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Final Cruise Report, Marine Species Monitoring & Lookout Effectiveness Study Unit Level Training, July 2012, Southern California Range Complex

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List of Acronyms and Abbreviations

DDG	United States Navy guided missile destroyer
DMMO	data marine mammal observer
ft	foot (feet)
GPS	global positioning system
hr	hour(s)
km	kilometer(s)
LMMO	liaison marine mammal observer
m	meter(s)
min	minute(s)
mm	millimeter(s)
MFAS	mid-frequency active sonar
MMO	marine mammal observer
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
PMAP	Protective Measures Assessment Protocol
SMMO	survey marine mammal observer
SOCAL	Southern California Range Complex
U.S.	United States
yd	yard(s)

SECTION 1 INTRODUCTION

In order to train with mid-frequency active sonar (MFAS), the United States (U.S.) Navy has obtained a permit from the National Marine Fisheries Service (NMFS) under the Marine Mammal Protection Act and a Biological Opinion under the Endangered Species Act. The Southern California Range Complex (SOCAL) Monitoring Plan, implemented in January 2009, was developed with NMFS to comply with the requirements under the permits. The monitoring plan and reporting requirements provide science-based answers to questions regarding whether or not marine mammals are exposed and react to Navy MFAS. The objectives of the monitoring plan address the following questions:

1. Are marine mammals and sea turtles exposed to MFAS at regulatory thresholds of harm or harassment? If so, at what levels and how frequently are they exposed?
2. If marine mammals and sea turtles are exposed to MFAS in SOCAL, do they redistribute geographically as a result of continued exposure? If so, how long does the redistribution last?
3. If marine mammals and sea turtles are exposed to MFAS, what are their behavioral responses? Are they different at various levels?
4. What are the behavioral responses of marine mammals and sea turtles that are exposed to various levels and distances from explosives?
5. Are the Navy's suite of mitigation measures for MFAS and explosives (e. g. Protective Measures Assessment Protocol [PMAP], measures agreed to by the Navy through permitting and consultation) effective at avoiding harm and harassment of marine mammals and sea turtles?

In order to address these questions, data would be collected through various means, including contracted vessel and aerial surveys, tagging, passive acoustic monitoring, and placing marine mammal observers (MMOs) aboard Navy warships. In a concerted effort to address the fifth question above, a study was initiated to determine the effectiveness of the Navy lookout team, including lookouts in the pilot house or on the bridge wings. Trained biologists were utilized for the study to collect data that would characterize the likelihood of detecting marine species in the field from a U.S. Navy destroyer (DDG). The University of St. Andrews, Scotland, under contract to the U.S. Navy, developed an initial protocol for use during this study. Necessary changes to the protocol were identified and made during prior cruises. Data collected are intended to be combined with future monitoring efforts in order to determine the effectiveness of Navy lookout teams as a whole, rather than specific to each vessel.

As part of this data collection effort, three U.S. Navy civilian MMOs (Dr. Stephanie Watwood, Mr. Chip Johnson, and Ms. Christiana Boerger) and one contractor (Dr. Thomas Jefferson) embarked from 23-27 July 2012 during a unit level training event in SOCAL. These MMOs were stationed aboard a U.S. Navy guided missile destroyer, hereafter referred to as DDG-H. The goals of the monitoring and this study were:

1. Collect data to assess the effectiveness of the Navy lookout team.
2. Obtain data to characterize the possible exposure of marine species to MFAS.

SECTION 2 METHODS

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 or maneuvers, and would remove themselves from the bridge wing if necessary for DDG-H 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 operations (200 yards [yds], 183 meters [m]) and was not sighted 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 initial protocol for data collection was developed by the University of St. Andrews which was modified by the MMOs on prior surveys. Additional changes were made as necessary during these events. The MMO survey on DDG-H was conducted on the bridge wings (elevated 60 feet [ft; 20 m] above the waterline), with one MMO on each wing (called survey MMOs, or SMMOs). One MMO acted as a liaison to the starboard and port lookouts (called liaison MMO or LMMO). The fourth MMO was primarily responsible for recording data (data MMO or DMMO) reported by the two SMMOs and the LMMO. A rotation schedule was used, such that an MMO would be on effort for one hour on port, one hour as the LMMO, one hour as an SMMO on starboard, and one hour as DMMO. While on effort, MMOs used naked eye and 7 X 50 magnification binoculars to scan the area from 10 degrees on the opposite side of dead ahead to just aft of the beam. This equates to a 180 degree field in front of the ship that was covered by the MMOs, with a 20 degree overlap in the area forward of the trackline covered by both observers.

If an animal was visually detected by the SMMOs, information would be collected on both the marine mammal sighting and concurrent operational parameters. Environmental data were collected routinely. Sightings obtained first by the SMMOs before the Navy lookout were considered to be "trials." If applicable, photographs would be taken using a Canon EOS 7D digital camera with a 100 – 300 millimeter (mm) zoom lens. No photographs would be taken until the Navy lookout had also made the sighting so as not to inappropriately call attention to the sighting. The track of the DDG-H was not altered as result of the sightings. Therefore, the species identification level represents the best ability to recognize species specific characteristics at a distance from the ship, without approaching the animals for study. The LMMO or SMMOs reported sightings made by the Navy bridge wing lookouts. The LMMO was also responsible for noting sightings made by the bridge team or watchstanders. After a sighting by the Navy lookout or bridge team, the LMMO would also query the personnel to clarify information on the sighting such as animals seen, bearing, distance, and time. All four MMOs were equipped with headset two-way radios in order to maintain communications without leaving their post, as well as communicating sighting and effort data without cueing the Navy lookouts to sightings. The DMMO was responsible for recording all data and making initial determination as to whether sightings were considered a duplicate, e. g., the same animal seen by two observers. The DMMO recorded effort-related events (e.g., begin effort, end effort, observer rotation, weather change) in addition to time, location, and weather information as per the protocol. At the time of events and sightings, a waypoint was immediately taken by the DMMO such that the accurate time and location would be recorded, with associated information to be appended. Effort and environmental information was collected when the MMOs began effort, at each rotation, as weather changes occurred, and when the MMOs went off effort. At the conclusion of each observation day, all photographs were reviewed to assist with species identification.

SECTION 3 RESULTS

The MMO team spent 31 hours and 3 minutes searching for marine species during the Unit Level Training (Table 1). For whole days out at sea, approximately 7.7 hours per day were spent on effort. Figure 1 shows the breakdown of Beaufort Sea State (BSS) as a total of the on-effort observation period and the percentage of sightings that occurred at each BSS. Over 70 percent of the observations occurred in a BSS of 2 or 3, creating excellent observation conditions. A smaller portion of observation time was spent in BSS 4 or greater. Portions of each observation day included time spent in a BSS of 2, which amounts to almost ideal environmental sighting conditions (Table 1).

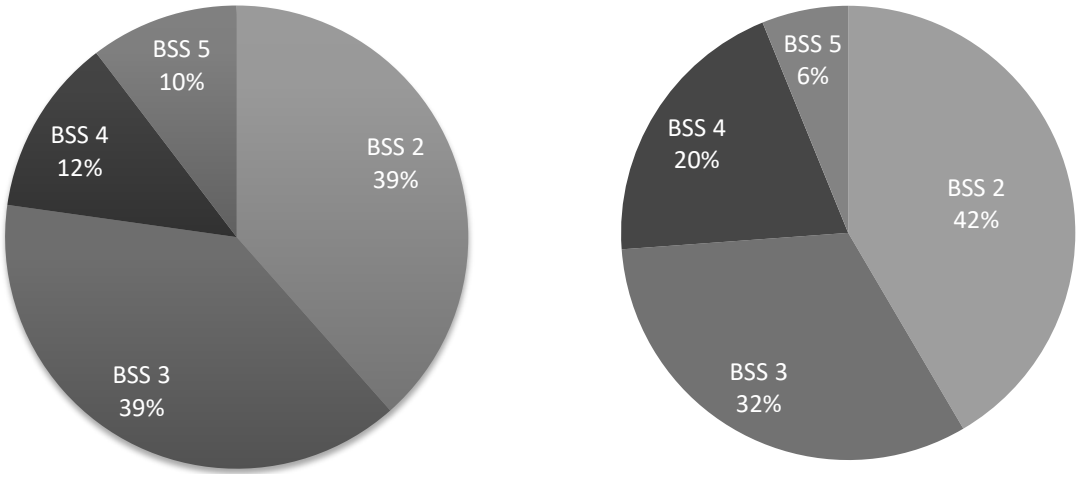

Figure 1. Total percentage of effort (*left*) and sightings (*right*) at various Beaufort Sea States (BSS)

Table 1. Effort Hours and Environmental Conditions

Date	Team Hours On-Effort	Time	Beaufort Sea State (range)	% Cloud Cover (range, conditions)	Visibility
23 Jul	4 hr 2 min	1219-1520;1533-1634	2 - 3	70 - 87	Excellent
24 Jul	8 hr 17 min	715-1122, 1312-1622,1843-1944	3 - 4	0 - 100	Excellent
25 Jul	7 hr 39 min	0716-1119, 1308-1645	2 - 5	0 - 95	Excellent
26 Jul	7 hr 9 min	0716-1125, 1319-1620	2- 5	3 – 97.5	Excellent
27 Jul	3 hr 55 min	0839-0923, 0945-1145,1221-1331	2 - 4	0 – 95	Excellent
Total	**31 hr 3 min**		**2 – 5**	**0 – 100**	**Excellent**

In total, 63 unique sightings comprising at least 1065 individual marine mammals were recorded during the five days of observation. MMOs made 56 sightings independent of the ship's LO team (Table 2, Figure 2 through Figure 6). There were six sightings made concurrently by both the MMO and LO team. The LO team made one sighting independent of the MMOs.

It should be noted that due to the ship's training schedule, MFAS was not used during this cruise. Therefore, the ship's bridge team's primary focus was on safety of navigation and avoidance of ship strike to whales while underway. In several cases, the ship actively changed course to avoid crossing a whale's path. A total of 911 photographs were taken, of which 637 include visible cetaceans (see Figure 7 for selected photographs), with the remainder being of other marine species, vessels, staff, and procedures.

Table 2. Number of Sightings

Date	Independent MMO Sightings	Independent Navy Lookout Team Sightings	Sightings by both Teams
23 Jul	10	0	0
24 Feb	19	0	4
25 Feb	14	0	1
26 Feb	6	1	1
27 Feb	7	0	0
Total	**56**	**1**	**6**

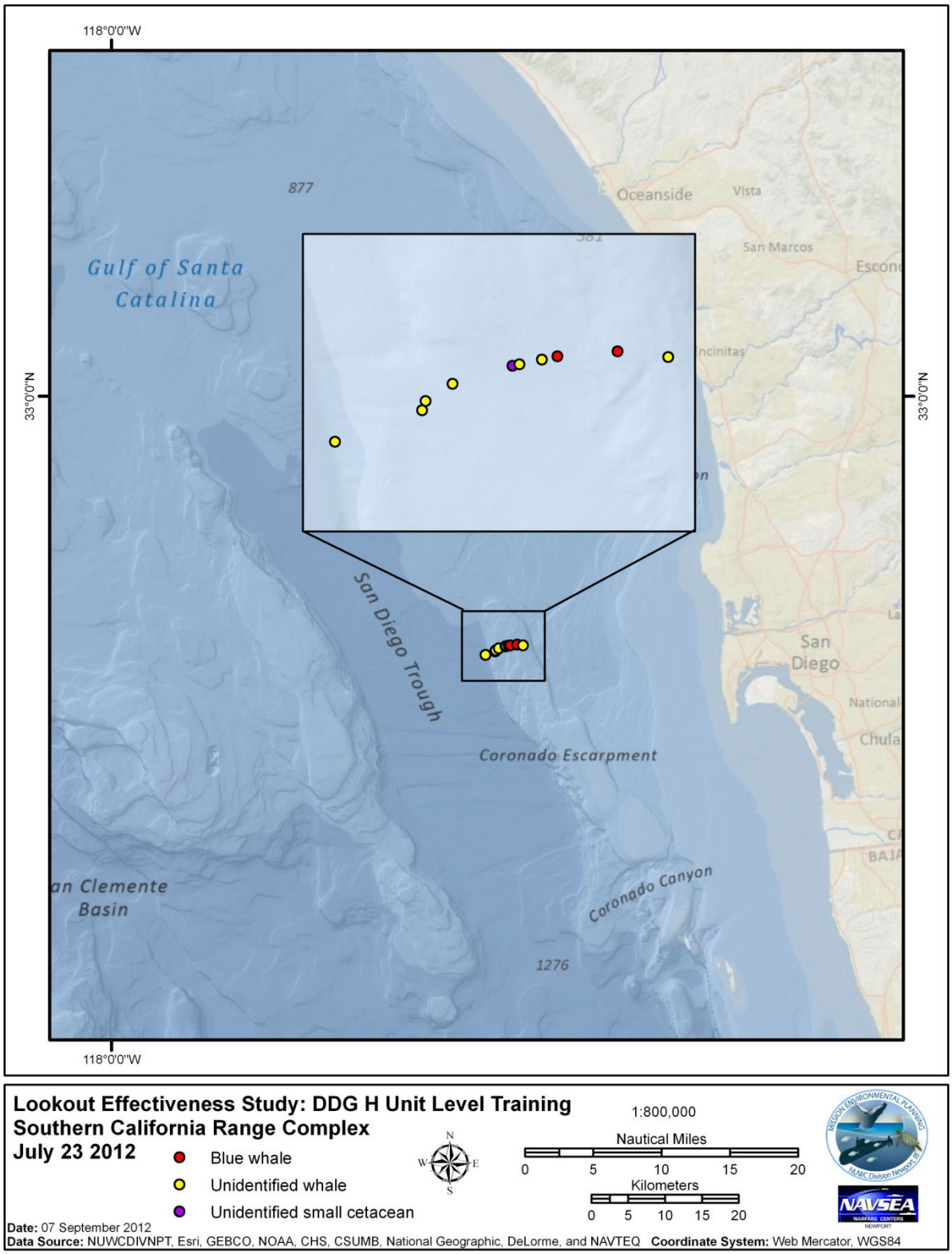

Figure 2. Marine Mammal Sighting Locations on 23 July 2012

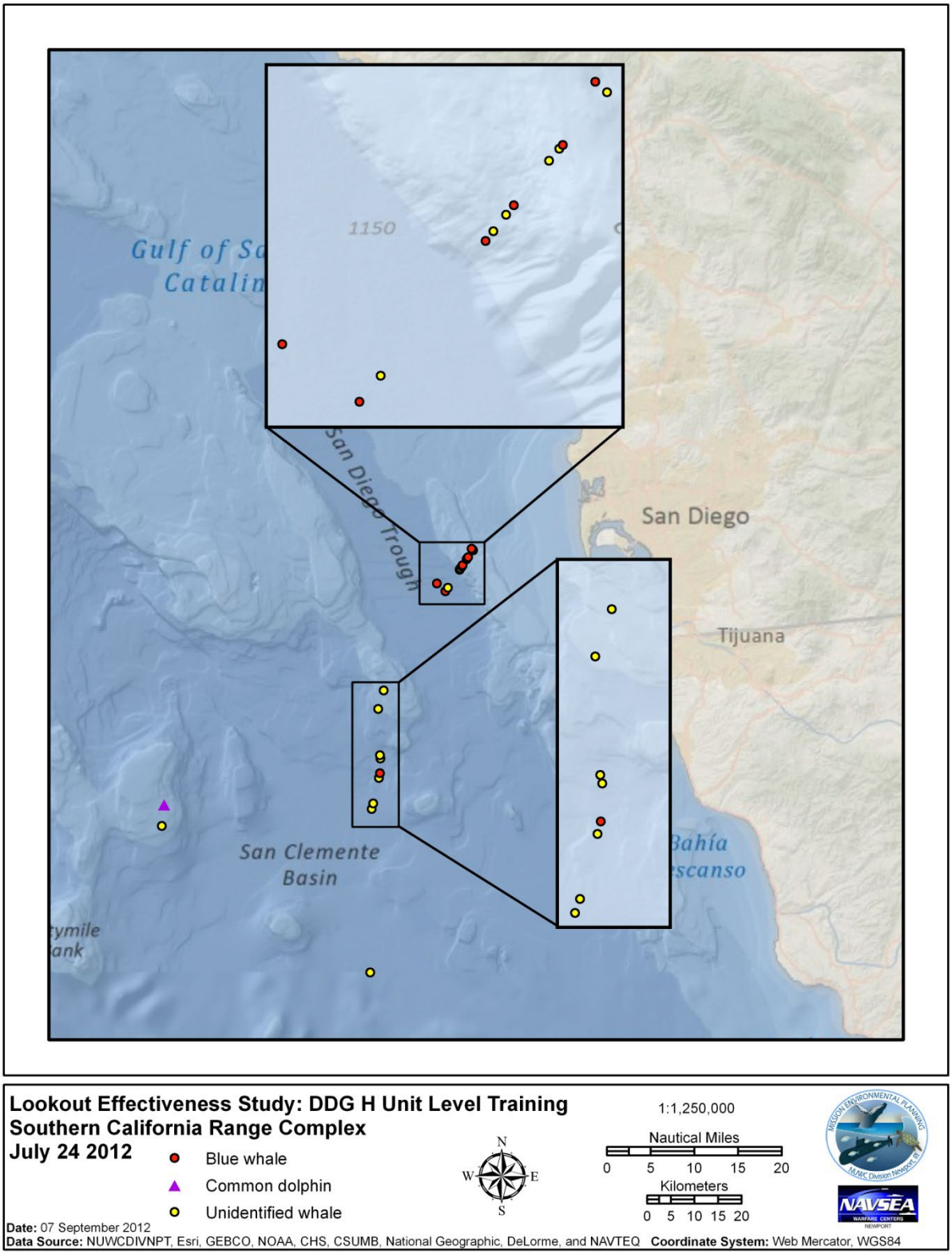

Figure 3. Marine Mammal Sighting Locations on 24 July 2012

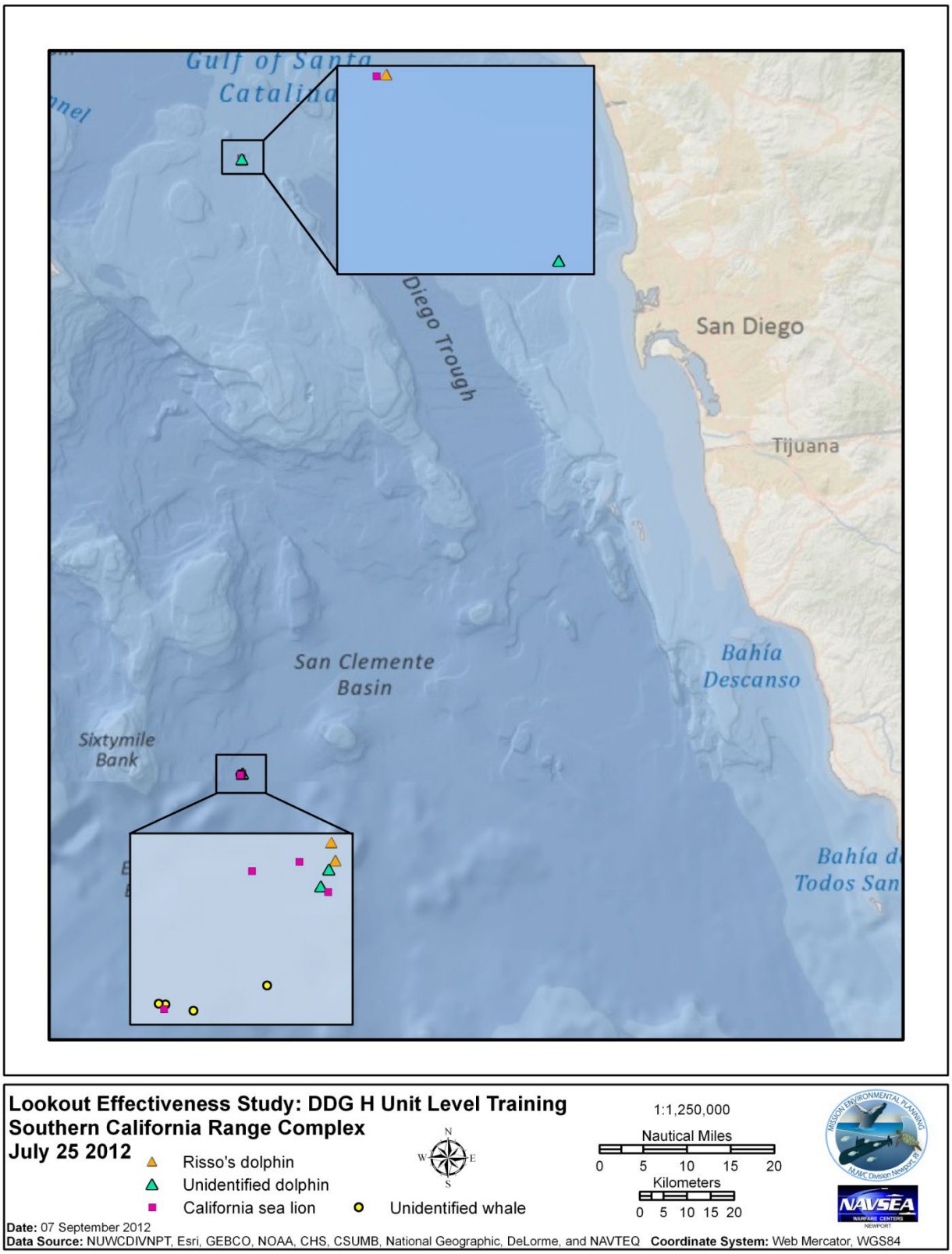

Figure 4. Marine Mammal Sighting Locations on 25 July 2012

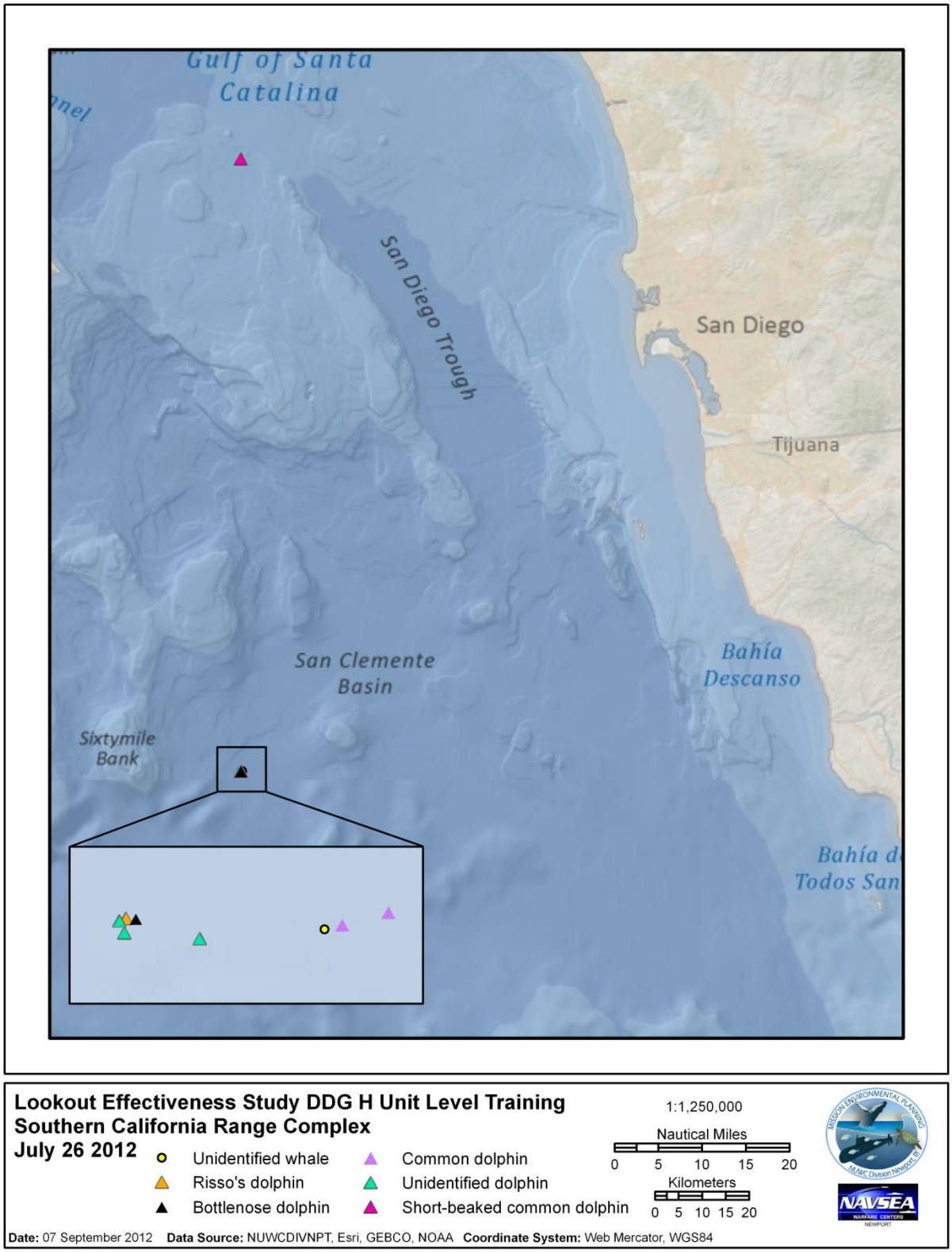

Figure 5. Marine Mammal Sighting Locations on 26 July 2012

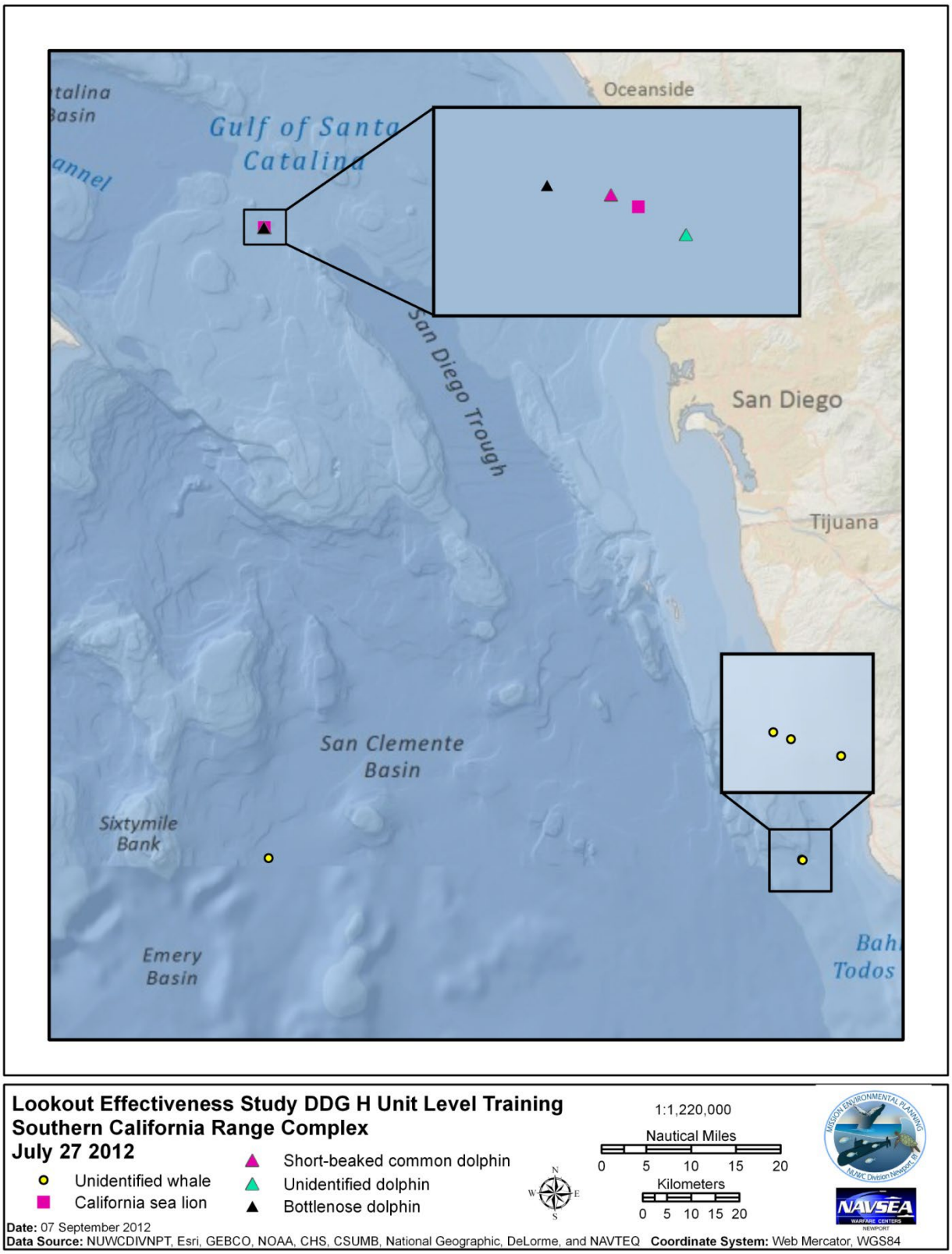

Figure 6. Marine Mammal Sighting Locations on 27 July 2012

Trials were successfully conducted on five days of the event, with 61 of the 63 sightings (97%) available for trials, or an average rate of 1.97 trials per hour of effort across all five days (Table 3).

Table 3. Effort hours, sighting rates, and trial rates

Date	Hours MMO Team Effort	# of Unique Sightings*	Sightings/ Hour	# of Trials	Trials/Hour
23 Jul	4 hr 2 min	10	2.48	10	2.48
24 Jul	8 hr 17 min	23	2.77	22	2.65
25 Jul	7 hr 39 min	15	1.96	14	1.83
26 Jul	7 hr 09 min	8	1.12	8	1.12
27 Jul	3 hr 55 min	7	1.78	7	1.78
Cumulative	**31 hr 3 min**	**63**	**1.97**	**61**	**1.97**

Figure 7. Sightings from DDGH. A) **Risso's dolphins sighted on 25 July 2012** B) **Short-beaked common dolphins sighted on 26 July 2012** C) **Blue whale sighted on 24 July 2012**

Of the 63 sightings, five species were positively identified, the blue whale (*Balaenoptera musculus*), California sea lion (*Zalophus californianus*), Risso's dolphin (*Grampus griseus*), short-beaked common dolphin (*Delphinus delphis*), and bottlenose dolphin (*Tursiops truncatus*) and accounted for 24 of the sightings (Table 4). The second day of the effort had the greatest frequency of unique sightings, 2.77 sightings/hour of effort.

Table 4. Unique Marine Mammal Sightings

Data Category	Sighting 1	Sighting 2	Sighting 3	Sighting 4	Sighting 5	Sighting 6	Sighting 7
Sighting Information							
Effort	On	On	On	On	On	On	On
Date	7/23/2012	7/23/2012	7/23/2012	7/23/2012	7/23/2012	7/23/2012	7/23/2012
Time (HST)	13:06:35	13:47:39	13:49:49	14:05:27	14:36:32	14:40:47	14:52:11
Location	32.73515 N 117.54398 W	32.73877 N 117.53203 W	32.73983 N 117.53153 W	32.74182 N 117.52783 W	32.7439 N 117.51963 W	32.74407 N 117.51868 W	32.74462 N 117.5156 W
Detection Sensor	MMO	MMO	MMO	MMO	MMO	MMO	MMO
Species/Group	Unidentified Whale	Unidentified Whale	Unidentified Whale	Unidentified Whale	Small Unidentified Cetacean	Unidentified Whale	Blue Whale
Group Size estimate (estimated range)	1 (1)	1 (1-2)	1 (1)	2 (2)	10 (8-20)	1 (1-2)	1 (1)
# Calves	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Bearing (relative)	55	40	330	30	45	30	80
Distance (m)	7515.65	8590.34	4297.88	7515.65	6120.48	6120.48	10266.91
Animal motion	Opening	Unknown	Parallel	Closing	Opening	Unknown	Unknown
Sighting Cue	Body	Blow	Back	Blow	Splash	Blow	Blow
Behavior	Fluke up	Unknown	Unknown	Unknown	Unknown	Unknown	Travel
Environmental Information							
Wave height (ft)	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft
Visibility	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Beaufort Sea State	2	2	2	2	2	2	2
Cloud cover (%)	87	87	87	80	80	80	80
Glare (%)	5	5	5	0	0	0	0
Operational Information							
Sonar	Off	Off	Off	Off	Off	Off	Off
Ship bearing (true)	337	353	350	348	6	8	0
Mitigation implemented	None	None	None	None	None	None	None
Comments	Flukes. Probably not fin whale	Tall blows; 3 blows	Saw back	blows	Distributed pod	Photos: 7295-7305	

Table 4. (Cont) Unique Marine Mammal Sightings

Data Category	Sighting 8	Sighting 9	Sighting 10	Sighting 11	Sighting 12	Sighting 13	Sighting 14
Sighting Information							
Effort	On	On	On	On	On	On	On
Date	7/23/2012	7/23/2012	7/23/2012	7/24/2012	7/24/2012	7/24/2012	7/24/2012
Time	15:01:01	15:36:57	16:12:48	7:36:20	7:59:50	10:11:57	10:13:43
Location	32.74498 N 117.51347 W	32.74555 N 117.50523 W	32.74488 N 117.49828 W	32.27105 N 118.04777 W	32.23648 N 118.0519 W	32.00064 N 117.65537 W	32.26382 N 117.6527 W
Detection Sensor	MMO	MMO	MMO	MMO	MMO	MMO	MMO
Species/Group	Blue Whale	Blue Whale	Unidentified Whale	Common Dolphin	Unidentified Whale	Unidentified Whale	Unidentified Whale
Group Size estimate (estimated range)	3 (2-3)	1 (1)	2 (2)	50 (20-50)	1 (1)	2 (2)	1 (1)
# Calves	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Bearing (relative)	10	50	20	350	40	275	45
Distance (m)	6120.48	4297.88	7515.65	4297.88	2964.51	4863.86	6120.48
Animal motion	Parallel	Opening	Parallel	Parallel	Closing	Parallel	Opening
Sighting Cue	Blow	Blow	Blow	Back	Blow	Blow	Blow
Behavior	Unknown	Unknown	Unknown	Travel	Unknown	Unknown	Unknown
Environmental Information							
Wave height (ft)	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft
Visibility	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Beaufort Sea State	2	2	2	3	3	3	3
Cloud cover (%)	80	70	70	85	85	100	100
Glare (%)	0	0	0	0	0	0	0
Operational Information							
Sonar	Off	Off	Off	Off	Off	Off	Off
Ship bearing (true)	6	353	15	196	108	16	15
Mitigation implemented	None	None	None	None	None	None	None
Comments	Tall blows, fluke up Photos: 7307-7349			Photos: 7367-7414; past beam at WP34	Likely fin whale, single blow, no mottling, dark body	Unidentified large whale	Probable fin whale, pronounced dorsal fin; dove

Table 4. (Cont) Unique Marine Mammal Sightings

Data Category	Sighting 15	Sighting 16	Sighting 17	Sighting 18	Sighting 19	Sighting 20	Sighting 21
Sighting Information							
Effort	On	On	On	On	On	On	On
Date	7/24/2012	7/24/2012	7/24/2012	7/24/2012	7/24/2012	7/24/2012	7/24/2012
Time (HST)	10:15:48	10:25:25	10:27:14	10:32:48	10:34:13	10:51:12	10:58:19
Location	32.27263 N 117.64958 W	32.31343 N 117.6387 W	32.32118 N 117.63667 W	32.34507 N 117.63568 W	32.35028 N 117.63693W	32.42452 N 117.64008 W	32.45427 N 117.62973 W
Detection Sensor	MMO	MMO	MMO	MMO	MMO	MMO	MMO
Species/Group	Unidentified Whale	Unidentified Whale	Blue Whale	Unidentified Whale	Unidentified Whale	Unidentified Whale	Unidentified Whale
Group Size estimate (estimated range)	2 (2)	1 (1)	2 (2)	1 (1)	1 (1)	3 (3)	2 (2)
# Calves	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Bearing (relative)	345	90	300	310	60	10	10
Distance (m)	6731.20	7515.65	1348.68	1623.26	3349.76	6120.48	4297.88
Animal motion	Unknown	Unknown	Opening	Parallel	Opening	Opening	Parallel
Sighting Cue	Blow	Blow	Blow	Blow	Blow	Blow	Blow
Behavior	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Environmental Information							
Wave height (ft)	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft
Visibility	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Beaufort Sea State	3	3	3	3	3	3	3
Cloud cover (%)	100	100	100	100	100	100	100
Glare (%)	0	0	0	0	0	0	0
Operational Information							
Sonar	Off	Off	Off	Off	Off	Off	Off
Ship bearing (true)	14	0	0	350	350	16	15
Mitigation implemented	None	None	None	None	None	None	None
Comments			Photos: 7421-7429	Possible Blue Whale	Probable Blue		

Table 4. (Cont) Unique Marine Mammal Sightings

Data Category	Sighting 22	Sighting 23	Sighting 24	Sighting 25	Sighting 26	Sighting 27	Sighting 28
Sighting Information							
Effort	On	On	On	On	On	On	On
Date	7/24/2012	7/24/2012	7/24/2012	7/24/2012	7/24/2012	7/24/2012	7/24/2012
Time (HST)	13:13:09	14:05:34	14:47:24	15:24:10	15:27:17	15:31:56	15:34:45
Location	32.62557 N 117.52858 W	32.6134 N 117.51222 W	32.61888 N 117.50768 W	32.64747 N 117.48543 W	32.64952 N 117.48378 W	32.65302 N 117.48112 W	32.65505 N 117.47947 W
Detection Sensor	MMO	MMO	MMO	MMO	MMO	MMO	MMO
Species/Group	Blue Whale	Blue Whale	Unidentified Whale	Blue Whale	Unidentified Whale	Unidentified Whale	Blue Whale
Group Size estimate (estimated range)	2 (2-3)	1 (1)	1 (1)	1 (1)	2 (2-3)	1 (1)	3 (1-3)
# Calves	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Bearing (relative)	18	350	355	10	315	90	5
Distance (m)	7515.65	8590.34	8590.34	4297.88	6731.20	7515.65	5625.74
Animal motion	Opening	Opening	Unknown	Closing	Unknown	Unknown	Opening
Sighting Cue	Blow	Blow	Blow	Blow	Blow	Blow	Blow
Behavior	Milling	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Environmental Information							
Wave height (ft)	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft
Visibility	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Beaufort Sea State	3	3	3	4	4	4	4
Cloud cover (%)	40	40	5	0	0	0	0
Glare (%)	2.5	2.5	12.5	10	10	10	10
Operational Information							
Sonar	Off	Off	Off	Off	Off	Off	Off
Ship bearing (true)	27	65	26	25	24	25	25
Mitigation implemented	None	None	None	None	None	None	None
Comments	Fluked up, light backs	At horizon, rhib circling whale	Rhib moved to this sighting; Photos: 7444-7465	Photos: 74465-7515 – behavior first parallel, then closing; Also photos:7517-7550			

Table 4. (Cont) Unique Marine Mammal Sightings

Data Category	Sighting 29	Sighting 30	Sighting 31	Sighting 32	Sighting 33	Sighting 34	Sighting 35
Sighting Information							
Effort	On	On	On	On	On	On	On
Date	7/24/2012	7/24/2012	7/24/2012	7/24/2012	7/24/2012	7/25/2012	7/25/2012
Time (HST)	15:48:38	15:52:39	15:54:10	16:11:23	16:17:15	7:29:48	7:56:42
Location	32.66447 N 117.47198 W	32.66703 N 117.46982 W	32.66783 N 117.46908 W	32.67898 N 117.45972 W	32.68123 N 117.46217 W	33.0021 N 118.0053 W	33.00211 N 118.00525 W
Detection Sensor	MMO	MMO	MMO	MMO	MMO	MMO	MMO
Species/Group	Unidentified Whale	Blue Whale	Blue Whale	Unidentified Whale	Blue Whale	California Sea Lion	Risso's Dolphin
Group Size estimate (estimated range)	1 (1)	4 (3-5)	2 (1-3)	1 (1)	3 (2-4)	1 (1)	12 (9-16)
# Calves	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Bearing (relative)	30	310	0	15	290	30	355
Distance (m)	2343.24	6731.20	6120.48	8590.34	4064.80	75	2754.81
Animal motion	Parallel	Opening	Opening	Unknown	Closing	Opening	Closing
Sighting Cue	Unknown	Blow	Back	Blow	Blow	Body	Dorsal
Behavior	Unknown	Unknown	Unknown	Unknown	Unknown	Leap	Slow Travel
Environmental Information							
Wave height (ft)	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft
Visibility	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Beaufort Sea State	4	4	4	4	4	2	2
Cloud cover (%)	0	0	0	5	5	95	95
Glare (%)	10	10	10	20	20	1	1
Operational Information							
Sonar	Off	Off	Off	Off	Off	Off	Off
Ship bearing (true)	25	25	25	350	273	184	193
Mitigation implemented	None	None	None	None	None	None	None
Comments		Possible resight/merging of groups; Photos: 7551-7579			Photos:7582-7599		Photos: 7607-7613

Table 4. (Cont) Unique Marine Mammal Sightings

Data Category	Sighting 36	Sighting 37	Sighting 38	Sighting 39	Sighting 40	Sighting 41	Sighting 42
Sighting Information							
Effort	On	On	On	On	On	On	On
Date	7/25/12	7/25/12	7/25/12	7/25/12	7/25/12	7/25/12	7/25/12
Time (HST)	8:40:22	9:35:13	9:40:15	9:53:26	10:03:40	10:13:37	10:19:42
Location	33.00106 N 118.00427 W	32.01586 N 118.00323 W	32.01551 N 118.00315 W	32.01549 N 118.00383 W	32.01502 N 118.00343 W	32.01492 N 118.00329 W	32.01535 N 118.00327 W
Detection Sensor	MMO	MMO	MMO	MMO	MMO	MMO	MMO
Species/Group	Unidentified Dolphin	Risso's Dolphin	Risso's Dolphin	California Sea Lion	Unidentified Dolphin and California Sea Lion	California Sea Lion	Unidentified Dolphin
Group Size estimate (estimated range)	2 (2-5)	15 (10-25)	5 (5-8)	1 (1)	8 (5-10)	1 (1)	8 (5-10)
# Calves	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Bearing (relative)	15	2	50	50	12	40	290
Distance (m)	731.91	3857.19	1008.47	1623.26	2491.78	895.64	2040.42
Animal motion	Closing	Unknown	Opening	Unknown	Opening	Opening	Parallel
Sighting Cue	Splash/body	Body	Body	Flipper Up	Body	Splash	Body
Behavior	Travel	Milling	Milling	Thermo regulating	Unknown	Unknown	Slow travel
Environmental Information							
Wave height (ft)	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft
Visibility	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Beaufort Sea State	2	2	2	2	2	2	2
Cloud cover (%)	75	75	40	40	40	40	40
Glare (%)	15	15	10	10	10	10	10
Operational Information							
Sonar	Off	Off	Off	Off	Off	Off	Off
Ship bearing (true)	355	170	170	230	159	359	0
Mitigation implemented	None	None	None	None	None	None	None
Comments		Photos 7616-7620	Photos: 7621-7678	Photos: 7680-7698		Past Beam	Photos: 7737-7739. Possible Risso's.

Table 4. (Cont) Unique Marine Mammal Sightings

Data Category	Sighting 43	Sighting 44	Sighting 45	Sighting 46	Sighting 47	Sighting 48	Sighting 49
Sighting Information							
Effort	On	On	On	On	On	On	On
Date	7/25/12	7/25/12	7/25/12	7/25/12	7/25/12	7/25/12	7/26/12
Time (HST)	11:12:56	13:35:41	15:21:02	16:09:29	16:20:33	16:42:59	7:37:54
Location	32.01532 N 118.00474 W	32.01313 N 118.00445 W	32.01265 N 118.00585 W	32.01277 N 118.00638 W	32.01278 N 118.00651 W	32.01268 N 118.00641 W	32.01632 N 118.00342 W
Detection Sensor	Bridge/MMO	MMO	MMO	MMO	MMO	MMO	MMO
Species/Group	California Sea Lion	Unidentified Whale	Unidentified Whale	Unidentified Whale	Unidentified Whale	California Sea Lion	Common Dolphin
Group Size estimate (estimated range)	3 (2-5)	1 (1)	2 (2-3)	1 (1-2)	1 (1)	1 (1)	400 (200-500)
# Calves	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Bearing (relative)	10	350	320	345	20	10	350
Distance (m)	1348.68	7515.65	4863.86	8590.34	8590.34	45.72	3857.19
Animal motion	Unknown	Unknown	Unknown	Unknown	Opening	Closing	Unknown
Sighting Cue	Body	Blow	Blow	Blow	Blow	Body	Splash
Behavior	Milling	Travel	Unknown	Unknown	Unknown	Unknown	Milling, feeding, leaping
Environmental Information							
Wave height (ft)	< 3 ft	< 3 ft	3-5 ft	3-5 ft	3-5 ft	3-5 ft	< 3 ft
Visibility	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Beaufort Sea State	2	3	5	5	5	5	3
Cloud cover (%)	8	5	0	0	3	3	72.5
Glare (%)	5	2.5	12.5	12.5	20	20	0
Operational Information							
Sonar	Off	Off	Off	Off	Off	Off	Off
Ship bearing (true)	133	185	272	279	277	85	248
Mitigation implemented	None	None	None	None	None	None	None
Comments	seen by bridge crew as well	Light colored back					Dispersed school; passes beam at WP146; Photos: 7805-7821

Table 4. (Cont) Unique Marine Mammal Sightings

Data Category	Sighting 50	Sighting 51	Sighting 52	Sighting 53	Sighting 54	Sighting 55	Sighting 56
Sighting Information							
Effort	On	On	On	On	On	On	On
Date	7/26/2012	7/26/2012	7/26/2012	7/26/2012	7/26/2012	7/26/2012	7/26/2012
Time (HST)	7:49:40	7:54:57	8:32:51	8:54:25	9:07:22	9:38:22	10:06:19
Location	32.01616 N 118.00402 W	32.0161 N 118.00425 W	32.01598 N 118.00586 W	32.01606 N 118.00683 W	33.00002 N 118.0068 W	32.01662 N 118.00679 W	32.01621 N 118.0069 W
Detection Sensor	MMO	MMO	MMO	MMO	MMO	MMO	Bridge
Species/Group	Common Dolphin	Unidentified Whale	Unidentified Dolphin	Unidentified Dolphin	Short-Beaked Common Dolphin	Risso's Dolphin and Bottlenose Dolphin	Unidentified Dolphin
Group Size estimate (estimated range)	120 (80-250)	1 (1)	20 (10-25)	2 (2)	250 (150-400)	90 (70-150)	
# Calves	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Bearing (relative)	10	355	320	80	15	325	79
Distance (m)	4561.83	1807.79	4297.88	895.64	3349.76	6120.48	Unknown
Animal motion	Opening	Opening	Unknown	Closing	Unknown	Parallel	Unknown
Sighting Cue	Splash	Blow	Splash	Body	Splash	Splash	Unknown
Behavior	Feeding	Travel	Feeding/milling	Unknown	Feeding/leaping	Travel	Unknown
Environmental Information							
Wave height (ft)	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft	< 3 ft
Visibility	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Beaufort Sea State	3	3	2	2	2	2	2
Cloud cover (%)	72.5	72.5	97.5	97.5	97.5	95	95
Glare (%)	0	0	0	0	0	0	0
Operational Information							
Sonar	Off	Off	Off	Off	Off	Off	Off
Ship bearing (true)	249	249	272	90	350	181	340
Mitigation implemented	None	None	None	None	None	None	None
Comments	Dispersed group, maybe DELCA; passed beam at WP 150	Small body, dark. Larger than dolphin, smaller than fin whale	San Clemente Island 8.3nm from ship. Passed beam at WP 153. Probable DEL--	Possible DEL--. Passed beam at WP 155. Photos: 7827-7829	Large dispersed group; Photos:7832-7965	Photos: 7967-8148	Combat saw dolphins on camera – were unsure of distance

Table 4. (Cont) Unique Marine Mammal Sightings

Data Category	Sighting 57	Sighting 58	Sighting 59	Sighting 60	Sighting 61	Sighting 62	Sighting 63
Sighting Information							
Effort	On	On	On	On	On	On	On
Date	7/27/2012	7/27/2012	7/27/2012	7/27/2012	7/27/2012	7/27/2012	7/27/2012
Time (HST)	10:17:36	10:23:56	10:27:36	10:41:43	13:14:19	13:16:42	13:23:40
Location	33.00196 N 118.00713 W	33.00232 N 118.00774 W	33.00247 N 118.00809 W	33.00259N 118.00891 W	32.01162 N 117.00913 W	32.01149 N 117.00881 W	32.01119 N 117.0079 W
Detection Sensor	MMO	MMO	MMO	MMO	MMO	MMO	MMO
Species/Group	Unidentified Dolphin	California Sea Lion	Short-Beaked Common Dolphin	Bottlenose Dolphin	Blue Whale	Unidentified Whale	Unidentified Whale
Group Size estimate (estimated range)	1 (1)	1 (1)	15 (10-20)	40 (30-60)	1 (1)	1 (1)	1 (1)
# Calves	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Bearing (relative)	45	345	220	350	340	280	330
Distance (m)	1623.26	3349.76	2754.81	2964.52	3349.76	6120.48	6120.48
Animal motion	Parallel	Parallel	Closing	Closing	Opening	Unknown	Parallel
Sighting Cue	Body	Splash	Splash	Splash	Blow	Blow	Blow
Behavior	Travel	Unknown	Unknown	Travel	Unknown	Unknown	Unknown
Environmental Information							
Wave height (ft)	< 3 ft	< 3 ft	< 3 ft	< 3 ft	3-5 ft	3-5 ft	3-5 ft
Visibility	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Beaufort Sea State	3	2	2	2	3	3	3
Cloud cover (%)	95	82.5	82.5	82.5	10	10	10
Glare (%)	0	0	0	0	3	3	3
Operational Information							
Sonar	Off	Off	Off	Off	Off	Off	Off
Ship bearing (true)	303	300	296	180	109	109	Unknown
Mitigation implemented	None	None	None	None	None	None	None
Comments	Light color side possibly, no photos, passed beam WP 180	Passed beam at WP 183	Passed beam at WP 185	Photos: 8158-8186		Probable blue whale	Prob. Blue Whale, reticle is from land

SECTION 4 CONCLUSION

4.1. MARINE MAMMAL MONITORING

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 lookout team.

   This event is the eighth aboard a DDG in which data were collected to determine effectiveness; data will be combined with future monitoring efforts in order to determine the effectiveness of Navy lookouts as a whole, rather than specific to each vessel.

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

   Sighting information included the bearing and distance of the animal to DDG-H. This information can be used to determine the level of exposure a marine mammal may experience during an MFAS event. For this embark, no MFAS occurred during visual observation periods.

4.2. RECOMMENDATIONS

Minor changes to the data forms, protocols, and recommended equipment were made by the MMO team, and will be considered for implementation in future lookout effectiveness studies.

Data-entry on the same day after data collection, especially the first day, was a previous recommendation that is reiterated here, as it is especially valuable in the process of training of new Navy civilian biologists in the execution of the study. One avenue that should be explored is the use of technology to assist with data collection real-time during observation sessions. This would drastically decrease the time required for data-entry after data collection. Software and hardware systems should be explored that could be used easily by the MMO team, but still allow the team to maintain an inconspicuous footprint on the bridge.