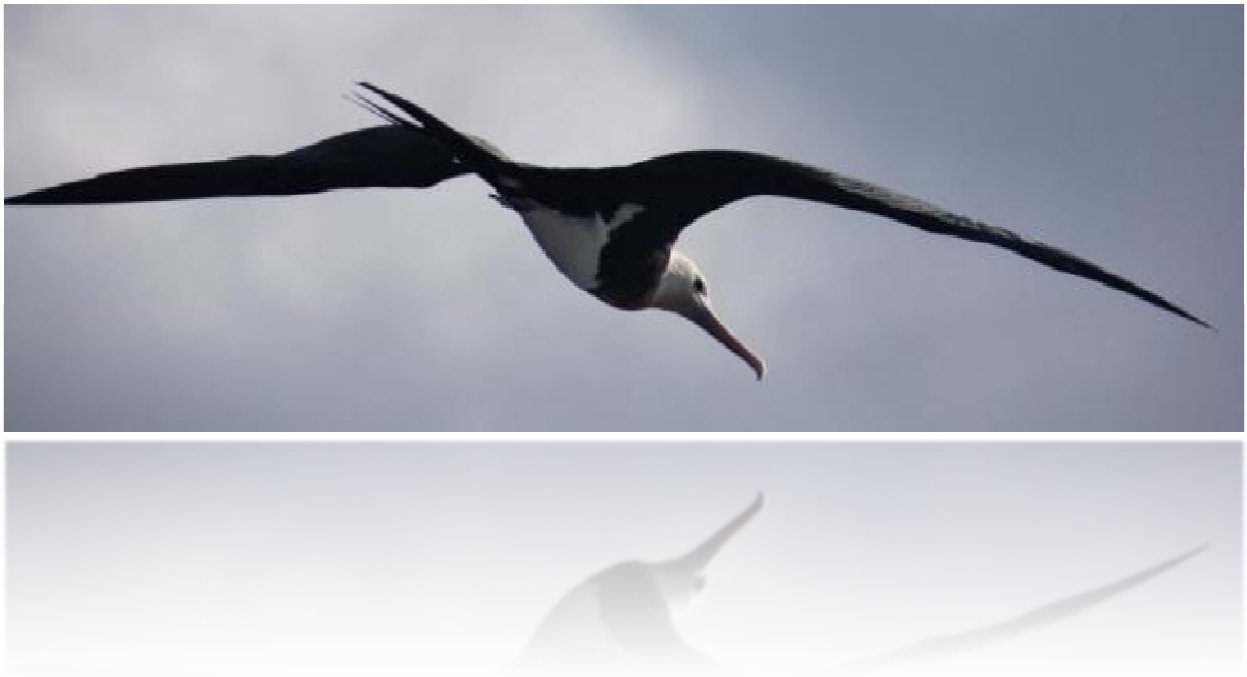
APPENDIX C. Ka‘ula / Kaua‘i Field Report, HRC Marine Species Monitoring, February 15-20, 2011



KA‘ULA / KAUA‘I FIELD REPORT
HRC Marine Species Monitoring
February 15-20, 2011

Prepared for COMMANDER, U.S. PACIFIC FLEET

Morgan W. Richie and Justin Fujimoto

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List of acronyms and abbreviations

RHIB	Rigid hull inflatable boat
MMO	Marine mammal observer
CRC	Cascadia Research Collective
PMRF	Pacific Missile Range Facility
RIMPAC	Rim of the Pacific (Naval Exercise)
BSURE	Barking Sands Underwater Range Expansion
BARSTUR	Barking Sands Tactical Underwater Range
NMFS	National Marine Fisheries Service
HRC	Hawai‘i Range Complex
MFAS	Mid-frequency Active SONAR
CPF	Commander, U. S. Pacific Fleet
ASW	Anti-submarine Warfare

List of species abbreviations

MEGNO	Humpback whale
GLOMA	Long-finned pilot whale
STEBR	Rough toothed dolphin
STELO	Spinner dolphin
TURTR	Bottlenose dolphin
MONSC	Monk seal
WHALE	Unidentified large whale
DOLPH	Unidentified dolphin
UNID	Unidentified animal

SECTION 1 INTRODUCTION

The February 2011 cruise to Ka'ula was comprised two components: a dedicated seabird survey at the island of Ka'ula to satisfy Sikes Act monitoring requirements and a marine mammal visual survey and tagging effort at the island of Kaua'i and during the transit to Ka'ula in order to satisfy Commander, Pacific Fleet's marine mammal and sea turtle monitoring requirements. Relatively little research and monitoring has occurred at Ka'ula. A comprehensive list of all visitors to Ka'ula can be found in Table 1.

Table 1. Survey dates and personnel, Ka'ula Island, Hawaii 1932-2011.

Date	Agency	Survey personnel	Title
16-19 Aug 1932	University of Hawaii	Harold S. Palmer	Professor of Geology
	Hawaiian Sugar Planters' Experiment Station	Edward L. Caum	Botanist
17-18 Aug 1971	U.S. Navy	Gerald Swedberg	Natural Resources Specialist
		J.S. Elmer	Operations & Readiness Officer
		H.W. Mixter	Unexploded Ordnance Escort
	U.S. Fish and Wildlife Service	Eugene Kridler	Wildlife Administrator
	Hawaii Dept of Land and Natural Resources	Ronald Walker	District Biologist
		David Woodside	Non-Game Biologist
		Thomas Telfer	Wildlife Biologist
		Richard Kaneyama	Aquatic Biologist
		Michael Fujimoto	Aquatic Biologist
		Ralph Daehler	District Forester
20-21 Jan 1976	U.S. Navy	Gerald Swedberg	Natural Resources Specialist
		Yoshito Doi	Photographer
		Scott Wood	Unexploded Ordnance Escort
	U.S. Fish and Wildlife Service	Palmer Sekora	Refuge Manager
	Hawaii Dept of Land and Natural Resources	Ronald Walker	Wildlife Branch Chief
		David Woodside	Non-Game Biologist
		Thomas Telfer	Wildlife Biologist
		Kenji Ego	Fisheries Branch Chief
		Michael Fujimoto	Aquatic Biologist
		Ralph Daehler	District Forester

Date	Agency	Survey personnel	Title
14-15 Sep 1976	U.S. Navy	Gerald Swedberg	Natural Resources Specialist
		John Walter	Special Asst for Ecology
		Holden	Asst Operations Officer
		Unknown	Unexploded Ordnance Escort
	U.S. Fish and Wildlife Service	Fred Zeillemaker	Biologist
	Hawaii Dept of Land and Natural Resources	Ronald Walker	Wildlife Branch Chief
		David Woodside	Non-Game Biologist
		Thomas Telfer	Wildlife Biologist
		Kenji Ego	Fisheries Branch Chief
		Henry Sakuda	Marine Section Chief
		Ralph Daehler	District Forester
		Robert Hommon	State Archaeologist
7 Mar 1978	U.S. Navy	Gerald Swedberg	Natural Resources Specialist
		C.C. Gage	Officer-in-Charge
		Phil Hinkle	Investigating Officer
		Becker	Public Affairs Officer
		Thomas Morrison	Legal Counsel
		Myers	Photographer
		Wykoff	Corpsman
	U.S. Fish and Wildlife Service	Eugene Kridler	Wildlife Administrator
		Kimberly Wright	Special Agent
	Hawaii Dept of Land and Natural Resources	Timothy Burr	Wildlife Biologist
21-22 Aug 1978	U.S. Navy	Gerald Swedberg	Natural Resources Specialist
		Unknown	Unexploded Ordnance Escort
	U.S. Fish and Wildlife Service	John Sincock	Wildlife Biologist
		Darrell Herbst	Botanist
		James Bartee	Special Agent-in-Charge
	Natl Oceanic and Atmospheric Administration	Robert Iversen	Marine Biologist
		John Naughton	Marine Biologist

Date	Agency	Survey personnel	Title
	Hawaii Dept of Land and Natural Resources	Ronald Walker	Wildlife Branch Chief
		Thomas Telfer	Wildlife Biologist
		Ralph Daehler	District Forester
	University of Hawaii	Andrew Berger	Professor of Zoology
6-8 Mar 1979	U.S. Navy	Scott Hamilton	Environmental Protection Spec
		George Tullos	Air Operations
		Jay M. Davidson	Public Affairs Officer
		D. K. Mashayekhi	Medic
		Chas. J. Galbreath	Unexploded Ordnance Escort
	U.S. Fish and Wildlife Service	Vernon Byrd	Wildlife Biologist
		Darrell Herbst	Botanist
	Natl Oceanic and Atmospheric Administration	Robert Iversen	Marine Biologist
		John Naughton	Marine Biologist
	Hawaii Dept of Land and Natural Resources	Ronald Walker	Wildlife Branch Chief
		Thomas Telfer	Wildlife Biologist
	University of Hawaii	George Balazs	HIMB Marine Biologist
		David Grooms	Geophysics Graduate Student
19-20 Jun 1980	U.S. Navy	Gerald Swedberg	Natural Resources Specialist
		Unknown	Unexploded Ordnance Escort
		Craig Swedberg	Assistant
	U.S. Fish and Wildlife Service	R. Shallenberger	Refuge Manager
	Natl Oceanic and Atmospheric Administration	Gene Nitta	Marine Biologist
	Hawaii Dept of Land and Natural Resources	Ronald Walker	Wildlife Branch Chief
		Thomas Telfer	District Wildlife Biologist
		Ralph Daehler	District Forester
	University of Hawaii	Michael Garcia	Geologist
	Honolulu Magazine	Victor Lipman	Writer

Date	Agency	Survey personnel	Title
16-18 Apr 1984	U.S. Navy	Unknown	U.S. Navy Representative
	U.S. Fish and Wildlife Service	Stewart Fefer	Wildlife Biologist
		Mark Rouzon	Wildlife Biologist
		Cameron Kepler	Wildlife Biologist
	Natl Oceanic and Atmospheric Administration	Gene Nitta	Marine Biologist
	Hawaii Dept of Land and Natural Resources	Ronald Walker	Wildlife Branch Chief
		Thomas Telfer	Wildlife Biologist
		Marie Morin	Wildlife Biologist
1-2 Jun 1993	U.S. Navy	Tim Sutterfield	Fish and Wildlife Biologist
		Mike Nahoopii	Kahoolawe Project Officer
		Ken	Unexploded Ordnance Escort
	U.S. Fish and Wildlife Service	Scott Johnson	Wildlife Biologist
		Kathleen Viernes	Wildlife Biologist
	Hawaii Dept of Land and Natural Resources	Ronald Walker	Wildlife Program Manager
		Thomas Telfer	Wildlife Biologist
		Thomas Kaiakapu	Wildlife Biologist
	KITV	Gary Sprinkle	Reporter
		Sonny Ahuna	Cameraman
16-17 Nov 1998	U.S. Navy	Sean Cole	Unexploded Ordnance Escort
	U.S. Fish and Wildlife Service	Ronald Walker	Wildlife Biologist
	Hawaii Dept of Land and Natural Resources	Thomas Telfer	Branch Wildlife Manager
		David Smith	Branch Wildlife Manager
		Alan Silva	Wildlife Management Asst
18, 21 Jan 2009	Hawaii Aviation (civilian contractor for U.S. Navy)	Adam Townley-Wren	Pilot
		Peter Gonsalves	Photographer
20-24 Jul 2009 (Ship-based survey)	U.S. Navy	Vanessa Pepi	Supervisory Fish & Wildlife Biologist
		Anurag Kumar	Marine Resources Specialist
	U.S. Fish and Wildlife Service	Megan Laut	Fish and Wildlife Biologist
		Jiny Kim	Wildlife Biologist Student Trainee

Date	Agency	Survey personnel	Title
	Hawaii Dept of Land and Natural Resources and University of Hawaii	Jessica Hallman	Kauai Endangered Seabird Recovery Project Avian Technician
28 June 2010 (Ship-based survey)	U.S. Navy	Angela Anders, PhD	Wildlife Biologist
		Justin Fujimoto	Wildlife Biologist Intern
		Sean Hanser, PhD	Marine Natural Resource Management Specialist
		Robert Uyeyama, PhD	Marine Natural Resource Management Specialist
		Aaron Hebshi, PhD	Natural Resource Program Biologist
	U.S. Fish and Wildlife Service	Megan Laut	Fish and Wildlife Biologist
	Hawaii Dept of Land and Natural Resources	Jessica Hallman	Kauai Endangered Seabird Recovery Project Avian Technician
16 February 2011 (Ship-based survey)	U.S. Navy	Justin Fujimoto	Wildlife Biologist Intern
		Frans Juola, PhD	Wildlife Biologist
		Morgan Richie	Marine Natural Resource Management Specialist
	Cascadia Research Collective	Robin Baird, PhD	Marine Biologist
		Daniel Webster	Marine Biologist

1.1 Seabird monitoring background information

As part of the Department of Navy's Coastal Zone Management Act consistency determination of the Hawaii Range complex (HRC), the Navy reinitiated seabird population monitoring at Kaʻula Island in 2009. A seabird monitoring plan for Kaʻula Island was finalized in 2009, and ship-based seabird monitoring was conducted from July 2009 to the present. Monitoring will detect changes in seabird population on Kaʻula Island over time, while ensuring the maintenance of military readiness.

The first formal seabird survey at Kaʻula was conducted by E.L. Caum, Hawaiʻi Sugar Plantation Botanist and H.S. Palmer, University of Hawaiʻi Geologist. Bird species observed by Caum included 12 species of seabirds (two Procellariiformes species, five Pelecaniformes species, and five tern species) and two species of migratory shorebirds (Table 2). The next avian and botanical survey was not conducted until 1971, when biologist from the Navy, State, and Fish and Wildlife Services visited the island to assess the effects of munitions training exercises on nesting seabirds. Elmer and Swedberg noted that ordnance had reduced the training impact area on the southeastern tip of the island (approximately 8% of the island area) to rubble. There was no

evidence of nesting by seabirds in the impact area (1971). A complete avian survey throughout the remaining 92% of the island indicated an estimated total of 98,022 individual birds of 19 species, including 15 seabird species, one migratory shorebird species, and three species of visiting landbirds (Table 2). The second complete avian survey conducted on Ka'ula took place in January 1976, outside of the breeding period for most central Pacific seabird species (DoN 1976a). The survey recoded the presence of approximately 3,521 individuals of 16 bird species, including black-footed and Laysan albatrosses (*Phoebastria immutabilis*). Although albatrosses, booby (*Sula*) species, and sooty terns *(Sterna fuscata*) nest during the month of January in the Hawaiian Archipelago, most of the other 12 seabird species observed on Ka'ula during previous (August) surveys would not have been actively nesting, and thus not necessarily present on the island at the time of the January 1976 survey. Eight additional avian surveys were conducted on Ka'ula Island by U.S. Navy, USFWS, and Hawai'i DLNR biologists from 1976 through 1998, with survey dates ranging from March through November (Table 2) (DoN 1976a; Walker 1979; DoN 1980; Walker 1983; Walker 1984; Walker 1993; Telfer 1998) months that span the peak breeding periods for the majority of central Pacific seabird species. No new seabird or shorebird species were observed during these later surveys. Throughout all of the avian surveys, a total of six landbird species have been observed, with only three identified from 1978 to 1998 (Table 2). From 2009 to 2010 two ship based surveys were conducted during the peak breeding season of central Pacific seabird species. No new species were recorded during these surveys.

Non-native barn owls have been recorded during multiple surveys on Ka'ula Island, with the species reported nesting on the island in 1979, 1980, 1984, and 1993 (Walker 1979; DoN 1980; Walker 1984; Walker 1993). During the 1993 survey, barn owl nests were located and the contents (eggs and chicks) were destroyed to prevent additional depredation on seabirds (Walker 1993).

Table 2. Results of land-based avian surveys conducted on Kaʻula Island, Hawaiʻi, 1932-1998

Common Name	Scientific Name	Aug 1932	Aug 1971	Jan 1976	Sep 1976	Mar 1978	Aug 1978	Mar 1979	Jun 1980	Apr 1984	Jun 1993	Nov 1998
Black-footed albatross	*Phoebastria nigripes*	1 old egg	-	100	-	75	-	75	-	2	4	10
Laysan Albatross	*Phoebastria immutabilis*	-	1 old egg	150	-	100	-	100	9	33	44	60
Wedge-tailed shearwater	*Puffinus pacificus*	many burrows	4,100	-	4,000	-	800	-	1,415	980	400	200
Christmas shearwater	*Puffinus nativitatis*	-	450	-	250	-	100	25	20	60	18	-
Bonin petrel	*Pterodroma hypoleuca*	1 chick	-	-	-	-	-	-	-	-	-	-
Bulwer's petrel	*Bulweria bulwerii*	several	100	-	100	-	50	-	100	580	100	-
Red-tailed tropicbird	*Phaethon rubricauda*	common	950	-	450	60	100	40	276	209	146	15
White-tailed tropicbird	*Phaethon lepturus*	-	3	1	1	-	1	2	-	-	-	1
Masked booby	*Sula dactylatra*	common	1,000	300	1,200	125	200	400	236	202	567	350
Brown booby	*Sula leucogaster*	common	1,700	50	1,000	75	60	200	212	169	397	60
Red-footed booby	*Sula sula*	uncommon	1,300	100	150	85	200	400	344	222	1,375	1,200
Great frigatebird	*Fregata minor*	common	950	250	800	400	250	250	134	155	701	650
Pacific golden plover	*Pluvialis fulva*	several	-	10	14	-	1	2	-	21	-	15
Ruddy turnstone	*Arenaria interpres*	-	50	5	20	-	4	24	1	7	1	12
Wandering tattler	*Heteroscelus incanus*	-	-	5	1	-	1	1	-	-	-	-
Gray-backed tern	*Sterna lunata*	uncommon	2,800	-	250	1,250	50	300	4,110	1,467	35	-
Sooty tern	*Sterna fuscata*	common	16,800	2,500	1,000	130,000	2,500	50,000	28,850	83,680	27,255	200
Blue-gray noddy	*Procelsterna cerulea*	small colony	-	-	200	-	-	-	-	-	-	1
Brown noddy	*Anous stolidus*	most numerous	67,700	-	7,000	7,000	10,000	1,000	10,560	3,950	5,778	-
Black noddy	*Anous minutus*	-	100	20	100	75	200	-	-	207	6	-
White tern	*Gygis alba*	uncommon	10	10	200	40	10	-	9	12	9	-
Barn owl	*Tyto alba*	-	1	3	3	-	1	6	4	2	7	3
Japanese white eye	*Zosterops japonicus*	-	-	2	3	-	-	-	-	-	3	-
House finch	*Carpodacus mexicanus*	-	6	15	40	-	20	6	-	1	1	8
Northern cardinal	*Cardinalus cardinalus*	-	2	-	7	-	-	-	-	-	-	-
Mockingbird	*Mimus polyglottos*	-	-	-	2	-	-	-	-	-	-	-
Nutmeg mannikin	*Lonchura punctulata*	-	-	-	20	-	-	-	-	-	-	-
Total estimated number of birds			98,022	3,521	16,811	139,285	14,548	52,831	46,280	91,959	36,847	2,785
Total number of species		**16**	**19**	**16**	**24**	**12**	**19**	**17**	**15**	**19**	**19**	**15**

1.2 Botanical survey history

The first formal biological surveys of Ka'ula Island were conducted in August 1932 (Caum 1936). E.L. Caum, a botanist with the Hawaiian Sugar Planters' Experiment Station, and H.S. Palmer, a professor of geology at the University of Hawaii, were provided access and transportation to Ka'ula by the U.S. Lighthouse Service (Caum 1936; Palmer 1936). Although Caum did not quantify the population sizes of the plant communities on Ka'ula, he provided complete species lists, including 15 plant species (Table 3) (Caum 1936). Caum indicated that plant cover was extensive across areas of the island where plants were able to grow, but that many areas of the island had no plant cover, and all species that occurred on the island were those that could tolerate arid conditions and strong winds. Four of the 15 plant species (27%) observed by Caum were species not native to Hawaii. The next botanical survey was not conducted until 1971, when biologists from the Navy, State, and the Fish and Wildlife Services visited the island to assess the effects of munitions training exercises on nesting seabirds. Elmer and Swedberg noted that ordnance had reduced the training impact area on the southeastern tip of the island (approximately 8% of the island area) to rubble (1971). The team also discovered three explosions outside of the impact area and evidence of one fire that may have been started by a flare (Elmer 1971). Two additional botanical surveys were conducted in 1976 and 1998. The 1976 survey by the U.S. Navy and USFWS, and Hawaii DNLR found 13 plant species not observed by Caum (1936). Of these, seven were species not native to Hawaii. During the 1998 survey, one new plant species, milo (*Thespesia populnea*), a plant introduced historically to Hawaii by Polynesians, was observed bringing the total number of plant species seen on Ka'ula to 30 (Table 3). Of these, 14 species (47%) are not native to Hawaii. Both the January 1976 and November 1998 botanical surveys reported an increase in the number of non-native plant species relative to those present in 1932 (DoN 1976a; Telfer 1998).

Table 3. Results of botanical surveys conducted on Ka'ula Island, Hawaii, 1932-1998[1]

Family	Common Name	Species Name	Origin	Caum 1932	DON 1976	Telfer 1998
Gramineae	'Ume'alu	*Cenchrus echinatus*	Introduced		x	x
	Swollen finger grass	*Chloris inflata*	Introduced		x	x
	Kukaipua'a	*Digitaria setigera*	Introduced		x	x
	Jungle rice	*Echinochola colonum*	Introduced		x	x
	Kakonakona	*Panicum torridum*	Endemic		x	x
	Bristly foxtail	*Setaria verticillata*	Introduced		x	x
		Panicum lanaiense (rcrded by Caum (1939) easy to mistake for *P. torridum*)	Introduced	x		

1 From Caum (1936), DON (1976a), and Telfer (1998). None of the species observed are listed under the U.S. Endangered Species Act.

Family	Common Name	Species Name	Origin	Caum 1932	DON 1976	Telfer 1998
Chenopodiaceae	Australian salt bust	*Atriplex semibaccata*	Introduced		x	x
	Alaweo	*Chenopodium oahuense* (formerly *Chenopodium sandwicheum*)	Endemic	x	x	x
Amaranthaceae	Slender amaranth	*Amaranthis viridis*	Introduced	x	x	x
Nyctaginaceae	Alena	*Boerhavia diffusa*	Indigenous	x	x	
Portulacaceae	'Ihi	*Portulaca lutea*	Indigenous	x	x	
	Purslane	*Portulaca oleracea*	Introduced	x	x	x
	'Ihi	*Portulaca villosa* (formerly *Portulaca caumii*)	Endemic	x	x	x
Capparaceae	Maiapilo	*Capparis sanwichiana*	Endemic	x	x	x
Leguminosae	Koa haole	*Leuceana leucocephala*	Introduced		x	x
Zygophyllaceae	Nohu	*Tribulus cistoides*	Indigenous	x	x	x
Euphorbiaceae	'Akoko	*Chamaesyce celastroides* (formerly *Euphorbia celastroides*)	Endemic	x	x	x
Malvaceae	'Ilima	*Sida fallax*	Indigenous	x	x	x
	Milo	*Thespesia populnea*	Polynesian Intro			x
Cactaceae	Pa nini	*Opuntia megacantha*	Introduced	x	x	
Plumbaginaceae	'Ilieo	*Plumbago zeylanica*	Indigenous		x	x
Convulvulaceae	Sweet koali 'ai	*Ipomoea carica*	Indigenous		x	x
	Koali 'awania	*Ipomoea congesta*	Indigenous		x	x
	Koali 'awa	*Ipomoea indica*	Indigenous	x		
Boraginaceae	Nena	*Heliotropium curassavicum*	Indigenous	x	x	x
Solanaceae	'Ohelo kai	*Lycium sandwicense*	Indigenous		x	x
	Popolo	*Solanum nigrum*	Indigenous	x	x	x
Asteraceae	Horseweed	*Erigeron canadensis*	Introduced		x	x
	Pualele	*Sonchus oleraceus*	Introduced		x	x
Total number of species				15	27	25

1.3 Marine mammal and sea turtle monitoring background information

In order to train with active sonar and explosives within the Hawaii Range Complex (HRC), the Navy has obtained a permit from the National Marine Fisheries Service (NMFS) under the Marine Mammal Protection Act and Endangered Species Act. The Hawai'i Range Complex (HRC) Monitoring Plan, finalized in December 2008 for implementation in January 2009, and amended in 2010, was developed with NMFS to comply with the requirements under the permit. The monitoring plan and reporting intends to provide science-based answers to questions regarding whether or not marine mammals are exposed and reacting to Navy training.

Monitoring requirements in the HRC for fiscal year 11 include attempted deployment of 15 satellite tags and 120-160 hours of visual monitoring. In order to address the questions above, NAVFAC – Pacific, in cooperation with Cascadia Research Collective, and with funding from Commander, U.S. Pacific Fleet (CPF), conducted a cruise to Ka'ula Rock, Ni'ihau and Kaua'i in an effort to deploy satellite tags on odontocetes and rare mysticetes as well as conduct a visual survey. The cruise occured during the Submarine Commanders' Course which took place on the Pacific Missile Range Facility (PMRF) near Kaua'i from February 16 – 19, 2011. The primary goal of the cruise was to deploy satellite tags near the PMRF underwater ranges, Barking Sands Underwater Range Expansion (BSURE), Barking Sands Tactical Underwater Range (BARSTUR) and the Shallow Water Training Range, during an anti-submarine warfare (ASW) exercise in order to contribute knowledge regarding how odontocetes are using the range complex and whether they are exposed to MFAS. Additionally, MMOs recorded the time and location of all marine mammal and sea turtle sightings, except for humpback whales which were numerous.

Relatively little is known about the marine mammals of the western HRC (Baird 2011). Few marine mammal and sea turtle surveys have been conducted at Ka'ula and thus the area is not well characterized. Two National Oceanic and Atmospheric Administration (NOAA) marine mammal surveys not associated with the on-island plant and seabird surveys at Ka'ula Island have included the waters surrounding the island (Mobley et al., 2000; Baird et al., 2003). Both surveys recorded spinner dolphins (*Stenella longirostris*) and bottlenose dolphins (*Tursiops truncatus*). Additionally, marine mammals were recorded during a U.S. Navy seabird survey in 2009 (Pepi et al., 2009). Five biologists, including four seabird observers and one marine mammal observer, carried out the surveys. Four species of marine mammals were observed near Ka'ula Island, including three species of odontocetes and one species of pinniped. Bottlenose dolphins (*Tursiops truncatus*) and spinner dolphins (*Stenella longirostris*) were all sighted off of the northwest coast of the island within 820 ft (250 m) of the coastline. The spotted dolphins (*Stenella attenuata*) were sighted during transit to the survey area off of the southeast coast of Ka'ula within 4.9 miles (8 km) of the coastline. Hawaiian monk seals (*Monachus schauinslandi*) were observed hauled out on two separate ledges on the leeward (western) side of the island. During June 26-28, 2010 three U.S. Navy biologists conducted marine mammal and sea bird surveys in the waters between Kaua'i, Ni'ihau, and Ka'ula. A total of five marine mammal groups were sighted during the three days of observation (two additional sightings were made off-effort). Species sighted were *Tursiops truncatus*, *Stenella longirostris*, *Steno bredadensis*, and *Pseudorca crassidens* (Uyeyama 2010).

Research near the island of Kaua'i has been conducted by the contractor "Marine Mammal Research Consultants" under Navy funding. Both vessel and aerial surveys have been conducted as part of the North Pacific Acoustic Laboratory (NPAL) program as well a the Navy's monitoring program (Mobley 2005; Mobley 2006; Tiemann 2006). Tiemann 2006 was a combination of

acoustic monitoring and aerial surveys at PMRF for detecting and tracking marine mammals on the hydrophone range. An acoustic and visual survey which included Kaua'i and Ni'ihau was conducted by CETOS Research Organization in 2005 (Norris 2005). Passive acoustic line transect surveys and fixed passive acoustic surveys were conducted at PMRF in 2010 in order to compare minke whale boings with other geographic locations, estimate the abundance of minke whales, and assess spatial distribution. The analyses of the results are on-going but preliminary results suggest that minke whale boings are sufficiently different to classify to location. Density estimates have been derived from both data sources but line transect data are undergoing a detailed review (Martin 2010; Norris 2010). Preliminary results from a Navy-funded Ecological Acoustic Recorder (EAR) in 800 meters of water on the northwest side of Ni'ihau showed beaked whales, not surprisingly, echolocating at night. Beaked whales were present all year. Other odontocetes which were detected included pilot whales, Risso's dolphins, sperm whales, and Stenella species (Au 2011). Further diagnostics on the small odontocete detections should produce refinements in these results.

Research near the islands of Kaua'i and Ni'ihau has been conducted by scientists at CRC and has focused on tagging, photo-identification and biopsy sampling (Baird 2011). From 2003 – present, CRC has conducted small vessel surveys (Baird 2003; Baird 2006; Baird 2008a; Baird 2008b; Baird 2008c; Baird 2009; Baird 2011) in the western main Hawaiian Islands and identified the presence of some island-specific populations of rough-toothed dolphins and bottlenose dolphins (Baird 2008a; Baird 2009). In 2008, 33 medium-term satellite tags were affixed to 4 species of odontocetes, which allowed CRC the ability to examine animal movements before, during, and – in some cases – after RIMPAC. False killer whales, Blainville's beaked whales, and short-finned pilot whales remained associated with the Main Hawaiian Islands while the tags remained attached. Melon-headed whales moved west over 400 km away from the main Hawaiian Islands over the duration of the tag attachment (Baird 2008c). Recommendations from this 2008 report for future effort surrounding naval exercises will be reiterated in Section 3.7 of this report.

1.4 Regional background information

Kaua'i, Ni'ihau, and Ka'ula are the westernmost islands in the main Hawaiian Island archipelago (Figure 1). PMRF is the largest instrumented multi-environment test range in the world and includes land, sea, and air zones (Figure 2). The main base is at Barking Sands on Kaua'i. Additionally, Ni'ihau houses radar, optics, and electronic warfare facilities and Ka'ula is used for aircraft gunnery and inert ordnance target practice (DoN 2010).

1.4.1 Kaua'i and Barking Sands background information

The largest and principle operation for PMRF is Barking Sands on the western shore of Kaua'i. Barking Sands includes three underwater ranges: BSURE, BARSTUR, and the Shallow Water Training Range. BSURE is an area which extends north from the Ka'ulakahi Channel between Kaua'i and Ni'ihau and covers 2,279 square kilometers. BARSTUR is an area between and slightly to the north of the Ka'ulakahi Channel and covers 310 square kilometers (Figure 2) (DoN 2010). A deepwater canyon runs north to south in the channel between Ni'ihau and Kaua'i. Federally threatened, endangered and candidate marine species which are expected to occur in this area are Hawaiian monk seals, humpback whales, hawksbill sea turtles, green sea turtles, and false killer whales (candidate) (DoN 2010).

1.4.2 Ni‘ihau background information

Ni‘ihau is a privately owned island approximately 15 miles west of Kaua‘i, across the Ka‘ulakahi Channel (Figure 1). The Navy leases land from the owners, the Robinson Family, for communications/electronics training activities, Perch Site and Optical Tracking Station, and Paniau Radar Site (DoN 2010).

1.4.3 Ka‘ula Island background information

Ka‘ula is a small uninhabited islet near the islands of Ni‘ihau and Kaua‘i in the Hawaiian Archipelago (Figure 1). It is located 20 nautical miles (37 kilometers [km]) west-southwest of Ni‘ihau and approximately 60 nautical miles (111 km) southwest of the Pacific Missile Range Facility (PMRF), Kaua‘i (Figure 2)(Elmer 1971). Ka‘ula Island is a crescent shaped island of approximately 55 hectares. Approximately 9% of the island (4 hectares on the southern tip) is used to train aviators in air-to-surface inert weapons delivery. Past use has included military bombing and strafing training with live ordnance. As a result, unexploded ordnance is a hazard, and public access to the island is not permitted. Federally threatened and endangered marine species which are known to occur at Ka‘ula include the Hawaiian monk seals, humpback whales, hawksbill sea turtles, and green sea turtles (DoN 2010). Additionally, false killer whales, which are ESA-candidate species, were sighted at Ka‘ula by Navy biologists in 2010 (Uyeyama 2010).

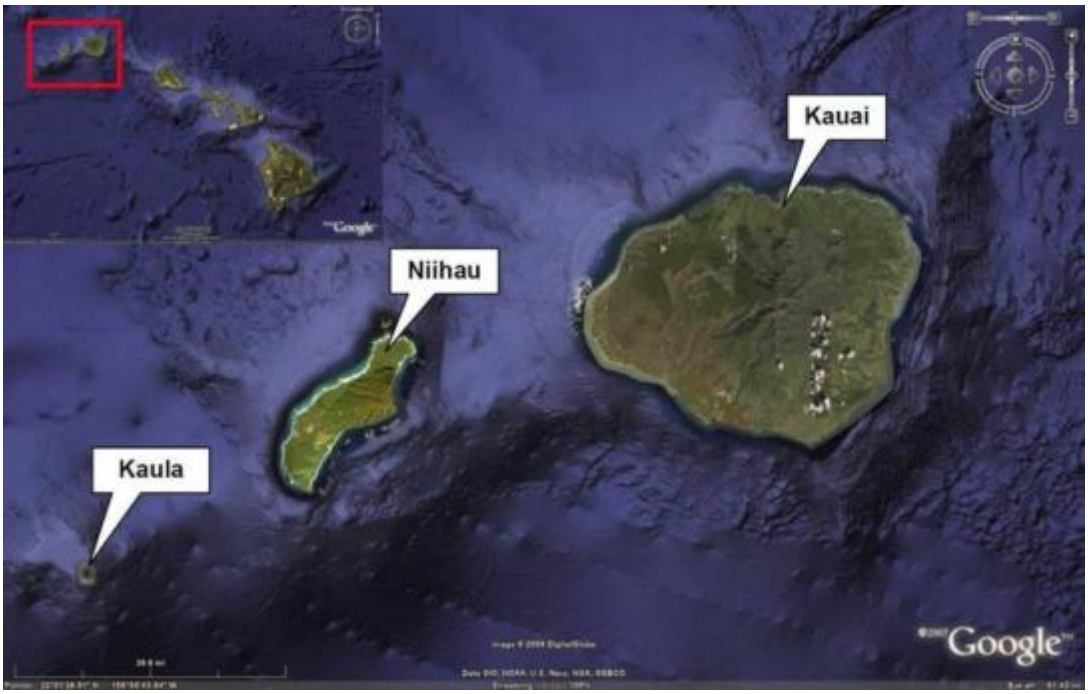

Figure 1. Location of Ka‘ula, Ni‘ihau, and Kaua‘I

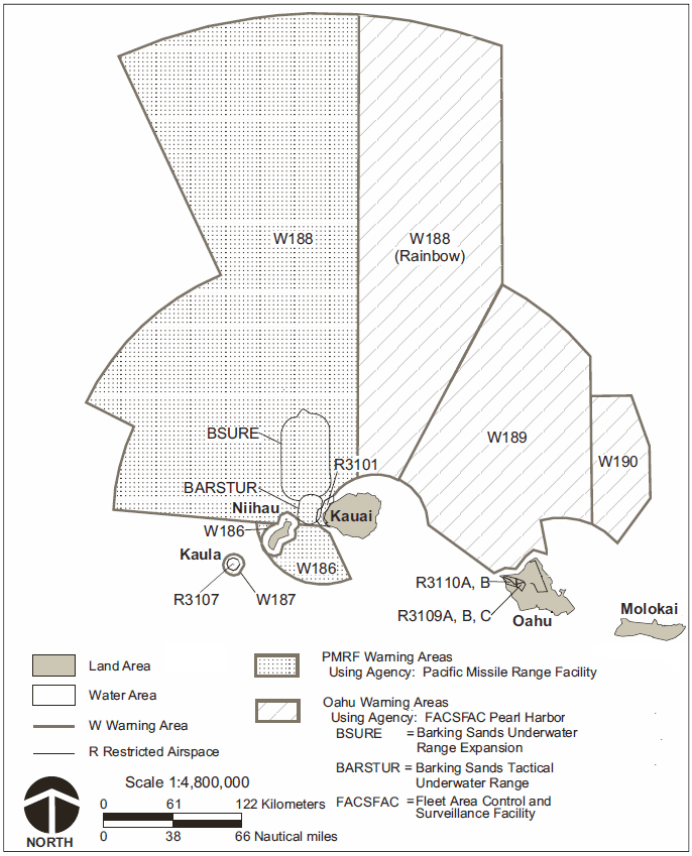

Figure 2. Location of the Pacific Missile Range Facility, BSURE, and BARSTUR

SECTION 2 SURVEY DESCRIPTION

2.1 Survey timeline

Date	Location	Description of survey	Team(s)
2/15/2011	Kauaʻi to Kaʻula	Transit at night	Navy bird biologists, Navy marine mammal biologists, Cascadia Research Collective
2/16/2011	Kaʻula, Niʻihau, Kauaʻi	Kaʻula bird survey, Kaʻula marine mammal survey, transit to Kauaʻi along the north side of Niʻihau	Navy bird biologists, Navy marine mammal biologists,
2/17/2011	Kauaʻi	Marine mammal observation and tagging on the north western side of Kauaʻi	Navy marine mammal biologists, Cascadia Research Collective
2/18/2011	Kauaʻi	Marine mammal observation and tagging on the north western side of Kauaʻi	Navy marine mammal biologists, Cascadia Research Collective

Date	Location	Description of survey	Team(s)
2/19/2011	Kaua'i	Marine mammal observation and tagging on the north western side of Kaua'i	Navy marine mammal biologists, Cascadia Research Collective, HDR aerial surveyors
2/20/2011	Kaua'i and Ka'ulakahi Channel	Marine mammal observation and tagging on the north western side of Kaua'i, transit to Port Allen from the north side of Kaua'i	Navy marine mammal biologists, Cascadia Research Collective

2.2 Description of platforms and teams

Three platforms were used for the sea bird and marine mammal field effort during February 15-20, 2011. The main platform was the 96-foot research vessel *Searcher (*Figure 3). *Searcher* is owned and operated by the Medical Foundation for the Study of the Environment. The upper deck of the *Searcher* is outfitted as an observation deck where observers were stationed (Figure 4). For marine mammal tagging, *Searcher* also launched the 15 foot inflatable RHIB and secured it on the back deck for transport (Figure 5). The bird survey team consisted of Justin Fujimoto of NAVFAC- Pacific, Dr. Frans Juola of NAVFAC- Pacific, and Morgan Richie of NAVFAC- Pacific. The MMO team on the *Searcher* consisted of Dr. Sean Hanser of NAVFAC-Pacific, Morgan Richie of NAVFAC-Pacific, and Michele Bane of the Kaua'i Marine Mammal Response Program, NOAA. The RHIB team consisted of Dr. Robin Baird of CRC, Daniel Webster of CRC, and Jessica Aschettino of CRC.

Figure 3. Marine mammal Observer Morgan Richie photographing a pilot whale from the bow of the R/V Searcher

Figure 4. MMOs Michele Bane and Sean Hanser on the R/V Searcher observation deck.

Figure 5. CRC Tagging crew (Dr. Robin Baird, Daniel Webster, and JEssica Aschettino) aboard the 15-foot inflatable RHIB.

A 15-foot inflatable RHIB was provided to CRC in order to allow the tagging crew to operate independently from the *Searcher*. Upon arrival to the leeward side of Kaua'i, the RHIB was launched. Due to good weather, the RHIB was able to stay in the water the entire field period and tied up at night alongside *Searcher*.

One aerial survey day was used for the purpose of spotting animals for tagging. The aircraft used was an FAA part-135 certified Rockwell Aero Commander 5005, which features dual engines and an above-wing configuration (Figure 6).

Figure 6. Rockwell Aero Commander 500S Aircraft

The aircraft flew a grid pattern over the study area and enabled *Searcher* and the RHIB to respond to three cetacean sightings. The aircraft crew consisted of Dr. Joe Mobley and Lenisa Blair of HDR.

SECTION 3 SEABIRD SURVEY

3.1 Methods

On 16 February, five biologists, including three from the U.S. Navy, and two from Cascadia Research Collective, conducted seabird surveys at Ka'ula Island from the Motor Vessel *Searcher*. Three of these people had previous experience conducting off-shore seabird surveys, and a fourth was a seabird biologist.

The M/V *Searcher* departed Port Allen, Kaua'i , on the evening of 15 February and arrived at Ka'ula Island on 16 February at 08:00. The ship circumnavigated Ka'ula Island two times at approximately 2 to 4 knots, maintaining a distance of approximately 750 ft (228 m) from the

coastline. The island was divided into north, northwest, southwest, and east quadrants, with section boundaries defined by the island's terrain (Figure 7). Each observer was assigned one or two species and identified birds using 7x50 hand-held binoculars. The two white booby species (masked boobies and red-footed boobies) were difficult to distinguish from the distance of the observation deck, such that these two species were combined during the survey. Seabirds were counted on land and in the air. For all species, the mean and standard deviation of counts from the first and second circumnavigations were calculated and relative abundance was compared to results of surveys from previous years (Figure 10). A list of all seabird species observed between Ka'ula Island and Ni'ihau was also compiled during the survey.

3.2 Results

During the surveys of Ka'ula Island, a total of six seabird species were observed for the M/V *Searcher* (Table 4). These included five Procellariiformes species (brown boobies (*Sula leucogaster*), red-footed boobies (*Sula sula rubripes*), masked boobies (*Sula dactylatra*), Laysan albatross (*Phoebastria immutabilis*), and great frigatebirds (*Fregata minor*)) and one tern species (sooty tern (*Sterma fuscata*)). All species observed in 2011 had been observed during the 1932-2010 surveys (no new seabird species were observed in 2011). Masked and red-footed boobies were present in the greatest numbers, followed by sooty terns, and great frigatebirds. Masked and red-footed boobies were observed primarily on the east side of the island, in stream-carved ravines. Sooty terns were observed on the upper slopes of the northwest side of the island, circling the island in a large cloud (Figure 8). Great frigatebirds were seen roosting and flying above the eastern side of the island. Relatively few seabirds were seen on the southeastern tip (1000ft) of the island used by the Navy as a munitions training target (Figure 9).

Complete counts of individual birds across the entire island were not possible from the observation deck of the ship, as all individual birds across the top of the island may not have been visible and some species present may not have been seen from the ship, including Christmas shearwaters and other nocturnal Procellariiformes, migratory shorebirds, and visiting landbirds. Therefore, a complete species list and estimates of the numbers of individuals of each species observed are not directly comparable to results of past land-based seabird surveys. However, relative abundance of the species seen in 2011 can be compared to survey results from past years. Figure 10 indicates the relative abundance of species observed during the surveys of November 1998, April 1984, and March 1979. During all four survey years, sooty terns were the most abundant species observed. Relative abundance of red-footed and masked boobies was also observed in relatively greater numbers in 1998 and 2011. Differences in seabird abundances between these years are likely due to differences in survey methods. The 1998, 1984, and 1979 surveys were land-based surveys compared to the sea-based survey in 2011.

In terms of absolute species abundance during the 2011 surveys, 665 masked and red-footed boobies were estimated to be in Ka'ula Island (Figure 10). This number is lower than the numbers detected in November 1998 (1,550). Typically, the species lay eggs in the winter months, therefore higher numbers are expected at this time. The Laysan albatross also nests during the winter. In 2011, the lowest number of laysan albatrosses (8) was observed, compared to 1998 (60), 1984 (33), and 1979 (100). The close resemblance of laysan albatrosses to red-footed or masked boobies from a ship at this distance could account for the low number of albatross detections in 2011 compared to the land-based surveys in previous years.

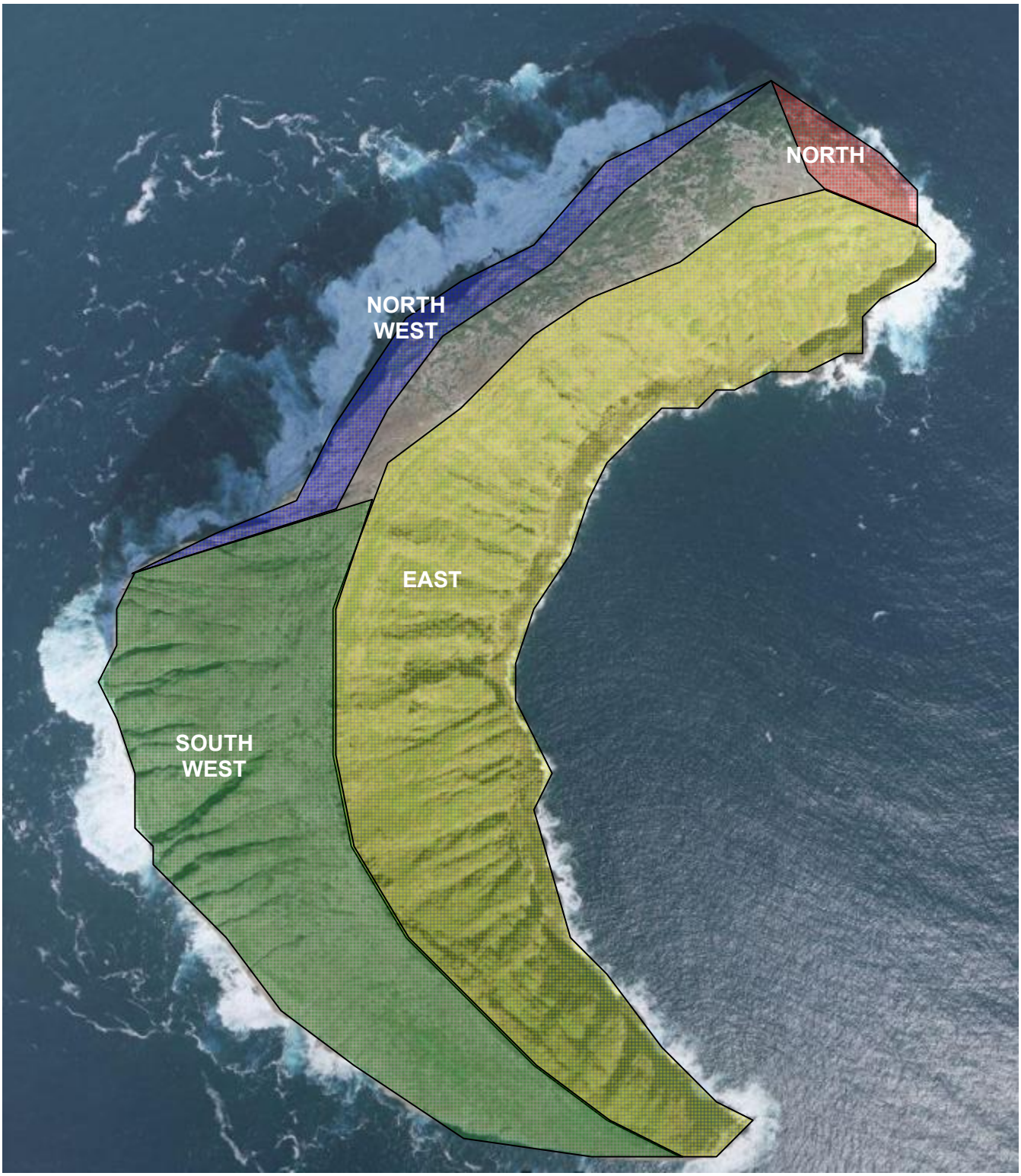

Figure 7. Survey quadrants defined on Ka'ula Island for the 16 February 2011 seabird surveys.

Figure 8. Sooty terns (Sterna fuscata) flying and masked or red-footed boobies (Sula dactylatra, S. Sula) nesting on the ground, northwest side of Kaʻula Island, 16 February 2011

Figure 9. Munitions training target area at southeastern end of Kaʻula Island, 16 February 2011. No birds were observed nesting in this area.

Table 4. Seabird species observed, and the means, standard deviations, and ranges of numbers of individuals counted at Ka'ula Island during the June 2010 and February 2011 ship-based surveys.

Common name	Scientific name	Jun-10				Feb-11			
		Mean # observed	Standard deviation	Minimum	Maximum	Mean # observed	Standard deviation	Minimum	Maximum
Wedge-tailed shearwater	*Puffinus pacificus*	**0**	0	0	0	**0**	0	0	0
Bulwer's petrel	*Bulweria bulwerii*	**1**	1	0	1	**0**	0	0	0
Red-tailed tropicbird	*Phaethon rubricauda*	**3**	1	2	3	**0**	0	0	0
Masked /red-footed booby	*Sula dactylatra, S. sula*	**850**	67	775	907	**665**	0	654	704
Brown booby	*Sula leucogaster*	**1**	1	0	1	**1**	1	0	2
Great frigatebird	*Fregata minor*	**430**	28	410	450	**110**	285	67	154
Gray-backed tern	*Sterna lunata*	**3**	3	1	5	**0**	0	0	0
Sooty tern	*Sterna fuscata*	**3,382**	663	2,913	3,851	**477**	290	272	683
Brown noddy	*Anous stolidus*	**705**	78	649	760	**0**	0	0	0
White tern	*Gygis alba*	**9**	9	2	15	**0**	0	0	0
Blue noddy	*Procelsterna cerulea*	**1**	1	0	2	**0**	0	0	0
Totals		**5,385**	**--**	**4,752**	**5,995**	**1,253**	**--**	**993**	**1,543**

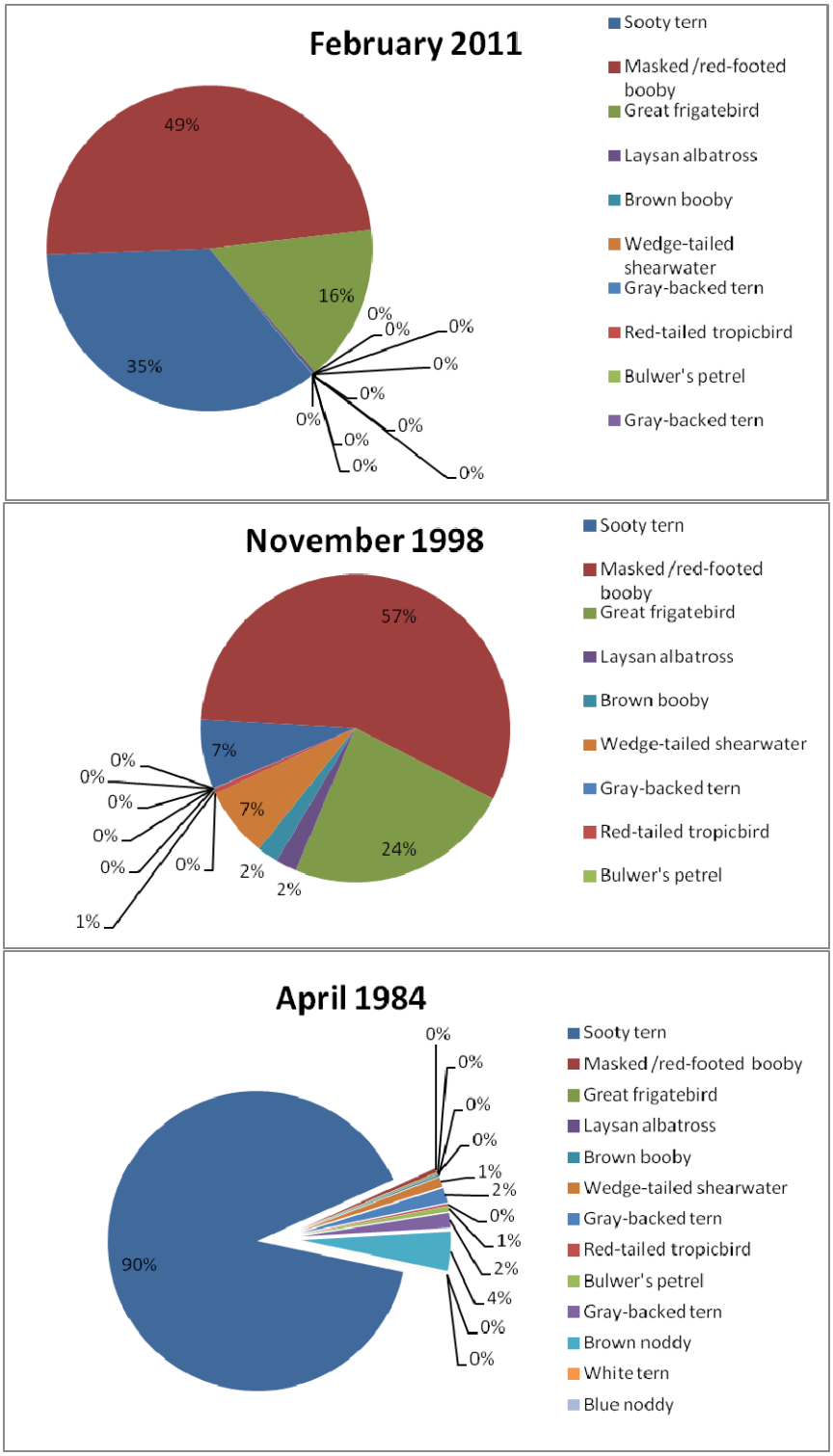

Figure 10. Relative abundance of seabirds observed during the February 2011, November 1998, April 1984, and March 1979 Kaʻula Island surveys. The February 2011 survey was conducted from a ship platform, while the 1998 to 1979 surveys were conducted on land.

The numbers of red-footed and masked boobies as well as great frigatebirds detected in 2011 were similar to those seen during ground surveys in 1998 and 1984. The lack of shearwater and petrel observations during the 2011 survey is likely due to the fact that these burrow-dwelling species are smaller and nocturnal, making them difficult to observe during the day from offshore. Brown boobies were observed in substantially low number compared to other winter survey dates, again this is likely due to problems with detection from offshore.

3.3 Conclusion

This survey provided the first ship-based observations of seabird attendance on Ka'ula Island during the winter. Six previous surveys were conducted during the winter/spring season, but were land-based surveys, providing more accurate species counts.

Identifying and counting certain species of birds was difficult during this survey due to rough ocean conditions and the distance from the island that the survey was conducted from. During the survey, any white booby (red-footed or masked) was grouped together into one species count. It's possible that some of the birds counted here may have been Laysan albatrosses because of the similarity and color and general difficulty in differentiating these species from offshore. As a result, relatively few Laysan albatrosses were observed during this survey as compared to surveys in previous years.

SECTION 4 MARINE MAMMAL SURVEY AND TAGGING

4.1 Methods

The primary goal of the marine mammal component of the cruise was to deploy as many satellite tags as possible on odontocetes and rare mysticetes in waters near BSURE and BARSTUR. Data collection protocols were a mix of both established and novel methods. The survey, in general, followed Dr. Robin Baird's established non-random, non-systematic protocols which have been developed to be successful in tropical, low density ecosystems (Baird 2008a). A novel protocol was tested in which the MMO team on the *Searcher* worked in conjunction with the tagging team on the RHIB in order to locate animals, collect photographs, and deploy satellite tags. Vessel based survey effort covered a total of 872.82 kilometers over 60 hours and 13 minutes. Vessel tracklines are found in Figure 11. Additionally, on 19 February 2011, the teams on the *Searcher* and RHIB worked in conjunction with the spotter aircraft, which flew a saw tooth grid over the north side of Kaua'i and alerted the surface vessels to the presence of species of interest (Figure 12). When animals were sighted from the aircraft, the *Searcher* crew was notified immediately using standard text messages on cell phone, and the information was subsequently relayed to the RHIB crew via VHF radio. Vessel and aircraft movements were coordinated at the discretion of Dr. Baird and the MMO crew depending upon the circumstances. Aircraft crew data collection methods followed standard protocols used by Dr. Mobley for other Navy aerial surveys.

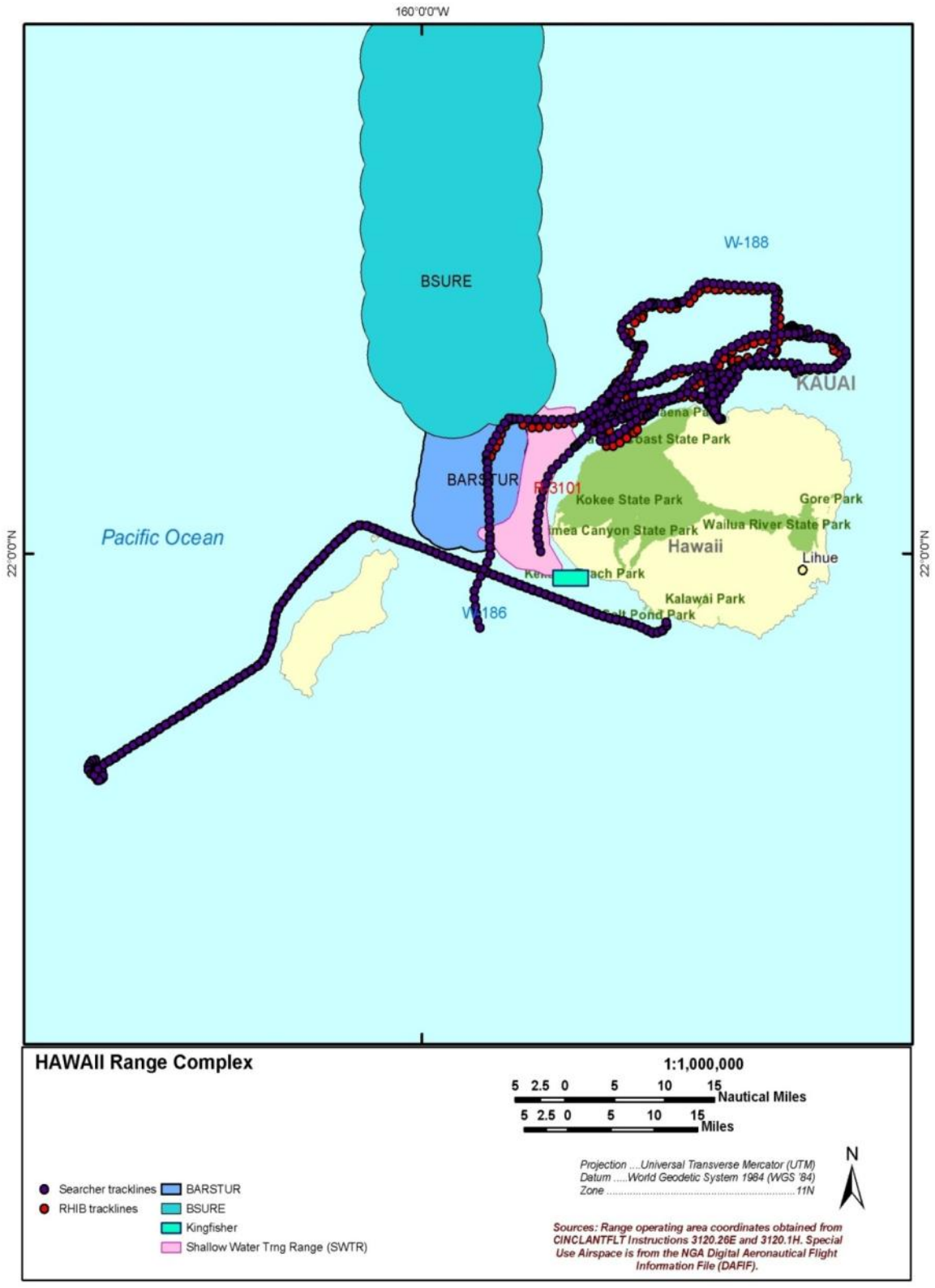

Figure 11. Track lines from Searcher and RHIB in Relation to BSURE and BARSTUR

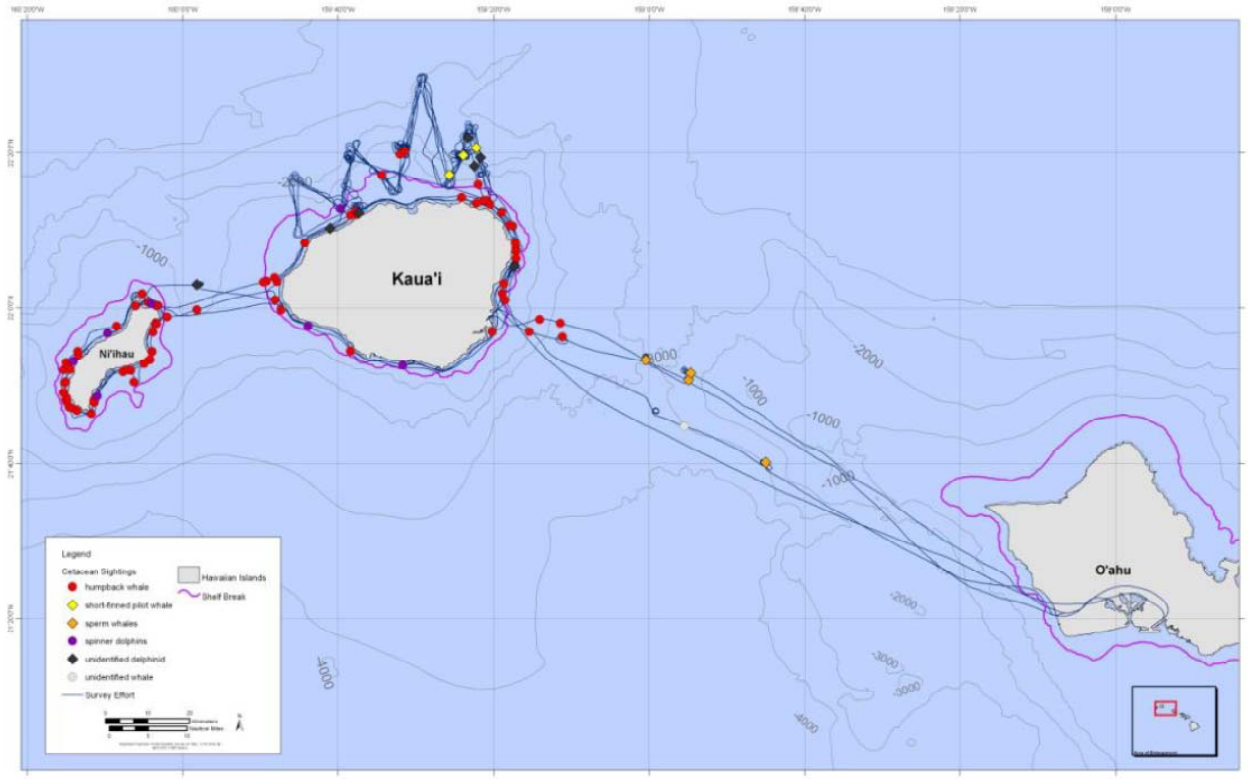

Figure 12. Aerial survey track lines during aerial support of Cascadia tagging effort on Feb. 19, 2011 (Mobley 2011)2.

Both the MMOs on the *Searcher* and the crew on the RHIB surveyed for animals while underway. The RHIB was always within visual contact of the *Searcher* crew for safety. If animals were sighted, waypoints were taken by the crew on board the sighting vessel and location information was conveyed to the other vessel. Both the crew of the *Searcher* and the crew of the RHIB recorded waypoints upon making a sighting, even if it was determined that the sightings were the same. When necessary, an MMO from the *Searcher* observation deck would then go to the bow sprit, where they would be better able to collect identifying photographs. Turtles and monk seals were recorded, but humpback whales were not recorded so as to not detract from the focus of the cruise. No turtles were seen during the effort.

2 A summary of aerial sightings of sea turtles and marine mammal during this effort can be found in Mobley, J. R. (2011). Aerial survey monitoring for marine mammals and sea turtles in the Hawaii Range Complex in Conjunciton with two Navy Training Events. SCC Februrary 16-March 5, 2011 DRAFT Field Report. Submittted by HDR to NAVFAC-Pacific under Contract No. N62470-10-D-3011 KB07.

4.1.1 Summary of effort

Date	*Searcher* hours of effort and transect length		RHIB hours of effort and transect length		Aircraft hours of effort		TOTALS	
	(hh:mm)	(km)	(hh:mm)	(km)	(hh:mm)	(km)	(hh:mm)	(km)
2/16/2011	5:49	139.0					**5:49**	**139.0**
2/17/2011	7:20	97.0	5:31	103.8			**12:51**	**200.8**
2/18/2011	7:37	87.9	7:36	81.8			**15:13**	**169.7**
2/19/2011	8:26	115.0	8:36	120.0	6:36		**17:02**	
2/20/2011	5:30	69.8	3:47	58.5			**9:17**	**128.3**
TOTALS	**34:42**	**508.72**	**25:30**	**364.1**	**6:36**		**60:12**	

4.1.2 Summary of environmental data

Weather was exceptionally good for this time of year and enabled the vessels to work in deep water during the morning hours. The sea state was a Beaufort 1 for approximately 7% of on-effort time, a Beaufort 2 for approximately 47% of on-effort time and a Beaufort 3 for approximately 26% of on-effort time (Figure 13).

4.2 Results

4.2.1 Summary of sightings

During the circumnavigation of Kaʻula Island and the transit past Niʻihau to Kauaʻi, 39 sightings of an estimated 78 humpbacks were made. This portion of the cruise is the only time in which humpbacks whales were counted so as to focus our attention on tagging odontocetes or rare mysticetes. The RHIB was not launched this day due to weather. Notable sightings were the in-water monk seal sighting at Kaʻula Islet and the off-effort sighting of 2 bottlenose dolphins near Lehua (Figure 14; Table 5). During the effort at Kauaʻi, species sighted were *Steno bredanensis, Globicephala macrorhynchus, Tursiops truncatus, Stenella longirostris*, and unidentified dolphins (Tables 6, 7, and 8; Figures 15, 16, and 17).

4.2.2 Satellite tag track lines

Three tags were deployed on 3 Globicephala macrorhynchus (Figure 18). Top: GmTag49 tagged 18 February 2011, showing 30.9 days of movements. Middle: GmTag50 tagged 18 February 2011, showing 36.8 days of movements. Bottom: GmTag51 tagged 19 February 2011, showing 37.1 days of movements. Dotted lines connect consecutive locations but do not necessarily reflect travel routes (text taken directly from (Baird 2011).

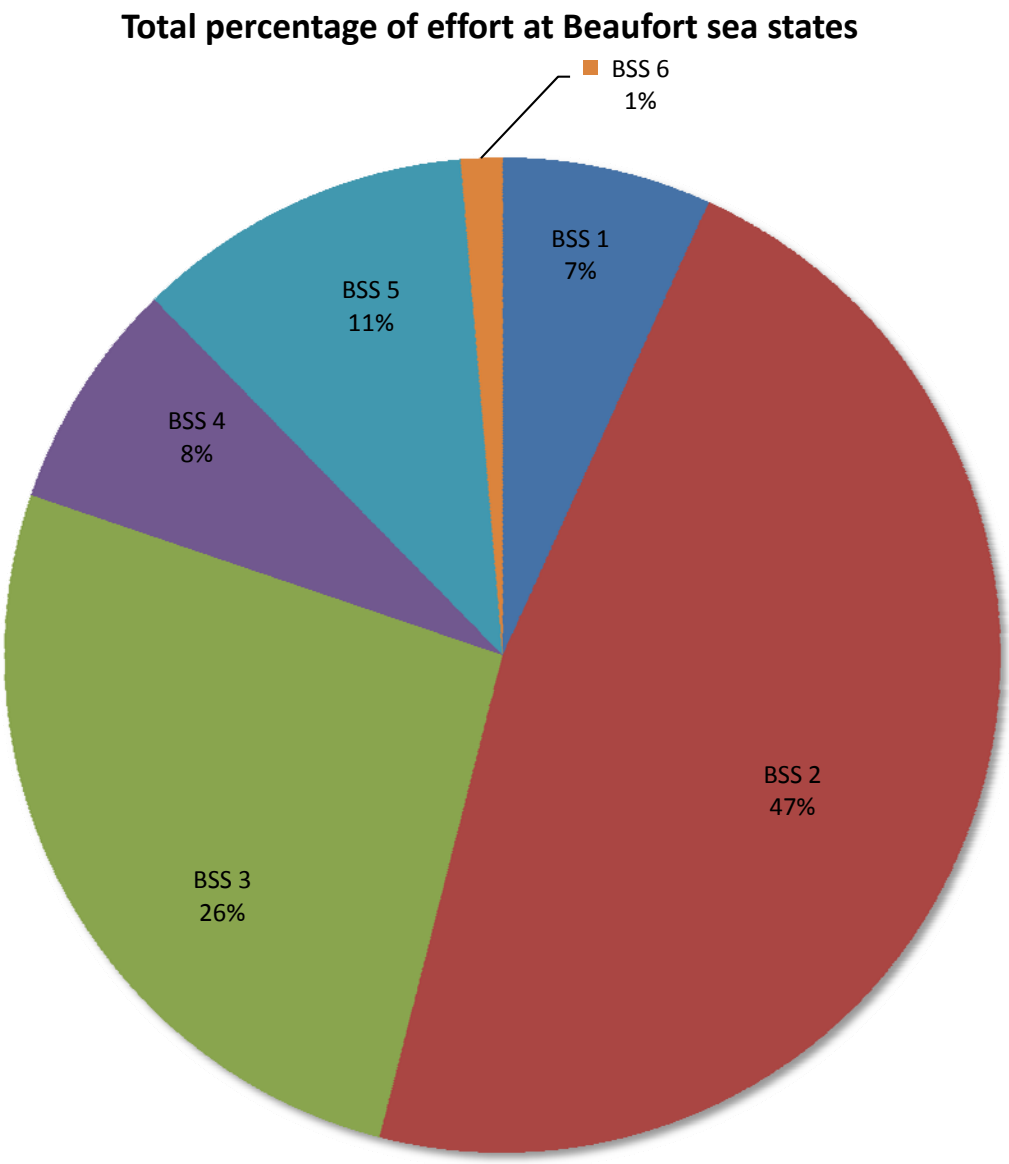

Figure 13. Total percentage of effort at Beaufort Sea states (BSS) based on Searcher data

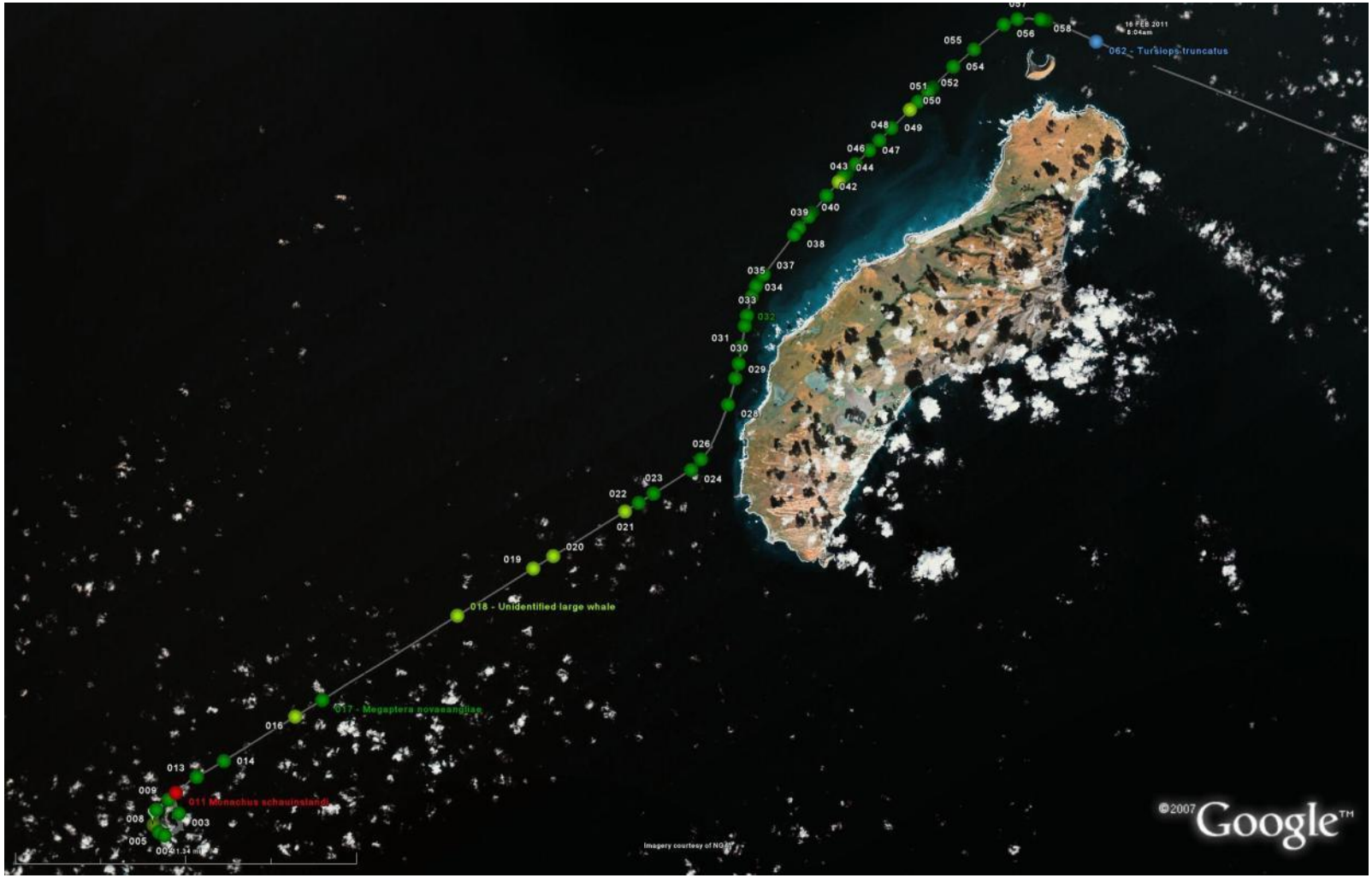

Figure 14. Sightings made from the Searcher on 02/16/2011. Ka‘ula is at the lower left and Ni‘ihau is at the upper right.

Table 5. Summary of marine mammal sightings for 2/17/11

Searcher[3]						RHIB							
Sighting #	**Species**	**Time**	**Location**	**BSS**	**Notes**	**Sighting #**	**Species**	**Time**	**Location**	**BSS**	**Group size**	**Tags**	**Notes**
Off effort	MONSC	Approx 1000	21.66629 160.53642										
Off effort	TURTR	14:20	22.03378 160.06653										
1	STEBR	10:56	22.21020 159.69650	2		1	STEBR	11:00	22.41919 159.69426	2	2/2/3		MEGNO present, 2 bowriders
2	STEBR	11:31	22.22580 159.68653	2	2 bowriders, approach from 200 m / 1-2 more joined	2	STEBR	11:33	22.23563 159.67789	2	10/12/14		

3 Sightings recorded by *Searcher* MMOs, RHIB, and aircraft are not independent.

Table 6. Summary of marine mammal sightings for 2/18/2011

Searcher						RHIB							
Sighting #	**Species**	**Time**	**Location**	**BSS**	**Notes**	**Sighting #**	**Species**	**Time**	**Location**	**BSS**	**Group size**	**Tags**	**Notes**
1	STEBR	08:54	22.29083 159.36655	2	MEGNO present, same group as RHIB	1	MEGNO	08:34	22.28856 159.37959	1			
2	STEBR	09:50	22.33385 159.31042	3	1 bowrider, then 3 more bowriders	2	STEBR	08:34	22.28856 159.37959	1	4/4/5		2 bowriders
3	GLOMA	10:58	22.35338 159.38482	2	15-17 animals, interacting with MEGNO, STEBR bowriding	3	STEBR	09:57	22.33635 159.31201	3	5/5/6		2 bowriders
4	DOLPH	14:21	22.24487 159.52267	3	Likely TURTR or STEBR	4	STEBR	10:31	22.34114 159.35486	2	5/5/5		2 mom/juvenile pairs
						5	STEBR	10:59	22.34813 159.38506	1	3/3/3		Playing with fishing net on dorsal, mixed in with GLOMA
						6	GLOMA	11:02	22.35382 159.38597	1	18/19/21	Tag# 102470 on adult male Tag #98358 on adult male	Mixed in with STEBR, 5 adult males

Table 7. Summary of marine mammal sightings for 2/19/2011

Aircraft				Searcher						RHIB							
Sighting#	Species	Time	Location	Sighting#	Species	Time	Location	BSS	Notes	Sighting#	Species	Time	Location	BSS	Group size	Tags	Notes
54	DOLPH	07:58	22.30763 159.3756	1	UNID	07:54	22.28697 159.48317	2	Unidentified splashing	1	GLOMA	08:14	22.31963 159.40729	2	8/8/8		Same GLOMA as yesterday, did not approach to determine max group size
8	GLOMA	08:07	22.3276 159.3960	2	GLOMA	08:22	22.31415 159.42752		Plane brought us to them, same GLOMA as yesterday	2	STEBR	10:49	22.38999 159.6143	2	16/18/22		8 bowriders
13	GLOMA	13:39	22.3445 159.3710	3	WHALE	10:17	22.39318 159.61270	3		3	GLOMA	12:02	22.3255 159.6378	2	16/16/18	# 102469 on small adult male	Associated with MEGNO
14	DOLPH	13:42	22.36632 159.3890	4	STEBR	10:48	22.39318 159.61270	2	Estimated 7 animals	4	MEGNO[5]	12:02	22.3255 159.6378	2			
15	STELO	14:20	22.21398 159.6618	5	GLOMA	11:51	22.39517 159.56568	2	Spyhopping is cue, with MEGNO	5	STELO	14:30	22.21468 159.62434	1	45/55/65		1 with remora
16	GLOMA	15:28	22.28572 159.4286	6	MEGNO	13:22	22.34018 159.66253	1									
17	DOLPH	15:35	22.32315 159.3618	7	STELO	14:32	22.21685 159.62193	1									

4 The aerial team recorded humpback whales, which are not listed in this table.
5 Humpbacks which are reported in this table were investigated for associated odontocetes.

Table 8. Summary of marine mammal sightings for 2/20/2011

Searcher						RHIB							
Sighting #	**Species**	**Time**	**Location**	**BSS**	**Notes**	**Sighting #**	**Species**	**Time**	**Location**	**BSS**	**Group size**	**Tags**	**Notes**
1	TURTR	07:51	22.28075 159.51675	2		1	TURTR	07:51	22.28531 159.51743	3	3/4/4		2 bowriders
2	TURTR	08:31	22.27975 159.59418	3		2	TURTR	08:31	22.27789 159.59595	3	1/1/1		1 bowrider

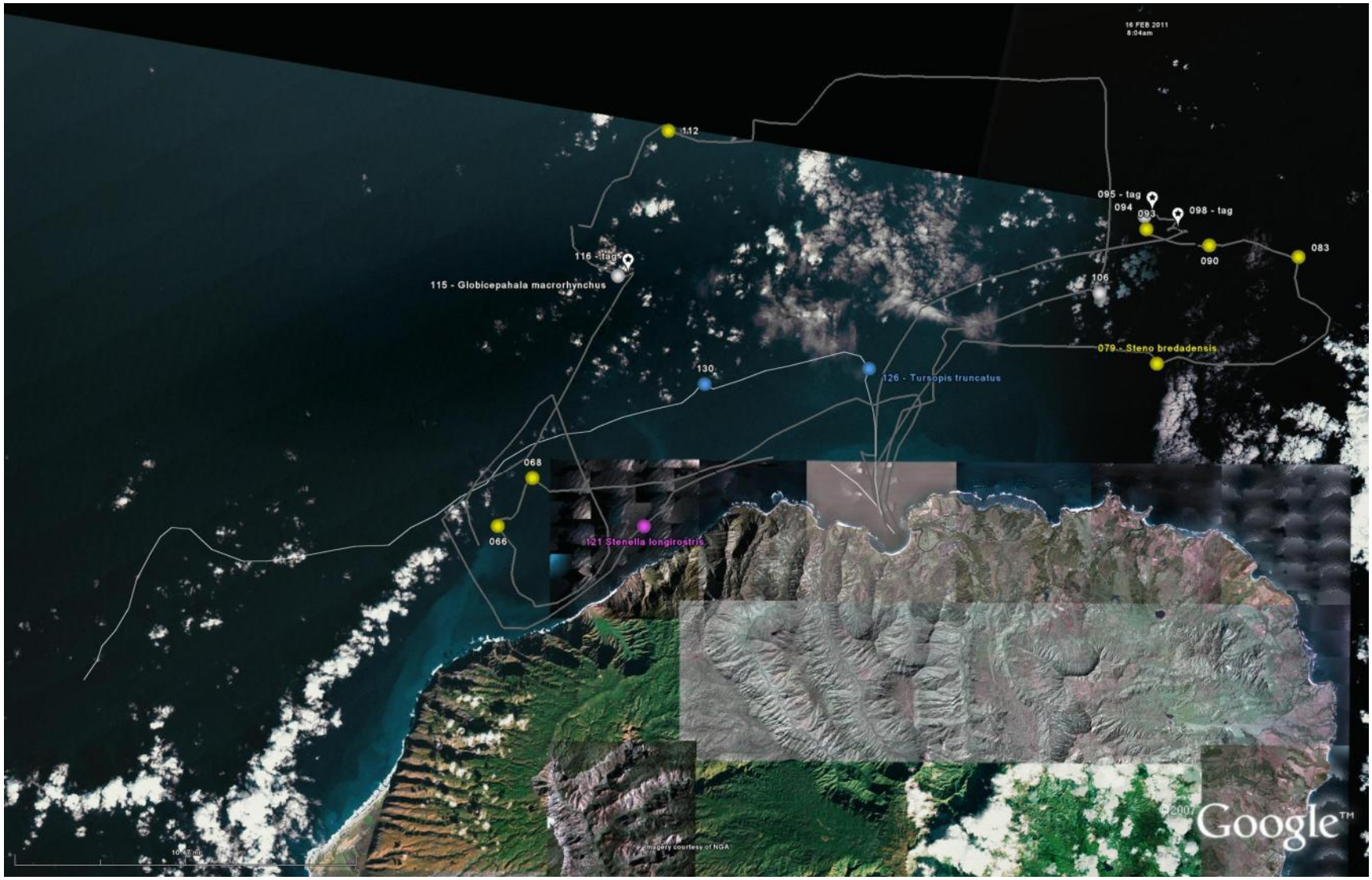

Figure 15. Sightings of Odontocetes from RHIB during 02/17 - 02/20/2011

Figure 16. Locations of tag deployments on Globicephala macrorhynchus *(see waypoints 095 and 096, deployed on 18 February 2011 and waypoint 116, deployed on 19 February 2011)*

Figure 17. Pilot whale from aircraft

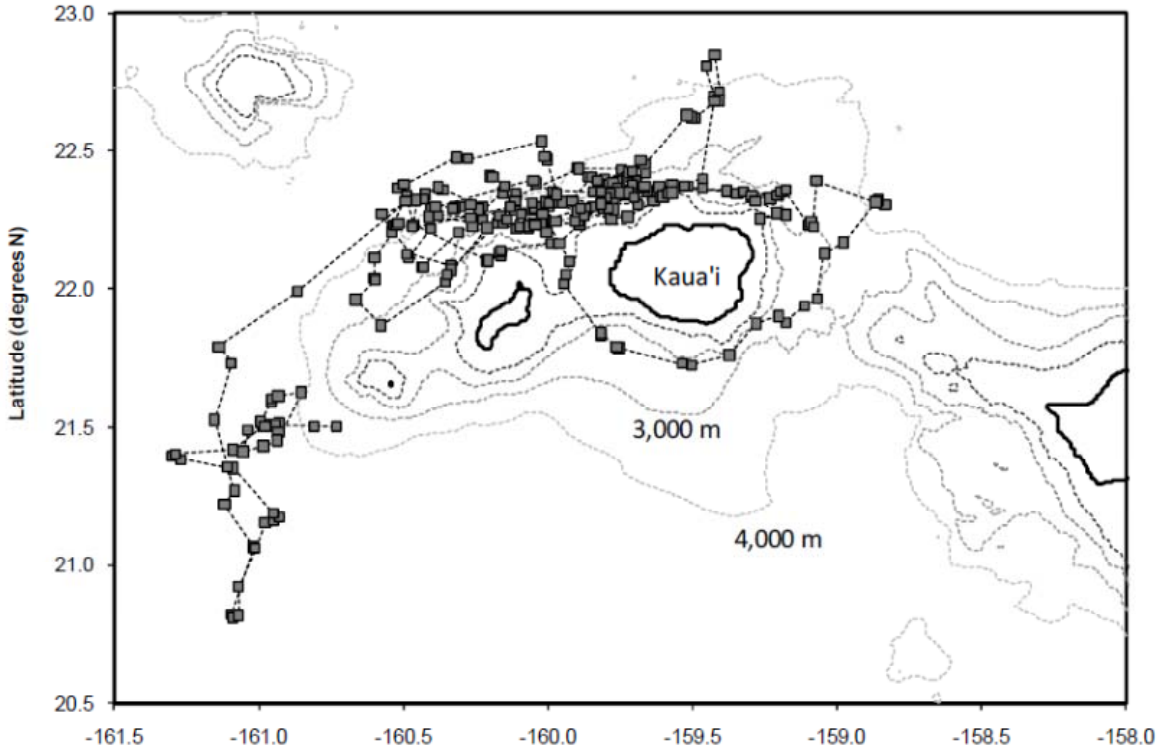

Figure 18. Movement of three satellite-tagged pilot whales tagged off Kaua'i in February 2011

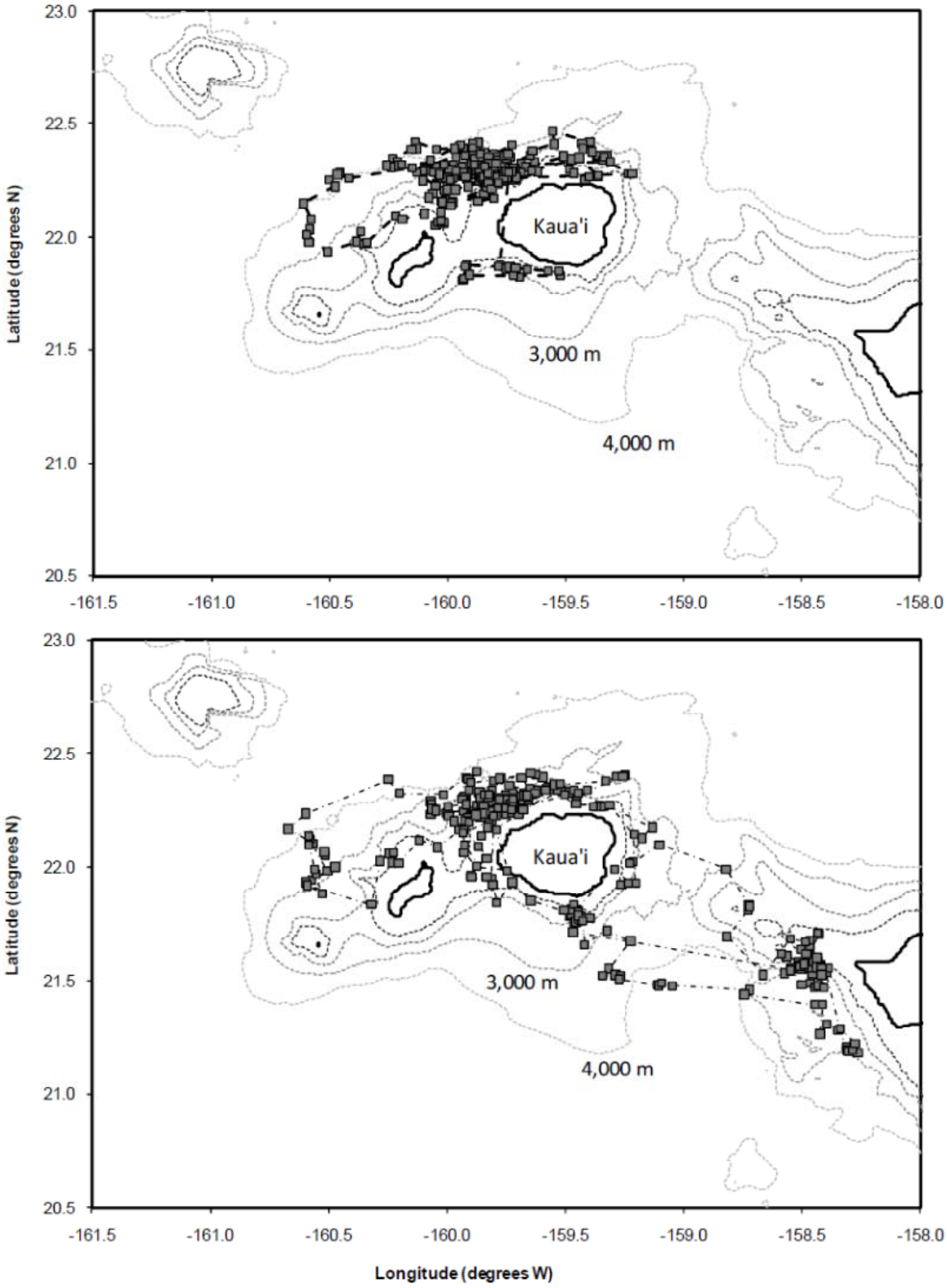

Figure 19 (continued). Movement of three satellite-tagged pilot whales tagged off Kaua'i in February 2011

4.3 Conclusion

4.3.1 Summary of independent report from Cascadia Research Collective

The three pilot whales which were satellite tagged appeared, based on CRC analysis, to be from different social units. One sub-group had had no previous sightings, based on photo-identification. Another sub-group had been sighted previously off the island of Oahu. Results from this work represent a significant increase in our understanding of short-finned pilot whales residency patterns and spatial use of areas adjacent to and on the Navy Range (Baird 2011). Baird 2011 is found in appendix J of this report.

4.3.2 Monitoring conclusions

If number of satellite transmissions are used as a proxy for the amount of time spent in a particular location, then all three groups of short-finned pilot whales appear to be substantially utilizing habitat within and adjacent to PMRF, within the monitoring period. This suggests that the area north of the channel between Niʻihau and Kauaʻi may have importance to this species. Additional monitoring and research is needed to determine what behaviors the animals are engaging in to more fully understand how and when this habitat area is being utilized. Analyzing the animal movements in conjunction with SONAR transmission during SCC may provide data on whether animals displaced to another location during the exercise.

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