

April 2011

Cruise Report, Marine Species Monitoring & Lookout Effectiveness Study SOCAL Unit Level Training Exercise DDG-D

Prepared for:
Commander, Pacific Fleet



Delphinus capensis

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LIST OF ACRONYMS AND ABBREVIATIONS

ft	foot (feet)
km	kilometer(s)
m	meter(s)
MFAS	mid-frequency active sonar
MMO	marine mammal observer
LO	lookout (refers to Navy lookouts)
nm	nautical mile(s)
yd(s)	yard(s)
SOCAL	Southern California (refers to Southern California Range Complex)
ULT	Unit Level Training

SECTION 1 INTRODUCTION

In order to address requirements under the Marine Mammal Protection Act Letters of Authorization permitted to the U.S. Navy, three U.S. Navy civilian marine mammal observers (MMOs) (Ms. Morgan Richie, Mr. Josh Frederickson, and Mrs. Andrea Balla-Holden) and one U.S. Navy contractor (Dr. Tom Jefferson) participated in a unit-level training exercise (ULT) in the Southern California Range Complex (SOCAL) from April 4-7, 2011. These MMOs were stationed aboard a U.S. Navy destroyer, hereafter referred to as DDG-D. The goals of the monitoring and this study were to:

1. Collect data to assess the effectiveness of the Navy lookout team.
2. Obtain data to characterize the possible exposure of marine species to mid-frequency active sonar (MFAS).

1.1. SHIPBOARD MONITORING

MMO surveys were conducted on a not-to-interfere basis, which means that the MMOs would not replace required Navy lookouts, would not dictate operational requirements/maneuvers, and would remove themselves from the bridge wing if necessary for DDG-D to accomplish its mission objectives. The exceptions would be if a marine mammal was sighted by the MMO within the shut-down zone during MFAS use (200 yards [yds], 183 meters [m]) and was not seen by the Navy lookout team, or if the vessel was in danger of striking the marine species. In these cases, the MMO would report the sighting to the Navy lookout team for appropriate reporting and action.

The MMO survey on DDG-D was conducted on the bridge wings (elevated 66 feet [ft; 20 m] above the waterline), with two MMOs actively searching for marine mammals, one MMO recording data, and one MMO acting as a liaison with the bridge team/lookouts to relay their sightings. While on effort, MMOs used naked eye and 7 X 50 magnification binoculars to scan the area from dead ahead to just aft of the beam.

SECTION 2 RESULTS

2.1. SHIPBOARD MONITORING

Effort and environmental information was collected when the MMOs began effort, at each rotation, and as significant weather changes occurred. The MMO team spent 20 hours 57 minutes, and 05 seconds searching for marine species during the exercises (Table 1).

For all four observers, a total of 83 hours, 48 minutes, and 20 seconds of marine mammal shipboard monitoring was conducted. Beaufort Sea States ranged from 2 to 5, with the majority of the time occurring in Sea States 4 – 5. The Beaufort Sea State was a 6 for 1 hour and 32 minutes on 4/6/2011, and the team went off effort (Figure 1 and Figure 2). The majority of effort was conducted in an area south of San Clemente Island (Figure 3).

Table 1. Effort Hours and Environmental Conditions

Date	Team Hours On-Effort	Beaufort Sea State (range)	% Cloud Cover (range, conditions)	Visibility
4 April	2.23	3-4	5% - 100%	Moderate -Good
5 April	7.32	2-5	40%-100%	Poor – Moderate
6 April	8.07	4-5	100%	Poor - Moderate
7 April	3.33	3-5	40%-100%	Moderate
Total	20.95	2-5	5%-100%	Poor – Good

Figure 1. Total Percentage of Effort at Beaufort Sea States

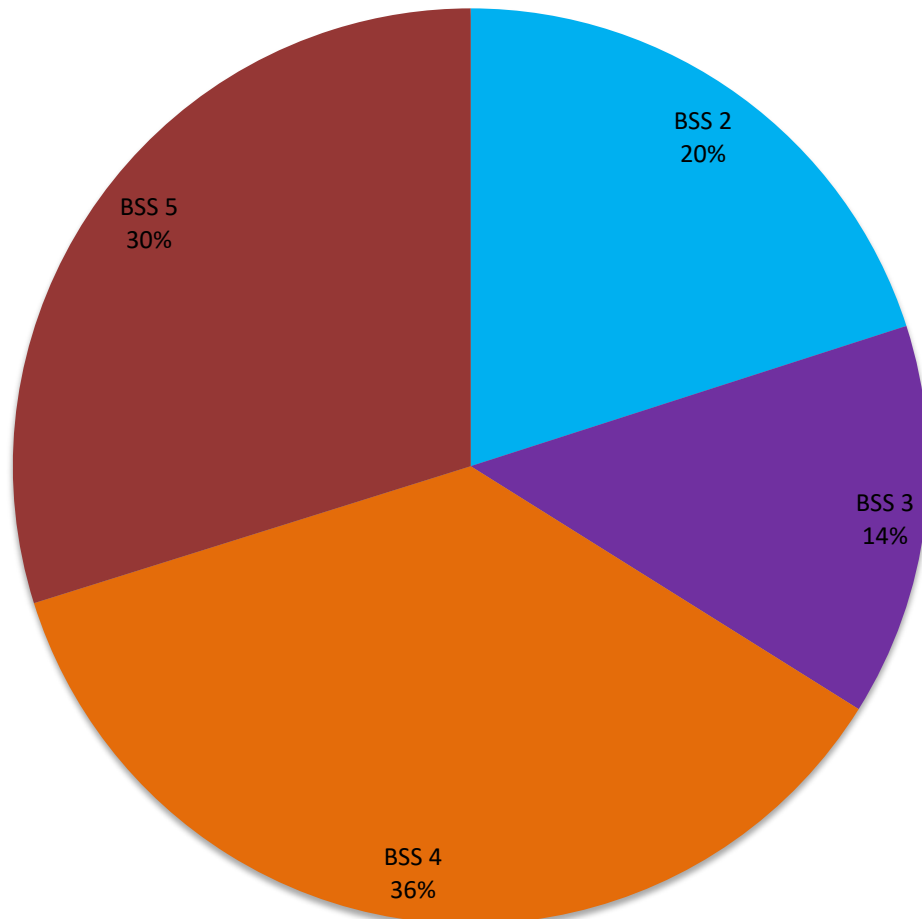


Figure 2. Daily percentage of effort at Beaufort Sea State

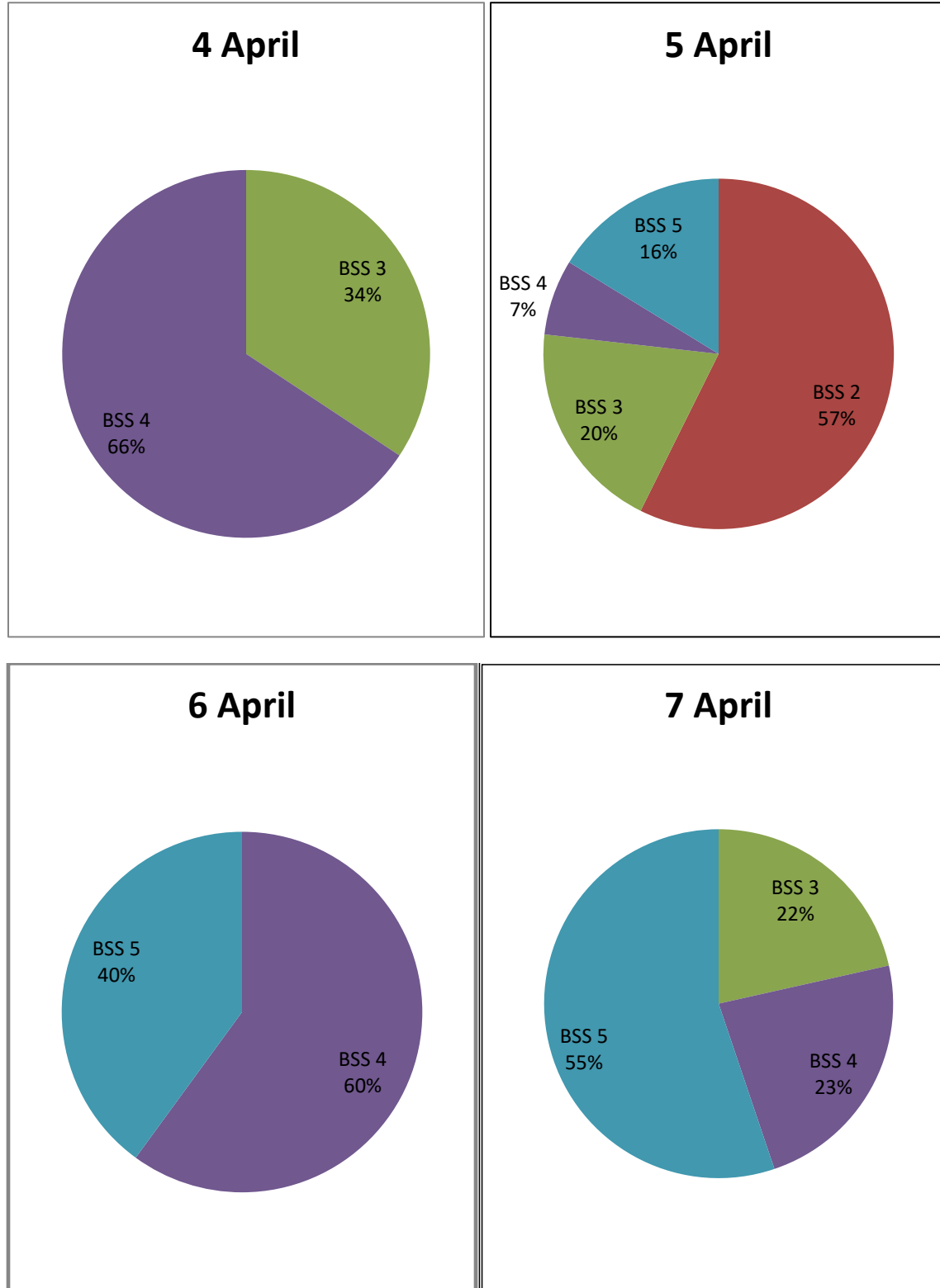
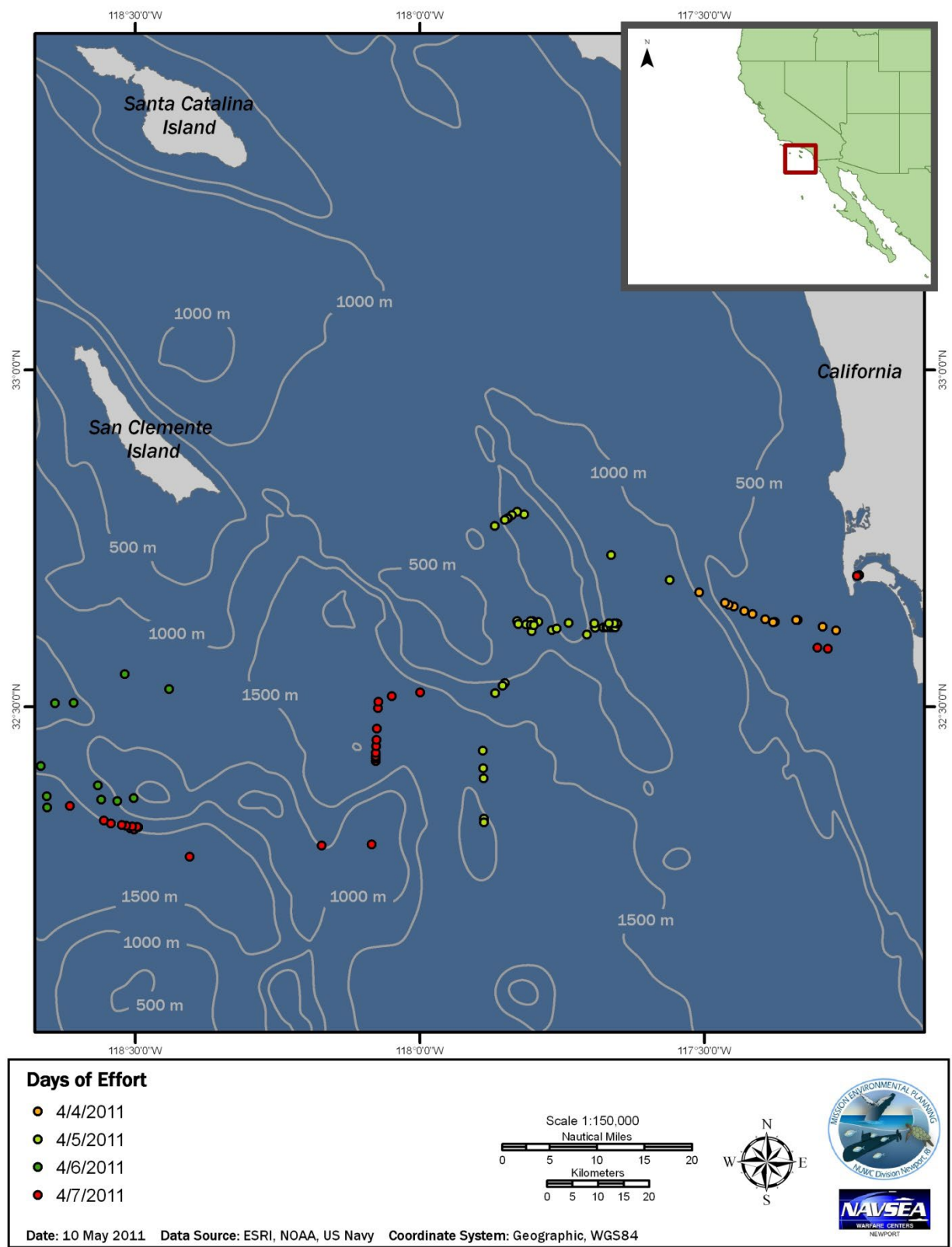


Figure 3. Location of MMO Effort



In total, 24 sightings of marine mammals including 23 sightings of cetaceans, 1 sighting of a pinniped, and 0 sightings of turtles were recorded during the four days of observation (Table 4). Nineteen of the sightings were made independently by the MMOs, that is, not seen by the Navy lookout team. Additionally, two sightings were made by the Navy lookout team, but were not sighted by the MMOs. Three sightings were sighted by both the MMOs and Navy lookout team (Table 2). Four sightings were identifiable to species; one sighting of long-beaked common dolphins (*Delphinus capensis*), one sighting of Risso's dolphins (*Grampus griseus*), one sighting of a Minke whale (*Balaenoptera acutorostrata*), and one sighting of a California sea lion (*Zalophus californianus*) (Table 3).

Table 2. Marine Mammal and Sea Turtle Sightings by Observer

Date	Independent MMO Sightings	Independent Navy Lookout Team Sightings	Sightings by both Teams
4 April	9	0	1
5 April	6	0	2
6 April	2	0	0
7 April	2	2	0
Total	19	2	3

Table 3. Unique sightings by species

Species	Unique animal group sightings	Total number of animals (based on best group size estimate)
Long-beaked common dolphin	1	15
Risso's dolphin	1	12
California Sea Lion	1	1
Minke whale	1	1
Delphinus species	7	528
Unidentified dolphin	4	32
Unidentified balaenopterid	4	5
Unidentified whale	5	5
Total	24	599

Table 4. Marine Mammal and Sea Turtle Sightings

Data Category	Sighting 1	Sighting 2	Sighting 3	Sighting 4	Sighting 5	Sighting 6	Sighting 7
Sightings Information							
Effort (on/off)	On	On	On	On	On	On	On
Date	4/4/2011	4/4/2011	4/4/2011	4/4/2011	4/4/2011	4/4/2011	4/4/2011
Time	155031	155031	160224	160309	161302	161751	162416
Location	32.61883 117.29227	32.61883 117.29227	32.62902 117.33572	32.62895 117.33847	32.62587 117.37580	32.62998 117.39310	32.63765 117.41520
Detection Sensor	MMO	MMO	MMO	MMO	MMO	MMO	MMO
Species/Group	Long-beaked common dolphins	California sea lion	Unidentified Delphinus spp	Unidentified Delphinus spp	Unidentified Delphinus spp	Unidentified whale	Unidentified balaenopterid
Group Size (min/max/best)	10/15/15	1/1/1	30/48/39	52/107/78	9/22/16	1/1/1	1/2/1
# Calves							
Bearing (rel)	270	120	315	90	315	350	300
Distance (m)	20	50	1009	2343	896	2755	3350
Environmental Information							
Wave height (ft)	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Visibility	Good	Good	Good	Good	Good	Good	Good
BSS	4	4	4	4	4	4	4
% cloud cover	p0% s5%	p0% s5%	p0% s5%	p0% s5%	p0% s5%	p0% s5%	p0% s5%
% glare	P35% s10%	P35% s10%	P35% s10%	P35% s10%	P35% s10%	P35% s10%	P35% s10%
Operational Information							
Sonar on/off	Off	Off	Off	Off	Off	Off	Off
Ship bearing (true)	287	287	265	265	295	295	295
Animal motion	Parallel	None			Closing	None	None
Sighting Cue/ Behavior	Body	Body	Splash	Birds	Body	Blow	Blow
Mitigation implemented	None	None	None	None	None	None	None
Comments	Photos taken (#014-119, blank 120)		Dolphins heard on SONAR. Photos 121-131				Nearby dolphins heard on SONAR (report from SONAR room)

Table 2 (cont). Marine Mammal and Sea Turtle Sightings Information

Data Category	Sighting 8	Sighting 9	Sighting 10	Sighting 11	Sighting 12	Sighting 13	Sighting 14
Sightings Information							
Effort (on/off)	On	On	On	On	On	On	On
Date	4/4/2011	4/4/2011	4/4/2011	4/5/2011	4/5/2011	4/5/2011	4/5/2011
Time	163334	165107	190929	083936	084600	084951	090002
Location	32.64868 117.44798	32.66982 117.50903	32.77982 117.84490	32.61803 117.67770	32.61793 117.66380	32.61808 117.65680	32.62382 117.65417
Detection Sensor	MMO	MMO	MMO	MMO	MMO	MMO	MMO
Species/Group	Unidentified dolphin	Unidentified balaenopterid	Minke whale	Unidentified dolphin	Delphinus spp	Delphinus spp	Delphinus spp
Group Size (min/max/best)	7/9/12	1/1/1	1/1/1	4/13/7	1/1/1	1/1/1	65/475/294
# Calves							
Bearing (rel)	275	290	315	270	290	315	0
Distance (m)	1009	2041	2755	2041	2041		2041
Environmental Information							
Wave height (ft)	Moderate	Light	Light	Light	Light	Light	Light
Visibility	Good	Good	Good	Good	Good	Good	Good
BSS	4	4	3	2	2	2	2
% cloud cover	p0% s5%	p0% s 0%	p15% s5%	p100% s100%	p100% s100%	p100% s100%	p100% s100%
% glare	P35% s10%	P 35% s 0%	p45% s0%	p0% s0%	p0% s0%	p0% s0%	p0% s0%
Operational Information							
Sonar on/off	Off	Off	Off	Off	Off	Off	Off
Ship bearing (true)	295	295	315	90	90	90	90
Animal motion	Closing	None	Parallel	Parallel	Closing	Closing	Closing
Sighting Cue/ Behavior	Body	Blow	Splash	Splash, body	Splash	Body	Body
Mitigation implemented	None	None	None	None	None	None	None
Comments	Passed beam		Minke breached 3 times	Passed abeam at 0843		Second sighting by crew member, did not give bearing or distance. She asked bridge to log sighting.	Bridge crew called them "seals." Some closed to bowride. Pod was spread out.

Table 2 (cont). Marine Mammal and Sea Turtle Sightings Information

Data Category	Sighting 15	Sighting 16	Sighting 17	Sighting 18	Sighting 19	Sighting 20	Sighting 21
Sightings Information							
Effort (on/off)	On	On	On	On	On	On	On
Date	4/5/2011	4/5/2011	4/5/2011	4/5/2011	4/6/2011	4/6/2011	4/7/2011
Time	100125	102917	103402	130510	081115	181651	084249
Location	32.62638 117.79150	32.62298 117.82722	32.62198 117.81320	32.53147 117.85460	32.38283 118.69468	32.31875 118.50855	32.41910 118.07755
Detection Sensor	MMO	MMO	MMO	MMO	MMO	MMO	MMO
Species/Group	Risso's dolphin	Unidentified whale	Unidentified dolphin	Unidentified dolphin	Unidentified whale	Delphinus spp	Unidentified balaenopterid
Group Size (min/max/best)	6/20/12	1/1/1	4/7/5	5/10/8	1/1/1	50/225/93	2/2/2
# Calves							
Bearing (rel)	38	290	300	358	30	3	45
Distance (m)	1154	4298	2041	4298	4298	3350	3350
Environmental Information							
Wave height (ft)	Light	Light	Light	Light	Moderate	Moderate	Light
Visibility	Good	Good	Good	Good	Poor	Moderate	Moderate
BSS	2	2	2	3	4	4	3
% cloud cover	p100% s100%	p80% s80%	p80% s80%	p50% s50%	p100% s100%	p100% s100%	p100% s98%
% glare	p0% s0%	p25% s0%	p25% s0%	p15% s20%	p0% s0%	p0% s0%	p0% s1%
Operational Information							
Sonar on/off	Off	Off	Off	Off	Off	Off	Off
Ship bearing (true)	270	100	94	224	309	104	0
Animal motion	Closing, parallel		Parallel	Closing	None	Closing	Closing
Sighting Cue/ Behavior	Body	Blow	Body	Body	Blow	Dorsal fin	Blow
Mitigation implemented	None	None	None	None	None	Yes	None
Comments	Turned to move parallel to the ship, toward the stern			Not a trial – went off effort due to potential radio interference with ammunition		1821 informed bridge (waypoint #82). Acoustically detected prior to visual detection. Bridge lookouts did not detect. Gunnex secured.	

Table 2 (cont). Marine Mammal and Sea Turtle Sightings Information

Data Category	Sighting 22	Sighting 23	Sighting 24
Effort (on/off)	On	On	On
Date	4/7/2011	4/7/2011	4/7/2011
Time	173349	091208	091539
Location	32.42635 118.07703	32.49780 118.07327	32.50735 118.07253
Detection Sensor	LO	LO	MMO
Species/Group	Unidentified whale	Unidentified whale	Unidentified balaenopterid
Group Size (min/max/best)	1/2/1	1/1/1	1/1/1
# Calves			
Bearing (rel)	90	300	300
Distance (m)		2755	2000
Environmental Information			
Wave height (ft)	Light	Moderate	Moderate
Visibility	Moderate	Moderate	Moderate
BSS	3	4	4
% cloud cover	p100% s98%	p70% s90%	p70% s90%
% glare	p0% s1%	p0% s5%	p0% s5%
Operational Information			
Sonar on/off	Off	Off	Off
Ship bearing (true)	0	0	0
Animal motion	Closing	None	None
Sighting Cue/Behavior	Blow	Blow	Blow
Mitigation implemented	None	None	None
Comments	LO did not give estimate of distance	Distance estimated by MMO. CIWS successfully hit target	

Sightings

- California sea lion
- Long-beaked common dolphin
- Minke whale
- Risso's dolphin
- Unidentified balaenopterid
- Unidentified delphinus spp.
- Unidentified dolphin
- Unidentified whale

Date: 23 April 2011 **Data Source:** ESRI, NOAA, US Navy **Coordinate System:** Geographic, WGS84

Nineteen of the sightings (79%) were considered trials for the lookout effectiveness study. Trials were conducted on all days of the study, for an average rate of .91 trials per hour across all four days (Table 5).

Table 5. Effort Hours, Sighting Rates, and Trial Rates

Date	Hours MMO Team Effort	# of Unique Sightings*	Sightings/Hour	# of Trials	Trials/Hour
4/4/2011	02:13:46	10	4.49	8	3.59
4/5/2011	07:19:27	8	1.09	7	.96
4/6/2011	08:04:19	2	.25	2	.25
4/7/2011	03:19:33	4	1.2	2	.6
Total	20:57:05	24	1.15	19	.91

** Number of sightings includes both MMO and Navy lookout team sightings combined*

2.2. MARINE MAMMAL MODELING

The goals of the lookout effectiveness monitoring effort are provided below, with a conclusion regarding each of the goals:

1. Collect data to determine the effectiveness of the Navy LO team.

The Lookout configuration on the DDG complied exactly with the LOA. This DDG used active SONAR at dusk and at night. Therefore, dedicated Navy LOs were only positioned on the bridge wings at this time. During the rest of the daylight hours, the LO team consisted of the individuals on watch on the bridge. Therefore, this study mainly compared the effectiveness of the bridge LOs to the MMOs. The Navy teams of biologists were able to collect 19 trials in approximately 21 hours of effort, and therefore would be considered a successful event. This event is the fifth aboard a DDG in which data were collected to determine LO effectiveness. Data will be combined with past and future monitoring efforts in order to determine the effectiveness of Navy LOs as a whole, rather than specific to each vessel.

2. Obtain data to characterize the possible exposure of marine species to MFAS.

During this cruise, there was interaction with John Beegle, a Training Specialist from Program Executive Office (PEO) Integrated Warfare Systems (IWS) in Dam Neck, Virginia. Mr. Beegle and a colleague from Lockheed Martin were installing an upgrade to the AN/SQQ-89A(V)15 SONAR. Mr. Beegle was particularly interested in identifying vocalizing “biologicals” using the passive detection capabilities of the SQQ-89A(V)15. He stated that he would be developing a training tool for the SONAR techs to be able to identify which species they were listening to on the new passive system. Mr. Beegle was able to localize dolphins and whales from several kilometers away and would alert the bridge to the animals’ presence. While this caused some interference with the Lookout Effectiveness Study since the MMO team did

not have the ability to listen to communication directly between the SONAR room and the bridge which made it difficult to record instances when the bridge LO team was cued by SONAR, it was noted that passive detection is required in the LOA and that the SONAR room must alert the bridge to the presence of marine mammals.

This passive SONAR device was effective at localizing animals for mitigation and would also make it possible to characterize the animals' received levels during active SONAR. Mr. Beegle expressed interest in continuing work with the Navy bioacoustic community to further refine and improve sailor training, which represents a unique opportunity to leverage the Lookout Effectiveness Study to directly benefit the effectiveness of detecting marine mammals during training activities.

2.3. RECOMMENDATIONS

Changes to the data forms, protocols, and recommended equipment and logistics were made by the MMO team, and will be considered for implementation in future studies.

2.3.1. Data Forms

Specific data form recommendations include:

- Sightings form:
 - Specify in the protocol whether each line in the sighting form requires all information to be recorded anew or only the relevant changes. The important point here is whether we should just copy data like group size down from a previous line for that sighting, or whether we should only put data on a line that were specifically collected at the time associated with the line. This is very unclear, and can have a significant impact on what is recorded.
 - Specify in the protocol the data collection which occurs with the following scenario: The Navy LO sights (an) animal(s). Do the MMOs capture only the information which is supplied by the LO or do they augment the data with additional information collected by the MMO (i.e. species, etc.)?
 - Provide more clarification for what information is required for “end of track.” Adding the time in which the “end of track” occurred would provide data on the elapsed time in the event that the sighting is a trial. “End of track” could also be recorded as an event.

2.3.2. Lookout Effectiveness Study Protocol

- Identify which cruises plan to go active during daylight hours and plan LOE study to occur during these cruises.

2.3.3. Equipment and Logistics

- The headset marked with tape needs to be serviced as the talk button on the headset is not working.

- Make sure “Active Tracks” on the GPS is turned off before traveling to and from the event location.
- There was a GPS glitch (on all GPS devices on the DDG) during the cruise. We corrected the time in the data sheets.
- A cheat-sheet (wheel) converting bearings would be helpful.

SECTION 3 PHOTOGRAPHS

Figure 5. *Delphinus capensis*



Figure 8. *Mola mola*



Figure 6. *Delphinus* species



Figure 9. Black-footed albatross



Figure 7. Josh Frederickson on the port bridge wing



Figure 10. Andrea Balla-Holden collecting data



Figure 11. Tom Jefferson in the berthing area



Figure 14. GUNEX



Figure 12. Morgan Richie and Andrea Balla-Holden recording data



Figure 15. GUNEX, not whale blows



Figure 13. MMO crew on the DDG bow



Figure 16. Leer jet with drone

