1 "whale" traveling and spouting at 6000 yards. MFAS NOT in use. No action taken.	1	whale
12/04- 2312	Surface ship sights 3 "whales" traveling at 8000 yards. MFAS NOT in use. No action taken.	3	whale
12/05- 0840	Surface ship sights 40 "dolphins" traveling at 400 yards. MFAS NOT in use. No action taken.	40	dolphin
12/05- 1004	Surface ship sights 1 "whale" traveling at 200 yards. MFAS NOT in use. No action taken.	1	whale
12/05- 1430	Surface ship sights 5 "dolphins" traveling at 6000 yards. MFAS NOT in use. No action taken.	5	dolphin
12/06- 0715	Surface ship sights 20 "dolphins" feeding at 500 yards. MFAS NOT in use. No action taken.	20	dolphin
12/06- 0837	Surface ship sights 4 "dolphins" traveling at 2500 yards. MFAS NOT in use. No action taken.	4	dolphin
12/06- 0955	Surface ship sights 4 "dolphins" traveling at 500 yards. MFAS NOT in use. No action taken.	4	dolphin

Date-Time	Description of Actions Taken	# of animals	Animal Type
12/06- 1008	Surface ship sights 5 "dolphins" traveling at 500 yards. MFAS NOT in use. No action taken.	5	dolphin
12/06- 1547	Surface ship sights 20 "dolphins" traveling at 2000 yards. MFAS NOT in use. No action taken.	20	dolphin
12/07- 0749	Surface ship sights 10 "dolphins" traveling at 200 yards. MFAS NOT in use. No action taken.	10	dolphin
12/08- 1820	Surface ship sights 10 "dolphins" traveling at 200 yards. MFAS NOT in use. Ship alters course.	10	dolphin
12/08- 1046	Surface ship sights 1 "whale" traveling at 1000 yards. *MFAS in use. Ship changes course AND reduces output 6 dB*	1	whale
12/08- 1300	Surface ship sights 13 "dolphins" traveling at 400 yards. MFAS NOT in use. No action taken.	13	dolphin
12/08- 1509	Surface ship sights 1 "whale" traveling at 200 yards. MFAS NOT in use. Ship alters course.	1	whale
12/09- 0655	Surface ship sights "unknown marine mammal", no range given. **MFAS in use. Sonar secured.**	unk	unknown
12/09- 0759	Surface ship sights 1 "whale" traveling at 4000 yards. *MFAS in use. No action taken.*	1	whale
12/09- 0821	Surface ship sights 1 "whale" traveling at 4000 yards. **MFAS in use. Sonar secured.**	1	whale
12/09- 0905	Surface ship sights 1 "unknown marine mammal", no range given. **MFAS in use. Sonar secured.**	unk	unknown
12/09- 1024	Surface ship sights 1 "whale" traveling at 4000 yards. *MFAS in use. No action taken.*	1	whale
12/09- 1035	Surface ship sights 1 "whale" traveling at 600 yards. *MFAS in use. Sonar reduces output 10 dB*	1	whale
12/09- 1131	Surface ship sights "unknown marine mammal", no range given. **MFAS in use. Sonar secured.**	unk	unknown
12/10- 0706	Surface ship sights 1 "whale" traveling at 600 yards. MFAS NOT in use. Ship alters course.	1	whale
12/10- 0946	Surface ship sights 1 "whale" traveling at 200 yards. MFAS NOT in use. Ship alters course.	1	whale
12/11- 0533	Surface ship sights 20 "dolphins" bow riding. MFAS NOT in use. No action taken.	20	dolphin
12/13- 2252	Surface ship sights 1 "whale" traveling at 4000 yards. **MFAS in use. Sonar secured.**	1	whale
12/15- 0905	Surface ship sights 9 "dolphins" jumping at 6000. MFAS NOT in use. No action taken.	9	dolphin
12/17- 2217	Surface ship sights 1 "whale" traveling at 3100 yards. **MFAS in use. Sonar secured.**	1	whale
12/18- 1336	Surface ship sights 12 "dolphins" traveling at 100 yards. MFAS NOT in use. No action taken.	12	dolphin
12/19- 1018	Surface ship sights 12 "dolphins" traveling at 100 yards. MFAS NOT in use. No action taken.	12	dolphin
12/19- 1410	Surface ship sights 35 "seals or sea lions" jumping at 100. MFAS NOT in use. No action taken.	35	pinniped

Date-Time	Description of Actions Taken	# of animals	Animal Type
12/19- 1442	Surface ship sights 2 "whales" tail slapping at 3000 yards. MFAS NOT in use. Ship alters course.	2	whale
12/20- 0857	Surface ship sights 7 "dolphins" traveling at 5000 yards. MFAS NOT in use. No action taken.	7	dolphin
12/20- 0920	Surface ship sights 3 "dolphins" jumping at 50 yards. MFAS NOT in use. No action taken.	3	dolphin
48	= total sighting events total number of animals =	**376**	

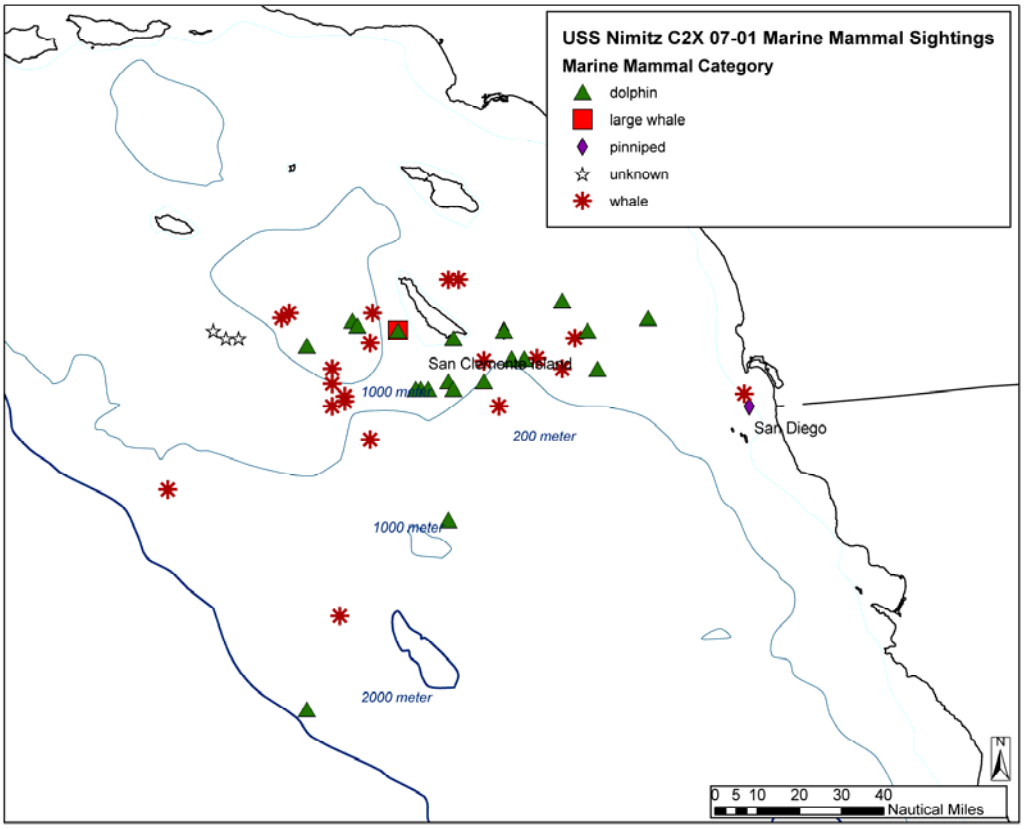


Figure 1. Marine mammal sightings C2X 07-01.

SECTION 2: Mitigation and Monitoring

As required under 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.

C2X 07-01 Assessment

MFAS sonar is only used during carefully reviewed scenarios and for only a small sub-set of any given exercise time frame. Therefore, as expected in C2X, a majority of these mammals were sighted during periods when MFAS was not in use (**Figure 2**). Approximately **85%** of the sightings (32 of 48 sightings) were in this category.

Although there was high-level emphasis placed upon adhereing to the marine mammal protection measures as written, during C2X 07-01, there were seven instances where MFAS was secured (i.e. turned-off) due to sighting of marine mammals. This represented **15%** of the total sighting events, and directly impacted ASW training readiness. Sonar was secured at ranges of from 600 to 6000 yards. While securing MFAS beyond the 200 yard range is not required under Navy SOP and NDE, it appears that an overly-conservative approach was applied by individual ships.

There were three events (6% of total sighting events) where operators reduced sonar dB levels per Navy SOP and NDE due to approaching marine mammals (by 6 dB at 1000 yards, by 6 dB at 2000 yards, by 10 dB at 600 yards). The reduced output event at 2000 yards is greater than mandated by Navy SOP and NDE. Operators commented on decreased detection ranges due to power down requirements and resulting loss of ASW tactical awareness.

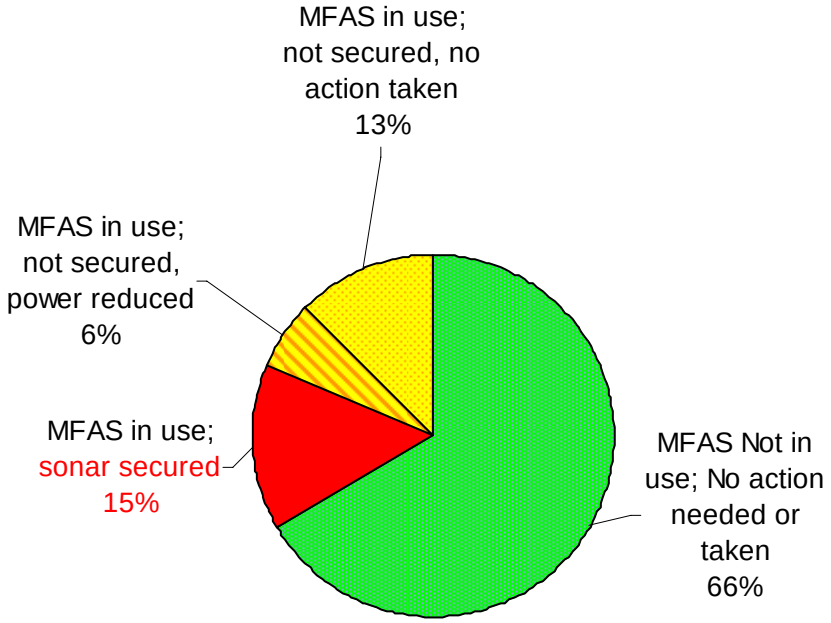
There were six sightings representing 13% of the total sightings where MFAS was in use, and because the animals were outside of the mitigation zones, sonar was not secured.

There were four marine mammal sightings at night (approximately 8% of total sightings). Two of the sonar securing events occurred at night, and happen to have occurred even though the animals were sighted at 3100 and 4000 yards.

There were also six instances when a ship altered course in the presence of marine mammal, but MFAS was not in operation at these times, and no ASW training opportunities were lost.

The reports from exercise participants contained nothing that could be construed as abnormal or "observed effects" of MFAS, or other vessel operations. There were no instances where marine mammals behaved in an erratic, unusual, or anything other than an apparently normal manner. Therefore, further analysis based on observed effects, as mandated by the reporting requirement, was not warranted.

Figure 2. Actions taken by surface ships reporting marine mammal sightings during C2X 07-01.



NDE Assessment

NDE measures adhered to and impacts to operations are discussed below.

A subset of the additional measures required by the NDE was not applicable within the context of C2X 07-01 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*"
- Requirements specific to operating MFAS in choke-points
- Restrictions from operating MFAS within constricted channels

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), 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 effective in detecting marine mammals. In addition, the steps taken by individual ship commanding officers to avoid impacts to marine mammals were effective, although not applicable in this C2X due to lack of sighting during use of MFAS.

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

The three categories of mitigation and monitoring measures required by the June 30, 2006 NDE are assessed in this section. For ease of reference, the text of the measures is provided in italics, followed by an assessment, an analysis of operational impact, and a recommendation on any improvements to each measure.

Measures 1-2

Mitigation measures 1 and 2 detail training requirements and operating procedures for units participating in MFAS ASW exercises. All of the training requirements within these two measures reflect 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 regional staff 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 require 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 DVD (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 these 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. The measure has not been officially described in a SOP for surface ships. The measure 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.

---

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 this event; for this major exercise there were no active sonar operations within 12 nm of a coast except those on the established instrumented ranges near San Clemente Island.

Operational Impact of this mitigation measure:
None.

Recommendation
Not applicable.

---

ii. *Conduct sonar activities in constricted channels.*

Navy Assessment:
There are no naturally occurring bathymetrically constricted channels within the SOCAL area used for C2X 07-01.

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 is 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 is not met in the reactions of the participating units during C2X 07-01 when marine mammals were sighted during MFAS use. Upon sighting of animals, regardless of range, but at 1000 yards or more from two of five events, sonar was secured.

Operational Impact of this mitigation measure:

Not determinable in the reactions of the participating units. In the unit after action reports, four scenarios exist: Unit observed marine mammals and was not active; unit was active and sonar was secured; unit was active and sonar not secured but ship reduce sonar output; and unit was active and sonar not secured because animals were at or beyond 1500 yards. This loss of MFAS training hours is more than a simple metric involving a loss of training time as a small percentage of the overall exercise hours since, in at least several of the C2X 07-01 cases, the proximity of a submarine in the vicinity meant there was a potential submarine detection opportunity missed by the exercise participants. During C2X 07-01, operators directly commented on lost detection opportunities due to deceased power output resulting from marine mammal sightings.

Recommendation

A “safety zone” mitigation measure was already SOP and this mitigation measure should be retained. A safety zone of 1000 m is based on the attenuation of sonar power level from a source of 235 dB to a received level of 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 was a 173 dB accumulated energy level..

---

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 implementation of this measure unrealistic.

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

---

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 four nighttime marine mammal sightings (Table 1). Two instances occurred at night where MFAS was secured at 3,100 yds and 4,000 yds. 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 with respect to power down, but the ability to sight marine mammals at night was demonstrated.

Measure 3. <u>Stranding Response and Reporting</u>

- *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.*

<u>Navy Assessment:</u>
There were no occurrences of unusual marine mammal behavior during or subsequent to C2X 07-01.

<u>Operational Impact of this mitigation measure</u>:
Not applicable.

<u>Recommendation</u>
None, this measure was not applicable for C2X 07-01. 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.*

<u>Navy Assessment:</u>
The details of the effectiveness assessment are discussed within this report.

<u>Operational Impact of this mitigation measure</u>:
Manpower time for data collection, analysis, report writing and . drafting the after action marine mammal sighting Naval messages is required.

<u>Recommendation</u>
None at this time.

  - *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.*

<u>Navy Assessment:</u>
The details of the marine species monitoring are contained within Table 1 and Section 3 of this report.

<u>Operational Impact of this mitigation measure</u>:
None

<u>Recommendation</u>
None. Navy and NMFS dialogue on monitoring and reporting is ongoing.

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.

Note that the reporting of marine mammal observations in Section 1 represents 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 C2X 07-01. 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 animals observed were behaving within the confines of apparent normal behavior. Information presented previously in Table 1 provides a list of instances when marine mammals were observed.

CONCLUSIONS AND SUMMARY

- Marine mammals were sighted 48 times by exercise participants. Approximately 376 animals were observed within Southern California waters (Table 1, Figure 1). In each of these cases, the marine mammals were detected by Navy watchstanders operating in accordance with Navy standard operational procedures and as reiterated by NDE mitigation measures.
- Of the 48 instances where marine mammals were detected, MFAS was not operating in 32 events and there were no mandated sonar shut downs.
- MFAS was secured ten times representing a 15% loss of ASW training opportunities for sighting events, as well as potentially interrupting the tactical situational awareness of the participating units and CSG (Figure 2).
- There were no indications of any effects to any marine species throughout the exercise. All behaviors described in the after action report were within the range of normal behaviors.
- 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.

Prepared for
National Marine Fisheries Service
Office of Protected Resources

Prepared by
Department of the Navy

In accordance with
Biological Opinion 09 February 2007
National Defense Exemption 23 January 2007

U.S. Navy
SOUTHERN CALIFORNIA
JOINT TASK FORCE EXERCISE 08-5
USS RONALD REAGAN CSG
After Action Report
11 – 17 April 2008

SUBMITTED TO
Office of Protected Resources, National Marine Fisheries Service

25 July 2008

Abstract
This report presents an analysis of the effectiveness of the mitigation and monitoring measures as required under the Biological Opinion on the U.S. Navy's Proposed Composite Training Unit Exercises and Joint Task Force Exercises off Southern California from February 2007 to January 2009

AND

Discussion of the nature of effects on marine mammals, if observed, under the National Defense Exemption from the Requirements of the Marine Mammal Protection Act (MMPA) for Mid-Frequency Active Sonar

---

EXECUTIVE SUMMARY

- As required by the 23 January 2007 National Defense Exemption (NDE) from the Requirements of the MMPA for Certain DoD Military Readiness Activities That Employ Mid-Frequency Active Sonar (MFAS) or Improved Extended Echo Ranging Sonobuoys and the 30 July 2007 *Biological Opinion (BO) on the U.S. Navy's Composite Training Unit Exercises (COMPTUEX) and Joint Task Force Exercises (JTFEX) Off Southern California From February 2007 to January 2009*, this report summarizes marine mammal sightings and provides an assessment of mitigation effectiveness for the U.S. Navy's Joint Task Force Exercise (JTFEX) 08-5 conducted by the USS RONALD REAGAN Carrier Strike Group (CSG) from 11 to 17 April 2008 within the offshore waters of Southern California.
- There were a total of 59 marine mammal sightings at all ranges for a minimum estimated 936 animals during JTFEX 08-5. The majority of sightings were dolphins which accounted for 35 sightings (59% of total sightings) and 879 animals (94% of total animals observed). Combined, unspecified whale and large whales totaled 16 of the 59 sightings (27%) but only accounted for 21 animals or 2% of the total number of animals.
- Out of the 59 total sightings at all ranges, there were 55 marine mammal sightings of 755 animals within 2,000 meters. There were 23 MFAS secure (i.e., MFAS was turn off) or power down events within 2,000 meters during JTFEX 08-5 because of marine mammal sightings during MFAS use. Of these 23 events, only 10 sightings of potential ESA-listed species occurred.
- In context of the NMFS BO Terms and Conditions (NMFS 2007), 14 potential ESA-listed marine mammals were possibly exposed to MFAS during JTFEX 08-5 at Receive Levels (RL) equal to or greater than 173 dB re 1 $Pa^2 \cdot s$ for a limited time. However, given the time of year of this exercise, it is unknown if some of these sightings might have been non-ESA whales (either gray whale, or minke whale), or more common pinniped species such as California sea lions, Pacific harbor seals, or northern elephant seals.
- There were no obvious indications or reports that any marine mammal sighted during JTFEX 08-5 behaved in a manner not associated with normal movement or foraging; however, biological information available at the time of this report is limited.
- Based on visual reports of marine mammals from U.S. Navy lookouts during JTFEX 08-5, the U.S. Navy's Composite Training Unit Exercise/Joint Task Force Exercise Environmental Assessment/Overseas Environmental Assessment (EA/OEA) acoustic modeling appears to have over-estimated the number of potential acoustic exposures, including those to ESA-listed species. The acoustic model tends to over predict exposures due to limitations of available marine mammal density estimates, assumptions that animals are universally distributed throughout an area, and do not leave or enter the area. Additionally, exposures are calculated without accounting for any mitigation measures that are used.

INTRODUCTION

This report is presented to fulfill U.S. Navy written reporting requirements of the 23 January 2007 National Defense Exemption (NDE) from the Requirements of the MMPA for Certain DoD Military Readiness Activities That Employ Mid-Frequency Active Sonar (MFAS) or Improved Extended Echo Ranging Sonobuoys. Additionally, the 9 February 2007 *Biological Opinion (BO) on the U.S. Navy's Composite Training Unit Exercises (COMPTUEX) and Joint Task Force Exercises (JTFEX) Off Southern California From February 2007 to January 2009* requires the submittal of a written report to the Office of Protected Resources at NMFS (reporting requirements outlined in box below). This report also fulfills the BO reporting requirements. Training restrictions applicable to JTFEX 08-5, including those contained in court-ordered MFAS mitigation measures and National Environmental Policy Act (NEPA) alternative arrangements, are also noted in this report. Notification of this report's availability will also be provided to CEQ in support of the Alternative Arrangements agreed to on 19 January 2008.

COMPTUEX/JTFEX BO (NMFS 2007) Reporting Requirements:

5. Within 120 calendar days of completing an exercise the U.S. Navy shall provide the Chief, Endangered Species Division, Office of Protected Resources (with a copy provided to the Assistant Regional Administrator for Protected Resources in NMFS' Southwest Regional Office) with a written report that shall include the following information.

a. Summary of exercise (starting and ending date of exercise, number of ships and aircraft involved in exercise, and number of hours passive and active sonar was used during the exercise);

b. Specific mitigation measures Navy implemented during exercise;

c. Number of blue whales, fin whales, humpback whales, sei whales, sperm whales, and Guadalupe fur seals that (i) had been detected within 200 yards of a sonobuoy and 500 and 1,000 yards of a sonar dome or during an active transmission and (ii) the estimate of number of blue whales, fin whales, humpback whales, sei whales, sperm whales, and Guadalupe fur seals that had been exposed to MFAS at received levels equal to or greater than 173 dB re 1 $\mu Pa^2 \cdot s$;

d. Reports of the activity or activities that blue whales, fin whales, humpback whales, sei whales, sperm whales, and Guadalupe fur seals had been observed to exhibit while they were within 200 yards of a sonobuoy and 500 and 1,000 yards of a sonar dome that was actively transmitting during exercise;

Reports of observations shall identify date, time, and visual conditions associated (if the observation is produced from a helicopter, the report should identify the speed, vector, and altitude of the airship; the sea state, and lighting conditions) with observation; and how long an observer or set of observers maintained visual contact with a marine mammal;

e. evaluation of effectiveness of those mitigation measures at avoiding exposing endangered whales to ship traffic and endangered whales and pinnipeds to MFAS. This evaluation shall identify the specific observations that support any conclusion U.S. Navy reaches about effectiveness of mitigation measures;

f. evaluation of monitoring program's ability to detect marine mammals that occur within 200 yards of a sonobuoy and 500 and 1,000 yards of a sonar dome, during an active transmission (or close enough to an exercise to be exposed to mid-frequency sonar at received levels equal to or greater than 173 dB re 1 $\mu Pa^2 \cdot s$) with specific evidence that supports any conclusions U.S. Navy reaches.

REPORT ORGANIZATION

This report contains unclassified material and provides the information and analysis for Joint Task Force Exercise (JTFEX) 08-5 and is submitted in fulfillment of NDE and BO written requirements. The report focuses on addressing the biological impact questions presented in the COMPTUEX/JTFEX BO (NMFS 2007) Reporting Requirements text box shown on the preceding page. Discussion on impacts of mitigation measures and the court's restrictions on U.S. Navy training are contained in separate, classified reporting.

This report is organized by section in the following order:

Background

Section A - Exercise Summary provides exercise specific information including the starting and ending dates, the number of ships and aircraft participating, and the number of hours of MFAS used by all emitters.

Section B - Mitigation Measure Summary describes specific mitigation measures implemented.

Section C/D - Biological Observations and Exposure Assessment provides an overview of marine mammal observations obtained during the exercise in terms of BO required Terms and Conditions statements 5c and 5d listed previously. The exposure assessment during JTFEX 08-5, estimates potential MFAS exposure for animals observed within 1,000 yards. The BO required that this analysis focus on marine mammal observations within 1,000 yards of an MFAS transmission; however, NEPA alternative arrangements granted on 15 January 2008 required analysis of marine mammal observations within 1,000 meters of an MFAS transmission. Therefore, analysis results are presented for ranges within 1,000 meters, although sighting reports are sometime still recorded in yards by exercise participants.

Section E/F - Mitigation Assessment discusses the effectiveness of the NDE and BO safety zones when marine mammals are sighted in the vicinity of ships using MFAS.

Appendix A categorizes and lists specific NDE based mitigation measures and subsequent court-ordered mitigation implemented during the exercise.

BACKGROUND

JTFEX is conducted in the Sustainment or Final Phase of the Fleet Response Training Plan (FRTP) and may involve either a Carrier Strike Group (CSG) or an Expeditionary Strike Group (ESG). It is a scenario-driven, at-sea training exercise designed to evaluate the Strike Group's preparedness for forward deployed contingency and combat operations. JTFEX also utilizes a simulated (mock) opposition force and serves as the venue for U.S. THIRD Fleet to assess the readiness, interoperability, and proficiency of naval forces in realistic, free-play scenarios, ranging from military operations other-than-war to armed conflict. As the final certification event of the FRTP, the Strike Group must demonstrate the ability to operate and integrate into a Joint Operations Area under simulated austere, hostile conditions.

Prior to the exercise, NMFS-approved Marine Species Awareness Training (MSAT) was provided to exercise participants. A Letter of Instruction (LOI) which reiterated the mitigation measures to be employed during the exercise was also distributed to participants and explained procedures for reporting marine mammal sightings discussed in Section C/D. On 23 January 2007, the Deputy Secretary of Defense granted the US Navy an exemption from certain permitting requirements of the MMPA for Certain DOD Military Readiness Activities That Employ Mid-Frequency Active Sonar (MFAS) or Improved Extended Echo Ranging Sonobuoys. This exemption included a list of mitigation measures developed in coordination with NMFS to be used when operating MFAS. On 17 January 2008, a federal appeals court temporarily lifted a preliminary injunction which imposed training restrictions on COMPTUEXs and JTFEXs conducted in the Southern California Operating Area (SOCAL OPAREA). The stay was granted in part based on the Council on Environmental Quality (CEQ) granting Navy authorization for "Emergency Alternative Arrangements" under NEPA. Those emergency alternative measures required Navy to continue to adhere to the NDE mitigation measures that were developed in coordination with NMFS; ensure active public participation in the preparation of the SOCAL Environmental Impact Statement (EIS); implement measures for adaptive management; and continue long-term research commitments. The NDE mitigation measures implemented during JTFEX 08-5 are presented in **Appendix A**.

During JTFEX 08-5, the U.S. Navy adhered to the NDE mitigation measures and the measures set forth in the CEQ Alternative Arrangements as well those measures made applicable by court order.

SECTION A EXERCISE SUMMARY

EXERCISE PARTICIPANTS

JTFEX 08-5 was conducted from 11 to 17 April 2008, for the USS RONALD REAGAN (CVN 76) CSG (**Table 1 and Figure 1**). Participating units included CSG assigned ships (aircraft carrier, surface combatants, submarines, and supply ships), and MFAS-equipped opposition forces (including submarines). A total of nine MFAS equipped surface ships participated in JTFEX 08-5: seven AN/SQS-53 MFAS-equipped surface ships (CG, DDG), and two AN/SQS-56 ships (FFG). However, there was minimum active sonar use by some CSG and non-CSG assigned platforms due to either tactical considerations for surface ships and submarines or lack of MFAS capability (aircraft carrier, supply ships). For aviation assets, four helicopters with AN/AQS-13F dipping sonars and two P-3 maritime patrol aircraft for sonobuoy deployment were available.

Total MFAS Use:

During JTFEX 08-5, 218 hours of MFAS time was reported from all sources including hull mounted surface ship sonar (SQS-53), helicopter dipping sonar, and DICASS sonobuoys. Use of helicopter dipping sonar is more variable given the unique tactical and training objectives required by each ESG or CSG. Key caveats to the derivation of this total are presented in Section C/D.

Table 1. Exercise summary for JTFEX 08-5 conducted within the SOCAL OPAREA March 2008.

Participants	Event Name	Dates	MFAS Use Reported (hours)
USS REAGAN CSG	JTFEX 08-5	11-17 April 2008	218 hrs
Number of MFAS equipped surface ships : 9 Estimated number of potential ASW helicopters available: 4			 (Ticonderoga class guided cruiser CG, Arleigh Burke class destroyer DDG, Oliver Perry class frigate FFG)

Figure 1. Approximate area of reported marine mammal sightings during exercise JTFEX 08-5.

Note: this polygon only represents the area in which marine mammal sightings were reported by exercise participants and does not imply overall operational region or areas where MFA sonar was used.

SECTION B MITIGATION MEASURES FOLLOWED

Appendix A has a list of mitigation measures used during JTFEX 08-5.

The NDE issued on January 23, 2007 provides for protection of marine mammals, in the absence of an MMPA Letter of Authorization, by including specific conditions to minimize potential impacts on marine mammals. These mitigation measures were developed in coordination with the NMFS, the agency with substantive responsibility for marine mammals. All NDE mitigation measures were adhered to during JTFEX 08-5. Those NDE measures include specific details for personnel training, lookout and watchstander responsibilities, specific operating procedures, and coordination and reporting requirements.

In addition, the Navy adhered to the Alternative Arrangements approved by the Council on Environmental Quality pursuant to 40 C.F.R. section 1506.11 (Volume 73, Federal Register, No. 16, pages 4189-4193) and any additional measures imposed by applicable court order (also included in **Appendix A**).

SECTION C/D- BIOLOGICAL OBSERVATIONS AND EXPOSURE ASSESSMENT

Section C/D provides an overview of marine mammal observations that require reporting under the Terms and Conditions of the NMFS BO (NMFS 2007).

The biological summary in this section includes the total number of marine mammals sighted, the number of marine mammals observed within 2,000 meters, and science-based analysis of species likely present in Southern California during this time of year.

JTFEX 08-5 BIOLOGICAL OBSERVATIONS

Figure 1 shows the approximate boundaries of all marine mammal sightings during JTFEX 08-5. All marine mammal sightings described in this section were made by standard Navy surface ship and aircrew lookouts using reporting procedures as detailed in the formal LOI issued prior to the exercise. Based on reports from individual U.S. Navy ships, sea states during reported marine mammal sightings ranged from 1 to 4 (**Table 2 and Appendix B Table B-1**).

There are two metrics used in this section. One is the use of the word “sighting” to classify each unique marine mammal observation. One sighting might be of a single animal, or multiple animals such as a dolphin pod. The other metric used is the term “number of animals” to quantify the total number of marine mammals within each sighting.

There were a total of 59 marine mammal sightings at all ranges for a minimum estimated 936 animals during JTFEX 08-5. The majority of sightings were dolphins which accounted for 35 sightings (59% of total sightings) and 879 animals (94% of total animals observed). Combined, unspecified whale and large whales totaled 16 of the 59 sightings (27%) but only accounted for 21 animals or 2% of the total number of animals observed during JTFEX 08-5. In addition, there were 6 pinniped (seal or sea lion) sightings for 34 animals, 1 sighting of 1 small whale, and 1 sighting of 1 unknown marine mammal (**Table 2**).

35 dolphin+16 whale/large whale+6 pinniped+1 small whale+1 unknown= 59 sightings;

879 dolphins+ 21 whale/large whale +34 pinnipeds+ 1 small whale+ 1 unknown = 936 marine mammals

One of the ships assigned to the CSG participating in JTFEX 08-5 was an aircraft carrier which does not have MFAS capability. This vessel reported 12 marine mammal sightings or approximately 22% of the 55 total sightings (12/55).

Of the total 59 marine mammal sightings and estimated 936 animals detected during JTFEX 08-5, there were **55 sightings of approximately 722 animals within 2,000 meters** of a surface ship or helicopter (**Table 2**). These 55 sightings represent approximately 93% of the total sightings during JTFEX 08-5 (55/59), and 77% of the total animals (722/936).

As discussed in the “MFAS EXPOSURE ASSESSMENT” assessment below, of these 55 sightings within 2,000 meters, there were 23 sightings where MFAS mitigation occurred (75 or 95% power reduction, or turned off) based on either MFAS NDE mitigation or court-ordered training restrictions for marine mammal sightings during MFAS operation. These 23 sightings represent 42% of sightings within 2,000 meters, and 32% of all marine mammal sightings during JTFEX 08-5.

In addition to the 55 total sightings within 2,000 meters, there were an additional four sightings of approximately 214 marine mammals by ships and helicopters at ranges greater than 2,000

meters not shown in **Table 2**. A single sighting of a dolphin pod estimated at 200 animals accounts for a majority of the 214 animals reported at ranges greater than 2,000 meters.

There were no sightings of any floating carcasses or stranded marine mammals during JTFEX 08-5.

The CEQ Alternative Arrangement requirement #3 states that "*Navy will use meters rather than yards to describe the safety zone set forth in NDE mitigation measure 20*." While surface ships sometimes continue to report initial sightings in yards, conversion to meters is done within this report. Therefore, estimated numbers of marine mammals observed within 2,000 meters of a U.S. Navy ship during JTFEX 08-5 are presented in **Table 2** which lists each individual sighting. These sightings were taken during the exercise based on visual observations from five trained U.S. Navy lookouts per ship during ASW events, or three lookouts during non-ASW events.

Appendix B Table B-2 provides a summary of 2006-2007 marine mammal sighting data from Navy funded SOCAL surveys conducted quarterly from July 2004 to April 2007 (Soldevilla et al. 2006, Hildebrand 2007). This paper represents data useful for predicting potential marine mammal seasonal groups within Southern California, and one of the few reports with winter and early spring survey results.

More detailed information on marine mammal seasonal occurrence in Southern California can be found in Forney and Barlow (1998), Carretta et al. (2000), Soldevilla et al. (2006), Barlow and Forney (2007), Hildebrand (2007), and Oleson et al. (2007). Based on the references discussed above, and given the time of year JTFEX 08-5 occurred (April), likely ESA species present in Southern California during the exercise include fin whales, humpback whales, sei whales, and sperm whales. Sperm whales have a much more variable abundance in the deep offshore waters off California (Barlow and Forney 2007, Hildebrand 2007). The majority of sperm whale sightings reported in Barlow and Forney (2007) were from waters west of the Patton Escarpment (**Appendix B Figure B-1**), in areas of the SOCAL OPAREA not used for this exercise (west of the polygon in **Figure 1**).

Blue whales and humpback whales are thought to winter off Baja California, coastal Mexico (for humpback whales), in the Gulf of California, and on the Costa Rica Dome in the Eastern Tropical Pacific (Forney and Barlow 1998; Carretta et al. 2007). Depending on large scale oceanographic processes, the exact time when animals begin their northward migration to feeding areas off Southern California, Central California, the Pacific Northwest, and Gulf of Alaska can not always be precisely determined. In April, for instance, Soldevilla et al. (2006) and Hildebrand (2007) did report humpback sightings within Southern California during April. Fin and sei whales inhabit southern California waters in all seasons or with unknown seasonal patterns (Hildebrand 2007). Blue whales are not expected given the April time frame of JTFEX 08-5.

At-sea distributions of Guadalupe sea lions are poorly documented so no determination of presence or absence can be inferred. For non-ESA-listed animals, the most abundant winter-spring dolphins species expected are common dolphins (short-beaked and long-beaked), Pacific white-side dolphins, Risso's dolphins, Dall's porpoise, Northern right-whale dolphins, and bottlenose dolphins (**Appendix B Table B-2**).

Table 2. Marine mammal sightings and actions by exercise participants for marine mammals sighted within 2,000 meters of a U.S. Navy vessel or helicopter during JTFEX 08-5.
nr = not reported; unk = unknown; N/A = not applicable

Date	Description of Actions Taken	Sea State	#	Animal Type	MFAS in use?	Mitigation
11 Apr	DDG surface ship sights 3 dolphins at 100 yards for 10 minutes. MFAS not in use. No action taken.	1	3	dolphin	no	N/A
11 Apr	DDG surface ship sights 12 dolphins swimming spouting at 100. MFAS not in use. No action taken.	1	12	dolphin	no	N/A
12 Apr	CG surface ship sights 50 dolphins swimming at 50 yards. MFAS not in use. No action taken.	1	50	dolphin	no	N/A
12 Apr	DDG surface ship sights 100 dolphins swimming at 500 yards. MFAS not in use. No action taken.	1	100	dolphin	no	N/A
12 Apr	DDG surface ship sights 1 large whale swimming at 1500 yards. MFAS not in use. No action taken.	1	1	large whale	no	N/A
12 Apr	DDG surface ship sights 1 large whale swimming at 1500 yards. Whale passed near ship and swam under bow. MFAS not in use. No action taken.	1	1	large whale	no	N/A
12 Apr	Non-MFAS surface ship sights 12 dolphins swimming at 300 yards. No MFAS equipment. No action taken.	1	12	dolphin	no	N/A
12 Apr	Helicopter sights 4 whales and 2 dolphins swimming and spouting at unreported range. MFAS not in use. No action taken.	1	4	whale	no	N/A
13 Apr	DDG surface ship sights 4 dolphins swimming at 500 yards. MFAS not in use. No action taken.	1	4	dolphin	no	N/A
13 Apr	DDG surface ship sights 12 dolphins swimming at 200 yards for 10 minutes. MFAS not in use. No action taken.	1	12	dolphin	no	N/A
13 Apr	CG surface ship sights unknown number of dolphins within 10 yards for 57 minutes. MFAS was in use. MFAS secured (i.e., turned off).	nr	unk	dolphin	Yes	Secured
13 Apr	DDG surface ship sights 2 seals swimming normally at surface at 500 yards for 8 minutes. MFAS was in use. MFAS secured.	1	2	seals	yes	Secured
13 Apr	DDG surface ship sights 2 large whales spouting at 150 yards. MFAS not in use. No action taken.	1	2	large whale	no	N/A
13 Apr	Non-MFAS surface ship sights 5 dolphins swimming at 1000 yards. No MFAS equipment. No action taken.	2	5	dolphin	no	N/A
13 Apr	FFG surface ship sights 10 seals swimming on surface at 150 yards for 10 minutes. MFAS not in use. No action taken.	1	10	seal	no	N/A
13 Apr	Non-MFAS surface ship sights 1 whale swimming at 2000 yards. No MFAS equipment. Ship alters course to open distance between ship and whale.	3	1	whale	no	N/A
13 Apr	Non-MFAS surface ship sights 5 dolphins for 5 minutes swimming at 1000 yards. No MFAS equipment. No action taken.	2	5	dolphin	no	N/A
13 Apr	Non-MFAS surface ship sights 5 dolphins for 5 minutes swimming and spouting at 2000 yards. No MFAS equipment. No action taken. Ship alters course to open distance between ship and dolphins.	3	5	dolphin	no	N/A
13 Apr	DDG surface ship sights 5 dolphins swimming and spouting normally at 500 yards for 39 minutes. MFAS was in use. MFAS secured.	2	5	dolphin	yes	Secured

Date	Description of Actions Taken	Sea State	#	Animal Type	MFAS in use?	Mitigation
13 Apr	CG surface ship sights 30 dolphins swimming on the surface at 1000 yards for 11 minutes. MFAS was in use. MFAS secured.	1	30	dolphin	yes	Secured
13 Apr	DDG surface ship sights 3 seals swimming on surface at 40 yards for 6 minutes. MFAS was in use. MFAS secured.	1	3	seal	yes	Secured
13 Apr	CG surface ship sights 20 dolphins at 500 yards swimming and spouting for 6 minutes. MFAS was in use. MFAS secured.	1	20	dolphin	yes	Secured
13 Apr	Non-MFAS surface ship sights 12 dolphins swimming at 2700 yards. No MFAS equipment. No action taken.	2	12	dolphin		
13 Apr	DDG surface ship sights 1 large whale spouting at 1000 yards for 10 minutes. MFAS was in use. MFAS power down -6 dB.	1	1	large whale	yes	75% Power down
13 Apr	FFG surface ship sights 8 seals swimming on surface at 150 yards for 5 minutes. MFAS not in use. No action taken.	1	8	seal	no	N/A
13 Apr	FFG surface ship sights 10 seals swimming on surface at 150 yards for 10 minutes. MFAS not in use. No action taken.	1	10	seal	no	N/A
13 Apr	Non-MFAS surface ship sights 6 dolphins swimming and spouting at 2000 yards. No MFAS equipment. No action taken. Ship alters course to open distance between ship and dolphins.	3	6	dolphin	no	N/A
13 Apr	DDG surface ship sights 12 dolphins swimming and spouting at 400 yards for 6 minutes. MFAS was in use. MFAS powered down -10 dB.	2	12	dolphin	yes	90% Power down
13 Apr	Non-MFAS surface ship sights 12 dolphins swimming at 1500 yards. No MFAS equipment. Ship alters course to open distance between ship and dolphins.	3	12	dolphin	no	N/A
13 Apr	DDG surface ship sights one whale at 1000 yards for 24 minutes. MFAS was in use. MFAS powered down -6 dB.	nr	1	whale	yes	75% Power down
13 Apr	CG surface ship sights pod of dolphins within 10 yards for 57 minutes. MFAS was in use. MFAS secured.	nr	nr	dolphin	yes	Secured
13 Apr	DDG surface ship sights 2 dolphins swimming on surface at 500 yards. MFAS was in use. MFAS powered down -10 dB.	2	2	dolphin	yes	90% Power down
13 Apr	DDG surface ship sights 20 dolphins swimming at 1200 yards for 7 minutes. MFAS was in use. MFAS powered down by -6 dB.	1	20	dolphin	yes	75% Power down
13 Apr	DDG surface ship sights one dolphin at 900 yards for 6 minutes. MFAS in use. MFAS secured.	nr	1	dolphin	yes	Secured
13 Apr	CG surface ship sights 100 dolphins swimming and spouting on surface at 1000 yards. MFAS was in use. MFAS powered down -6 dB.	1	100	dolphin	yes	75% Power down
13 Apr	DDG surface ship sights 1 seal swimming at 800 yards for 20 minutes. MFAS was in use. MFAS secured.	2	1	seal	yes	Secured
13 Apr	DDG surface ship sights 2 dolphins swimming on surface at 50 yards for 6 minutes. MFAS was in use. MFAS secured.	1	2	dolphin	yes	Secured

Date	Description of Actions Taken	Sea State	#	Animal Type	MFAS in use?	Mitigation
13 Apr	Non-MFAS surface ship sights 6 dolphins swimming at 100 yards. No MFAS equipment. No action taken.	1	6	dolphin	no	N/A
13 Apr	Non-MFAS surface ship sights 30 dolphins swimming at 1500 yards for 15 minutes. No MFAS equipment. No action taken.	3	30	dolphin	no	N/A
13 Apr	Helicopter sights 1 whale spouting at unreported range. MFAS not in use. No action taken.	2	1	whale	no	N/A
13 Apr	Helicopter sights 12 dolphins swimming on surface at unreported range. MFAS not in use. No action taken.	1	12	dolphin	no	N/A
13 Apr	Helicopter sights 12 dolphins swimming on surface at unreported range. MFAS not in use. No action taken.	2	12	dolphin	no	N/A
13 Apr	FFG surface ship sights 1 small whale swimming and breaching at 100 yards. MFAS not in use. No action taken.	1	1	small whale	no	N/A
14 Apr	CG surface ship sights 1 large whale swimming at 500 yards for 18 minutes. MFAS was in use. MFAS secured.	1	1	large whale	yes	Secured
14 Apr	DDG surface ship sights 50 dolphins swimming on surface at 30 yards for 18 minutes. MFAS was in use. MFAS secured.	1	50	dolphin	yes	Secured
14 Apr	DDG surface ship sights 10 dolphins swimming at 500 yards. MFAS was not in use. No action taken.	3	10	dolphin	no	N/A
14 Apr	DDG surface ship sights 3 dolphins riding ship's bow wake at 10 yards. MFAS was on. MFAS not secured due to bow riding exclusion measure.	1	3	dolphin	yes	Not required for bow riding dolphins
14 Apr	Non-MFAS surface ship sights 12 dolphins swimming at 1500 yards. No MFAS equipment. No action taken.	1	12	dolphin	no	N/A
15 Apr	DDG surface ship sights 100 dolphins swimming at 10 to 1000 yards. Some dolphins were bow riding. MFAS in use. MFAS secured.	4	100	dolphin	yes	Secured
15 Apr	Non-MFAS surface ship sights 1 large whale swimming at 1500 yards. No MFAS equipment. No action taken.	4	1	large whale	no	N/A
16 Apr	DDG surface ship sights 2 large whales swimming and spouting at 1000 yards for 10 minutes. MFAS was in use. MFAS powered down -10 dB.	4	2	large whale	yes	90% Power down
16 Apr	DDG surface ship sights one unknown marine mammal at 1100 yards for 4 minutes. MFAS was in use. MFAS powered down -6dB.	nr	1	unknown marine mammal	yes	75% Power down
16 Apr	DDG surface ship sights 1 large whale swimming at 1200 yards for 15 minutes. MFAS was in use. MFAS powered down -10 dB.	3	1	large whale	yes	90% Power down
16 Apr	DDG surface ship sights 1 large whale at 2000 yards for 4 minutes. MFAS was in use. MFAS powered down -6 dB.	2	1	large whale	yes	75% Power down
16 Apr	Helicopter sights 2 dolphins swimming on surface at 1000 yards. MFAS not in use. No action taken.	1	2	dolphin	no	N/A
17 Apr	DDG surface ship sights 1 large whale swimming and spouting on parallel course as ship at 1500 yards for 15 minutes. MFAS was in use. MFAS powered down -6 dB.	3	1	large whale	yes	75% Power down

MFAS EXPOSURE ASSESSMENT

As in any review of the operational aspects of U.S. Navy ASW operations using MFAS, specific source levels, numbers of sources, and frequencies of sonar used during JTFEX 08-5 are classified because release of this information may provide potential adversaries with critical tactical data. The following discussion is focused on the 1) amount of time spent visually searching the ocean, 2) the amount of time conducting MFAS training, and 3) a discussion of individual events when MFAS was active and marine mammals were spotted within 2,000 meters.

This report presents marine mammal sighting information out to 2,000 meters. Mitigation discussions reference the 200, 500, and 1,000 meter NDE safety zones applicable to this exercise. But due to court restrictions, MFAS equipped ships were required to adhere to a larger shutdown zone at times out to 2,000 meters when not at a Critical Point in the Exercise (CPE) (CPE exemption discussed in **Appendix A**).

Visual sighting effort: Visual sighting effort for JTFEX 08-5 is calculated using the length of the exercise (7 days), the number of hours per day (24), the standard operating procedure for all vessels to conduct visual searches 24/7 with three lookouts on watch and scanning the ocean at all times, and an additional two lookouts during ASW events, and the presence of 5 MFAS-equipped vessels.

Over 1,512 hours of visual survey effort was conducted by U.S. Navy lookouts assigned to 9 MFAS-equipped surface ships over the entire course of the exercise (7 days x 24 hrs/day = 168 hrs x 9 MFAS ships = 1,512 hours), including MFAS and non-MFAS events. This total does not include additional visual sighting results from one non-MFAS ship which represents an additional 168 hours of survey effort (1,512 + 168 = 1,680 hours).

MFAS use: During JTFEX 08-5, 218 hours of MFAS time was reported from all sources including hull-mounted surface ship AN/SQS-53 sonar, helicopter dipping sonar, and DICASS sonobuoys (**Table 1**).

Note, however, that the 218 hours of MFAS time is not indicative of continuous and consecutive use. MFAS is only used for a relatively small portion of any given exercise time frame. Total active sonar hours represent the sum of the total time of a number of individual training events during JTFEX 08-5. In other words, an individual unit using MFAS records when the sonar was turned on at the beginning of a training event and reports MFAS time until the event is finished. These sonar hours are reported into the U.S. Navy's Sonar Positional Reporting System (SPORTS) as a conservative estimate of total sonar hours based on a unit reporting it had sonar "on" for a training event, and then sonar "off". The sonar “on period” may not always be directly equivalent to all actual active sonar transmission (i.e., sound in the water) since there may be tactical and maintenance reasons why MFAS may not be in transmit mode for the portions of a training event reported in SPORTS. Therefore, MFAS hours derived from SPORTS and presented in this after action report are a conservative over estimate of total MFAS hours.

Furthermore, during periods when there is an active transmission, MFAS puts sound into the water at discrete intervals. Sonar signals are not a continuous source of acoustic energy. A surface ship sonar signal consists of a pulse (i.e., ping) approximately one second long with a period of time between successive pings based on the classified tactical considerations. Navy’s modeling of time between pings is 30 seconds which results in an overstatement of the energy in the water because time between pings is, in many instances, greater than 30 seconds. Accordingly, during typical active sonar use, MFAS is silent for the vast majority of the time. This

was the case for JTFEX 08-5. Therefore, for the 218 hours of total sonar period reported, the actual amount of time sonar put energy into the water was less than two and a half hours. The calculation for this determination is presented below:

2 seconds of pings* /1 minute x 60 min/1 hr x 218 hrs = 26,160 sec (436 min or 7.3 hrs)

*one ping approximately every 30 seconds

Ten nautical miles distance at sea is almost the same equivalent distance as from the shore line at the Ocean Beach pier to La Mesa in San Diego County, or from the shoreline at Santa Monica to Beverly Hills in Los Angeles (**Figure 2**). Over a one hour time, only 120 seconds of acoustic energy would be released during this period. MFAS propagation loss results in significant loss of any biologically relevant energy over distances greater than 200 meters from the source. Animals at one location would not be expected to be continuously exposed to repeated sonar signals, and quite possibly would be exposed to from zero to two or three pings (0-3 seconds) depending on animal movement or diving patterns. Marine mammals observed within MFAS mitigation zones would have even less exposure when MFAS is either powered down up to 75% or turned off.

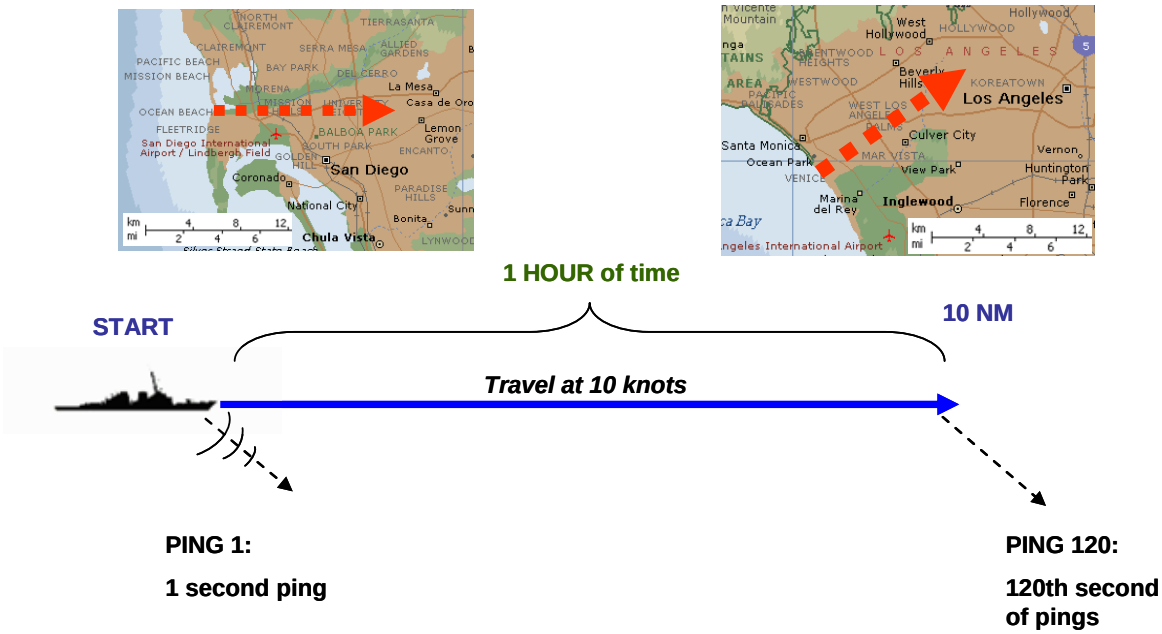


Figure 2. Example showing relative movement of MFAS surface ship over one hour and the limited amount of actual sonar energy used during this time period base on duty cycle of hull mounted sonar. This represents a generalized, typical scenario. The 120th ping represents the time at which the 120th ping will occur after an hour of travel given notional MFAS duty cycle of 1 ping every 30 seconds (2 pings per minute x 60 minutes per hour = 120 pings per hour).

NDE Safety And Litigation Training Restriction Zone Assessment for JTFEX 08-5

To address NMFS requirements to assess potential exposure levels of marine mammals to sonar, general transmission loss formulas derived from Urick (1982) were used and results are presented in **Table 3**. Estimated exposures can be determined based on standard generic formulas of how sound propagates in water [defined as spherical spreading where propagation loss from a source = 20 log [R] with "R" being range from the source (Urick 1982)]. However, spherical spreading is only an appropriate sound propagation formula to a range of 1,000 yards from a source in open ocean, after which sound propagation is determined by cylindrical spreading [defined as spherical spreading where propagation loss from a source = 10 log [R]+30 with "R" being range from the source >1000 yards and 30 being the spherical loss from 0 to 1000 yards]. Depending on the range of the sighting reported in **Table 3**, either Urick's spherical or cylindrical formula was used.

This estimate of potential exposure makes several very conservative assumptions. The formula above is a generic estimation of propagation and does not take into account other factors that could limit actual propagation such as oceanographic conditions and Navy-unique MFAS operating parameters which would result is slightly lower propagation ranges. Use of this approach to estimate potential Receive Levels (RL) at any given animal assumes the horizontal range from a visual sighting accounts for an animal across all depths at which an animal travels to predict the maximum, worst case potential exposure. In other words, this estimated worst case exposure is presented independent of the animal's actual depth level, since a) time and depth of current and previous dives cannot be deduced from a limited surface sighting, and b) oceanographic and tactical conditions influence actual sound propagation at different depths. Given relative motion of ships and animals at sea, the time spent with any given exposure from surface ships is likely to be limited.

Table 3 shows JTFEX 08-5 marine mammal sightings of potential ESA-listed species in relation to applicable safety zones. For all species, there were 23 mitigation events where MFAS was secured or powered down upon sighting a marine mammal within 2,000 meters.

The following assessment addresses potential exposure to possible ESA-species as described in the NMFS BO Terms and Conditions (NMFS 2007). Of note, given the April time frame of this exercise, it is possible that several of the large whale sightings reported by exercise participants were in fact late migrating gray whales. Given the uncertainty in species identification, however, all whale and large whale sightings are considered as potential ESA cetacean species for the purposes of this exposure assessment (fin, humpback, sei, sperm whales which could be seasonally expected within the area) (**Appendix B Figure B-2**). This same approach applies also to unidentified seals. While each seal sighting is assumed to be the less frequently encountered ESA-listed Guadalupe fur seal, the most common pinniped species within Southern California offshore waters are the California sea lion, Pacific harbor seal, and northern elephant seal (Carretta et al. 2007).

The following range specific discussion applies to estimating potential exposure to potential ESA-listed marine mammals as requested in the NMFS BO (NMFS 2007):

< 200 meter NDE safety zone: There was one surface ship sighting that resulted in MFAS mitigation for potential ESA-listed marine mammal presence within 200 meters. This was one mitigation event where MFAS was secured at a range of 27 meters (40 yards) (**Table 3**).

For the sighting at 27 meters (40 yards), and assuming maximum Receive Level (RL) before sonar being secured (turned off), sonar exposure is conservatively estimated as 204 dB re 1 $Pa^2 \cdot s$. Following sonar being turned off, exposure would have been zero.

Based on the above sightings within this range category, it is estimated that a total of 3 potential ESA marine mammals might have been exposed to RL equal to or greater than 173 dB.

201-500 meter NDE safety zone: There were two surface ship sightings that resulted in MFAS mitigation for potential ESA-listed marine mammals between 201-500 meters. In both events, MFAS was secured at a range of 457 meters (500 yards) (**Table 3**).

For the sightings at 457 meters (500 yards-2 seals and 1 large whale), and assuming a maximum RL before securing, sonar exposure is conservatively estimated as 182 dB re 1 $Pa^2 \cdot s$. Following sonar being turned off, exposure would have been zero.

Based on the above sightings within this range category, it is estimated that a total of 3 potential ESA marine mammals might have been exposed to RL equal to or greater than 173 dB.

501-1,000 meter NDE safety zone: There were four surface ship sightings that resulted in MFAS mitigation for potential ESA-listed marine mammals between 501 to 1,000 meters. In one event, MFAS was secured at a range of 732 meters (800 yards), and in three events MFAS was powered down at a range of 914 meters (1,000 yards) (**Table 3**).

For the sighting at 732 meters (800 yards) (1 seal), and assuming a maximum RL before securing, sonar exposure is conservatively estimated as 178 dB re 1 $Pa^2 \cdot s$. Following sonar being turned off, exposure would have been zero. For the two of three sightings at 914 meters (1,000 yards) (1 whale, 1 large whale), and assuming a maximum potential RL before power down, sonar exposure is conservatively estimated as 176 dB re 1 $Pa^2 \cdot s$. Following a 70% reduction in power (-6 dB), subsequent exposure might have been 170 dB for one event. For the third of three sightings (2 large whales) at 914 meters (1,000 yards) and following a 90% reduction in power (-10 dB) subsequent exposure might have been 166 dB.

Based on the above sightings within this range category, it is estimated that a total of 5 potential ESA marine mammals might have been exposed to RL equal to or greater than 173 dB.

1,001-2,000 meter litigation imposed Training Restriction zone: There is no NDE required MFAS mitigation for ranges equal to or greater than 1,000 meters. Due to ongoing litigation training restrictions (**Appendix A**), ships complied by using MFAS mitigation out to ranges of 2,000 meters unless a Critical Point of the Exercise exemption was declared, in which case NDE mitigation measures applied.

There were three surface ship sightings that resulted in MFAS mitigation for potential ESA-listed marine mammals between 1,001 to 2,000 meters. In these events MFAS was powered down at ranges of 1,005, 1,097, and 1,372 meters (1,100, 1,200, and 1,500 yards) (**Table 3**).

Assuming a maximum potential receive level (RL) before power down, sonar exposure at 1,005 meters (1,100 yards-1 unknown marine mammal) is conservatively estimated as 175 dB re 1 $Pa^2 \cdot s$. Following a 75% reduction in power (-6 dB), subsequent exposure might have been 169 dB. Assuming a maximum potential receive level (RL) before power down, sonar exposure at 1,097 meters (1,200 yards-1 large whale) is conservatively estimated as 175 dB re 1 $Pa^2 \cdot s$. Following a 90% reduction in power (-10 dB), subsequent exposure might have been 165 dB. For the sighting at 1,372 meters (1,500 yards-1 large whale), and assuming a maximum potential receive level (RL) before power down, sonar exposure is conservatively estimated as 174 dB re 1 $Pa^2 \cdot s$. Following a 70% reduction in power (-6 dB), subsequent exposure might have been 168 dB. Of note, given the sighting location behind the ship for the 1,372 meters (1,500 yards) sighting, actual exposures both before and after power down are likely to have been significantly less or even negligible (**Table 3**).

Based on the above sightings within this range category, it is estimated that a total of 3 potential ESA marine mammals (all large cetaceans) might have been exposed to RL equal to or greater than 173 dB. Given the time of year for the exercise (April), it is unknown if these sightings might have been non-ESA whales, either late migrating gray whales or minke whales.

SUMMARY

Based on reporting requirements from the NMFS BO, for JTFEX 08-5 the total number of potential ESA marine mammals exposed to MFAS at RL equal to or greater than 173 dB can be estimated (**Table 3)**. Given the time of year for the exercise (April), it is unknown if some of these sightings might have been non-ESA species, either late migrating gray whales, minke whales, or the more commonly seen California sea lions, Pacific harbor seals, or northern elephant seals.

There were 11 MFAS secure (i.e., turn off) or power down events involving 15 potential ESA-listed marine mammal within 2,000 meters during JTFEX 08-5. Of these 11 events, four occurred within the court-ordered training restriction zone between 1,001 and 2,000 meters.

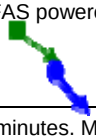
In relation to the NMFS BO Terms and Condition reporting requirements, factoring the conservative estimation of Receive Level (RL) discussed above, there were 10 events for 14 potential ESA-listed marine mammals that might have initially been exposed to RL >173 dB re 1 Pa2•s as required to be reported to NMFS under the BO.

Range	Estimated # of potential ESA-listed marine mammals exposed to RL >173 dB re 1 $Pa^2 \cdot s$	
<200 m	3	3 seals
201-500 m	3	2 seals, 1 large whale
501-1,000 m	5	1 seal, 1 whale, 1 large whale, 2 large whales
1,001-1,500 m	3	1 unknown, 1 large whale, 1 large whale
total	14	

It should be noted, however, this estimation of exposure to RL >173 only applies to the moment of initial marine mammal sighting. Following this initial sighting MFAS ships either turned off sonar or powered down which effectively eliminates any exposure or lowers potential exposure below 173 dB. In addition, due to relative movement of ship and animals, time any particular animal was in a given exposure zone is limited to less than a few minutes or few tens of minutes.

Table 3. Sightings during JTFEX 08-5 where MFAS was on and mitigation occurred (listed by range).

Assessment by Range for Surface Ship MFA sonar **NDE Range (meters)**	**Marine Mammal Type** (potential ESA species in bold)	**Comments** *Estimated exposure based on 20 Log [R] spherical spreading propagation loss for ranges less than 1000 meters and where nominal MFAS source level (SL) assumed to be 235 dB (Urick 1982); for ranges > 1000 m, then propagation loss is better approximated as 10 Log(R) + 30 dB* [Pictograms represent ship movement (blue circle and arrow) and sighting location of marine mammal (green square) relative to ship's movement]
< 200 m **Sonar secured** **(turned off)**	unknown # dolphins	13 Apr: CG surface ship sights pod of dolphins within 10 yards for 57 minutes. MFAS was in use. MFAS secured.
	100 dolphins	15 Apr: DDG surface ship sights 100 dolphins swimming at 10 to 1000 yards. Some dolphins were bow riding. MFAS in use. MFAS secured.
	50 dolphins	14 Apr: DDG surface ship sights 50 dolphins swimming on surface at 30 yards for 18 minutes. MFAS was in use. MFAS secured.
	3 seals	13 Apr: DDG surface ship sights 3 seals swimming on surface at 40 yards for 6 minutes. MFAS was in use. MFAS secured (i.e., turned off). MAX. est. MFAS exposure before shutdown: **204** dB re 1 $Pa^2 \cdot s$ and **0** dB after shutdown.
	2 dolphins	13 Apr: DDG surface ship sights 2 dolphins swimming on surface at 50 yards for 6 minutes. MFAS was in use. MFAS secured.
201-500 m **Sonar reduced -10 dB**	12 dolphins	13 Apr: DDG surface ship sights 12 dolphins swimming and spouting at 400 yards for 6 minutes. MFAS was in use. MFAS powered down 10 dB.
90% power reduction	**2 seals**	13 Apr: DDG surface ship sights 2 seals swimming normally at surface at 500 yards for 8 minutes. MFAS was in use. MFAS secured. MAX. est. MFAS exposure before shutdown: **182** dB re 1 $Pa^2 \cdot s$ and **0** dB after shutdown.
	5 dolphins	13 Apr: DDG surface ship sights 5 dolphins swimming and spouting normally at 500 yards for 39 minutes. MFAS was in use. MFAS secured.
	20 dolphins	13 Apr: CG surface ship sights 20 dolphins at 500 yards swimming and spouting for 6 minutes. MFAS was in use. MFAS secured.
	2 dolphins	13 Apr: DDG surface ship sights 2 dolphins swimming on surface at 500 yards. MFAS was in use. MFAS powered down 10 dB
	1 large whale	14 Apr: CG surface ship sights 1 large whale swimming at 500 yards for 18 minutes. MFAS was in use. MFAS secured. MAX. est. MFAS exposure before shutdown: **182** dB re 1 $Pa^2 \cdot s$ and **0** dB after shutdown.
500- 1000 m **Sonar reduced -6 dB** **70% power reduction**	**1 seal**	13 Apr: DDG surface ship sights 1 seal swimming at 800 yards for 20 minutes. MFAS was in use. MFAS secured. MAX. est. MFAS exposure before shutdown: **178** dB re 1 $Pa^2 \cdot s$ and **0** dB after shutdown.
	1 dolphin	13 Apr: DDG surface ship sights one dolphin at 900 yards for 6 minutes. MFAS in use. MFAS secured.
	30 dolphins	13 Apr: CG surface ship sights 30 dolphins swimming on surface at 1000 yards for 11 minutes. MFAS was in use. MFAS secured.
	1 whale	13 Apr: DDG surface ship sights one whale at 1000 yards for 24 minutes. MFAS was in use. MFAS powered down 6 dB. MAX. est. MFAS exposure before shutdown: **176** dB re 1 $Pa^2 \cdot s$ and **166** dB AFTER power down.
	1 large whale	13 Apr: DDG surface ship sights 1 large whale spouting at 1000 yards for 10 minutes. MFAS was in use. MFAS powered down 6 dB. MAX. est. MFAS exposure before shutdown: **176** dB re 1 $Pa^2 \cdot s$ and **170** dB AFTER power down.
	100 dolphins	13 Apr: CG surface ship sights 100 dolphins swimming and spouting on surface at 1000 yards. MFAS was in use. MFAS powered down 6 dB.
	2 large whales	16 Apr: DDG surface ship sights 2 large whales swimming and spouting at 1000 yards for 10 minutes. MFAS was in use. MFAS powered down 10 dB. MAX. est. MFAS exposure before shutdown: **176** dB re 1 $Pa^2 \cdot s$ and **166** dB AFTER power down.

Assessment by Range for Surface Ship MFA sonar **NDE Range (meters)**	**Marine Mammal Type** (potential ESA species in bold)	**Comments** *Estimated exposure based on 20 Log [R] spherical spreading propagation loss for ranges less than 1000 meters and where nominal MFAS source level (SL) assumed to be 235 dB (Urick 1982); for ranges > 1000 m, then propagation loss is better approximated as 10 Log(R) + 30 dB* [Pictograms represent ship movement (blue circle and arrow) and sighting location of marine mammal (green square) relative to ship's movement]
1001-2000 m	**1 unknown marine mammal**	16 Apr: DDG surface ship sights one unknown marine mammal at 1100 yards for 4 minutes. MFAS was in use. MFAS powered down 6 dB. MAX. est. MFAS exposure before shutdown: **175** dB re 1 $Pa^2 \cdot s$ and **166** dB AFTER power down.
	20 dolphins	16 Apr: DDG surface ship sights 20 dolphins swimming at 1200 yards for 7 minutes. MFAS was in use. MFAS powered down by 6 dB.
	1 large whale	16 Apr: DDG surface ship sights 1 large whale swimming at 1200 yards for 15 minutes. MFAS was in use. MFAS powered down 10 dB. MAX. est. MFAS exposure: **175** dB re 1 $Pa^2 \cdot s$ and **169** dB AFTER power down.
	1 large whale	17 Apr: DDG surface ship sights 1 large whale swimming and spouting on parallel course as ship at 1500 yards for 15 minutes. MFAS was in use. MFAS powered down 6 dB. MAX. est. MFAS exposure: **174** dB re 1 $Pa^2 \cdot s$ and **168** dB AFTER power down. 
	1 large whale	16 Apr: DDG surface ship sights 1 large whale at 2000 yards for 4 minutes. MFAS was in use. MFAS powered down 6 dB. MAX. est. MFAS exposure: **172** dB re 1 $Pa^2 \cdot s$ and **166** dB AFTER power down.
Assessment by Range for Helicopter MFA dipping sonar NDE Range (meters)	**Marine Mammal Type**	**Comments** *Nominal MFAS source level (SL) assumed to be 216 dB*
< 200 m **Sonar secured (turned off)**		No reports

PASSIVE SONAR

Passive sonar is an acoustic device used for listening to underwater sound and does not involve transmitting active sound into the water column. Passive sonar use is driven by the tactical nature of an ASW or training event, and is employed whenever possible. Given the nature of passive sonar technology and underwater sound propagation, determining range and absolute position of a marine mammal is exceedingly difficult and generally not possible with any single ship-based passive sonar. Skilled operators or unique circumstances may sometimes allow real-time or near-real time determinations of marine mammal range at the expense of interrupting the ship's ASW training at the time. Active sonar, on the other hand, is critical in providing range and bearing to potential underwater submarines and mines.

In addition, passive sonar can only detect marine mammals that are vocalizing (i.e., making underwater sound as part of communication and echolocation). Marine mammal vocalization is based on individual needs at a particular moment, species-level foraging, and mating strategies, and other oceanographic or biological factors. For instance, for some species, only males typically vocalize (ex. humpback whales, blue whales, fin whales, and minke whales). Depending on oceanographic conditions and animal source levels, when marine mammals do vocalize, sounds can easily travel one to several tens of kilometers (km) (0.5 nautical mile (nm) to tens of nm) for some mid-to-low frequency animals, and tens to hundreds of km for very low frequency baleen whales (i.e., blue and fin whales). These ranges demonstrate that even if the marine mammal vocalization can be detected, it does not mean the mammal is necessarily close to the passive sonar sensor. Determining when or if a marine mammal is within an NDE mitigation zone or court required training restriction zone by passive acoustic detection is not always possible.

OTHER EVENTS

There were no marine mammal ship strikes involving participating ships during JTFEX 08-5.

During JTFEX 08-5, there were four instances where Navy ships proactively maneuvered to avoid close encounters with marine mammals.

There were no additional reports of stranded or injured marine mammals within the SOCAL OPAREA during or after JTFEX 08-5.

SECTION E/F- MITIGATION ASSESSMENT

JTFEX 08-5 ASSESSMENT

OVERVIEW

This section of the report provides an assessment of the effectiveness of the mitigation and monitoring measures used in JTFEX 08-5. The NDE requires the U.S. Navy to submit a report to NMFS that includes a discussion of the nature of any effects or lack of effects of mitigation measures based on modeling results and marine mammal sightings. In addition, the BO Terms and Conditions require a report that evaluates the mitigation measures and provides results of the U.S. Navy's exercise monitoring and reporting program. In this case, the mitigation measures under the BO are the same as the NDE measures; therefore, the discussion is presented together in this section.

ASW proceeds slowly and requires careful development of a tactical frame of reference over time. Data is integrated from a number of sources and sensors. Once MFAS is turned off for a period of time, turning it back on later does not usually allow a commander to simply continue from the last frame of reference. From an individual operator perspective, securing sonar essentially clears the screen of all information, which then has to be rebuilt over time when the system power is restored. Lost MFAS time not only equates to lost exercise time, but has a broader, overall impact on the tempo and development of a "tactical picture" shared among exercise participants as they train toward the goal of improving ASW skills in general.

Mitigation measures were designed to minimize interactions between marine mammals and Navy vessels employing MFAS at levels with the potential to result in a Temporary Threshold Shift (TTS) or Permanent Threshold Shift (PTS) (DoN 2007). Navy ships were not tasked nor expected to maintain contact with marine mammals sighted for purposes of monitoring requirements. To do so would have unnecessarily interfered with military readiness activities and may have resulted in concerns with whether Navy ships were intentionally harassing marine mammals.

MODELING ESTIMATES APPLICABLE TO JTFEX 08-5

For the COMPTUEX/JTFEX EA/OEA (DoN 2007) an estimate of potential acoustic exposure to marine mammals was generated in support of the NEPA process. **Table 4** shows estimated marine mammal acoustic exposures from model derived calculations based on estimated marine mammal densities, operational parameters, sound transmission loss, and potential energy accumulated based strictly on pre-exercise acoustic impact modeling (DoN 2007). **Table 4** lists possible marine mammal species generally occurring in Southern California waters based solely on *estimated* distribution and abundance, but does not take into account potential seasonal distribution. The table also highlights the ESA-listed species described in the COMPTUEX/JTFEX BO (NMFS 2007), and shows estimated potential acoustic exposures derived from acoustic impact modeling (DoN 2007 COMPTUEX/JTFEX EA/OEA).

Table 4 shows the annual species-specific model estimated potential exposures for Southern California COMPTUEX and JTFEX exercises. Extrapolating for a single exercise (i.e., dividing the total annual species exposures by 7 exercises per year) results in an estimated 12,198 potential exposures to all marine mammals per exercise (11,564 behavioral sub-TTS Level B harassments, 590 TTS Level B harassments, and 44 Level A harassments). The total number of all marine mammal species visually observed and potentially exposed to MFAS equal to or

greater than 173 dB during JTFEX 08-5 was significantly lower than pre-exercise modeling assumptions. While a total of 936 marine mammals were observed by exercise participants (Section C/D), this total is for both MFAS and non-MFAS sightings. Only approximately 355 marine mammals (dolphins, whales, pinnipeds) were potentially exposed to MFAS at RL greater than 173 dB during JTFEX 08-5 as compared to pre-exercise model predictions of 12,198 animals.

In context of the NMFS BO Terms and Conditions (NMFS 2007), 101 potential exposures per exercise can be estimated for ESA species based on the pre-exercise acoustic impact model results (DoN 2007). However, in Section C/D the presence of blue whales in SOCAL during the time frame of this exercise is less likely given their normal seasonal distribution to the south. Therefore, the predicted model exposures can be adjusted from 101 to 53 animals (101-48 blue whale exposures = 53). From **Table 4** and Section C/D, 14 potential ESA-listed marine mammals were possibly exposed to MFAS during JTFEX 08-5 at RL equal to or greater than 173 dB.

JTFEX 08-5 Minimum Total Marine Mammals Sighted During MFAS Operations at RL ≥173 dB (Table 5)	355
Total Pre-exercise Estimated Exposures at RL ≥173 dB For **ALL Marine Mammals** (Table 5)	12,198
Total Pre-exercise Estimated Exposures at RL ≥173 dB For ESA-listed species only AND excluding blue whales (Table 5)	53
JTFEX 08-5 # of **Potential ESA Species Exposed** at RL ≥173 dB (at ranges < 1,000 m)	14 *
** (14 whale, large whale, and pinnipeds which could be potential ESA-species. Note given time of year for this exercise, April, there is high probability that several of these sightings may have been non-ESA-listed species)*	

The discrepancy between pre-exercise modeling, actual sightings, and actual potential exposures for all species is due to the conservative nature of the acoustic effects model process combined with lack of specific scientific information on regional occurrence and distribution for many species. Over-estimation of exposures in acoustic effects models can be partially attributed to the following factors: 1) acoustic exposures do not account for mitigation measures, 2) marine mammal density estimates are based on NMFS survey data that may be limited in duration and time of year (e.g., many surveys only occur in spring-summer, or summer-fall); and 3) marine mammal densities are averaged across active sonar activity areas and, therefore, are evenly distributed without consideration for real-world animal grouping or variation, or migration.

It is important to understand that there are limitations to the ecological data (diving behavior, migration or movement patterns and population dynamics) used in acoustic exposure modeling. The model results must be interpreted within the context of a given species' ecology. The large SOCAL OPAREA makes individual mammals' repeated or prolonged exposures to sonar signals unlikely. Similarly, due to the time delay between MFAS pings, platform speed, and animal movement, exposure of any animal to sonar that would lead to harassment would be minimized.

Table 4. Total estimated annual exposures based on pre-exercise modeling for MFAS sonar from DoN 2007 based on seven exercises per year (JTFEX/JTFEX EA/OEA Tables 4.3-6 and 4.3-7) (*left three columns*), and estimated exposures per exercise (estimated total exposures divided by seven) (*right three columns*).

Species	DoN 2007 annual estimated exposures			Estimated single exercise exposures		
	Level B Sub TTS	Level B	Level A	Level B Sub TTS	Level B	Level A
ESA-listed						
Blue whale	325	14	0	46	2.0	0
Fin whale	263	10	0	38	1	0
Humpback whale	33	0	0	5	0	0
Sei whale	2	0	0	>1	0	0
Sperm whale	59	4	0	8	>1	0
Non-ESA listed						
Baird's beaked whale	4	0	(4)*	>1	0	>1
Bottlenose dolphin	516	30	0	74	4	0
Bryde's whale	2	0	0	>1	0	0
Common dolphin	69,258	3,464	8	9894	495	1
Cuvier's beaked whale	208	10	(218)*	23	1	31
Dall's porpoise	142	3	0	20	>1	0
Dwarf sperm whale	0	0	0	0	0	0
False killer whale	16	0	0	2	0	0
Gray whale	64	0	0	9	0	0
Killer whale	12	1	0	2	>1	0
Mesoplodon spp.	0	0	0	0	0	0
Minke whale	24	2	0	3	>1	0
Northern right whale dolphin	3,003	227	0	429	32	0
Pacific white-sided dolphin	1,949	101	0	278	14	0
Pantropical spotted dolphin	547	0	0	78	0	0
Pygmy sperm whale	859	56	0	123	8	0
Risso's dolphin	2,050	96	0	293	14	0
Rough-toothed dolphin	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0
Striped dolphin	1,554	72	0	222	10	0
Ziphiid beaked whale	49	3	(52)*	7	>1	7
California sea lion	0	0	0	0	0	0
Northern elephant seal	0	0	0	0	0	0
Pacific harbor seal	6	0	0	1	0	0
Approximate Total accounting for rounding=				**11,564**	**590**	**44**

* ALL predicted beaked whale Level B exposures (sub-TTS and TTS) counted as Level A exposures as an overly conservative metric

NDE AND BO EXPOSURE MITIGATION ASSESSMENT

1) All measures promulgated in the 23 January 2007 *Mid-Frequency Active Sonar Mitigation Measures during Major Training Exercises or within Established DOD Maritime Ranges and Established Operating Areas* (NDE) and those agreed to in the NEPA Emergency Alternative Arrangements were implemented before and during JTFEX 08-5.

2) In addition to the above assessment of the NDE, the BO calls for a report that evaluates the effectiveness of the U.S. Navy's exercise mitigation measures. The three categories of measures (Personnel Training, Lookout and Watchstander Responsibilities, and Operating Procedures) outlined in the NDE are effective in detecting and responding appropriately to the presence of marine mammals, when visually observed. Fleet commanders and ship watch teams continue to improve individual awareness and enhance reporting through various pre-exercise conferences, lessons learned, and these after action reports. The NDE safety zones are adhered to and vessels apply mitigation when marine mammals are first visually observed within a zone. The U.S. Navy acknowledges that the mitigation measures do not account for potential marine mammals not visually observed, which is even difficult to determine within the civilian marine mammal scientific survey community. Deep diving animals if exposed may not be exposed to significant levels for long periods, given the moving nature of ship MFAS use, and even less frequent pings from lower power aviation deployed MFAS systems (dipping sonar, sonobuoys). For instance, during a one hour dive by a beaked whale or sperm whale, a MFAS ship moving at a nominal 10 knot speed could cover about 10 nm from its original location, well beyond ranges predicted to have significant exposures.

3) NMFS (2007) COMPTUEX/JTFEX BO Terms and Conditions require the U.S. Navy to estimate the number of ESA-listed marine mammals that may have been exposed to received energy level equal to or greater than 173 dB re 1 $\mu Pa^2 \cdot s$. A total of at least 14 marine mammals some of which may have been ESA-listed whales were potentially exposed during JTFEX 08-5 with no apparent or reported detrimental results from this exposure. Given the April time frame of this exercise, it is possible that some of the sighted whales in this total were actually non-ESA listed species.

4) For all marine mammal sightings occurring during JTFEX 08-5, there was no obvious indication or report that any animal behaved in a manner not associated with normal movement, or foraging, however, the biological information available at the time of this report is limited. In addition, not all species or even all individuals within a given species will react to external sound in the same manner. Some species, as acknowledged in recent NMFS Biological Opinions for other Navy exercises, are specialized for extremely low frequency sounds, as determined by scientific-based vocalization recordings. Blue whales, fin whales, and sei whales are typically open-ocean, low frequency specialist, with complex vocalizations less than 300-800 Hz (**Appendix B Figure B-2**). As NMFS acknowledges, these species likely cannot perceive (e.g., hear) mid-frequency sounds such as Navy MFAS. These species are only included within Navy acoustic impact analysis under NEPA as a very over conservative approach. In reality, the likelihood of these species biologically perceiving and potentially reacting to MFAS is remote. There has been no association between baleen whale behavioral impacts or strandings related to MFAS (ICES 2005).

Data Limitations and Improvements

There is no information from which to assess how many, if any, animals not observed by Navy lookouts may or may not have been exposed to MFAS received levels equal to or greater than 173 dB re 1 $\mu Pa^2 \cdot s$. However, many of the ESA-listed species in SOCAL with the exception perhaps the sperm whale, are easier to spot on the surface due to shorter dive times and larger animal size.

Data needed to address this question will be reviewed as it becomes available for potential incorporation into future exercises, although this remains a problematic science issue for even non-Navy marine mammal surveys. Real-time passive sonar systems used by the U.S. Navy, and to some degree by most of the marine mammal science community, lack the ability to automatically classify detected species, although there is substantial academic research into improving this capability. Most current passive data sets rely on extensive post-collection analysis by skilled subject matter experts to conclusively establish species identification. In addition to species classification, range detection using moving passive acoustic systems on U.S. Navy ships is limited in real time at the typical 8-10 knot speeds at which many ASW training events occur. Indeed, if passive range detection of any submerged contacts (submarines, marine mammals) was more advanced and easier, then there would be less tactical reliance on active sonar systems. Also, non-vocalizing marine mammals cannot currently be detected using passive systems. For instance, in minke whales, it is often only the male of the species that frequently vocalizes.

The U.S. Navy continues conducting robust and realistic exercises, and development of long-term range complex monitoring plans. The goal of these plans is to integrate multiple tools in an effort to generate better assessments of marine mammal occurrence and possible MFAS effects, or lack thereof. In accordance with the COMPTUEX/JTFEX BO, data collection needs to address unresolved questions regarding likely area-specific species composition and the potential for alternative detection technologies may be incorporated into future exercises as the U.S. Navy's exercise monitoring program evolves.

REFERENCES

Barlow, J. and K.A. Forney. 2007. Abundance and population density of cetaceans in the California Current ecosystem. Fishery Bulletin 105(4):509-526.

Carretta, J.V., M.S. Lowry, C.E. Stinchcomb, M.S. Lynn, R.E. Cosgrove. 2000. Distribution and abundance of marine mammals at San Clemente Island and surrounding offshore waters: results from aerial and ground surveys in 1998 and 1999. National Marine Fisheries Service, Southwest Fisheries Science Center, La Jolla, CA. Administrative Report LJ-00-02.

Carretta, J.V., K.A. Forney, M.S. Lowry, J. Barlow, J. Baker, B. Hanson, and M.M. Muto. 2007. DRAFT U.S. Pacific Marine Mammal Stock Assessments: 2007. NOAA-TM-NMFS-SWFSC-414.

Culik, B. 2004. Review of Small Cetaceans- Distribution, Behavior, Migration and Threats. United Nations environmental Programme (UNEP) and the Secretariat of the Convention on the Conservation of Migratory Species (CMS). Marine Mammal Action Plan/Regional Seas Report No. 177.

Geraci, J.R. and V.J. Lounsbury. 2005. Marine Mammals Ashore- A field guide for strandings 2nd edition. National Aquarium Baltimore.

DoN. 2007. Final Environmental Assessment/Overseas Environmental Assessment for Joint Task Force Exercises and Composite Training Unit Exercises- February 2007. Department of the Navy.

Forney, K.A., and J. Barlow. 1998. Seasonal patterns in the abundance and distribution of California cetaceans, 1991-1992. Marine Mammal Science 14(3):460-489.

Forney, K.A. J. Barlow, and J.V. Carretta. 1995. The abundance and distribution of California cetaceans, Part II: Aerial surveys in winter and spring of 1991 and 1992. Fisheries Bulletin 93:15-26.

Hildebrand, J. 2007. Marine Mammal Acoustic Monitoring and Habitat Investigation, Southern California Offshore Region, July 3, 2006 – June 30, 2007. Prepared for: Chief of Naval Operations (CNO N45), Washington, D.C. Prepared by: Marine Physical Laboratory, Scripps Institute of Oceanography. 42 pp.

ICES. 2005. Ad-Hoc Group on the Impact of Sonar on Cetaceans. International Council for the Exploration of the Sea. 44 pp.

Reeves, R.R., B.S. Stewart, P.J. Clapham, J.A. Powell. 2002. National Audubon Society Guide to Marine Mammals of the World. Alfred A. Knoff, New York. 523 pp.

Mellinger, D.K., K.M. Stafford, S.E. Moore, R.P. Dziak, and H. Matumoto. 2007. An Overview of Fixed Passive Acoustic Observation Methods For Cetaceans. Oceanography 20(4):36-45

NMFS. 2007. Biological opinion on the U.S. Navy's proposed Composite Training Unit Exercises and Joint Task Force Exercises off Southern California from February 2007 to January 2009. Office of Protected Resources, National Marine Fisheries Service, Silver Springs, MD. 182 pp.

NMFS. 2007. Draft Programmatic Environmental Impact Statement for the Marine Mammal Health and Stranding Response Program March 2007 Volume I: Draft Programmatic Environmental Impact Statement. National Marine Fisheries Service Office of Protected Resources, Silver Spring, MD.

Soldevilla, M.S., S.M. Wiggins, J. Calambokidis, A. Douglas, E.M. Oleson, J.A. Hildebrand. 2006. Marine Mammal Monitoring and Habitat Investigations During CALCOFI Surveys. In: California Cooperative Oceanic Fisheries Investigations Reports. Volume 47, January 1 to December 31, 2006. pp. 79-91.

Urick, R.J. 1982. Sound Propagation in the Sea. Peninsula Publishing, Los Altos CA.

APPENDIX A – MITIGATION MEASURES EMPLOYED

This appendix contains a list of applicable mitigation measures employed at the time JTFEX 08-5 occurred.

Table A-1. List of applicable mitigation measures for Southern California exercises.

	NDE II (01/07 Exemption)	2008 CTX/JTFX (with Court restrictions as of May 2008)
PERSONNEL TRAINING	All Lookouts onboard platforms involved in ASW training events will review the NMFS-approved Marine Species Awareness Training (MSAT) material prior to use of mid-frequency active sonar. All Commanding Officers, Executive Officers, and officers standing watch on the bridge will have reviewed the MSAT material prior to training event employing MFA sonar. Navy lookouts will undertake extensive training in order to qualify as a watchstander in accordance with Lookout Training Handbook (NAVEDTRA 129869-B). Lookout training will include on-the-job instruction under the supervision of a qualified, experienced watchstander. Following successful completion of this supervised training period, lookouts will complete Personal Qualification Standard program, certifying that they have demonstrated the necessary skills (such as detection and reporting of partially submerged objects). This does not preclude personnel being trained as lookouts from being counted as those listed in previous measures so long as supervisors monitor their progress and performance. Lookouts will be trained in the most effective means to ensure quick and effective communication within the command structure in order to facilitate implementation of protective measures if marine species are spotted.	All surface ship lookouts and topside watchstanders (i.e., OODS, JOODS) as well as maritime patrol aircraft (MPA) aircrews and ASW/MIW helicopter aircrews must complete Marine Species Awareness Training (MSAT) by viewing the U.S. Navy MSAT DVD. All units that employee MFAS shall ensure they fully understand and implement the marine mammal mitigation measures and reporting requirements promulgated in this message. Foreign participants are encouraged to follow mitigation measures to the extent they will not impair operations or operational capabilities. Commanding officers shall thoroughly review this guidance with key personnel and watchstanders to ensure full situational awareness and compliance.
AREA OF OPERATION		MFA sonar OPAREA. Use of MFAS in the SOCAL Operating Area for CTX 08-5 will occur in W-291 and SOAR only. Subject to additional restrictions as set forth in subsequent paragraphs. MFA Sonar Exclusion Zones. MFAS shall not be employed within 12 nm of the California coastline. Catalina Basin Exclusion. MFAS shall not be employed in the Catalina Basin (located between Santa Catalina Island and San Clemente Island). San Clemente Island Exclusion. MFAS shall not be employed within 5 nm of the western shore of San Clemente Island.
PRE-USE MONITORING	Prior to start-up or restart of active sonar, operators will check that the Safety Zone radius around the sound source is clear of marine mammals. Helicopters shall observe/survey the vicinity of an	Pre-Exercise Monitoring – Dedicated Aircraft. Dedicated aerial monitoring shall be conducted by either military or contract aircraft to monitor for the presence of marine mammals for 60 minutes prior to the first employment of MFAS and

	NDE II (01/07 Exemption)	2008 CTX/JTFX (with Court restrictions as of May 2008)
	ASW exercise for 10 minutes before the first deployment of active (dipping) sonar in the water. Submarine sonar operators will review detection indicators of close-aboard marine mammals prior to the commencement of ASW operations involving active mid-frequency sonar. *(See pre-exercise monitoring requirements under Environmental Factors Measure, below.)*	commencement of the ASW portion of the exercise. A gap between completion of aerial monitoring and the first use of MFAS shall be avoided (and shall not exceed 60 minutes). If marine mammals are detected, report sightings to assigned aircraft control unit (ACU) or Tactical Support Center (TSC) for submission to CIC. CIC will disseminate the sighting information to all platforms in the area with a recommendation for appropriate action. Subject to para. 6.E.6. exception, if marine mammals are detected within 2200 yards (2000 meters), MFAS shall not be employed until (1) the marine mammals are seen to leave the vicinity, or (2) the MFAS sonar employing unit has transited at least 2200 yards (2000 meters) away from the marine mammals. Exercise monitoring – individual units. Individual units are required to monitor for the presence of marine mammals for 60 minutes prior to the first use of MFAS each day. Dedicated aerial monitoring in the previous paragraph satisfies this requirement for the first day's use of MFAS. or subsequent days of the exercise, units shall continuously monitor for and report the presence of marine mammals throughout the exercise, as a matter of course, units will already be in compliance with this daily 60 minute monitoring requirement. Prior to start-up or restart of active sonar, operators will ensure that the 2200 yard (2000 meter) MFAS shutdown zone is clear of marine mammals. Sub sonar operators will check for passive indication of marine mammals close aboard prior to use of MFAS. Close aboard is defined as visible bearing rate on DIMUS display. Ship sonar operators will check for passive indication of marine mammals on the underwater telephone in order to alert lookouts prior to use of MFAS.
DURING USE MONITORING	**Surface Vessels:** On the bridge of surface ships, there will always be at least three people on watch whose duties include observing the water surface around the vessel. In addition to the three personnel on watch noted previously, all surface ships participating in ASW exercises will have at all times during the exercise at least two additional personnel on watch as lookouts. Personnel on lookout and officers on watch on the bridge will have at least one set of binoculars available for each person to aid in the detection of marine mammals. On surface vessels equipped with MFA, pedestal-	During Exercise Monitoring – Military and contract aircraft participating in the exercise shall monitor for marine mammals during their assigned missions and report sightings to assigned Aircraft Control Unit (ACU) or Tactical Support Center (TCS) for submission to CIC. CIC will disseminate the sighting information to all platforms in the area with a recommendation for appropriate action (e.g., MFAS shut down; MFAS power down; surface or subsurface vessels to avoid area or increase distance from mammals; aerial platforms to increase vigilance). Any spotting of marine mammals shall be communicated to units employing MFAS with all possible speed to allow for timely compliance with 2200 yard (2000 meter) MFAS shutdown zone (subject to para. 6.E.6. exception).

	NDE II (01/07 Exemption)	2008 CTX/JTFX (with Court restrictions as of May 2008)
	mounted "Big Eye" (20x110) binoculars will be present and in good working order to assist in the detection of marine mammals in the vicinity of the vessel. Personnel on lookout will employ visual search procedures employing a scanning methodology in accordance with the Lookout Training Handbook (NAVEDTRA 12968-B). After sunset and prior to sunrise, lookouts will employ Night Lookout Techniques in accordance with the Lookout Training Handbook. Personnel on lookout will be responsible for reporting all objects or anomalies sighted in the water (regardless of the distance from the vessel) to the Officer of the Deck, since any object or disturbance (i.e., trash, periscope, surface disturbance, discoloration) in the water may be indicative of a threat to the vessel and its crew or indicative of a marine species that may need to be avoided as warranted. **Aircraft:** Navy aircraft participating in exercises at sea will conduct and maintain, when operationally feasible and safe, surveillance for marine species of concern as long as it does not violate safety constraints or interfere with the accomplishment of primary operational duties. **Passive Acoustic:** All personnel engaged in passive acoustic sonar operation (including aircraft, surface ships, or submarines) will monitor for marine mammal vocalizations and report the detection of any marine mammals to the appropriate watch station for dissemination and appropriate action. During MFA operations, personnel will utilize all available sensor and optical systems (such as Night Vision Goggles) to aid in the detection of marine mammals. *(See additional exercise monitoring measures under Environmental Factors Measure, below.)*	During Exercise Monitoring – Lookouts. On the bridge of surface ships, there will always be at least three non-dedicated watchstanders required to look out for marine mammals whose duties include observing the water surface around the vessel. In addition to the three personnel on watch, all surface ships participating in ASW exercises will have at least two dedicated lookouts at all times when MFAS is being used during the exercise, required to look out for marine mammals. Each person on watch will have a set of binoculars to aid in detection of marine mammals. On surface vessels equipped with MFAS, pedestal-mounted (Big Eye/ 20 x 110) binoculars will be used as feasible to assist in detection of marine mammals in the vicinity of the vessel. All sightings of marine mammals by all watchstanders and all lookouts will be reported directly to the Combat Information Center (CIC) or via the appropriate watch stations for submission to CIC. CIC will disseminate the sighting information to all platforms in the area with a recommendation for appropriate action (e.g., MFAS shut down; MFAS power down; surface or subsurface vessels to avoid area or increase distance from mammals; aerial platforms to increase vigilance). During MFAS operations, personnel will utilize all available sensor and optical systems (such as night vision goggles) to aid in detection of marine mammals. Personnel on lookout will employ visual search procedures employing a scanning methodology IAW lookout training handbook (NAVEDTRA 12968-D).
MFAS OPERATIONS	Sonar levels (generally) – The ship or submarine will operate sonar at the lowest practicable level, not to exceed 235 dB, except as required to meet tactical training objectives.	MFAS Operations. Operate MFAS at the lowest practicable level, not to exceed 235 dB, except to meet tactical training objectives.
SAFETY ZONE SHIPS	20. Safety Zones – When marine mammals are detected by any means (aircraft, shipboard lookout, or acoustically) within 1,000 yards of the sonar dome (the bow), the ship or submarine will limit active transmission levels to at least 6 dB below normal operating levels. (i) Ships and submarines will continue to limit maximum transmission levels by this 6-dB factor until the animal has been seen to leave the area,	6.E.4. MFAS Shutdown Zone. Cease use of MFAS (either hull mounted or aircraft based sonobuoys or active dipping sonar) when marine mammals are spotted within 2200 yards (2000 meters) until unit has transited at least 2200 yards (2000 meters) away from the marine mammals or the mammals are seen to exit the safety zone. If sonar is shut down due to presence of marine mammals, then reporting requirements described in para. 7 apply.

	NDE II (01/07 Exemption)	2008 CTX/JTFX (with Court restrictions as of May 2008)
	has not been detected for 30 minutes, or the vessel has transited more than 2,000 yards beyond the location of the last detection. (ii) Should a marine mammal be detected within or closing to inside 500 yards of the sonar dome, active sonar transmissions will be limited to at least 10 dB below the equipment's normal operating level. Ships and submarines will continue to limit maximum ping levels by this 10-dB factor until the animal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yards beyond the location of the last detection. (iii) Should the marine mammal be detected within or closing to inside 200 yards of the sonar dome, active sonar transmission will cease. Sonar will not resume until the animal has been seen to leave the area, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yards beyond the location of the last detection. (iv) Special conditions applicable for dolphins and porpoise only: If, after conducting an initial maneuver to avoid close quarters with dolphins or porpoises, the Officer of the Deck concludes that dolphins or porpoises are deliberately closing to ride the vessel's bow wave, no further mitigation actions are necessary while the dolphins or porpoises continue to exhibit bow wave riding behavior. (v) If the need for power-down should arise as detailed in "Safety Zones" above, the ship or submarine shall follow the requirements as though they were operating at 235 dB – the normal operating level (i.e., the first power- down will be to 229 dB, regardless of at what level above 235 sonar was being operated).	6.E.5. Bow Riding Exception. Special conditions applicable to dolphins and porpoises only. If, after conducting an initial maneuver to avoid close quarters with dolphins or porpoises, the officer of the deck concludes that dolphins or porpoises are intentionally riding the vessel's bow wave, MFAS shutdown is no longer required for as long as the dolphins or porpoises continue to exhibit bow wave riding behavior. Note: this provision also applies to 6.E.6 and 6.E.7. 6.E.6. MFAS Shutdown Exception. Officer Conducting the Exercise (OCE) will determine critical point in the exercise (CPE) and promulgate to all participating units when a CPE exists. When CPE exists, the following mitigation measures will apply: 6.E.6.A 1000 meters. When a marine mammal is detected within 1000 meters from the sonar source, power down MFAS by 6 dB below normal operating levels. 6.E.6.B. 500 meters. When a marine mammal is detected within 500 meters from the sonar source, power down MFAS by 10 dB below normal operating level. 6.E.6.C. 200 meters. When a marine mammal is detected within 200 meters from the sonar source, shut down MFAS. 6.E.6.D. A critical point in the exercise is a point when, in the discretion of the Officer Conducting the Exercise (OCE), the continued use of MFAS is critical to the certification of a STRKGRU or the effective training of its personnel. 6.E.6.E. OCE Critical Point in the Exercise (CPE) determination shall be promulgated via chat to exercise participants.
SAFETY ZONE SONOBUOYS	Aircraft with deployed sonobuoys will use only the passive capability of sonobuoys when marine mammals are detected within 200 yards of the sonobuoy.	Sonobuoys. Aircraft shall observe/survey the vicinity of each ASW event location for 10 min prior to commencement of the prosecution (i.e. before deploying DICASS sonobuoys). Subject to para. 6.E.6. Exception, if marine mammals are spotted within the 2200 yard (2000 meter) safety zone, all use of active sonar shall cease until the mammals are seen to exit the safety zone. Sonobuoys (CPE determination only). Aircraft deploying sonobuoys will cease active transmissions and use only passive capability of sonobuoys when marine mammals are detected within 1000 meters of the sonobuoy (no SSD) and 2000 meters (during SSD conditions). Sonobuoys. Whenever SSD is present, aircraft deploying sonobuoys will cease active transmissions and use only passive capability of sonobuoys when marine mammals are detected

	NDE II (01/07 Exemption)	2008 CTX/JTFX (with Court restrictions as of May 2008)
		within 2000 meters of the sonobuoy.
HELO DIPPING	Helicopters shall observe/survey the vicinity of an ASW exercise for 10 minutes before the first deployment of active (dipping) sonar in the water. Helicopters shall not dip their sonar within 200 yards of a marine mammal and shall cease pinging if a marine mammal closes within 200 yards after pinging has begun.	Helicopters. Helicopters shall observe/survey the vicinity of each ASW event location for 10 min prior to commencement of the prosecution (i.e. before deploying active dipping sonar). Subject to para. 6.E.6. Exception, if marine mammals are spotted within the 2200 yard (2000 meter) safety zone, all use of active sonar shall cease until the helicopter has transited at least 2200 yards (2000 meters) away from the marine mammals, or the mammals are seen to exit the safety zone. If sonar is shut down due to presence of marine mammals, then reporting requirements described in para. 7 apply. When CPE exists (No SSD), the following mitigation measures will apply for dipping sonar: When a marine mammal is spotted within 1000 meters of any helicopter-based sonar, power down helicopter-based sonar to 500 watts (to approximately 204 dB), to be maintained until the animal has left the area, is not sighted for 30 minutes, or the sonar-emitting helicopter transits more than 1000 meters from the location of the sighting; When a marine mammal is detected within or closing to within 500 meters of any helicopter-based sonar, shut down helicopter-based sonar, to be maintained until the animal has left the area, is not seen for 30 minutes, or the sonar-emitting helicopter transits more than 500 meters beyond the location of the sighting. When CPE exists (SSD present), the following mitigation measures will apply for dipping sonar: When a marine mammal is spotted within 2000 meters of any helicopter-based sonar, power down helicopter-based sonar to 500 watts (to approximately 204 dB), to be maintained until the animal has left the area, is not sighted for 30 minutes, or the sonar-emitting helicopter transits more than 2000 meters from the location of the sighting; When a marine mammal is detected within or closing to within 1000 meters of any helicopter-based sonar, shut down helicopter-based sonar, to be maintained until the animal has left the area, is not seen for 30 minutes, or the sonar-emitting helicopter transits more than 1000 meters beyond the location of the sighting.
SURFACE DUCTING MEASURE		Significant Surface Ducting Conditions. Significant surface ducting conditions is defined as a mixed layer of constant water temperature extending from the sea surface to 100 feet or more. When significant surface ducting conditions are detected and CPE is not designated by OCE, units

	NDE II (01/07 Exemption)	2008 CTX/JTFX (with Court restrictions as of May 2008)
		shall comply with para. 6.E.4. MFAS shutdown zone. When significant surface ducting conditions are detected and CPE has been designated by OCE, units will utilize the following mitigation measures: 2000 meters (2200 yards). A 6 dB power down will occur when a marine mammal is detected within 2000 meters (2200 yards) from the sonar source. 1000 meters (1100 yards). A 10 dB power down will occur when a marine mammal is detected within 1000 meters (1100 yards) from the sonar source. 500 meters (550 yards). MFAS shut down will occur when a marine mammal is detected within 500 meters (550 yards) from the sonar source. Surface ducting conditions will be monitored by the SCC and promulgated to all ASW units.
ENVIRONMENTAL FACTORS MEASURE	26. Increased vigilance during major ASW training exercises with tactical active sonar when critical conditions are present: Based upon lessons learned from strandings in the Bahamas (2000), the Madeiras (2000), the Canaries (2002) and Spain (2006), beached whales are of particular concern since they have been associated with MFA operations. Navy should avoid planning major ASW training exercises with MFA in areas where they will encounter conditions that, in their aggregate, may contribute to a marine mammal stranding event. **[note: This increased vigilance is not required in Southern California because the below conditions do not exist in the aggregate in this region.]** The conditions to be considered during exercise planning include: (1) Areas of at least 1,000 m depth near a shoreline where there is a rapid change in bathymetry on the order of 1,000-6,000 meters occurring across a relatively short horizontal distance (e.g., 5 nm). (2) Cases for which multiple ships or submarines (≥ 3) operating MFA in the same area over extended periods of time (≥ 6 hours) in close proximity (≤ 10 nm apart). (3) An area surrounded by land masses, separated by less than 35 nm and at least 10 nm in length, or an embayment, wherein operations involving multiple ships/subs (≥ 3) employing MFA near land may produce sound directed toward the channel or embayment that may cut off the lines of egress for marine mammals. (4) Although not as dominant a condition as bathymetric features, the historical presence of a	

	NDE II (01/07 Exemption)	2008 CTX/JTFX (with Court restrictions as of May 2008)
	significant surface duct (i.e., a mixed layer of constant water temperature extending from the sea surface to 100 or more feet). If the major exercise must occur in an area where the above conditions exist in their aggregate, these conditions must be fully analyzed in environmental planning documentation. Navy will increase vigilance by undertaking the following protective measure: A dedicated aircraft (Navy asset or contracted aircraft) will undertake reconnaissance of the embayment or channel ahead of the exercise participants to detect marine mammals that may be in the area exposed to active sonar. Where practical, advance survey should occur within about two hours prior to MFA use, and periodic surveillance should continue for the duration of the exercise. Any unusual conditions (e.g., presence of sensitive species, groups of species milling out of habitat, any stranded animals) shall be reported to the Officer in Tactical Command (OTC), who should give consideration to delaying, suspending or altering the exercise. All Safety Zone requirements described in Measure 20 apply. The post-exercise report must include specific reference to any event conducted in areas where the above conditions exist, with the exact location and time/duration of the event, and noting results of surveys conducted.	
REPORTING REQUIRE-MENTS	Navy will coordinate with the local NMFS Stranding Coordinator regarding any unusual marine mammal behavior and any stranding, beached live/dead, or floating marine mammals that may occur at any time during or within 24 hours after completion of mid-frequency active sonar use associated with ASW training activities. Navy will submit a report to the Office of Protected Resources, NMFS, within 120 days of the completion of a Major Exercise. This report must contain a discussion of the nature of the effects, if observed, based on both modeled results of real-time events and sightings of marine mammals. If a stranding occurs during an ASW exercise, NMFS and Navy will coordinate to determine if MFA should be temporarily discontinued while the facts surrounding the stranding are collected. *(See special reporting requirements under Environmental Factors Measures.)*	7. Reports and Data Collection. Data collection requirements will support marine mammal After Action Report (AAR) required to comply with MMPA and ESA post-exercise assessment products. Marine Mammal After Action Report. All units are required to submit an AAR input to Commander, ESG. Commander ESG shall consolidate all reports into a final AAR message within 10 days of completion of the exercise. This timeline is required due to regulatory requirements that Navy verbally report marine mammal sighting information and impacts to MFAS Ops to National Marine Fisheries Services within 15 business days from exercise completion. The Final Report will be comprised of two parts. Part one will report all marine mammals sighted during the exercise, and will include the data listed below: A. DTG of initial sighting. B. Unit and posit (unit name and lat/long). Note, if report is for ASW helo assigned to vessel, this must be reported separately from surface ship reports. C. Description of animal by species if known,

	NDE II (01/07 Exemption)	2008 CTX/JTFX (with Court restrictions as of May 2008)
		otherwise specify dolphin/porpoise, large whale, small whale, seal/sea-lion, etc. D. Estimated number of animals. E. True bearing and range from unit. F. Sea state-WEAX at time of obs (i.e., wave height and visibility). G. Animal observation at time of sighting: describe animal's motion relative to ship, how long animal was in view, and any further ampn of what was seen. H. MFAS status at initial sighting: MFAS on, MFAS off, NA (for non-MFAS equipped ships). I. Action taken (none, altered course to avoid, MFAS power down, MFAS shut down). Only in cases where MFAS is powered down or shut down, the following additional information is required in order to conduct post-exercise Impact assessment. J. Unit course and speed. K. Animal direction of relative motion and estimated speed. L. Action timeline: length of time for MFAS power down or shut down. M. As applicable, whether significant surface ducting conditions existed at time of marine mammal sighting. N. As applicable, at time of marine mammal sighting, start and stop time that unit implemented CPE measures and, as applicable, action taken (i.e., 6 dB/1000 meters, 10 dB/500 meters or MFAS shutdown at 200 meters). O. Action impact summary (i.e., tactical degradation assessment – none, slight, moderate, significant). P. Action impact analysis (i.e., demonstration of operational impact to ASW prosecution and realistic training at time of marine mammal sighting). Repeat paras. A-P as necessary to report additional sightings. Sightings shall be in the following format: A. DTG/B. Unit and Posit/C. Description/D. #Animals/E. Brng-Rng/F. Sea State-WEAX/G. Behavior/H. MFAS status. If MFAS mitigation measures were required, report the following additional information: I. Action taken/J. Unit CRS-SPD/K. Animal crs-spd/L. Action timeline/M. Significant surface ducting (SSD) conditions/N. Start and stop time of CPE

	NDE II (01/07 Exemption)	2008 CTX/JTFX (with Court restrictions as of May 2008)
		measure/O. Impact summary/P. Impact analysis. Part two of the report will provide (1) a commander's assessment of the overall effectiveness of the mitigation measures (to include discussion of circumstances affecting operating during instances that CPE designated and/or powerdown was required due to significant surface ducting conditions), (2) make recommendations to improve these measures, and (3) report any impact to training fidelity caused by these measures. It is particularly important for the commander to capture the negative impact that these measures have on realistic training. **Ongoing Reporting:** **Sightings:** Sightings of all marine mammals shall be passed via the chain of command to the COMTHIRDFLT Fleet Watch Officer in order to alert other units in the area to the possibility of the marine mammal's presence. **Collision:** A Navy report is required in the event of a whale collision. If possible, take video and/or photographs of the stricken whale. Coordinate further actions with C3F. Attempt to identify distinguishing characteristics of the whale involved. The 'whale wheel,' a device that lists various species of whales and their identifying features, can assist in this regard. **Stranding/Floating:** In addition, a Navy report is required in the event sighting of a stranded or floating marine mammal. If possible, take video and/or photographs of the marine mammal carcass. Coordinate further actions with C3F. **Report of Training:** All units that employ MFAS shall ensure they fully understand and implement the marine mammal mitigation measures and reporting requirements promulgated in this message. Foreign participants are encouraged to follow mitigation measures to the extent they will not impair operations or operational capabilities. Commanding officers shall thoroughly review this guidance with key personnel and watchstanders to ensure full situational awareness and compliance.

APPENDIX B– SUPPORTING INFORMATION

This appendix contains supporting science based information use to augment discussions within this report.

Table B-1. SOCAL sea states as reported by ship exercise participants for JTFEX 08-5 conducted within the SOCAL OPAREA from 20 March through 7 April 2008.

Graphic	Beaufort Wind Force Scale *	Observed Sea Surface Condition	Sailor's Term	Effects on Land	Typical Wind Speed (MPH)
	0	Mirror smooth and glassy surface	Calm	Calm; smoke rises straight up	0
Beaufort Scale 1	1	Small ripples or capillary waves on glassy surface	Light Air	Smoke drifts with wind direction	1-3
Beaufort Scale 2	2	Larger ripples or wavelets on glassy surface	Light Breeze	Leaves begin to rustle; wind felt on face	4 - 7
Beaufort Scale 3	3	Wavelets of irregular direction and shape; a few crests break on glassy surface	Gentle Breeze	Small flags extend; leaves in constant motion	8 - 12
Beaufort Scale 4	4	Small chop, defined direction; numerous whitecaps	Moderate Breeze	Dust, leaves, and loose paper move	13 - 18

* One of the first scales to estimate wind speeds and the effects at sea was created by Britain's Admiral Sir Francis Beaufort (1774-1857) who developed the scale in 1805 to help sailors estimate winds via visual observations. The scale starts with 0 and goes to a force of 12. The Beaufort scale is still used today to estimate wind strengths.

Table B-2. Visual detections of cetaceans over CalCOFI cruises from July 2006 – April 2007. Total number of schools sighted and total number of animals sighted per species for each trip. (Table from: Hildebrand 2007). Red box indicates sightings from same seasonal time period but not year as JTFEX 08-5 (Mar-Apr). Graphic below shows likely April ESA-listed species (images not to scale).

	July 2006		November 2006		January 2007		April 2007		July 2006 – April 2007	
Species	# sight	# animals	# sight	# animals	# sight	# animals	# sight	# animals	# sight	# animals
Blue whale	11	16	3	4					14	20
Fin whale	7	7	8	11	1	2	1	2	17	22
Humpback whale	3	5	1	1			3	5	7	11
Sei whale							1	1	1	1
Minke whale	2	2			1	1	1	1	4	4
Gray whale					40	73	2	4	42	77
Sperm whale	4	12	1	4	2	3	3	6	10	25
Short-beaked common dolphin	36	1802	10	678	23	1488	2	193	71	4161
Long-beaked common dolphin	3	137	2	68			1	1800	6	2005
Common dolphin species	15	717	3	395	9	2638	5	1297	32	5047
Pacific white-sided dolphin			3	60	1	30	5	100	9	190
Risso's dolphin					2	292	4	73	6	365
Northern right-whale dolphin			1	45			2	35	3	80
Bottlenose dolphin			6	45	1	30	2	16	9	91
Dall's porpoise			1	1	10	53	15	78	26	132
Short-finned pilot whale	1	30							1	30
Killer whale	1	3							1	3
Cuvier's Beaked whale					1	1			1	1
Unidentified large whale	8	20	15	20	11	15	3	4	37	59
Unidentified small whale	1	4					2	2	3	6
Unidentified odontocete					1	2	1	1	2	3
Unidentified dolphin	7	172	5	162	7	480	2	4	21	818
Unidentified beaked whale					1	5			1	5
Total	99	2927	59	1494	111	5113	55	3622	324	13156

Possible ESA-listed species that could have been sighted by exercise participants give APRIL exercise time frame of JTFEX 08-5

Fin whale

Humpback whale

Possible, but less likely ESA-listed species that could have been sighted by exercise participants give APRIL exercise time frame of JTFEX 08-5

Sperm whale

Guadalupe fur seal

Minke whale

Other common but non-ESA listed species that could have been sighted by exercise participants give APRIL exercise time frame of JTFEX 08-5

Gray whale

Minke whale

Northern elephant seal

California sea lion

Pacific harbor seal

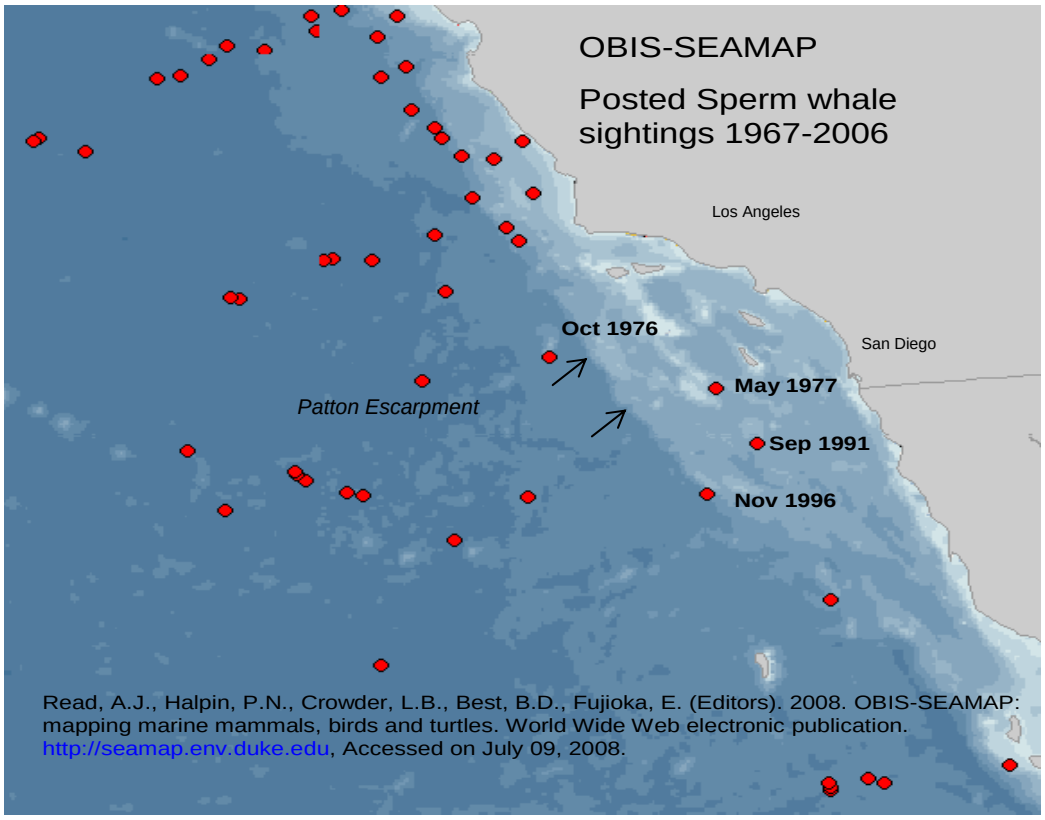


Figure B-1. Sperm whale sightings from 1967 to 2006 within the offshore waters of Central California, Southern California, and Baja Mexico. Date from OBIS-SEAMAP.

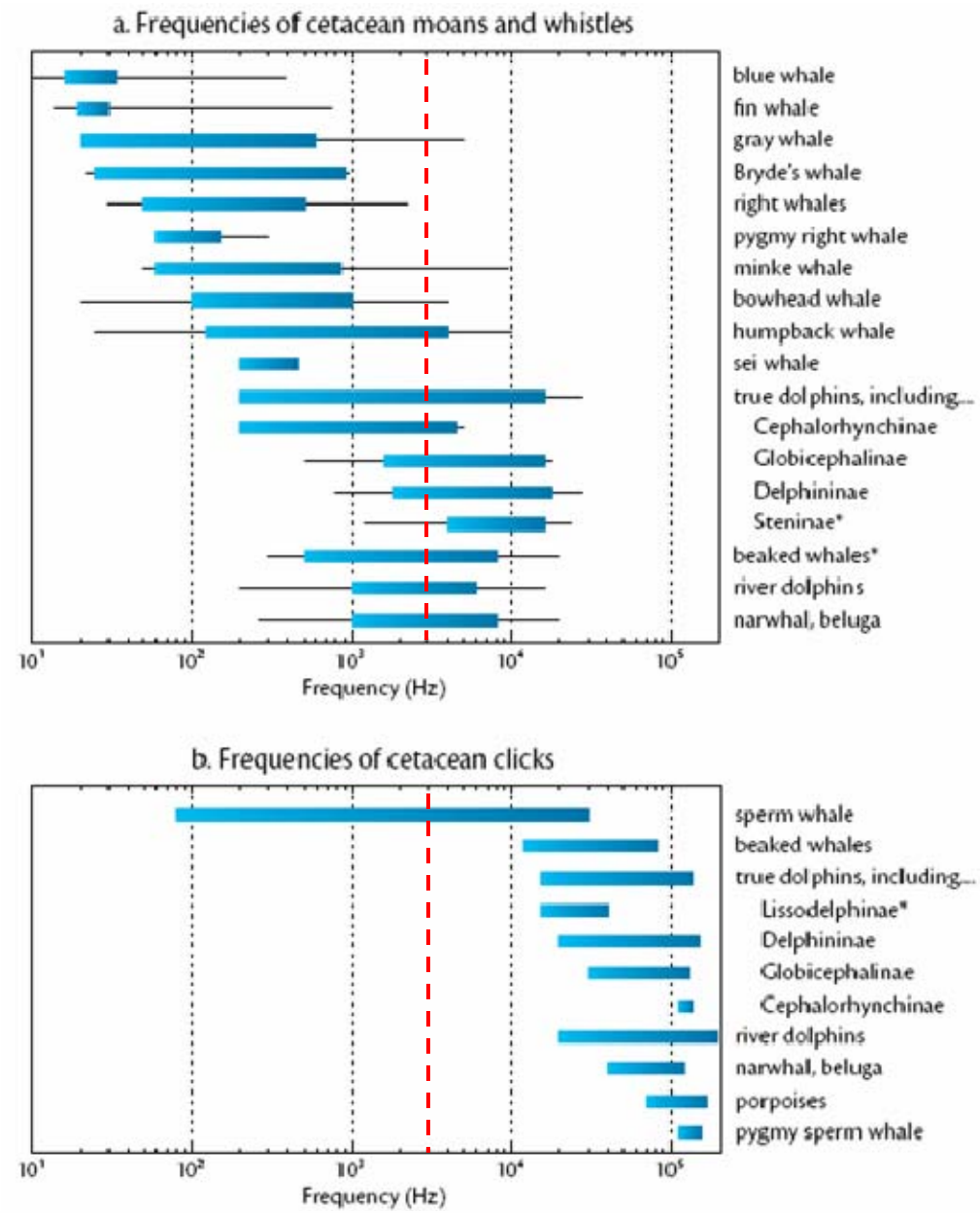


Figure 1. Known frequency ranges of cetacean sounds. Large whales are listed by species, while toothed whales are grouped into families. The thick bar shows the range of the most common types of vocalizations, while the thinner line shows recorded extremes of frequency. An asterisk (*) indicates that the upper frequency is unknown because of recording equipment limitations. (a) Tonal sounds—moans and whistles—with most baleen whale species shown separately. (b) Echolocation clicks. Baleen whales do not produce high-frequency echolocation clicks, while some toothed whales, dolphins, and porpoises do not produce tonal sounds.

Figure B-2. Known frequency range of cetacean vocalizations and echolocation. Frequency of U.S. Navy MFAS (AN/SQS-53) shown in dashed line (From: Mellinger et al. 2007).

Prepared for
National Marine Fisheries Service
Office of Protected Resources

Prepared by
Department of the Navy

In accordance with
National Defense Exemption 30 June 2006

USS Stennis CSG

COMPOSITE TRAINING UNIT EXERCISE 06-04

(C2X 06-04)

20 Sep-12 Oct 2006

After Action Report

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

INTRODUCTION

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

The following information is for the USS Stennis Carrier Strike Group (CSG) Composite Training Unit Exercise (C2X) 06-04 conducted from 20 Sep-12 Oct 2006 in Southern California (SOCAL). The types of ASW training conducted during C2X 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 Southern California Offshore Range (SCORE) and the Southern California Offshore ASW Range (SOAR) west of San Clemente Island. 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 as follows:

Section 1 provides an estimated number of marine mammals observed during the C2X 06-04 ASW events based on analysis of 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 impact of the measures on the military readiness activities.

Section 3 provides data on the location and hours of active MFAS used during C2X 06-04 placed in context with observations of cetacean behaviors resulting from the ship based reports and exercise participants.

SECTION 1: Marine Mammals Observed

Section 1 provides estimated numbers of marine mammals observed in Southern California waters during C2X 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.

All detections were made by standard Navy surface ship lookout marine mammal detection and reporting procedures. There were no sighting reported from aircraft platforms. U.S. Navy participating Mid-Frequency Active Sonar (MFAS) equipped units included five P-3C maritime patrol aircraft, four SH-60B helicopters, five SH-60F helicopters and two submarines. U.S.Navy MFAS equipped participating surface vessels included three cruisers, five destroyers and two frigates.

Table 1 provides a detailed timeline of marine mammal observations made by Navy exercise participants. During C2X 06-04, there were **73** marine mammal sightings for a total estimate of **1,225** animals observed.

Thirty-one of the 73 sightings included a total of 1,091 “dolphins” which comprised 42% of the sightings and 89% of total animal seen during C2X 06-04. This observation is consistent with science-based reports that dolphins, and in particular, the short-beaked common dolphin (*Delphinus delphis*), comprise as much as 85-95% of the marine mammal abundance within Southern California.

Large whale sightings comprised 34% of the total sightings (n=25 sighting totaling 43 animals). Small whale sightings comprised 14% of the total sightings (n=10 sightings totaling 32 animals). Pinnipeds (seals or sea lions) sighting comprised 10% of the total sightings (n=7 sighting totaling 54 animals).

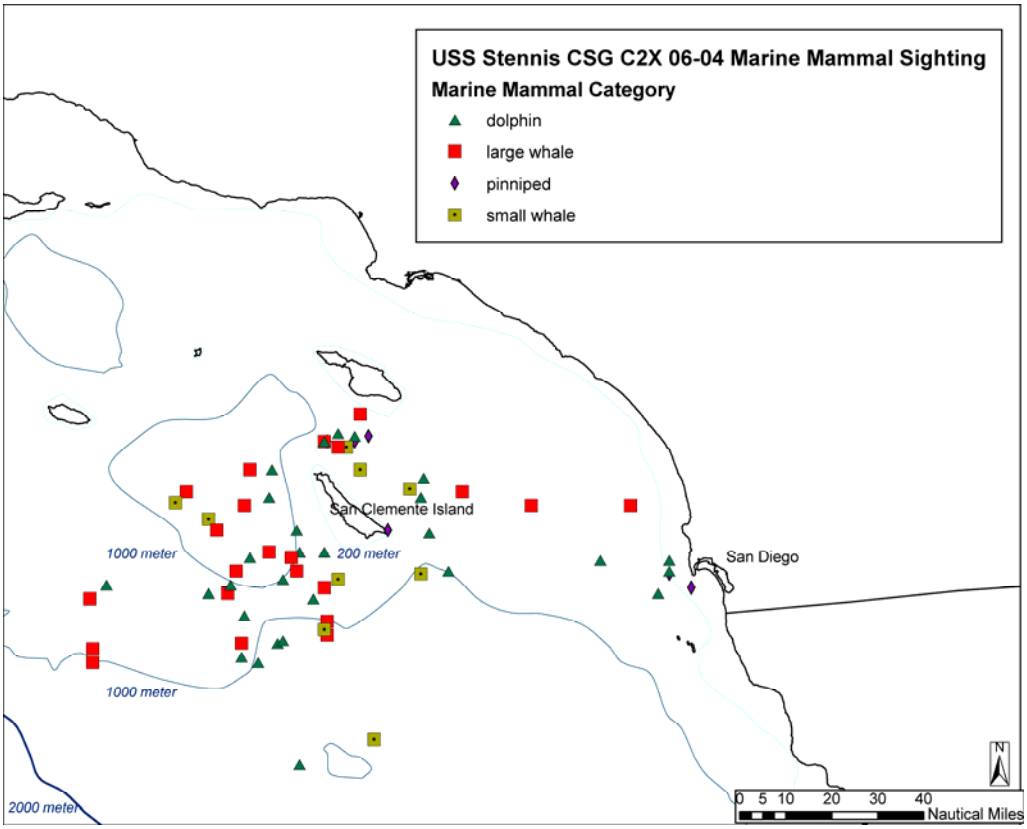
Table 1. Marine mammal sightings and actions by exercise participants during C2X 06-04. Text in red **Bold** indicates events when MFAS was in use and secured due to marine mammal mitigation. Red text in *Italics* indicates when MFAS was in use, but mitigation other than securing sonar was enacted.

Date-Time	Description of Actions Taken	# of animals	Animal Type	Observation
09/21-1104	Surface ship sights 14 "seals or sea lions" at 100 yards. MFAS NOT in use. No action taken.	14	pinniped	resting on surface
09/21-1004	Surface ship sights 20 "seals or sea lions" at 50 yards. MFAS NOT in use. No action taken.	20	pinniped	resting on surface
09/21-1232	Surface ship sights 1 "seal or sea lion" at 150 yards. MFAS NOT in use. No action taken.	1	pinniped	feeding
09/22-1740	Surface ship sights 25 "dolphins" at 100 yards. MFAS NOT in use. No action taken.	25	dolphin	traveling
09/22-0909	Surface ship sights 1 "small whale" at 1500 yards. MFAS NOT in use. No action taken.	1	small whale	traveling
09/22-0920	Surface ship sights 50 "dolphins" at 700 yards. MFAS NOT in use. No action taken.	50	dolphin	jumping
09/22-1257	Surface ship sights 1 "large whale" at 400 yards. MFAS NOT in use. No action taken.	1	large whale	traveling
09/22-1320	Surface ship sights 1 "large whale" at 200 yards. MFAS NOT in use. No action taken.	1	large whale	traveling
09/23-1819	Surface ship sights 20 "dolphins" at 1500 yards. MFAS NOT in use. No action taken.	20	dolphin	jumping
09/23-0800	Surface ship sights 100 "dolphins" at 1000 yards. MFAS NOT in use. No action taken.	100	dolphin	jumping
09/23-1203	Surface ship sights 20 "dolphins" at 300 yards. MFAS NOT in use. No action taken.	20	dolphin	jumping
09/23-1506	Surface ship sights 40 "dolphins" at 200 yards. MFAS NOT in use. No action taken.	40	dolphin	transiting
09/23-1520	Surface ship sights 1 "seal carcass" at 1000 yards. MFAS NOT in use. No action taken.	1	pinniped	-
09/24-0512	Surface ship sights 15 "dolphins" at 200 yards. MFAS NOT in use. No action taken.	15	dolphin	transiting
09/24-0616	Surface ship sights 50 "dolphins" at 100 yards. MFAS NOT in use. No action taken.	50	dolphin	jumping
09/24-0843	Surface ship sights 3 "small whales" at 400 yards. **MFAS in use. Sonar secured.**	3	small whale	traveling
09/24-1200	Surface ship sights 2 "large whales" at 1000 yards. MFAS NOT in use. No action taken.	2	large whale	milling
09/24-1355	Surface ship sights 1 "large whale" at 2000 yards. *MFAS in use. No action taken.*	1	large whale	milling
09/25-0714	Surface ship sights 2 "large whales" at 2000 yards. *MFAS in use. No action taken*.	2	large whale	milling
09/25-0735	Surface ship sights 20 "dolphins" at 300 yards. MFAS NOT in use. No action taken.	20	dolphin	traveling
09/25-0905	Surface ship sights 2 "large whales" at 2000 yards. *MFAS in use. Ship alters course.*	2	large whale	milling

Date-Time	Description of Actions Taken	# of animals	Animal Type	Observation
09/25-0943	Surface ship sights 1 "small whale" at 2000 yards. **MFAS in use. Sonar secured.**	1	small whale	traveling
09/25-1019	Surface ship sights 2 "large whales" at 1000 yards. MFAS NOT in use. No action taken.	2	large whale	milling
09/25-1122	Surface ship sights 16 "dolphins" at 150 yards. **MFAS in use. Sonar secured.**	16	dolphin	jumping
09/25-1157	Surface ship sights 1 "large whale" at 200 yards. MFAS NOT in use. No action taken.	1	large whale	traveling
09/25-1240	Surface ship sights 16 "dolphins" at 200 yards. **MFAS in use. Sonar secured.**	16	dolphin	jumping
09/26-1208	Surface ship sights 20 "dolphins" at 500 yards. MFAS NOT in use. No action taken.	20	dolphin	traveling
09/26-1409	Surface ship sights 5 "large whales" at 1000 yards. MFAS NOT in use. No action taken.	5	large whale	traveling
09/26-1415	Surface ship sights 5 "large whales" at 500 yards. MFAS NOT in use. No action taken.	5	large whale	traveling
09/26-1540	Surface ship sights 3 "small whales" at 800 yards. MFAS NOT active. No action taken.	3	small whale	traveling
09/27-0530	Surface ship sights 1 "small whale" at 500 yards. MFAS NOT active. No action taken.	1	small whale	traveling
09/27-1203	Surface ship sights 1 "small whale" at 2000 yards. *MFAS active. Ship alters course.*	1	small whale	traveling
09/28-1615	Surface ship sights 4 "large whales" at 1000 yards. MFAS NOT in use. No action taken.	4	large whale	traveling
09/28-0933	Surface ship sights 1 "large whale" at 800 yards. MFAS NOT in use. No action taken.	1	large whale	traveling
09/28-1115	Surface ship sights 1 "seal or sea lion" at 1000 yards. MFAS NOT in use. No action taken.	1	pinniped	jumping
09/28-1133	Surface ship sights 2 "large whales" at 1000 yards. **MFAS in use. Sonar secured.**	2	large whale	milling
09/28-1239	Surface ship sights 2 "large whales" at 1000 yards. MFAS NOT in use. No action taken.	2	large whale	milling
09/29-0543	Surface ship sights 1 "large whale" at 2000 yards. *MFAS in use. Ship alters course.*	1	large whale	milling
09/30-0841	Surface ship sights 1 "large whale" at 2000 yards. *MFAS in use. Ship alters course.*	1	large whale	milling
09/30-1117	Surface ship sights 30 "dolphins" at 500 yards. MFAS NOT in use. No action taken.	30	dolphin	jumping
10/01-1236	Surface ship sights 1 "large whale" at 1000 yards. MFAS NOT in use. No action taken.	1	large whale	traveling
10/01-1328	Surface ship sights 1 "large whale" at 2000 yards. MFAS NOT in use. No action taken.	1	large whale	traveling
10/01-1429	Surface ship sights 1 "large whale" at 1000 yards. MFAS NOT in use. Ship alters course.	1	large whale	traveling
10/02-1717	Surface ship sights 2 "large whales" at 600 yards. MFAS NOT in use. No action taken.	2	large whale	traveling

Date-Time	Description of Actions Taken	# of animals	Animal Type	Observation
10/02-1000	Surface ship sights 1 "dolphin" at 100 yards. MFAS NOT in use. No action taken.	1	dolphin	traveling
10/03-1123	Surface ship sights 20 "dolphins" at 1500 yards. MFAS NOT in use. No action taken.	20	dolphin	jumping
10/04-2219	Surface ship sights 2 "small whales" at 500 yards. MFAS NOT in use. No action taken.	2	small whale	traveling
10/04-0612	Surface ship sights 1 "large whale" at 500 yards. MFAS NOT in use. No action taken.	1	large whale	milling
10/05-0912	Surface ship sights 20 "dolphins" at 1500 yards. MFAS NOT in use. No action taken.	20	dolphin	jumping
10/06-0907	Surface ship sights 1 "large whale" at 1000 yards. MFAS NOT in use. No action taken.	1	large whale	traveling
10/06-1100	Surface ship sights 3 "small whales" at 1000 yards. MFAS NOT active. No action taken.	3	small whale	traveling
10/07-0634	Surface ship sights 50 "dolphins" at 1000 yards. MFAS NOT in use. No action taken.	50	dolphin	jumping
10/07-0842	Surface ship sights 20 "dolphins" at 50 yards. MFAS NOT in use. Ship alters course.	20	dolphin	jumping
10/08-1412	Surface ship sights 8 "dolphins" at 50 yards. MFAS NOT in use. No action taken.	8	dolphin	jumping
10/09-2131	Surface ship sights 40 "dolphins" at 100 yards. MFAS NOT in use. Ship alters course.	40	dolphin	jumping
10/09-0610	Surface ship sights 30 "dolphins" at 500 yards. MFAS NOT in use. No action taken.	30	dolphin	jumping
10/09-1157	Surface ship sights 17 "pilot whales" at 200 yards. MFAS NOT in use. Ship stops to allow animals to pass bow.	17	small whale	traveling
10/09-1320	Surface ship sights 13 "dolphins" at 1000 yards. MFAS NOT in use. No action taken.	13	dolphin	traveling
10/10-0543	Surface ship sights 2 "large whales" at 1000 yards. MFAS NOT in use. No action taken.	2	large whale	milling
10/10-0650	Surface ship sights 15 "dolphins" at 1000 yards. MFAS NOT in use. No action taken.	15	dolphin	jumping
10/10-0800	Surface ship sights 200 "dolphins" at 500 yards. MFAS NOT in use. No action taken.	200	dolphin	jumping
10/11-0836	Surface ship sights 2 "large whales" at 150 yards. MFAS NOT in use. Ship alters course.	2	large whale	traveling
10/11-1036	Surface ship sights 1 "seal or sea lion" at 200 yards. MFAS NOT in use. No action taken.	1	pinniped	milling
10/12-1625	Surface ship sights 125 "dolphins" at 2000 yards. MFAS NOT in use. No action taken.	125	dolphin	jumping
10/12-2225	Surface ship sights 4 "dolphins" at 1000 yards. MFAS NOT in use. No action taken.	4	dolphin	jumping
10/12-0002	Surface ship sights 1 "large whale" at 200 yards. MFAS NOT in use. No action taken.	1	large whale	traveling
10/12-0600	Surface ship sights 36 "dolphins" at 200 yards. MFAS NOT in use. No action taken.	36	dolphin	jumping

Date-Time	Description of Actions Taken	# of animals	Animal Type	Observation
10/12-0950	Surface ship sights 10 "dolphins" at 100 yards. MFAS NOT in use. No action taken.	10	dolphin	jumping
10/12-1028	Surface ship sights 20 "seals or sea lions" at 2000 yards. MFAS NOT in use. No action taken.	20	pinniped	traveling
10/13-1643	Surface ship sights 20 "dolphins" at 800 yards. MFAS NOT in use. No action taken.	20	dolphin	jumping
10/13-1655	Surface ship sights 1 "seal or sea lion" at 100 yards. MFAS NOT in use. No action taken.	1	pinniped	traveling
10/13-0028	Surface ship sights 50 "dolphins" at 1000 yards. MFAS NOT in use. No action taken.	50	dolphin	traveling
10/13-0925	Surface ship sights 5 "dolphins" at 200 yards. MFAS NOT in use. No action taken.	5	dolphin	jumping
73	= total sighting events total number of animals=	**1225**		



Marine mammal sightings C2X 06-04 (20 Sep-12 Oct 2006).

SECTION 2: Mitigation and Monitoring

As required under 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.

C2X 06-04 Assessment

Individual ship sonar use is contained in classified databases; approximately 310 hours of active MFAS occurred during C2X 06-04. MFAS sonar is only used during carefully reviewed scenarios and for only a small sub-set of any given exercise time frame. Therefore, as expected in C2X, a majority of marine mammals were sighted during periods when MFAS was not in use (Figure 1). Eight-five percent (85%) of the sightings (62 sightings) were in this category. Table 2 is the subset of marine mammal sightings during actual MFAS use during C2X 06-04.

During C2X 06-04, there were five instances where MFAS was secured (i.e. turned-off) due to sighting of marine mammals. This represented **7%** of the total sighting events, and directly impacted ASW training readiness. Sonar was secured at ranges of 150, 200, 400, 1000, and 2000 yards. Of interest is the fact that these events represent only two surface ship ASW platforms within C2X 06-04. While securing MFAS at the 2000 yard range is not required under Navy SOP and NDE, there is no indication in the data reports whether sonar transmission reduction of -6 dB at 1100 yards (approx. 1000 m), -10 dB at 550 yards (approx 500 meters) were applied, or whether the animals were sighted at the specified ranges and the decision was made to secure sonar at 400 and 1000 yards as an overly-conservative measure.

There were five large whale sightings during MFAS operation. One of these sightings occurred within an NDE 'safety zone' distance, and a DDG sonar (i.e. AN/SQS-53C) was secured due to large whale presence. Little if any sonar exposure is anticipated to have occurred during this sighting. First, while relative motion of the whales' travel was not reported, if the whales maintained their horizontal location as based on a milling behavior described in Table 2, then vessel motion would have taken the ship away from the animals at approximately 270 yards per minute assuming a nominal 8 knot (9.2 mph) speed of advance. Range to the whale would have then been 1,270 yards at time T+1 minute, and 2,350 yards by time T+5 minutes. Second, sonar

was secured as soon as the whale was sighted at 1000 yards, reducing the potential exposure to only that brief period prior to sighting and securing.

There were four sightings representing 5.5 % of the total sightings where MFAS was in use, and because the animals were outside of the mitigation zones, sonar was not secured. In these events, the animals were at 2000 yards and, as an added precaution, the ship maneuvered to open the distance between the animal and vessel. There were two sightings representing 3% of the total sightings where MFAS was in use, but since the animals were well beyond mitigation zones and there was no indication that maneuver to avoid was required, no action was taken and operations continued as normal.

There were five marine mammal sightings at night (approximately 7% of total sightings), although MFAS was not in use during any of these events. There were also five instances when a ship altered course in the presence of marine mammal (approximately 5% of total sightings), but MFAS was not in operation at these times, and no ASW training opportunities were lost.

The reports from exercise participants contained nothing that could be construed as abnormal or "observed effects" of MFAS, or other vessel operations. There were no instances where marine mammals behaved in an erratic, unusual, or anything other than apparently normal manner. Therefore, further analysis based on observed effects, as mandated by the reporting requirement, was not warranted.

Table 2. Marine mammal sightings only during MFAS operation and resulting actions during C2X 06-04.

Date-Time	Description of Actions Taken	Animal Type	Observation
09/24-0843	Surface ship sights 3 "small whales" at 400 yards. **MFAS in use. Sonar secured.**	3 small whales	traveling
09/24-1355	Surface ship sights 1 "large whale" at 2000 yards. *MFAS in use. No action taken.*	1 large whale	milling
09/25-0714	Surface ship sights 2 "large whales" at 2000 yards. *MFAS in use. No action taken*.	2 dolphins	milling
09/25-0905	Surface ship sights 2 "large whales" at 2000 yards. *MFAS in use. Ship alters course.*	2 large whales	milling
09/25-0943	Surface ship sights 1 "small whale" at 2000 yards. **MFAS in use. Sonar secured.**	1 small whale	traveling
09/25-1122	Surface ship sights 16 "dolphins" at 150 yards. **MFAS in use. Sonar secured.**	16 dolphins	jumping
09/25-1240	Surface ship sights 16 "dolphins" at 200 yards. **MFAS in use. Sonar secured.**	16 dolphins	jumping
09/27-1203	Surface ship sights 1 "small whale" at 2000 yards. *MFAS active. Ship alters course.*	1 small whale	traveling
09/28-1133	**Surface ship sights 2 "large whales" at 1000 yards. MFAS in use. Sonar secured.**	**2 large whales**	**milling**
09/29-0543	Surface ship sights 1 "large whale" at 2000 yards. *MFAS in use. Ship alters course.*	large whale	milling
09/30-0841	Surface ship sights 1 "large whale" at 2000 yards. *MFAS in use. Ship alters course.*	large whale	milling

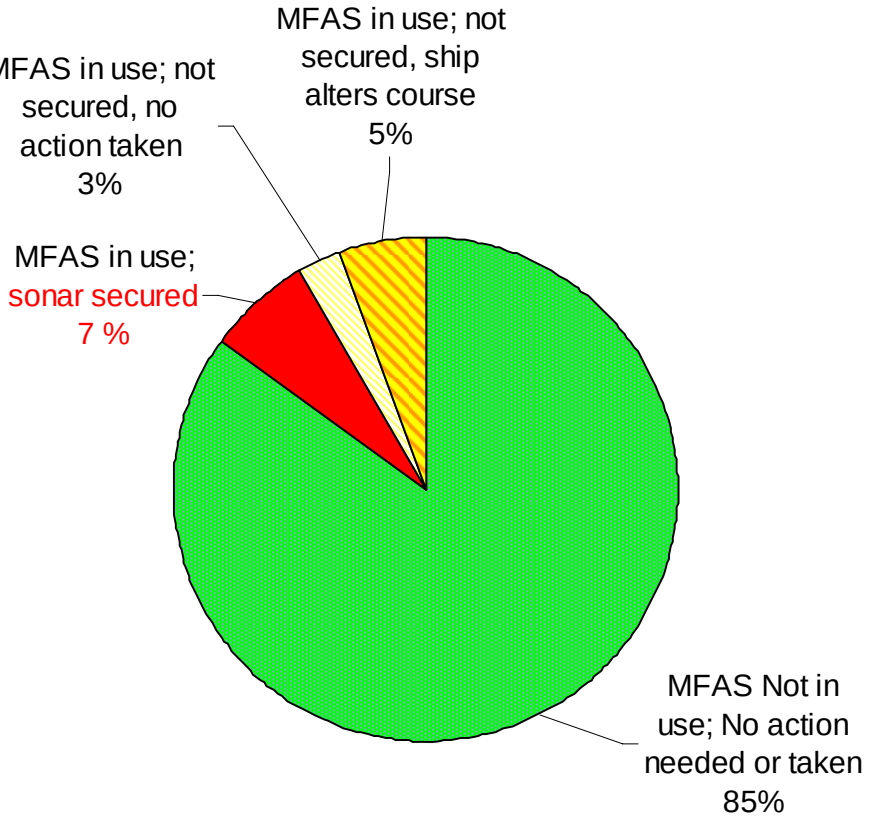


Figure 1. Actions taken by surface ships reporting marine mammal sightings during C2X 06-04.

NDE Assessment

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

A subset of the additional measures required by the NDE was not applicable within the context of C2X 06-04 due to the absence of the conditions described. This subset of mitigation measures is as follows:

- Requirements regarding "*strong surface ducting conditions*" (none observed)
- Requirements regarding "*low visibility conditions*" (detection to 1000m was maintained during MFAS use)
- Requirements specific to operating MFAS in choke-points (no choke points) ,
- Restrictions from operating MFAS in constricted channels (none present)

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), 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 or secured 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 effective in detecting marine mammals. In addition, the steps taken by individual ship commanding officers to avoid impacts to marine mammals were effective.

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

ASSESSMENT OF MITIGATION AND MONITORING MEASURES

The three categories of mitigation and monitoring measures required by the June 30, 2006 NDE are assessed in this section. For ease of reference, the text of the measures is provided in italics, followed by an assessment, an analysis of operational impact and a recommendation on any improvements to each measure.

Measures 1-2

Mitigation measures 1 and 2 detail training requirements and operating procedures for units participating in MFAS ASW exercises. All of the training requirements within these two measures reflect 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 and based on review of other marine species training materials. The training incorporates effective marine species detection cues and information necessary to protect marine species. This material is part of the Navy Lookout watchstander qualification system, is available as online training, and can also be provided in a video format for large audience presentations. NMFS regional staff 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 (first major bullets) require 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 and continues to be effective as a mitigation measure.

Operational Impact of these mitigation measures:

None.

Recommendation

None, these are effectively incorporated into Navy SOPs and the training curriculum.

- *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. The measure has not been officially described in a SOP for surface ships. The measure 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.

---

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 C2X 06-04; there were no active sonar operations within 12 nm of a coast except those on the established instrumented ranges near San Clemente Island.
Operational Impact of this mitigation measure:
None.

Recommendation
Not applicable.

---

ii. *Conduct sonar activities in constricted channels.*

Navy Assessment:
There are no naturally occurring bathymetrically constricted channels within the SOCAL area used for C2X 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 is 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 is not met in the reactions of the participating units during C2X 06-04 when marine mammals were sighted during MFAS use. Some units are securing versus powering down (one instance at 1000 yards), and one unit secured sonar at a distance where no action was required (2000 yards).

Operational Impact of this mitigation measure:

Not determinable in the reactions of the participating units. In the unit after action reports, four scenarios exist: Unit observed mammals and was not active, unit was active and sonar was secured, unit was active and sonar not secured because mammals were at or beyond 2000 yards and the ship altered course, and unit was active and sonar not secured because animals were at or beyond 2000 yards. This loss of MFAS training hours is more than a simple metric involving a loss of training time as a small percentage of the overall exercise hours since, in at least several of the C2X 06-04 cases, the proximity of a submarine in the vicinity meant there was a potential submarine detection opportunity missed by the exercise participants.

Recommendation

A “safety zone” mitigation measure was already SOP and this mitigation measure should be retained. A safety zone of 1000 m is based on the attenuation of sonar power level from a source of 235 dB to a received level of 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 was a 173 dB accumulated energy level. No behavioral effects were observed for any mammals that were present within the defined safety zones. The description of behaviors that NMFS believes would be useful for Navy observers to report as potential behavioral effects should be provided by NMFS in order that continued observation, over time, can factor into continued development of safety zones.

---

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 implementation of this measure unrealistic. .

Recommendation
This measure can not be effectively implemented, thus providing no additional protection and should be deleted as a real-time continuous monitoring requirement.

---

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 (Table 1) during periods of MFA sonar use. However, there were marine mammal sightings at night, demonstrating the effectiveness of Navy units in sighting marine mammals during nighttime (i.e., nighttime is not low visibility). Depending on vessel class and funding, some more advanced 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 with respect to power down, but the capability of sighting marine mammals at night was demonstrated.

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 occurrences of unusual marine mammal behavior during or subsequent to C2X 06-04. Note that, in the one instance a seal carcass was found.

Operational Impact of this mitigation measure:
None for this exercise.

Recommendation
None. Note that reporting of the seal carcass was not required in accordance with existing Navy policy, as the carcass was not associated with Navy exercise activities. However, , since the intent of the NDE is that any mammal, regardless of condition (e.g., state of decay indicative that death occurred well prior to Navy presence) is to be reported, clarification of the NDE measure will be provided to Navy units in future letters of instruction or mitigation messages.

- *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 C2X 06-04, marine mammal sightings occurred concurrent with MFAS during only a few activities, so effectiveness of some mitigation measures can not be fully assessed intrinsic to this exercise.

Operational Impact of this mitigation measure:
Manpower time for data collection, analysis, report writing and drafting the after action marine mammal sighting Naval messages is required.

Recommendation
None at this time.

- *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:
The details of the marine species monitoring are contained within Table 1 and Section 3 of this report.

Operational Impact of this mitigation measure:
None

Recommendation
None at this time. Navy and NMFS dialogue on monitoring and reporting will continue.

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.

Note that the reporting of marine mammal observations in Section 1 represents a 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 C2X 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 animals observed were behaving within the confines of apparent normal behavior. Information presented previously in Table 1 provides a list of instances when marine mammals were observed.

CONCLUSIONS AND SUMMARY

- Marine mammals were sighted 73 times by exercise participants. Approximately 1225 animals were observed within Southern California waters (Table 1, Figure 1). In each of these cases, the marine mammals were detected by Navy watchstanders operating in accordance with Navy standard operational procedures and as reiterated by some NDE mitigation measures
- Of the 73 instances where marine mammals were detected, MFAS was not operating in 63 events and there were no mandated sonar shut downs
- MFAS was secured five times representing a 7% loss of ASW training opportunities, as well as potentially interrupting the tactical situational awareness of the participating units and CSG (Figure 2)
- There were no indications of any effects to any marine species throughout the exercise. All behaviors described in the after action report were within the range of apparent normal behavior

Prepared for
National Marine Fisheries Service
Office of Protected Resources

Prepared by
Department of the Navy

In accordance with
National Defense Exemption 30 June 2006

USS Stennis CSG

JOINT TASK FORCE EXERCISE 07-01

(JTFEX 07-01)

07-16 Nov 2006

After Action Report

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 for Certain DoD Mid-Frequency Active Sonar Activities

INTRODUCTION

This report is presented to fulfill the requirements conditional to the 30 June 2006 "National Defense Exemption (NDE) from the Requirements of the Marine Mammal Protection Act for Certain DoD Mid-Frequency Active Sonar Activities." The Navy is submitting this report to NMFS' Office of Protected Resources, as required by the NDE.

The following information is for the USS Stennis Carrier Strike Group (CSG) Joint Task Force Exercise (JTFEX) 07-01 conducted from 07-16 Nov 2006 in Southern California (SOCAL). The types of ASW training conducted during JTFEX 07-01 involved the use of ships, submarines, aircraft, non-explosive exercise weapons, and other training related devices. ASW events occurred within portions of the Southern California Offshore Range (SCORE) and the Southern California Offshore ASW Range west of San Clemente Island. 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 as follows:

Section 1 provides an estimated number of marine mammals observed during the JTFEX 07-01 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 impact of the measures on the military readiness activities.

Section 3 provides data on the location and hours of active MFAS used during JTFEX 06-2 placed in context with observations of cetacean behaviors resulting from the ship based reports and exercise participants.

SECTION 1: Marine Mammals Observed

Section 1 provides estimated numbers of marine mammals observed in Southern California waters during JTFEX 07-01 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.

All detections were made by standard Navy surface ship lookout marine mammal detection and reporting procedures. There were no sightings reported from aircraft platforms. Participating U.S. Navy Mid-Frequency Active Sonar (MFAS) equipped vessels included three submarines, two cruisers and six destroyers. **Table 1** provides a detailed timeline of marine mammal observations made by Navy exercise participants.

During JTFEX 07-01, there were **18** marine mammal sightings for an estimated total of **140** animals observed (Table 1 and **Figure 1**). Note: the total animal count is biased downward because two sighting reports did not contain estimates for number of animals.

Seven of the 18 sightings included a total of 95 “dolphins” which comprised 39% of the sightings and 68% of total animals seen during JTFEX 07-01. This observation is consistent with science-based reports that dolphins, and in particular, the short-beaked common dolphin (*Delphinus delphis*), comprise as much as 85-95% of the marine mammal abundance within Southern California.

Small whale sightings comprised 39% of the total sightings (n=7 sighting totaling 41 animals). Large whale sighting comprised 6% of the total sightings (n=1 sightings totaling 1 animal). Pinnipeds (seals or sea lions) sightings comprised 11% of the total sightings (n=2 sighting totaling 3 animals).

Table 1. Marine mammal sightings and actions by exercise participants during JTFEX 07-01. Text in red **Bold** indicates events when MFAS was in use and secured due marine mammal mitigation. Red text in *Italics* indicates when MFAS was in use, but mitigation other than securing sonar was enacted. (all times local Pacific Standard Time)

Date-Time	Description of Actions Taken	# of animals	Animal Type
11/07- 1335	Surface ship sights 25 "dolphins" jumping at 1000 yards. **MFAS in use. Sonar secured.**	25	dolphin
11/07- 1520	Surface ship sights 2 "small whales" traveling at 1000 yards. MFAS NOT active. Ship reduced speed.	2	small whale
11/07- 0816	Surface ship sights 2 "small whales" milling at 4000 yards. MFAS NOT active. Ship reduced speed.	2	small whale
11/07- 0915	Surface ship sights 2 "small whales" traveling at 8000 yards. MFAS NOT active. Ship increased speed to open distance between whales and ship.	2	small whale
11/07- 0921	Surface ship sights 2 "small whales" traveling at 3000 yards. MFAS NOT active. No action taken.	2	small whale
11/08- 1031	Surface ship sights 20 "dolphins" traveling at 100 yards. MFAS NOT in use. No action taken.	20	dolphin
11/11- 0636	Surface ship sights 1 "small whale" milling at 2000 yards. MFAS NOT active. No action taken.	1	small whale
11/11- 0630	Surface ship sights 1 "large whale" traveling at 500 yards. MFAS NOT active. Ship slowed to avoid animal's path.	1	large whale
11/11- 0923	Surface ship sights 1 "seal or sea lion" lingering at 150 yards. **MFAS in use. Sonar secured.**	1	pinniped
11/12- 0636	Surface ship sights 1 "small whale" milling at 2000 yards. *MFAS in use. No action taken*.	1	small whale
11/12- 0704	Surface ship sights unknown number of "dolphins" traveling at 300 yards. MFAS NOT in use. No action taken.	not reported	dolphin
11/12- 0418	Surface ship sights 10 "dolphins" traveling at 50 yards. MFAS NOT in use. Ship decreased speed.	10	dolphin
11/12- 0600	Surface ship sights unknown number of "whales" traveling at 300 yards. MFAS NOT in use. Ship changed course to avoid animal path.	not reported	whale
11/13- 0651	Surface ship sights 28 "dolphins" traveling at 1000 yards. **MFA in use. Sonar secured**	28	dolphin
11/13- 1541	Surface ship sights 31 "small whales" traveling at 1000 yards. MFAS NOT in use. Ship altered course to avoid animal path.	31	small whale
11/14- 0711	Surface ship sights 7 "dolphins" traveling at 2000 yards. MFAS NOT in use. No action taken.	7	dolphin
11/14- 0845	Surface ship sights 5 "dolphins" traveling at 1500 yards. MFAS NOT in use. No action taken.	5	dolphin
11/14- 1505	Surface ship sights 2 "seals or sea lions" traveling at 700 yards. MFAS NOT is use. No action taken.	2	pinniped
18	= total sighting events total number of animals =	**140**	

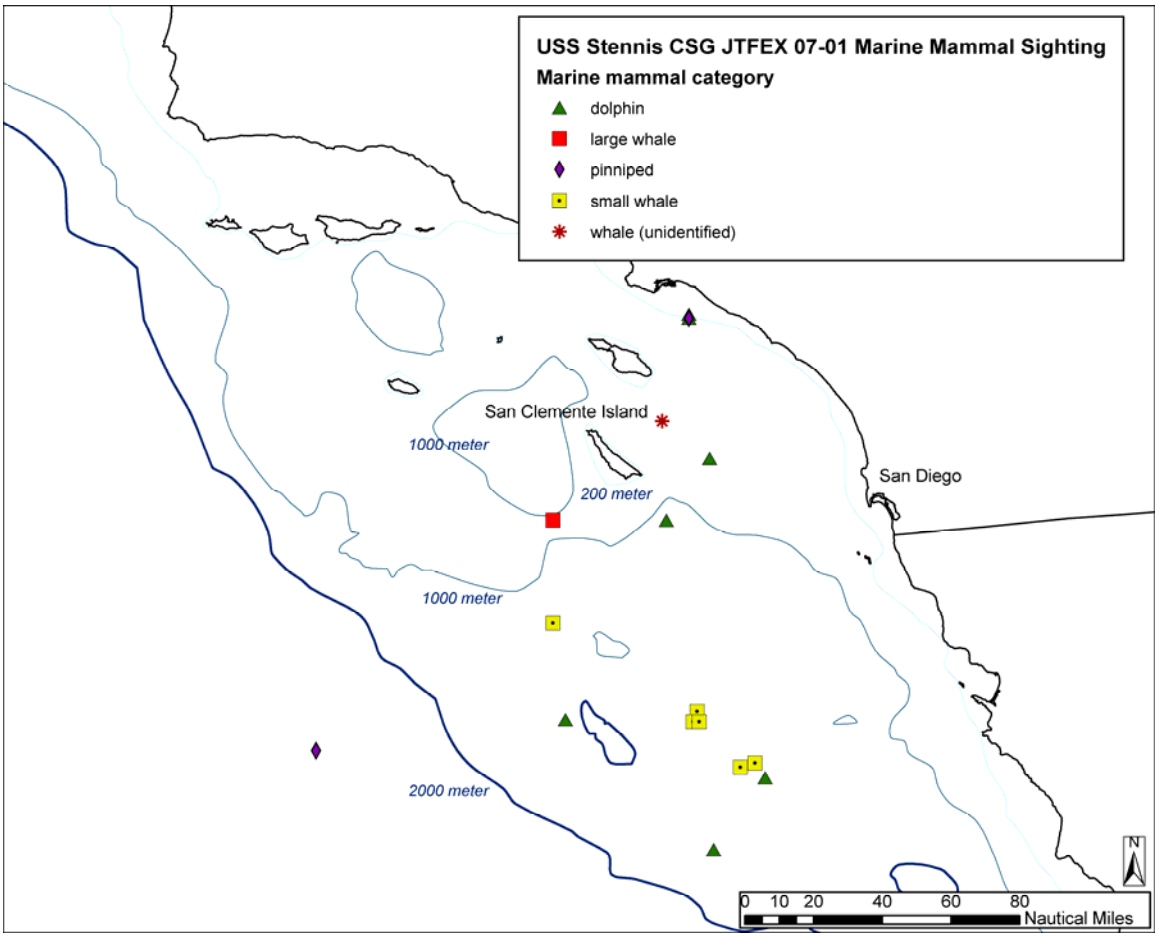


Figure 1. Marine mammal sightings JTFEX 07-01 (20 Sep-12 Oct 2006).

SECTION 2: Mitigation and Monitoring

As required under 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.

JTFEX 07-01 Assessment

MFAS sonar is only used during carefully reviewed scenarios and for only a small sub-set of any given exercise time frame. Therefore, as expected in JTFEX, a majority of these mammals were sighted during periods when MFAS was not in use (**Figure 2**). Seventy-eight percent (**78%**) of the sightings (14 sightings) were in this category.

During JTFEX 07-01, there were three (**3**) instances where MFAS was secured (i.e. turned-off) due to sighting of marine mammals. This represented **17%** of the total sighting events, and directly impacted ASW training readiness. Sonar was secured at ranges of 150 and 1000 yards. Of interest is the fact that these events represent only two ASW surface ships within JTFEX 07-01. While securing MFAS at the 1000 yard range is not required under Navy SOP and NDE, there is no indication in the data reports whether sonar transmission reduction of -6 dB at 1100 yards (approx. 1000 m), -10 dB at 550 yards (approx 500 meters) were applied, or whether the animals were sighted at the specified ranges and the decision made to secure sonar at 1000 yards as an overly-conservative measure.

Finally, there was one sighting representing 6% of the total sightings where MFAS was in use, but since the animals were well beyond mitigation zones, no action was taken and operations continued as normal.

There was one marine mammal sighting at night (approximately 6% of total sightings), and MFAS was not in use. There were also six instances when a ship altered course in the presence of marine mammal (33% of total sightings), but MFAS was not in operation at these times, and no ASW training opportunities were lost.

The reports from exercise participants contained nothing that could be construed as abnormal or "observed effects" of MFAS use or other vessel operations. There were no instances where marine mammals behaved in an erratic, unusual, or anything other than apparently normal manner. Therefore, further analysis based on observed effects, as mandated by the reporting requirement, was not warranted.

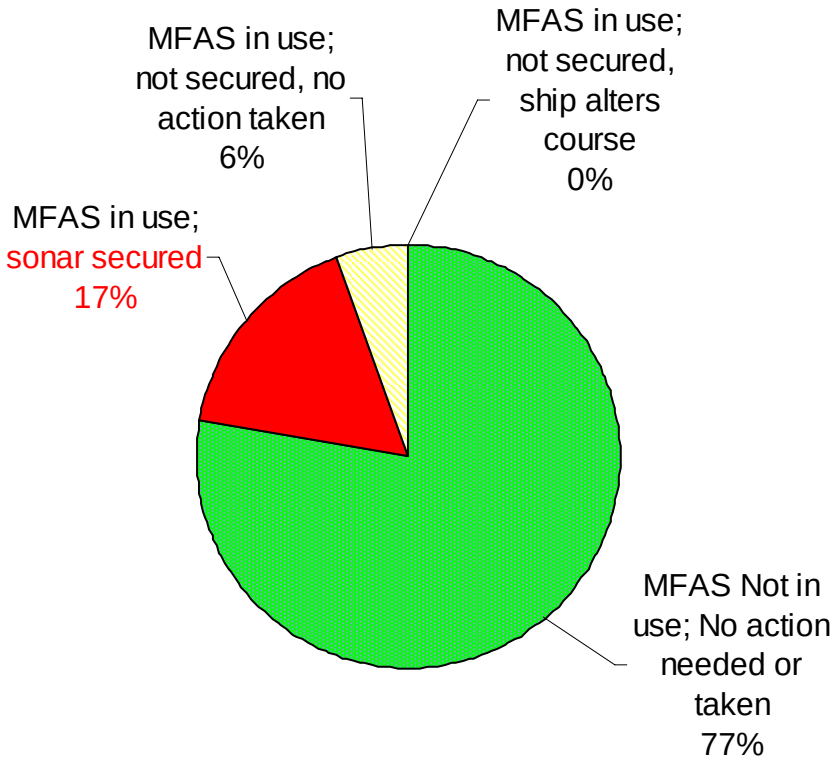


Figure 2. Actions taken by surface ships reporting marine mammal sightings JTFEX 07-01.

NDE Assessment

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

A subset of the additional measures required by the NDE was not applicable within the context of JTFEX 07-01 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*"
- Requirements specific to operating MFAS in choke-points
- Restrictions from operating MFAS in constricted channels

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), 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 effective in detecting marine mammals. In addition, the steps taken by individual ship commanding officers to avoid impacts to marine mammals were effective. .

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

ASSESSMENT OF MITIGATION AND MONITORING MEASURES

The three categories of mitigation and monitoring measures required by the June 30, 2006 NDE are assessed in this section. For ease of reference, the text of the measures is provided in italics, followed by an assessment, an analysis of operational impact and a recommendation on any improvements to each measure.

Measures 1-2

Mitigation measures 1 and 2 detail training requirements and operating procedures for units participating in MFAS ASW exercises. All of the training requirements within these two measures reflect 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 regional staff 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 require 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 these 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. The measure has not been officially described in a SOP for surface ships. The measure 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.

---

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 this event; for this major exercise there were no active sonar operations within 12 nm of a coast except those on the established instrumented ranges near San Clemente Island.

Operational Impact of this mitigation measure:
None.

Recommendation
Not applicable.

---

ii. *Conduct sonar activities in constricted channels.*

Navy Assessment:
There are no naturally occurring bathymetrically constricted channels within the SOCAL area used for JTFEX 07-01.

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 is 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 is not met in the reactions of the participating units during JTFEX 07-01 when marine mammals were sighted during MFAS use. Upon sighting of animals, regardless of range, but at 1000 yards or less from two of three sonar securing events, sonar was turned off.

Operational Impact of this mitigation measure:

Not determinable in the reactions of the participating units. In the unit after action reports, three scenarios exist: The unit observed mammals and was not active, the ship was active and sonar was secured, and the ship was active but animal was beyond mitigation range. This loss of MFAS training hours is more than a simple metric involving a loss of training time as a small percentage of the overall exercise hours since, in at least several of the JTFEX 07-01 cases, the proximity of a submarine in the vicinity meant there was a potential submarine detection opportunity missed by the exercise participants.

Recommendation

A “safety zone” mitigation measure was already SOP and this mitigation measure should be retained. A safety zone of 1000 m is based on the attenuation of sonar power level from a source of 235 dB to a received level of 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 was a 173 dB accumulated energy level. The types of behavioral observations that NMFS believes would be useful for Navy to report should

be discussed in more detail so that these monitoring reports and evaluation of safety zones continue to contribute to NMFS assessments.

---

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 implementation of this measure unrealistic, and therefore ineffective.

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

---

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 (Table 1). 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 occurrences of unusual marine mammal behavior during or subsequent to JTFEX 07-01.

Operational Impact of this mitigation measure:
Not applicable.

Recommendation
None, this measure was not applicable for JTFEX 07-01. There are existing Navy SOPs 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.

Operational Impact of this mitigation measure:
Manpower time for data collection, report writing, and drafting the after action marine mammal sighting Naval messages is required.

Recommendation
None at this time.

  - *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:
The details of the marine species monitoring are contained within Table 1 and Section 3 of this report.

Operational Impact of this mitigation measure:
None.

Recommendation
None at this time. Navy and NMFS dialogue on monitoring and reporting will continue.

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.

Note that the marine mammal observations reported in Section 1 represent 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 JTFEX 07-01. 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 animals observed were behaving within the confines of apparent normal behavior. Information presented previously in Table 1 provides a list of instances when marine mammals were observed.

CONCLUSIONS AND SUMMARY

- Marine mammals were sighted 18 times by exercise participants. Approximately 140 animals were observed within Southern California waters (Table 1, Figure 1). In each of these cases, the marine mammals were detected by Navy watchstanders operating in accordance with Navy standard operational procedures and as reiterated by some NDE mitigation measures.
- Of the 18 instances where marine mammals were detected, MFAS was not operating in 15 events and there were no mandated sonar shut downs.
- MFAS was secured three times representing a 17% loss of ASW training opportunities from sighting events, as well as potentially interrupting the tactical situational awareness of the participating units and CSG (Figure 2).
- There were no indications of any effects to any marine species throughout the exercise. All behaviors described in the after action report were within the range of normal behaviors.
- 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.