Final Field Report

Aerial Survey Monitoring for Marine Mammals and Sea Turtles in the Hawaii Range Complex in Conjunction with a Navy Training Event: SCC 18-20 February 2014

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Cover Photo:

Sperm whale (*Physeter macrocephalus*) photographed with a telephoto lens from the aircraft during an aerial monitoring survey in Hawaii. Photograph by M. Deakos taken under NOAA Permit No. 642-1536-03 issued to Joseph R. Mobley, Jr.

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14. ABSTRACT
Aerial surveys to monitor marine mammals and sea turtles (MM/ST) were conducted in conjunction with a U.S. Commander Pacific Fleet training event in the Hawaii Range Complex on the Pacific Missile Range Facility Barking Sands Tactical Underwater Range and Barking Sands Underwater Range Extension between Kauai and Niihau, Hawaii during 18-20 February 2014. The Submarine Commander's Course (SCC) training event was conducted during 17-20 February 2014. Two surface ships, both equipped with the AN/SQS-53C sonar, participated in the February 2014 training. SLs were assumed to be 235 decibels referenced to 1 dB re: 1μPa RMS. A fixed-wing aircraft flew elliptical-shaped orbits in advance of a U.S. Navy warship, monitoring an area within approximately 5 km of the warship. When marine mammals were observed close to the warship (i.e., within 5 km) and were judged to be suitable (i.e., were visible at the surface for extended periods), focal follows were performed in order to record the animals' behavior with a video camera. The aircraft accompanied a ship emitting MFAS for 11 hr, 51 percent of the total 21.4 hr of flight time. The majority of effort (90 percent) was spent viewing in BSS 3 or better resulting in the focal-following of eight sightings (three sperm whale, three short-finned pilot whale, and two humpback whale), six of which (three sperm whale, one short-finned pilot whale, and two humpback whale) were determined to be within 5 km of the ship transmitting MFAS, permitting the estimation of MFAS received levels (RLs) at the animal's location and behavioral response. The only videotaped behavioral focal-follow sessions involved the three sightings of short-finned pilot whales (group sizes of 17, 25, and 25). The duration of the taped sessions was a total of 44 min. Observers attempted to perform taped sessions of the sperm whale sightings, but the sperm whales were typically at the surface for 3 to 5 blows, dove, then remained underwater for 30 to 45 min, an interval too long for behavioral assessment. The two remaining attempts involved

sessions with single humpback whales. One was curtailed due to low fuel and the other when the whale could not be resighted. Nevertheless, sound exposure levels (SELs) were estimated for all eight sightings detected within 5 km of the ship, and ranged from 158 to 174 dB re: 1µPa. No instances of unusual behavior or signs of distress were observed throughout the three days of surveys, including for the overall 11 sightings (81 percent of which were of humpback whales).

15. SUBJECT TERMS

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Acronyms and Abbreviations

BSS	Beaufort Sea State
CG	missile cruiser
dB re: 1µPa	decibels referenced to 1 micro Pascal
hr	hour
HRC	Hawaii Range Complex
HST	Hawaii Standard Time
km	kilometer(s)
MFAS	mid-frequency active sonar
min	minute
MM/ST	marine mammals and sea turtles
RL	received level
PCIMAT	personal computer interactive multisensor analysis tool
PMRF	Pacific Missile Range Facility
SCC	Submarine Commander’s Course
SL	source level
SOW	Statement of Work
TL	transmission loss

Section 1 Introduction

Aerial surveys to monitor marine mammals and sea turtles (MM/ST) were conducted in conjunction with the Submarine Commander's Course (SCC) naval training event in the Hawaii Range Complex (HRC) on the Pacific Missile Range Facility (PMRF) Barking Sands Tactical Underwater Range and Barking Sands Underwater Range Extension between Kauai and Niihau, Hawaii during the period 18 to 20 February 2014 (**Figure 1**). The SCC training event occurred from 17 to 20 February 2014, in waters adjoining Kauai and Niihau, and involved surface ships, submarines, and aircraft.

These surveys were designed to address two of the five research questions identified in the U.S. Navy's *Hawaii Range Complex Monitoring Plan* (DoN 2008):

Question 1: "Are marine mammals (and sea turtles) exposed to MFAS, especially at levels associated with adverse effects? If so, at what levels are they exposed?"

Question 3: "If marine mammals (and sea turtles) are exposed to MFAS, what are their behavioral responses to various received levels?"

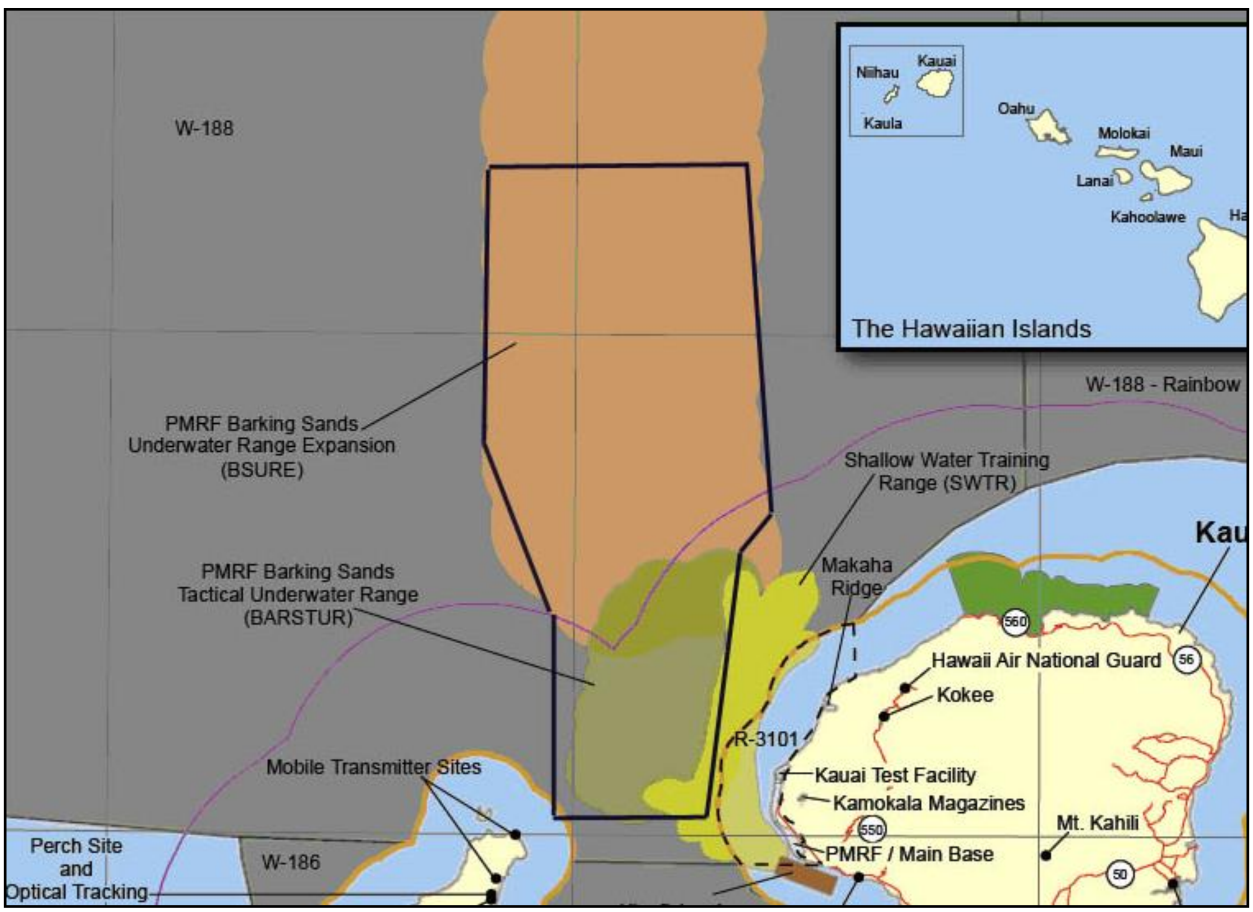

Figure 1. Location of the aerial survey monitoring area (black box = area for ship follows) in and near the U.S. Navy PMRF west and northwest of Kauai, Hawaii.

The survey methods and sampling design were submitted and approved in advance per the Statement of Work (SOW) to the Navy Contracting Officer Representative (COR), and followed previously established protocol (Mobley and Pacini 2013; Mobley and Milette 2010; Smultea et al. 2009a,b).

Prior to the training event, the Chief Scientist (Joseph Mobley) and pilot (Chris Gore) attended pre-planning sessions known as 'pre-sails' with the COR and other U.S. Navy staff at Pearl Harbor to coordinate survey efforts with the SCC February 2014 training event. Per the SOW, the goal of the aerial survey was to identify MM/ST near the missile cruiser (CG) (within 5 kilometers [km]), then perform focal follows using accepted observation methods (Altmann 1974) to monitor their behavior for any changes.

The CG conducted anti-submarine warfare training events such that the CG sometimes used mid-frequency active sonar (MFAS). The aerial surveys detected the presence of MM/ST within the vicinity of the CG, observed and recorded their behavior, and then determined levels of exposure of any MM/ST to MFAS following the event, when transmission times and ship positions could be compared to MM/ST positions by authorized U.S. Navy personnel.

Section 2 Methods

Monitoring effort followed protocols implemented in previous SCC training events (Mobley and Pacini 2013, Mobley 2011, Mobley and Milette 2010). The approach involved flying elliptical-shaped patterns in advance of the cruiser (CG), which extended from the front of the ship (approximately 200 meters) out to approximately 2,500 meters over a width of 5 km.

Surveys were conducted from a small fixed-wing Aero Commander 500 for all 3 days. Survey effort during this training event is summarized in **Table 1**.

Table 1. Summary of effort type, time on effort, and sea state by date.

Date	Type of Effort	Effort* (hr:min)	Mean Beaufort Sea State
18 Feb 2014	With CG	7:41	2.9
19 Feb 2014	With CG	7:00	3.0
20 Feb 2014	With CG	6:45	3.2
Total		**21:26**	**3.1**

* Note: Computed wheels up to wheels down

The aircraft flew at 185 km/hour (hr) (100 knots) groundspeed and an altitude of approximately 305 meters, unless the pilot was directed to fly at alternate altitudes by flight controllers for safety reasons. Observations from the monitoring aircraft involved five personnel: the pilot and copilot, two primary observers, and a data recorder. The survey crew and pilot were not informed as to the status of MFAS transmissions, which minimized the potential for observational bias.

When animals were detected, observers recorded the vertical angle to the sighting (when abeam at 90 degrees to the trackline) using hand-held Suunto clinometers, typically followed by orbiting to identify species and, in the case of marine mammals, to characterize behavior and direction of travel. Photographs were taken opportunistically to assist in species identification using a Canon 5D digital camera with a Canon 100–400-millimeter telephoto lens with image stabilizer. Environmental data (Beaufort Sea State [BSS], glare, and visibility) were recorded at the start of the effort and when conditions changed. Positional data via GPS were automatically recorded every 3 seconds and manually when sightings occurred. Data were recorded using Mysticetus data collection software (version 1.8.0.147).

When pods were observed close to the CG (i.e., within 5 km) and were judged to be suitable (i.e., were visible at the surface for extended periods), observers performed focal follows using accepted methods (Altmann 1974). The aircraft ascended to 457 meters, an altitude shown to minimize reactivity to fixed-wing aircraft (Smultea et al. 1995), and the pod was orbited and behavior video-recorded for as long as possible. A high-definition Canon Vixia HF10 camcorder with 12-power optical zoom was used to video focal follows. The intercom system of the aircraft inputted to the audio port of the digital camcorder so that all behavioral observations could be recorded with a minimum of ambient noise. Time stamps on the Canon camcorder were synchronized with those from the Garmin GPS receiver. The resultant digital audio/video file and digital photos will be made available to the U.S. Navy for subsequent behavioral analysis.

When away from the CG, positions to vocalizing cetaceans (e.g., beaked whales) were occasionally texted to the survey plane by personnel monitoring PMRF Range assets. This permitted detection of potential targets that might not be detected upon the initial overflight.

Communications

Communications were possible between the survey aircraft and marine mammal observers aboard the CG using aviation-band VHF radios broadcasting on 123.45 megahertz. This system was reliable whenever the aircraft was in the vicinity of the ship (i.e., less than 10 km) and when personnel onboard the CG were outside on the bridge wings. Communications at greater distances were possible via radio communications with PMRF Range Control or Outrider Bravo. Daily locations of the CG were usually communicated via onboard aviation-band VHF radio once in the air via PMRF Range Control or Outrider Bravo. A standard operating procedure was established prior to the event which was to be followed in the event that communications were lost (**Appendix B**).

Safety

Safety on PMRF is paramount. After a safety debriefing held at PMRF on 14 July 2011, rules were established to ensure the safe operation of civilian aircraft in the context of a U.S. Navy training event with active military aircraft in the vicinity (**Appendix B**). Safety issues were further discussed as part of the pre-sail briefing held on 14 February 2014 prior to the training event.

Section 3 Results and Discussion

Effort

During the SCC event surveys, the aircraft accompanied the CG for 11.0 hr (51 percent) of the total 21.4 hr of SCC-related flight time (**Table 2**). The remaining 10.4 hr (49 percent) while not with the CG primarily involved transiting between the CG's location and Lihue, Kauai, for refueling (**Figure 2**). The aircraft was considered "with the CG" upon commencement of elliptical orbits around the ship's location and "not with the CG" when not orbiting. Sightings initially recorded while orbiting were noted as "sightings with CG" otherwise they were noted as "away from CG."

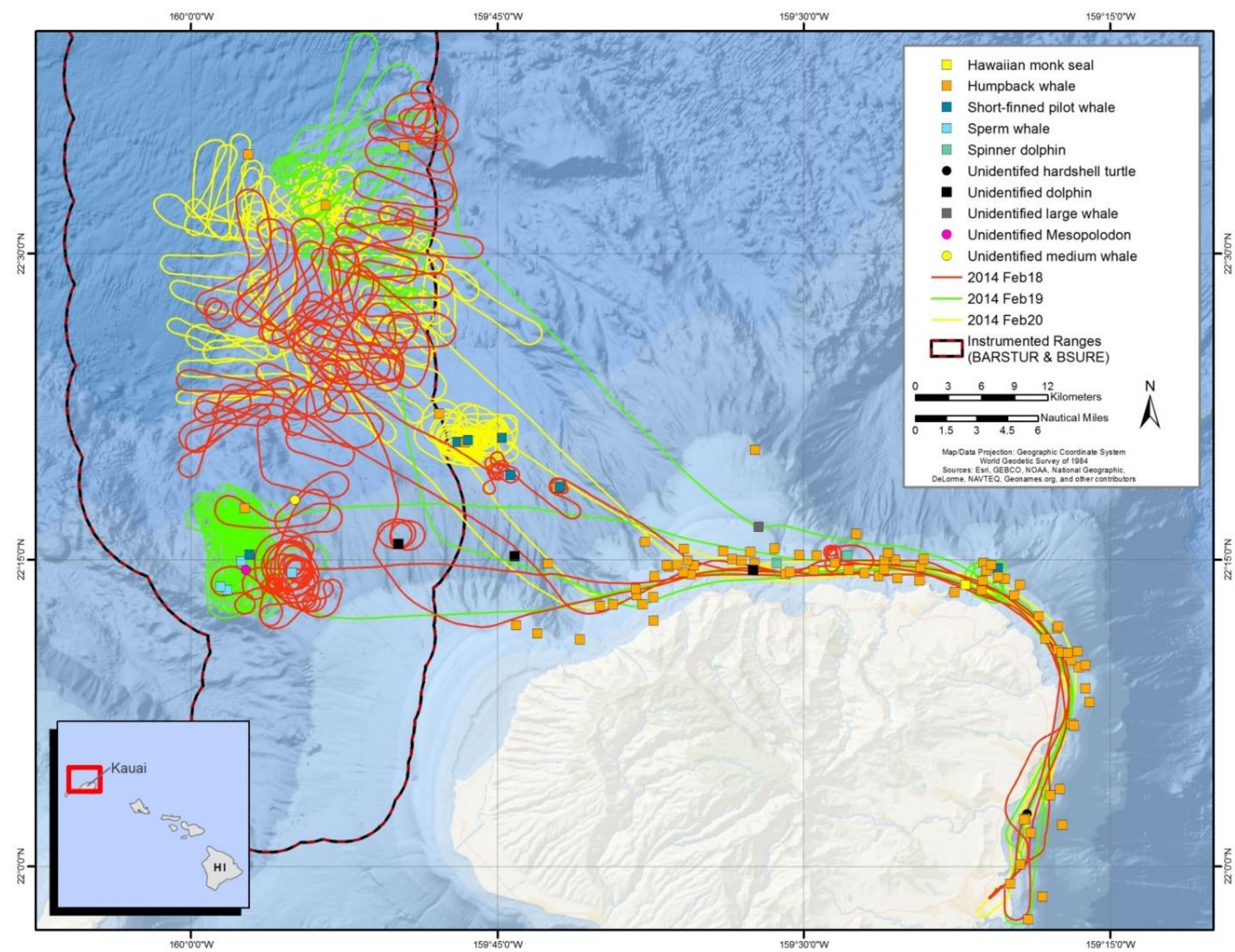

Figure 2. Effort and sighting locations during days involving ship follows with the CG (18–20 February 2014).

Table 2. Survey effort (with and not with CG). All times are Hawaii Standard Time (HST).

Date	Time Wheels up	Time Wheels Down	Total Flight Hours	Period not with CG*	Total Hours not with CG	Period with CG*	Total Hours with CG	No. of Sightings with CG	No. of Sightings away from CG
2/18/14	8:06 14:15	12:53 17:12	7:41	8:07-8:26 9:56-10:18 12:12-12:52 14:16-14:41 15:14-17:12	3:43	8:26-9:56 10:18-12:12 14:41-15:14	3:58	1	40
2/19/14	7:41 13:31	12:09 16:05	7:00	7:42-8:12 8:54-12:09 13:33-13:55 15:40-16:05	4:34	8:12-8:54 13:55-15:40	2:26	3	31
2/20/14	7:44 13:55	12:44 16:08	6:45	7:48-8:04 10:51-11:42 11:58-12:23 13:58-14:17 15:52-16:08	2:07	8:04-10:51 11:42-11:58 14:17-15:52	4:38	4	31
Totals			**21:26**		**10:25**		**11:01**	**8**	**102**

Note: *Survey plane noted as "with CG" during elliptical orbits around ship; otherwise noted as "not with CG." Sightings were noted as "with CG" if initially recorded during orbits; otherwise noted as "away from CG."

Sea State

The majority of overall effort (90 percent) was spent in favorable sea state conditions (i.e., BSS 3 or better), where 95 percent of sightings occurred (**Figure 3**). The relatively large number of sightings recorded during this survey was likely due to these favorable conditions, given the effects of sea state on visual sighting probability (Buckland et al. 2001).

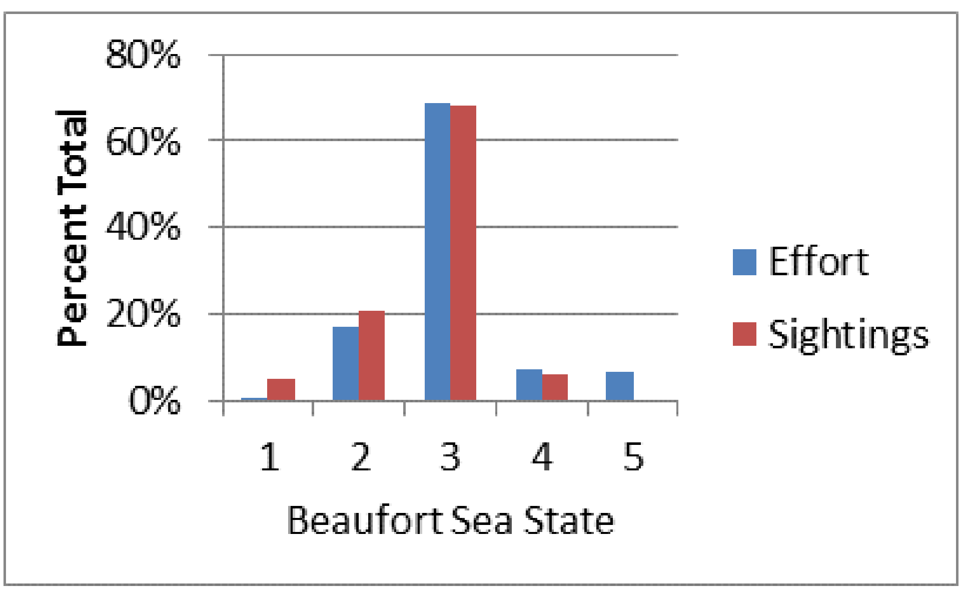

Figure 3. Beaufort Sea State by effort and sightings.

Focal-Follow Results

Most sightings during the 3-day SCC event occurred during transits between Lihue, Kauai, and the ship's position **(Figure 2)**. However, a total of eight sightings, including three sightings of sperm whales (*Physeter macrocephalus*), three sightings of short-finned pilot whales (*Globicephala macrorhynchus*), and two sightings of humpback whales (*Megaptera novaeangliae*), occurred in the vicinity of the CG (**Table 3**). Three of those sightings became the target of focal-follow sessions with video. All three of the videotaped cases involved short-finned pilot whales. Three of the attempted cases involved sperm whales that were typically at the surface for 3–5 blows, dove, then remained underwater for 30–45 minutes (min), an interval too long for behavioral assessment. The two remaining attempts involved sessions with single humpback whales. One was curtailed due to low fuel and the other when the whale could not be resighted.

Table 3. Summary of Sightings Observed within 5 km of CG (18–20 February).

Case #	Date	Time Sighted (HST)	Species	No. Indiv	Video ? (Y/N)	Video Length (min)	Comments:
1	02/18/2014	11:16:25	Sperm whale	1	N	--	Attempted focal—dove; (30-min dive times based on two dive-surface cycles)
2	02/19/2014	8:13:02	Sperm whale	1	N	--	Attempted focal—dove
3		9:06:46	Sperm whale	1	N	--	Attempted focal—dove (45-min dive times based on two dive-surface cycles)
4		10:33:43	Short-finned pilot whales	17	Y	23	Behavior: mostly surface swimming; inter-indiv distance one to three animal lengths
5	02/20/2014	11:05:00	Humpback whale	1	N	--	Session terminated due to low fuel
6		14:20:33	Short-finned pilot whales	25	Y	7	Behavior: mostly surface swimming, line astern formation; inter-indiv distance one to three animal lengths; two groups (smaller 10 indiv group in addition to focal)
7		14:38:34	Humpback whale	1	N	--	Not resighted
8		15:05:35	Short-finned pilot whales	25	Y	14	Still two groups (focal + smaller 10 indiv group) still swimming at surface; inter-indiv distance one to three animal lengths apart

The behavioral focal-follow sessions conducted while monitoring near the CG on 20 and 21 February (sighted at 10:33:43 on 19 February; 14:20:33 and 15:05:35 on 20 February) involved three sightings of short-finned pilot whales (pod sizes of 17, 25, and 25). The duration of the taped sessions was a total of 44 minutes. During much of this time, however, the whales were not in view due to the orientation of the plane, glare, or the pods traveling underwater.

Since the video quality was poor, the videotaped sessions obtained in these cases will not likely be useful for the ongoing analysis of videotaped focal follows. However, six of the eight sightings seen in proximity to the CG were at times found to overlap with MFAS transmissions. This permitted estimation of received levels of MFAS exposure in these instances. These results are described in the next section.

Estimated Received Levels—Focal Follow Pods

To estimate the received level (RL) that an animal, or group of animals, is exposed to requires knowing: 1) the location of the animal(s), 2) the location of the surface ship when it transmitted MFAS, 3) and the source level (SL) of the MFAS transmission. Given this information, the estimated RL is calculated as the SL minus the transmission loss (TL). Two surface ships, both equipped with the AN/SQS-53C sonar, participated in the February 2014 training. Source levels were assumed to be 235 decibels referenced to 1 micro Pascal (dB re: 1µPa) root mean square as provided for the AN/SQS-53C sonar (with center frequencies of 2.6 and 3.3 kilohertz) based on the published specifications associated with the 2000 Bahamas stranding event (Evans and England 2001). Since there were two ships involved in the SCC event that transmitted sonar, including the orbited CG and one additional ship in the area, RL estimates described here include transmissions from both ships.

Animal locations were provided in two ways. The initial location was an animal sighting position derived when observers on the plane initially sighted the animal(s) while in near level flight. Subsequent animal locations for each focal-follow group position were estimated as the center of approximate circular patterns of the sighting plane near the sighting times (**Table 4**). This represents the best estimate of the animal's location since the plane's orbit was executed with the goal of maintaining the sighting in the center of the orbit.

The U.S. Navy's standard propagation-modeling software PCIMAT (personal computer interactive multisensor analysis tool) was utilized to estimate TL from each MFAS transmitting surface ship to animal sighting. PCIMAT contains detailed databases for historic range-dependent sound-velocity profiles, bathymetry, and bottom and surface losses. The wind speed input to PCIMAT was 10 knots, which corresponds to the BSS of 3 that prevailed through most of the present surveys (**Figure 3**). For the sighting time of each estimated animal location, the MFAS transmission nearest in time, determined utilizing bottom hydrophone acoustic data, were noted and logged. The position of the surface ship at the time of the MFAS transmissions was obtained from PMRF data products. Distance and bearing from the ship to a sighting was calculated using PCIMAT and the historic data for each sighting date were used for the environmental inputs.

Table 4. Summary of estimated RLs for focal animals exposed to MFAS.

Case #[1]	Animal Latitude (°N)	Animal Longitude (°W)	Species	Ship	MFAS Time Delta[2] (hr:min:sec)	Distance[3] (km)	Animal Location re: Ship[3]	Mode of RL (min-max) (dB re: 1µPa)
1	22.2394	159.9177	sperm whale	A	- 0:04:43	5.923	beam qtr	171 (131-173)
				B	0:06:46	24.746	bow qtr	156 (144-160)
2	22.2487	159.9590	sperm whale	A	0:19:38	3.437	stern qtr	171 (142-174)
3	22.2253	159.9705	sperm whale	A	0:03:24	19.424	stern qtr	157 (135-158)
				B	0:00:06	13.891	stern qtr	161 (115-165)
5	22.5808	159.9534	humpback whale	A	0:11:10	16.114	stern qtr	162 (147-165)
				B	0:13:18	22.793	beam qtr	161 (140-162)
6	22.3461	159.7825	short-finned pilot whales	B	0:00:05	19.302	bow qtr	157 (128-164)
7	22.3459	159.7763	humpback whale	B	0:00:04	21.117	bow qtr	160 (138-163)

[1]Case numbers correspond to those in **Table 2**
[2]Difference between initial sighting time and time of beginning of MFAS transmission
[3]Distance between focal sighting and transmitting ship positions
[4]Positions divided into quarters: right and left beam, stern and bow

For each ship-animal encounter, the estimated TL was measured over a depth range of 0 to 20 meters to account for animal movement over limited depth relative to a sighting at the surface. The distance between the animal and ship was also investigated over a range of +/- 500 meters from the estimated distance to account for inaccuracies of the animal locations and potential movement over the time period between the sighting time and the MFAS time. Thus, for each encounter, the estimated TL varies as a function of both the presumed depth of the animal and its distance from the source. Often the minimum and maximum TLs are confined to small regions in depth-range space; therefore, the mode of the TL was also estimated. The mode and maximum RL are provided to represent both a likely exposure level along with the maximum estimated exposure level.

Estimated RLs were calculated for six of the eight groups sighted within approximately 5 km of the CG upon initial sighting that were exposed to MFAS (**Table 4**). Exposed species included sperm whales (three cases), humpback whales (two cases), and short-finned pilot whales (one case). Exposures were relatively high, with maximum estimates ranging from 158 to 174 dB re: 1µPa. These are higher than those reported by other comparable studies involving exposures to actual MFAS transmissions. Baird et al. (2014) reported RLs of 130–144, 149–168, and 141–162 dB re: 1µPa for satellite-tagged cetaceans, including two rough-toothed dolphins, a bottlenose dolphin, and a short-finned pilot whale, respectively. Tyack et al. (2011) used existing U.S. Navy assets on the Atlantic Undersea Test & Evaluation Center (AUTEC) range in the Bahamas to track echolocating Blainville's beaked whales during a U.S. Navy training event involving AN/SQS-56 and AN/SQS-53C sonars, and estimated RLs ranging from 101 to 157 dB re: 1 µPa at distances of 2.2–28.9 km away from transmitting ships. Thus, circling U.S. Navy ships generally results in detecting animal exposures at higher levels than other methods of monitoring marine mammals.

Overall Sightings

There were 110 sightings made during the 3 days of surveys (**Table 5, Appendix A**). The majority (81 percent) of these sightings were humpback whales (N=89); of these 72 (81 percent of humpback sightings) were observed in shallow areas (less than 183 meters or 100 fathoms deep), known to be preferred habitat of humpbacks based on past survey results (Mobley et al. 1999; Mobley 2004). These inshore sightings of humpback whales were seen during transits to and from the CG. When all humpback sighting data are converted to sighting rates, the result is 0.022 humpback sightings/km effort (*Note:* Effort distance calculated as time [hr] × 185 km/hr mean speed). This is double the sighting rate of 0.011 estimated from the 2013 SCC surveys (Mobley and Pacini 2013). The greater sighting rate for 2014 is likely due to the more favorable sighting conditions (mean BSS 3) that prevailed during the current surveys relative to those of the 2013 event (mean BSS 6).

Table 5. Summary of sightings by species.

Species	Groups	Individuals	Average Pod Size
Humpback whale *(Megaptera novaeangliae)*	89	137	1.5
Short-finned pilot whale (*Globicephala macrorhynchus*)	7	120	17.1
Sperm whale (*Physeter macrocephalus*)	4	4	1.0
Spinner dolphin (*Stenella longirostris*)	2	110	55.0
Mesoplodon spp	1	7	7.0
Hawaiian monk seal	1	1	1.0
Unidentified delphinid	3	6	2.0
Unidentified medium cetacean	1	2	2.0
Unidentified large whale	1	1	1.0
Unidentified cheloniidae (sea turtle)	1	2	2.0
Total	**110**	**390**	**--**

Also noteworthy was that the fact that sperm whales were sighted (**Table 5**), which, like humpback whales, are protected by the Endangered Species Act. This was the first SCC survey that included this species among the list of sightings. All three sperm whale sightings occurred within 5 km of the CG, thus affording the possibility of estimating received levels for this species.

No instances of unusual behavior or signs of distress (e.g., defensive or evasive behaviors) were observed throughout the 3 days of surveys. This was also the case for the eight cetacean groups seen within 5 km of the CG and the six groups exposed to relatively high received levels of MFAS (**Table 4**). This does not mean that no adverse effects occurred, merely that none were detected.

Section 4 Overall Conclusions

Given the caveats noted, overall there were no direct observations of adverse effects to marine mammals during the SCC training event. The following summarize findings with respect to each of the two research questions.

Question 1: “Are marine mammals (and sea turtles) exposed to MFAS, especially at levels associated with adverse effects? If so, at what levels are they exposed?”

Using procedures described in detail by Mobley et al. (2013), sighting position data from these surveys were compared against ship position data and MFAS transmission times to permit the calculation of estimated RLs for six of the eight sightings that were observed close to the CG and exposed to MFAS transmissions. Estimated RLs reported here (Table 4) ranged from 156 to 171 dB re: 1µPa, with peak estimates ranging from 158 to 174 dB re: 1µPa. It is also noteworthy that three of these estimates involved sperm whales, a species not sighted before during previous SCC focal follows. Determining received levels of exposed animals is an important step in ascertaining possible effects of MFAS transmissions. Use of the focal-follow method described here permitted the detection of marine mammal exposures at higher levels than described previously using different monitoring approaches (Tyack et al. 2011; Baird et al. 2014).

Question 3: “If marine mammals (and sea turtles) are exposed to MFAS, what are their behavioral responses to various received levels?”

This question is the more challenging of the two. As summarized in an earlier report (Mobley et al. 2013), analysis of the video data has been hampered by generally low image quality and short periods of usable footage. The Aerocommander aircraft used in these surveys was not designed for visual reconnaissance; specifically its large engine housings tend to occlude the top half of the observer’s window, and even more as the plane orbits. This resulted in only brief periods where the focal animals were visible through the observer’s window, which made it difficult to resight the focal animals when their previous positions came back into view. Most of the quantitative analyses described in Mobley et al. 2013 require continuous observation for reasonably long periods of time (>20 min). As a result, obtaining metrics such as respiration rate, dive/surface intervals and aerial behavior rates are not possible. Only gross behavioral characteristics, such as inter-individual distance and changes in pod size are available from the brief observations of behavior available from the video images captured here.

Per the SOW, the data obtained in this study are meant to contribute to a growing database of information on the distribution, occurrence, and behavior of MM/ST near U.S. Navy training events in the HRC per the HRC Marine Species Monitoring Plan (DoN 2009a) and as revised in the Hawaii Range Complex Annual Monitoring Report (DoN 2009b).

As was the case with the 2013 SCC surveys, Range Control interventions were reduced to near zero during the present event. As a result, there was virtually no disruption of the marine mammal monitoring effort. This fact underscores the importance of maintaining continuous and reliable communications with Range Control and Outrider Bravo during the event as well as during the pre-event briefing, and having standard operating procedures in the form of PACMISRANFAC INSTRUCTION 3125.1 in place for operating our civilian aircraft on PMRF.

Section 5 Acknowledgements

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A

Tables

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Appendix A: Summary of Sightings with Positions (GPS)

Date	Time (HST)	Species*	No. Indivs	Latitude (N)		Longitude (W)	
			(calf)	(degrees)	(minutes)	(degrees)	(minutes)
2/18/2014	8:13:05	MS	1	22	13.780	159	22.068
2/18/2014	8:15:51	MN	2	22	14.500	159	29.494
2/18/2014	8:17:00	MN	1	22	15.396	159	32.602
2/18/2014	8:18:04	MN	2	22	14.285	159	35.520
2/18/2014	8:18:52	MN	2	22	13.174	159	37.361
2/18/2014	8:19:05	MN	1	22	12.825	159	37.891
2/18/2014	11:16:25	PM	1	22	14.362	159	55.062
2/18/2014	12:29:06	UD	2	22	15.166	159	44.162
2/18/2014	12:29:44	MN	2	22	14.829	159	42.532
2/18/2014	12:31:33	MN	1	22	15.874	159	37.767
2/18/2014	12:32:09	MN	1	22	14.395	159	35.904
2/18/2014	12:35:06	SL	90	22	15.224	159	27.858
2/18/2014	12:42:42	MN	1	22	15.013	159	25.493
2/18/2014	12:44:18	MN	1	22	13.971	159	21.243
2/18/2014	12:44:55	MN	2	22	13.274	159	19.670
2/18/2014	12:45:51	MN	2	22	11.660	159	17.584
2/18/2014	12:49:53	MN	1	22	2.019	159	17.344
2/18/2014	14:17:18	MN	2	22	0.091	159	19.390
2/18/2014	14:18:13	UT	2	22	2.548	159	19.062
2/18/2014	14:20:59	MN	1	22	9.741	159	16.536
2/18/2014	14:21:43	MN	2	22	11.744	159	17.539
2/18/2014	14:22:39	MN	2	22	13.770	159	19.412
2/18/2014	14:24:55	MN	3	22	14.970	159	26.052
2/18/2014	14:25:26	MN	2	22	16.268	159	27.417
2/18/2014	14:26:55	SL	20	22	14.831	159	31.322
2/18/2014	14:27:19	MN	3(1)	22	14.855	159	32.402
2/18/2014	14:29:25	MN	1	22	12.011	159	37.354
2/18/2014	14:30:10	MN	1	22	12.811	159	39.337
2/18/2014	14:30:58	MN	2	22	11.096	159	40.947
2/18/2014	14:31:41	MN	2	22	11.401	159	43.031
2/18/2014	14:32:02	MN	1	22	11.798	159	44.076
2/18/2014	14:35:02	UD	3	22	15.766	159	49.848
2/18/2014	16:38:14	GM	18	22	19.162	159	44.353
2/18/2014	16:50:02	MN	1	22	18.533	159	42.080

Date	Time (HST)	Species*	No. Indivs	Latitude (N)		Longitude (W)	
			(calf)	(degrees)	(minutes)	(degrees)	(minutes)
2/18/2014	16:50:02	GM	10	22	18.575	159	41.937
2/18/2014	16:56:00	MN	1	22	14.728	159	35.372
2/18/2014	16:56:52	MN	1	22	15.044	159	33.495
2/18/2014	16:58:01	MN	2	22	14.306	159	30.894
2/18/2014	17:01:44	MN	1	22	14.630	159	24.265
2/18/2014	17:04:35	MN	1	22	10.590	159	17.559
2/18/2014	17:06:27	MN	1	22	6.965	159	16.902
2/19/2014	7:46:39	MN	1	22	10.072	159	16.896
2/19/2014	7:46:52	MN	1	22	10.471	159	17.373
2/19/2014	7:47:36	MN	1	22	12.233	159	18.493
2/19/2014	7:48:00	MN	3	22	13.512	159	21.287
2/19/2014	7:49:38	GM		22	14.581	159	20.479
2/19/2014	7:50:52	MN	2(1)	22	14.864	159	21.194
2/19/2014	8:03:39	MN	1	22	13.270	159	38.182
2/19/2014	8:13:02	PM	1	22	14.923	159	57.537
2/19/2014	8:40:54	UM	7	22	14.504	159	57.321
2/19/2014	8:56:33	MN	2	22	17.530	159	57.369
2/19/2014	9:06:46	PM	1	22	13.516	159	58.228
2/19/2014	10:09:09	PM	1	22	13.683	159	58.570
2/19/2014	10:33:43	GM	17	22	15.260	159	57.141
2/19/2014	11:49:16	UMC	2	22	17.934	159	54.919
2/19/2014	11:57:20	UW	1	22	16.623	159	32.199
2/19/2014	11:58:01	MN	2	22	14.391	159	30.659
2/19/2014	11:59:33	MN	2	22	14.189	159	26.324
2/19/2014	12:04:07	MN	2	22	8.702	159	16.192
2/19/2014	12:06:55	MN	2	22	2.329	159	19.122
2/19/2014	13:33:42	MN	1	21	58.516	159	18.299
2/19/2014	13:35:08	MN	1	22	2.282	159	19.201
2/19/2014	13:36:51	MN	2	22	6.889	159	16.762
2/19/2014	13:37:42	MN	2(1)	22	9.847	159	16.204
2/19/2014	13:39:54	MN	1	22	14.475	159	21.044
2/19/2014	13:41:27	MN	3	22	14.116	159	25.415
2/19/2014	13:46:17	MN	1	22	14.195	159	37.313
2/19/2014	13:47:26	MN	1	22	12.729	159	39.985
2/19/2014	15:50:54	MN	3	22	35.254	159	49.561
2/19/2014	15:54:04	MN	1	22	15.049	159	24.134

Date	Time (HST)	Species*	No. Indivs	Latitude (N)		Longitude (W)	
			(calf)	(degrees)	(minutes)	(degrees)	(minutes)
2/19/2014	15:54:57	MN	1	22	13.410	159	22.610
2/19/2014	16:00:35	MN	1	22	3.464	159	17.915
2/19/2014	16:01:27	MN	1	22	1.644	159	18.892
2/19/2014	16:03:24	MN	1	21	59.146	159	19.885
2/20/2014	7:50:00	MN	1	22	14.522	159	26.060
2/20/2014	7:52:27	MN	3	22	14.518	159	27.789
2/20/2014	7:52:59	MN	1	22	15.230	159	29.359
2/20/2014	7:53:39	MN	1	22	15.554	159	31.432
2/20/2014	7:54:15	MN	1	22	14.970	159	33.043
2/20/2014	7:55:37	MN	1	22	14.651	159	36.595
2/20/2014	7:57:00	MN	2	22	13.578	159	38.216
2/20/2014	10:55:00	MN	1	22	32.383	159	53.421
2/21/2014	11:05:00	MN	1	22	34.851	159	57.201
2/20/2014	12:08:49	MN	1	22	20.395	159	32.391
2/20/2014	12:14:50	MN	1	22	14.742	159	20.814
2/20/2014	12:15:04	MN	1	22	14.102	159	20.462
2/20/2014	12:15:04	MN	2	22	14.077	159	20.141
2/20/2014	12:17:05	MN	1	22	10.511	159	16.575
2/20/2014	13:58:45	MN	1	21	57.399	159	18.993
2/20/2014	14:03:16	MN	2	22	8.020	159	15.997
2/20/2014	14:04:06	MN	2	22	10.438	159	17.058
2/20/2014	14:05:49	MN	2	22	14.178	159	20.470
2/20/2014	14:08:08	MN	2	22	14.363	159	27.026
2/20/2014	14:11:43	MN	1	22	15.540	159	35.856
2/20/2014	14:11:53	MN	1	22	14.762	159	36.194
2/20/2014	14:12:04	MN	2	22	14.756	159	36.699
2/20/2014	14:18:16	MN	1	22	22.157	159	47.850
2/20/2014	14:20:33	GM	25	22	20.766	159	46.949
2/20/2014	14:38:34	MN	1	22	20.757	159	46.577
2/20/2014	15:05:35	GM	25	22	20.980	159	44.781
2/20/2014	15:33:21	GM	25	22	20.862	159	46.441
2/20/2014	15:54:27	MN	2	22	14.964	159	35.683
2/20/2014	15:54:59	MN	2(1)	22	15.429	159	33.937
2/20/2014	15:55:34	UD	1	22	14.490	159	32.476
2/20/2014	15:56:23	MN	2	22	15.234	159	30.214
2/20/2014	15:57:04	MN	2	22	14.852	159	28.464

Date	Time (HST)	Species*	No. Indivs	Latitude (N)		Longitude (W)	
			(calf)	(degrees)	(minutes)	(degrees)	(minutes)
2/20/2014	15:58:00	MN	2	22	15.342	159	25.872
2/20/2014	15:58:34	MN	2	22	13.984	159	24.331
2/20/2014	16:01:35	MN	1	22	11.135	159	18.163
2/20/2014	16:04:58	MN	3	22	3.782	159	17.445

*Species Code	Species (Latin name)
MN	humpback whale (*Megaptera novaeangliae*)
GM	short-finned pilot whale (*Globicephala macrorhynchus*)
PM	sperm whale (*Physeter macrocephalus*)
SL	spinner dolphin (*Stenella longisrostris*)
UD	unidentified dolphin spp.
UM	Unidentified Mesoplodon spp.
UMC	Unidentified medium cetacean spp.
UT	unidentified sea turtle spp.
UW	unidentified large whale spp.

B

Mitigation Flight Guidelines

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Appendix B: Mitigation Flight Guidelines

DEPARTMENT OF THE NAVY
PACIFIC MISSILE RANGE FACILITY
P.O. BOX 128
KEKAHA, HAWAII 96752-0128

IN REPLY REFER TO:
PMRFINST 3125.1
N3R/:RC:src
13 FEB 2012

PACMISRANFAC INSTRUCTION 3125.1

From: Commanding Officer, Pacific Missile Range Facility

Subj: MARINE MAMMAL MITIGATION FLIGHT GUIDELINES

Ref: (a) Meeting at PMRF with COMPACFLT Environmental Personnel on 27Jul11

1. Purpose. In accordance with (IAW) reference (a), this instruction is to establish procedures for operational execution and contract oversight for Marine Mammal Mitigation (M3) Flights during fleet exercises.

2. Background. As part of the Navy's permit to train with Medium Frequency Active Sonar (MFAS), marine mammal monitoring is required. This involves 120-160 hours of visual surveys by boat or air. Fleet exercises, such as the Submarine Commander Course (SCC), provide optimal opportunity to accomplish these requirements due mainly to the size and scope of their operations. In an effort to accomplish the M3 goals and ensure safe operation of all craft involved, procedures need to be put in place for civilian observer aircraft.

3. Operational Execution.

a. Aircraft check in points – remain at 2000 feet (ft) or above until cleared by air operations then descend to 800-1000ft as agreed to by Commander, Destroyer Squadron Three One (COMDESRON THREE ONE) and Pacific Missile Range Facility (PMRF) Range Safety.

(1) Northern approach – Makaha Ridge

(2) Southern approach – South Kauai Vortec

b. Check in procedures – aircraft should state the following information upon check in with PMRF Air Operations.

(1) Working call sign

(2) Mission (to include time on range)

PMRFINST 3125.1
13 FEB 2012

(3) Mode 3

(4) Number of souls on board

(5) Fuel state (meaning hours left on station)

c. Aircraft safe holding area/lost communications procedure – it is a requirement that aircraft have one (1) working radio at all times. Loss of radio communication will require aircraft to depart operating area.

(1) Aircraft must have at least one (1) working radio and be in communication with Range Operations at all times. Radio checks will be conducted if no communication from either the aircraft or Range Air Operations has been received on the quarter hour. If unable to establish radio communications, aircraft will be required to exit operation area, return to base, and call Range Control via land line to report loss of communications.

(2) Safe holding area is 10-15 miles on 360 radial at 2000 ft, weather permitting. In the event of bad weather they will depart the range and return to base. PMRF is a VFR (visual flight rules) range.

(3) Should communications fail, aircraft must attempt to contact Range Facility Control (RFCO) on VHF 125.2 first then the tower on VHF 126.2. If unable, return to base of origination, call Range Operations on a land line explaining loss of communication.

(4) Declared emergency

(a) Squawk 7700 for one (1) minute

(b) Call tower on VHF 125.2

(c) Send out International Air Distress on VHF 121.5

(d) Proceed to PMRF for emergency landing.

(e) All other emergencies, communicate intentions to PMRF if possible

d. Class D Airspace – aircraft is not permitted to enter any Class D airspace unless cleared to enter by Air Operations Control coordinated with PMRF tower.

e. PMRF Operation areas

PMRFINST 3125.1
13 FEB 2012

(1) Area of exercise (SCC operations or other scheduled exercises) is instrumented range within W-188.

(2) Minimum three (3) mile standoff of Niihau island.

(3) Unless in pursuit of mammals, the marine mammal observer aircraft is to remain off the bow of their assigned observer ship. When conducting observations of mammal groups, aircraft will inform PMRF Air Operation Control of sighting and remain with mammal group until observations are completed. Then return to station, which in most cases transects ahead (bow) of assigned ship.

(4) Observer aircraft are prohibited from entering pre-determined ships radii other than assigned unit unless cleared by air operations.

(5) Prior to the execution of any air launches, ships will be required to call in flight quarters. Flight quarter status changes of the assigned M3 surface vessel will be communicated to the M3 aircraft.

(6) Maintain 800 ft hard deck to allow U.S. Navy participating aircraft to maintain an airspace plan to work 500ft and below and 1500ft and above. Working altitude should be 800-1000 ft once cleared by assigned range air controller.

f. Operating around ships

(1) Safety briefs will define safe operating procedures and reference this instruction while also including special instances to include live fire events, Electromagnetic Interference (EMI), Hazards of Electromagnetic Radiation to Person (HERP), and Hazards of Electromagnetic Radiation to Ordnance (HERO) concerns.

(2) Marine Mammal Mitigation team to provide CONOPS of daily activities

(3) Aircraft will communicate clearly and regularly throughout their time on range, particularly when changing their course or altitude. They will inform range control when mammals are observed, when observations have ended, and when they are going to return to assigned ship.

PMRFINST 3125.1
13 FEB 2012

g. Pre-Flight Procedures for M3 aircraft

(1) Contact range on land line for following information

(a) Daily flight plan will include confirming relevant radio channel frequencies

(b) Situation report (SITREP) from PMRF

(c) Confirm contact phone numbers for all crew on board, PMRF, RFCO and Operations Conductor

(2) Provide PMRF with operational frequencies between aircraft and Marine Mammal Observer onboard ship.

h. Operational instructions between both ships and aircraft and aircraft to aircraft will be addressed at the mandatory safety briefs.

(1) Follow PMRF Air Operation procedures as required for safe operation and mission success.

(2) Operating areas – stay in W-188 unless cleared

4. <u>Conclusion</u>. Safety is of utmost importance and flight check in procedures will be strictly enforced. Failure to comply with range instructions will result in immediate expulsion from range area and termination of Marine Mammal Mitigation participation in fleet exercises.

NICHOLAS MONGILLO

<u>Distribution:</u>
List 1