May 2014

Final Cruise Report, Marine Species Monitoring & Lookout Effectiveness Study Submarine Commanders Course, February 2014, Hawaii Range Complex

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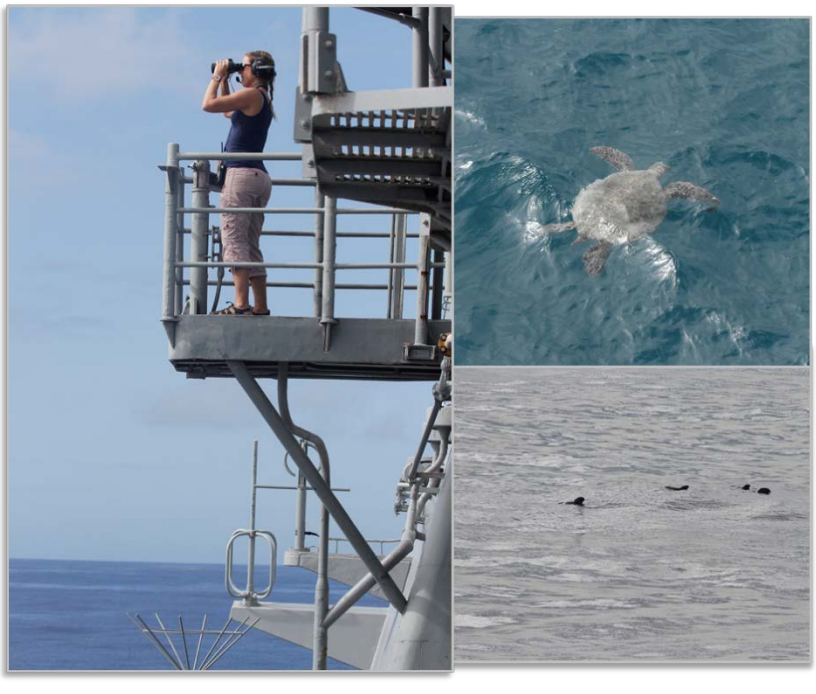

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14. ABSTRACT

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 (MMPA) and a Biological Opinion under the Endangered Species Act (ESA). The Navy has developed Monitoring Plans for individual Navy Range Complexes, guided by the Integrated Comprehensive Monitoring Program (ICMP), to provide marine mammal and sea turtle monitoring guidelines as required under the MMPA and the ESA (Department of the Navy 2010). The Hawaii Range Complex (HRC) Monitoring Plan, implemented in 2014, was developed with NMFS to comply with the requirements under the permits (Department of the Navy 2014).

The ICMP provides the overarching framework for coordination of the U.S. Navy Monitoring Program (Department of the Navy 2010). The ICMP outlines objectives for range/project-specific Monitoring Plans and U.S. Navy-funded research relating to the effects of naval training and testing activities on protected marine species (Department of the Navy 2010). The Marine Species Monitoring Report for the HRC includes the following scientific objectives (Department of the Navy 2014):

1. Determine what species and populations of marine mammals and sea turtles are present in Navy range complexes;
2. Continue development of passive acoustic monitoring techniques and tools for detecting, classifying, and localizing marine mammals;
3. Determine what populations of marine mammals are exposed to Navy training and testing activities;
4. Establish the baseline vocalization behavior of marine mammals where Navy training and testing activities occur;
5. Develop analytic methods to evaluate behavioral responses based on passive acoustic monitoring techniques;

6. Evaluate behavioral responses by marine mammals exposed to Navy training and testing activities;
7. Establish the baseline habitat uses and movement patterns of marine mammals where Navy training and testing activities occur;
8. Determine the effectiveness of Navy watch-standers/ lookouts;
9. Assess existing data sets which could be utilized to address the above objectives.

In order to address these objectives, 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 eighth scientific objective above, a study was initiated in 2010 to determine the effectiveness of the
Final Cruise Report, Marine Species Monitoring May 2014 And Lookout Effectiveness Study, HRC SCC, February 2014
Page 5
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 cruiser (CG). 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 initial embarks. Data collected are combined with prior and subsequent embarks 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, four U.S. Navy civilian MMOs (Mr. Thomas Vars, Ms. Natasha Dickenson, Ms. Meredith Fagan, and Ms. Jessica Bredvik) embarked from 17-21 February 2014 during a Submarine Commanders Course event in HRC. These MMOs were stationed aboard a U.S. Navy guided missile cruiser, hereafter referred to as CG-B. 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 MFAS.

15. SUBJECT TERMS
Monitoring, marine mammal, adaptive management review, Hawaii Range Complex

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Table of Contents

List of Tables

List of Figures

List of Acronyms and Abbreviations

BSS	Beaufort Sea State
CG	United States Navy guided missile cruiser
DMMO	data marine mammal observer
ft	foot (feet)
GPS	global positioning system
hr	hour(s)
HRC	Hawaii Range Complex
HST	Hawaii Standard Time
ICMP	Integrated Comprehensive Monitoring Program
LMMO	liaison marine mammal observer
m	meter(s)
min	minute(s)
MFAS	mid-frequency active sonar
MMO	marine mammal observer
NMFS	National Marine Fisheries Service
SMMO	survey marine mammal observer
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 (MMPA) and a Biological Opinion under the Endangered Species Act (ESA). The Navy has developed Monitoring Plans for individual Navy Range Complexes, guided by the Integrated Comprehensive Monitoring Program (ICMP), to provide marine mammal and sea turtle monitoring guidelines as required under the MMPA and the ESA (Department of the Navy 2010). The Hawaii Range Complex (HRC) Monitoring Plan, implemented in 2014, was developed with NMFS to comply with the requirements under the permits (Department of the Navy 2014).

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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 cruiser (CG). 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 initial embarks. Data collected are combined with prior and subsequent embarks 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, four U.S. Navy civilian MMOs (Mr. Thomas Vars, Ms. Natasha Dickenson, Ms. Meredith Fagan, and Ms. Jessica Bredvik) embarked from 17-21 February 2014 during a Submarine Commanders Course event in HRC. These MMOs were stationed aboard a U.S. Navy guided missile cruiser, hereafter referred to as CG-B. 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 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 CG-B 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 CG-B was conducted on the bridge wings (elevated 61.7 feet [ft; 18.8 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 a marine mammal or sea turtle was visually detected by the SMMOs, information would be collected on both the 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 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 CG-B 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. Seabirds are not the focus of this study, however, as they represent a white cue against a dark background, they were often observed during routine searches for marine mammals. They were only reported if the SMMO could quickly identify them and report to the DMMO without distracting from the primary mission. 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 29 hours and 51minutes searching for marine species during the training event (Table 1). For whole days out at sea, approximately 8.2 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. During the event, BSS ranged from 2 to 5 (Table 1). The majority of observation time was spent in a BSS of 2 or 3 (31.9% and 52.6%, respectively) which amounts to favorable environmental sighting conditions, with the majority of the sightings (66.7%) occurring in BSS 3 (Figure 1).

Table 1. Effort Hours and Environmental Conditions

Date	Team Hours On-Effort	Time	Beaufort Sea State (range)	% Cloud Cover (range)	Visibility
18 Feb	8 hr 6 min	748-1154, 1305-1706	2 – 3	5 - 55	Excellent
19 Feb	7 hr 59 min	722-1123, 1236-1635	2 – 3	50 – 87.5	Excellent
20 Feb	8 hr 25 min	720-1135, 1248-1659	2 – 5	20 - 90	Excellent
21 Feb	5 hr 21 min	714-1122, 1312-1426	3	41– 90	Excellent
Total	**29 hr 51 min**		**2 – 5**	**5 – 90**	**Excellent**

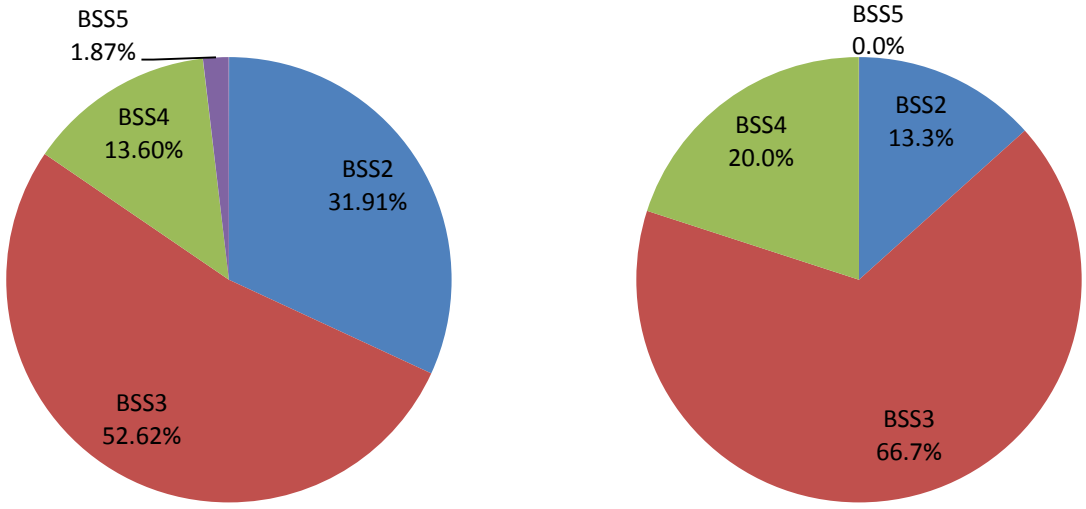

Figure 1. Total percentage of effort (left) and sightings (right) at various Beaufort Sea States (BSS)

In total, 15 unique sightings comprising at least 45 individual marine mammals and sea turtles were recorded during the four days of observation (Figure 2 through Figure 8). MMOs made 13 sightings independent of the ship's watchstander team (Table 2). There were two sightings made initially by the watchstander team and confirmed by the MMOs. The ship's passive acoustic detection detected one marine mammal group and identified the group as pilot whales after the MMOs had already recorded this sighting (sighting 4).

Seabird sightings were not recorded on this trip. A total of 414 photographs were taken, some of which include visible cetaceans. All other photos are of seabirds, sea turtles, vessels, helicopters, staff, and procedures.

Table 2. Number of Sightings

Date	Independent MMO Sightings	Independent Navy Watchstander Team Sightings	Sightings by both Teams
18 Feb	1	1	0
19 Feb	2	0	0
20 Feb	3	1	0
21 Feb	6	0	0
Total	**13**	**2**	**0**

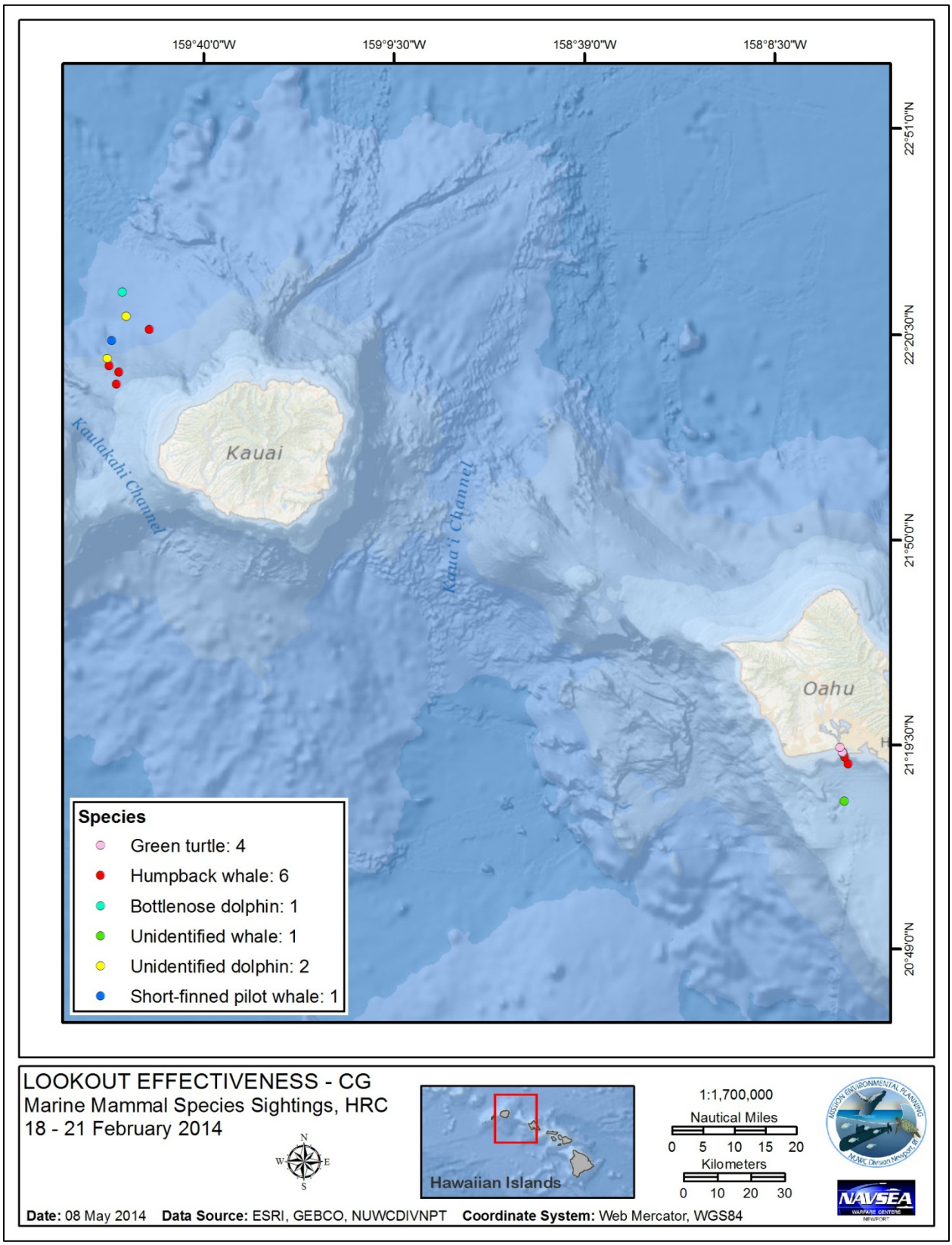

Figure 2. Locations of all marine mammal sightings

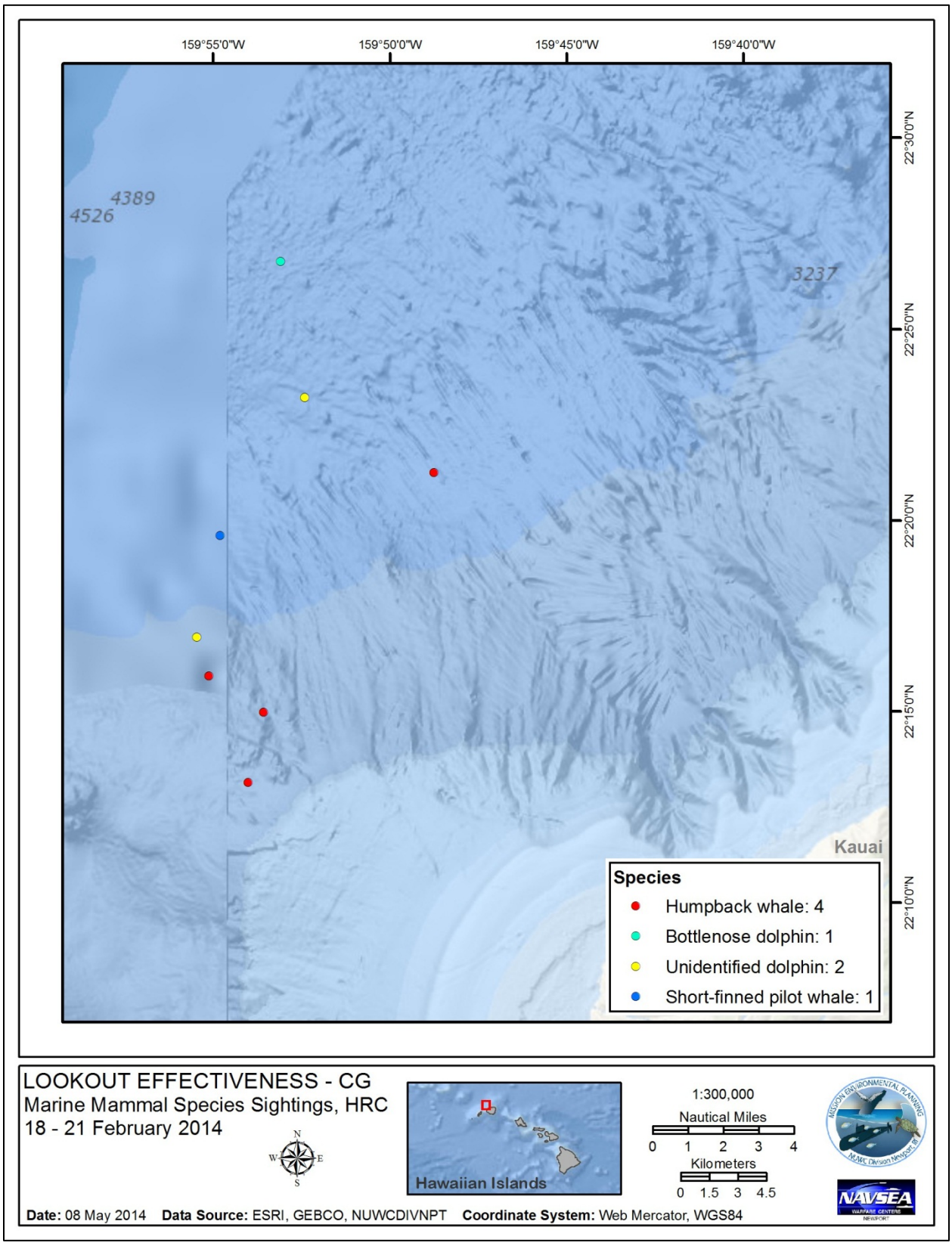

Figure 3. Marine mammal sightings near Kauai

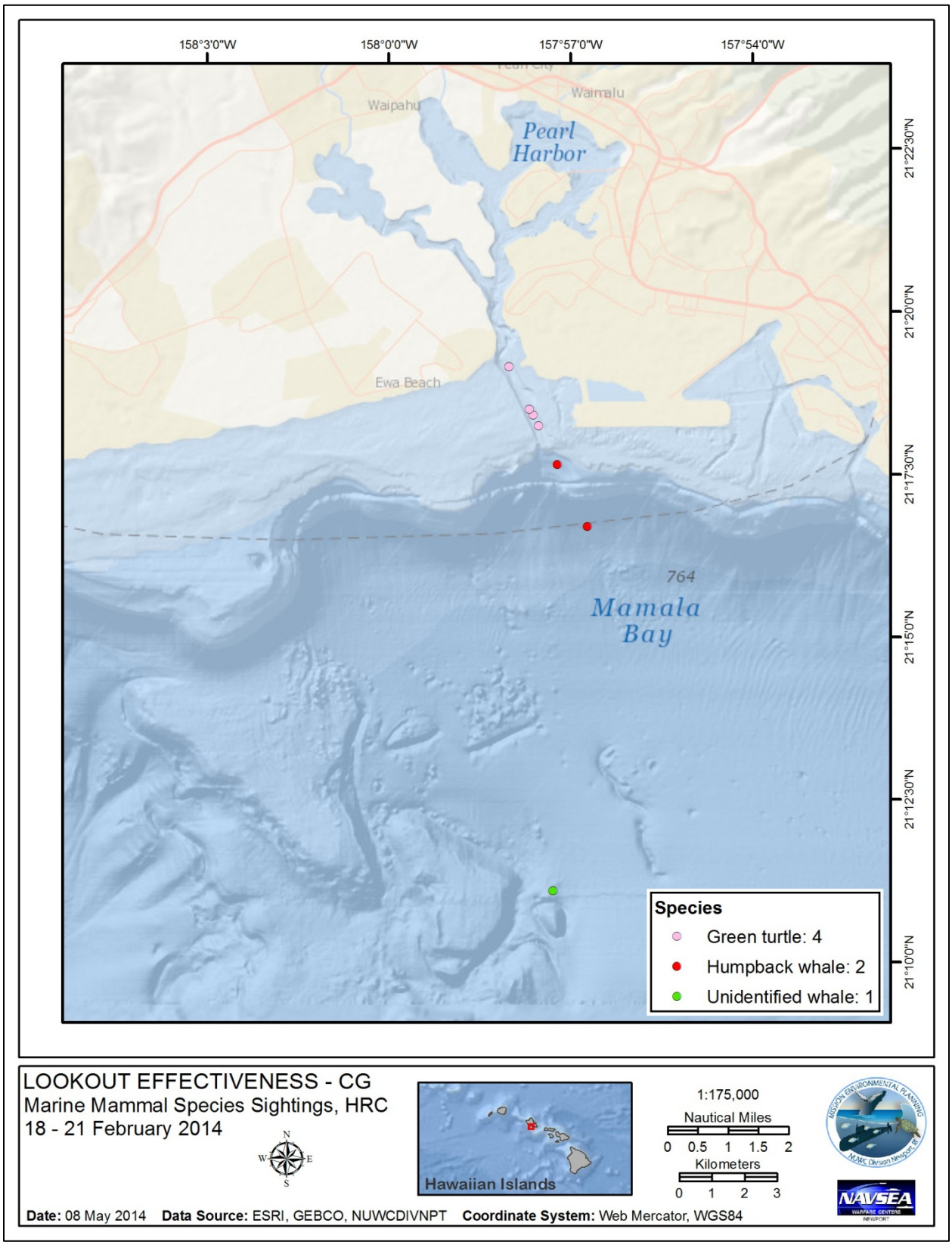

Figure 4. Marine mammal and sea turtle sightings near Oahu

Trials were successfully conducted on all but one day of the event, with 4 of the 15 sightings (27%) available for trials, or an average rate of 0.13 trials per hour of effort across all four 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
18 Feb	8 hr 6 min	2	0.25	1	0.12
19 Feb	7 hr 59 min	2	0.25	2	0.25
20 Feb	8 hr 25 min	4	0.48	1	0.12
21 Feb	5 hr 21 min	7	1.31	0	0
Cumulative	**29 hr 51 min**	**15**	**0.50**	**4**	**0.13**

Of the 15 sightings, 12 species were positively identified. Visual sightings included one short-finned pilot whale group (*Globicephala macrorhynchus*), six humpback whales (*Megaptera novaeangliae*), one unidentified whale, one bottlenose dolphin (*Tursiops truncatus*), two unidentified dolphin groups, and four green sea turtles (*Chelonia mydas*). The pilot whale was passively detected by the Navy sonar technicians amd reported to the bridge. The fourth day of the effort had the greatest frequency of unique sightings, with 1.31 sightings/hour of effort.

Figure 5. Dolphins from sighting 3 on 19 Feb 2014.

Figure 6. Pilot whales from sighting 4 on 19 Feb 2014.

Figure 7. Humpback whale from sighting 7 on 20 Feb 2014.

Figure 8. Green sea turtle from sighting on 21 Feb 2014.

Table 4. Unique Marine Mammal and Sea Turtle Sightings

Data Category	Sighting 1	Sighting 2	Sighting 3	Sighting 4	Sighting 5
Sighting Information					
Effort	On	On	On	On	On
Date	2/18/2014	2/18/2014	2/19/2014	2/19/2014	2/20/2014
Time (HST)	11:21:18	11:42:30	8:36:27	8:45:09	11:17:24
Location	22.2654 N 159.91861W	22.21891 N 159.90018 W	22.28237 N 159.9243 W	22.32661 N 159.91331 W	22.44611 N 159.88484 W
Detection Sensor	Lookout	MMO	MMO	MMO	MMO
Species/Group	Humpback Whale	Humpback Whale	Unidentified Dolphin	Short-finned pilot whale	Bottlenose dolphin
Group Size estimate (estimated range)	1(1)	1(1)	20 (15-30)	5 (3-6)	3
# Calves	Unknown	Unknown	Unknown	Unknown	Unknown
Bearing (relative)	170	170	95	25	210
Distance (m)	4091	5850	759	1930	2867
Animal motion	Opening	Unknown	Parallel	Closing	Parallel
Sighting Cue	Blow/Fluke	Blow	Dorsal Fin	Dorsal Fin/Head	Splash/Fin
Behavior	Travel/Diving	Travel	Travel	Feeding/Milling	Feeding
Environmental Information					
Wave height (ft)	4-6 ft	4-6 ft	0-3 ft	0-3 ft	0-3 ft
Visibility	Excellent	Excellent	Excellent	Excellent	Excellent
Beaufort Sea State	2	2	3	3	3
Cloud cover (%)	7.5	7.5	65	65	27.7
Glare (%)	4	4	5	5	10
Operational Information					
Sonar	Off	Off	On	On	On
Ship bearing (true)	155	220	30	185	245
Mitigation implemented	Ship slowed to 7 kts	None	None	Active sonar turned off and ship slowed to 7 knots.	Ship slowed to 11 knots.
Comments	Lookout saw first then MMO. Whale dove as ship approached.	2 blows then animal was lost.		Clicks reported to bridge by sonar technicians and identified visually by the MMO as pilot whales.	Lookout spotted about the same time as MMO. Torpedo launched.

Table 4. Unique Marine Mammal and Sea Turtle Sightings (cont'd)

Data Category	Sighting 6	Sighting 7	Sighting 8	Sighting 9	Sighting 10
Sighting Information					
Effort	On	On	On	On	On
Date	2/20/2014	2/20/2014	2/20/2014	2/21/2014	2/21/2014
Time (HST)	13:43:00	14:13:20	14:53:23	13:24:53	13:47:04
Location	22.38675 N 159.87338 W	22.35413 N 159.81248 W	22.24961 N 159.89276W	21.18498 N 157.95473W	21.27824 N 157.9453 W
Detection Sensor	MMO	Lookout	MMO	MMO	MMO
Species/Group	Unidentified Dolphin	Humpback Whale	Humpback Whale	Unidentified Whale	Humpback Whale
Group Size estimate (estimated range)	2 (1-4)	1(1)	1(1)	1(1)	1(1)
# Calves	Unknown	Unknown	Unknown	Unknown	Unknown
Bearing (relative)	57	340	145	95	320
Distance (m)	3181	2611	2611	640	1829
Animal motion	Unknown	Closing	Unknown	Parallel	Unknown
Sighting Cue	Splash	Blow/Fluke	Blow	Blow	Blow
Behavior	Feeding	Tail Slapping/Dive	Unknown	Travel	Travel
Environmental Information					
Wave height (ft)	4-6 ft	4-6 ft	4-6 ft	0-3 ft	0-3 ft
Visibility	Excellent	Excellent	Excellent	Excellent	Excellent
Beaufort Sea State	4	4	4	3	3
Cloud cover (%)	22.5	35	35	70	70
Glare (%)	17.5	2.5	2.5	0	0
Operational Information					
Sonar	Off	Off	Off	Off	Off
Ship bearing (true)	79	50	287	9	340
Mitigation implemented	None	None	None	None	None
Comments		Lookout saw first then MMO.			MMO spotted whale first while heading into channel then Lookout saw second blow

Table 4. Unique Marine Mammal and Sea Turtle Sightings (cont'd)

Data Category	Sighting 11	Sighting 12	Sighting 13	Sighting 14	Sighting 15
Sighting Information					
Effort	On	On	On	On	On
Date	2/21/2014	2/21/2014	2/21/2014	2/21/2014	2/21/2014
Time (HST)	13:57:31	14:02:40	14:03:55	14:04:06	14:09:14
Location	21.29408 N 157.95354 W	21.30401 N 157.9588 W	21.30678 N 157.96031 W	21.30717 N 157.96053 W	21.31913 N 157.96686 W
Detection Sensor	MMO	MMO	MMO	MMO	MMO
Species/Group	Humpback Whale	Green Turtle	Green Turtle	Green Turtle	Green Turtle
Group Size estimate (estimated range)	1(1)	1(1)	5(5)	1(1)	1(1)
# Calves	Unknown	Unknown	Unknown	Unknown	Unknown
Bearing (relative)	240	202	Unknown	35	60
Distance (m)	2611	183	183	18	23
Animal motion	Opening	Unknown	Unknown	Unknown	Unknown
Sighting Cue	Blow	Head	Head/Body	Head	Head
Behavior	Unknown	Basking at Surface	Surfacing	Unknown	Unknown
Environmental Information					
Wave height (ft)	0-3 ft	0-3 ft	0-3 ft	0-3 ft	0-3 ft
Visibility	Excellent	Excellent	Excellent	Excellent	Excellent
Beaufort Sea State	3	3	3	3	3
Cloud cover (%)	70	70	70	70	70
Glare (%)	0	0	37	37	37
Operational Information					
Sonar	Off	Off	Off	Off	Off
Ship bearing (true)	322	325	325	325	324
Mitigation implemented	None	None	None	None	None
Comments	MMO spotted whale while heading into channel, very close to kayakers.	Sea turtles < 100 cm in length and surfaced once shipped approached.	Sea turtles < 100 cm in length and surfaced once shipped approached.	Sea turtles < 100 cm in length and surfaced once shipped approached.	Sea turtles < 100 cm in length and surfaced once shipped approached.

SECTION 4 CONCLUSIONS

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 was the second aboard a CG 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 CG-B. This information can be used to determine the level of exposure a marine mammal or sea turtles may experience during an MFAS event.

SECTION 5 REFERENCES

Department of the Navy (2010). United States Navy Integrated Comprehensive Monitoring Program 2010 Update, 20 December 2010.

Department of the Navy (2014). Marine Species Monitoring for the U.S. Navy's Hawaii Range Complex 2013 Annual Report. U.S. Pacific Fleet, Pearl Harbor, HI.