

August 21, 2012

Final Report

Ka'ula Island ship-based marine
mammal survey, July 6, 2012

Hawaii Range Complex Field Report

Prepared for

Commander, U.S. Pacific Fleet

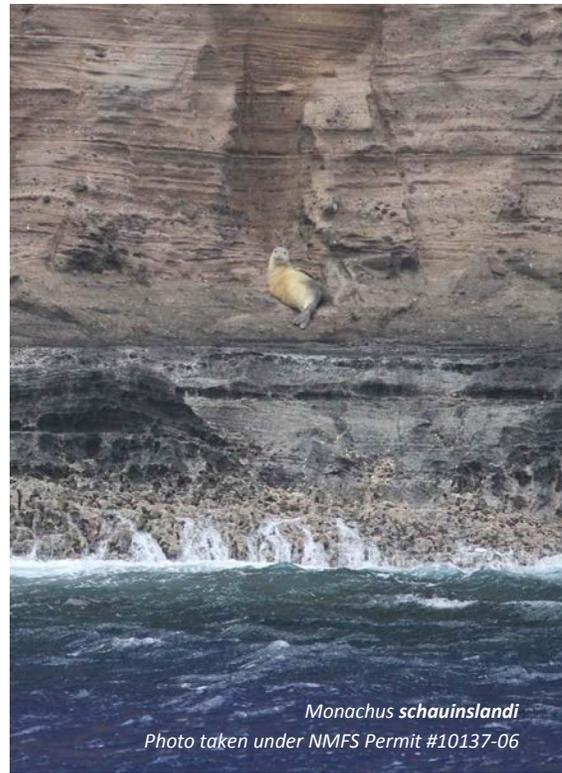


Prepared by:

Ms. Morgan W. Richie, MAS

Dr. Robert K. Uyeyama, Ph.D.

Mr. Justin Fujimoto



Monachus schauinslandi
Photo taken under NMFS Permit #10137-06



THIS PAGE INTENTIONALLY LEFT BLANK

Table of Contents

1. INTRODUCTION	5
1.1 Marine mammal and sea turtle monitoring	5
1.2 Ka'ula Island Background	5
1.2.1 Property Description	5
1.2.2 Prior Use	5
1.2.3 Marine Mammal Survey History and Species Observations at Ka'ula	6
2. METHODS	6
2.1 Ship-based marine mammal and sea turtle survey	6
2.2 Methods	6
3. RESULTS	9
3.1 Cetacean individual photo-identification	12
3.2 Monk seal monitoring results	17
3.3 Acoustic ground-truthing and dipping hydrophone results	18
4. CONCLUSIONS	18
4.1 Bottlenose dolphins	18
4.2 Spinner dolphins	18
4.3 Hawaiian monk seals	19
5. REFERENCES	19

List of Figures

Figure 1. Location of Ka'ula relative to the main Hawaiian Islands (inset) and Kauai and Ni'ihau (imagery from Google Earth).....	5
Figure 2. The r/v Searcher. Visible in this photo is the covered flying bridge from which the bird, monk seal, and cetacean/sea turtle survey takes place and the bow sprit which is the best position for cetacean photography.	6
Figure 3. Aerial image of Ka'ula. The red arrow points to the northwest ledge which is the main site where monk seals have been documented.	7
Figure 4. Entire survey track line with bottlenose dolphin (TURTR) sighting near Ni'ihau and EAR locations.....	10
Figure 5. Track line, sightings, and resightings of spinner dolphin (STELO), bottlenose dolphin (TURTR) and monk seal (MONSC) at Ka'ula on July 6, 2012.....	10
Figure 6. Spinner dolphin adult and calf swimming abreast of the vessel on the concave side of Ka'ula on July 6, 2012.	11
Figure 7. Breaching bottlenose dolphin.....	11
Figure 8. Bottlenose dolphin with cookie cutter scar and wound.....	12
Figure 9. Five identifiable bottlenose dolphin dorsal fins photographed at Ka'ula on July 6, 2012.....	13
Figure 10. Bottlenose dolphin dorsal fin previously photographed at Ka'ula on June 30, 2011 and matched to "e" from Fig. 9.....	13
Figure 11. Sixteen identifiable spinner dolphin dorsal fins photographed at Ka'ula on July 6, 2012.....	16
Figure 12. Spinner dolphin dorsal fin previously photographed at Ka'ula on June 30, 2011 and matched to "p" from Fig. 11.....	16
Figure 13. Two identifiable spinner dolphins also had notches on the dorsal peduncle. Top: "o" from Fig. 12. Bottom: "p" from Fig. 11.	16
Figure 14. Two adult monk seals at Ka'ula Island.	17
Figure 15. Individually identifying cookie cutter shark scar on seal from Figure 14.	17
Figure 16. Juvenile female monk seal with a "yellow belly".....	18

Recommended Citation

Richie, M.W., Uyeyama, R.K., Fujimoto, J. Ka'ula Island ship-based marine mammal survey, July 6, 2012, Hawaii Range Complex. Field Report. Pearl Harbor, HI, Naval Facilities Engineering Command, Pacific for Commander, U.S. Pacific Fleet.

List of Acronyms and Abbreviations

BSS	Beaufort Sea State
DLNR	Department of Land and Natural Resources
E	east
EAR	Ecological Acoustic Recorder
ft	feet
HRC	Hawaii Range Complex
ICMP	Integrated Comprehensive Monitoring Plan
IS	Image stabilized
km	kilometers
m	meter
MFAS	Mid-frequency Active SONAR
MHI	Main Hawaiian Islands
MONSC	<i>Monachus shauinslandi</i>
N	north
nm	nautical mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWHI	Northwest Hawaiian Islands
PIFSC	Pacific Island Fisheries Science Center
PIPIN	Pacific Islands Photo-identification Network
PMAP	Protective Measures Assessment Protocol
PMRF	Pacific Missile Range Facility
PRD	Protected Resources Division
RHIB	Rigid hull inflatable boat
r/v	research vessel
S	south
STELO	<i>Stenella longirostris</i>
TURTR	<i>Tursiops truncatus</i>
USFWS	US Fish and Wildlife Service
W	west

1. Introduction

1.1 Marine mammal and sea turtle monitoring

In order to train with mid-frequency active sonar (MFAS), the Navy has obtained a permit from the National Marine Fisheries Service (NMFS) under the Marine Mammal Protection Act and a Biological Opinion under the Endangered Species Act. The Hawai'i Range Complex (HRC) Monitoring Plan, finalized in December 2008 for implementation in January 2009, and amended in 2011 was developed with NMFS to comply with the requirements under the permit. The monitoring plan and reporting will provide science-based answers to questions regarding whether or not marine mammals are exposed and reacting to Navy MFAS. The Ka'ula Island monitoring effort is intended to provide data towards the monitoring plan goals through collecting baseline occurrence and population information.

1.2 Ka'ula Island Background

For more in-depth background information, please see (Uyeyama et al. 2011).

1.2.1 Property Description

Ka'ula Island (hereafter referred to as Ka'ula) is a small, uninhabited islet near the islands of Ni'ihau and Kauai in the Hawaiian Archipelago latitude: 21°39'29"N, longitude: 160°32'39"W). It is located 20 nautical miles (nm) (37 kilometers [km]) WSW of Ni'ihau and approximately 60 nm (111 km) SW of the Pacific Missile Range Facility (PMRF) Main Base, Kauai. Ka'ula has an area of approximately 136 acres, with a summit elevation of 540 feet (ft) (164.6 meters [m]) (Palmer 1936).

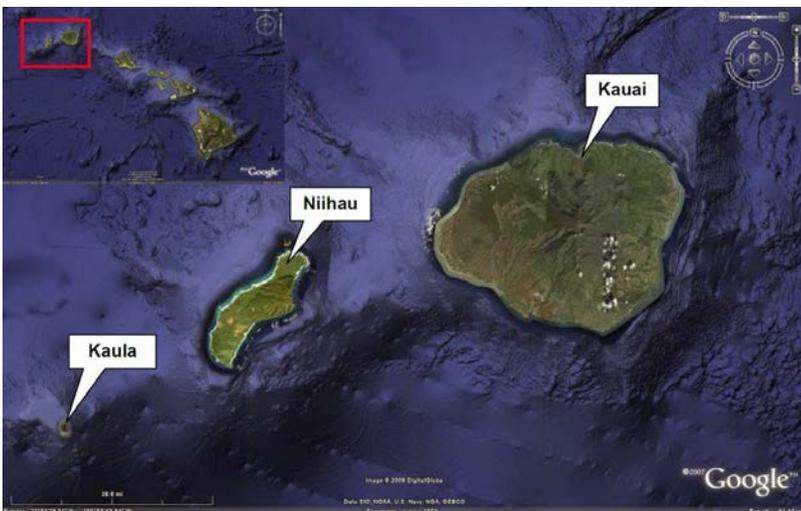


Figure 1. Location of Ka'ula relative to the main Hawaiian Islands (inset) and Kauai and Ni'ihau (imagery from Google Earth).

1.2.2 Prior Use

There has been intermittent use of Ka'ula since the early 1900s. The U.S. Lighthouse Service operated an automatic gas light near the summit of Ka'ula from 1932-1947. Following World War II, U.S. Coast Guard used Ka'ula as a radar navigation target. In 1952, the Navy designated the southeastern tip (1000 ft) of the island as a practice range for air-to-surface and surface-to-surface weapons delivery (Elmer and Swedburg 1971; DoN 1976a). Both live and inert ordnance were used during training missions through 1980. From 1981 through the present, the Navy restricted its munitions training at Ka'ula to inert ordnance delivery and aircraft gunnery (Walker 1979, 1983, 1984, 1993).

1.2.3 Marine Mammal Survey History and Species Observations at Ka'ula

The below references describe surveys which have taken place at Ka'ula and which marine mammals have been recorded (Table 1). The surveys have had multiple goals including dedicated cetacean surveys by Mobley and Baird, opportunistic surveys conducted by the Navy, and multiple monk seal surveys.

Reference	Recorded sightings at or Near Ka'ula
(Mobley et al. 2000)	Spinner dolphins, bottlenose dolphins
(Baird et al. 2003)	Spinner dolphins, bottlenose dolphins
(Mobley et al. 2001)	Killer whales (off the west side of Ni'ihau)
(Baker and Johanos 2004)	Hawaiian monk seals
(Baker et al. 2011)	Hawaiian monk seals
(Pepi et al. 2009)	Spinner dolphins, bottlenose dolphins, spotted dolphins, Hawaiian monk seals
(Uyeyama and Hanser 2010)	Spinner dolphins, false killer whales, bottlenose dolphins
(Richie and Fujimoto 2011)	Spinner dolphins, humpback whales, Hawaiian monk seals
(Uyeyama et al. 2011)	Spinner dolphins, bottlenose dolphins, rough-toothed dolphins and Hawaiian monk seals
PIFSC personal communication, 2011 (three surveys)	Hawaiian monk seals in 2006 and twice in 2010

Table 1. Summary of known surveys to Ka'ula and species recorded

2. Methods

2.1 Ship-based marine mammal and sea turtle survey

Non-systematic ship-based surveys were conducted for marine mammals and sea turtles offshore of Ka'ula and in the waters in a direct line from Kuala to Nawiliwili Harbor, Kauai on July 6, 2011. Eight biologists, including six from the U.S. Navy (Fujimoto, Juola, Richie, Rivers, Uyeyama and Savre), one from the NOAA Protected Resources Division (Wurth) and one from the USFWS (Bogardus). Surveys were conducted from the research vessel (r/v) Searcher, a 96 ft (29.3 m) ship with an observation deck above the bridge, placing observers approximately 24 ft (7 m) above the surface of the water. Distance to the horizon from this height was approximately eight nm. The bow sprit is the optimal location on board for cetacean photography while the flying bridge is the optimal location for monk seal photography (Figure 2).



Figure 2. The r/v Searcher. Visible in this photo is the covered flying bridge from which the bird, monk seal, and cetacean/sea turtle survey takes place and the bow sprit which is the best position for cetacean photography.

2.2 Methods

This survey is conducted from a platform of opportunity as seabird surveys were the primary objective. Therefore, the survey transects are not optimized for marine mammal observations, but designed for direct transit to and from Ka'ula

Submitted in support of the 2012 Annual Marine Species Monitoring report for the U.S. Navy's Hawaii Range Complex Island. Data collection protocols and forms generally followed those used during previous vessel-based marine mammal and sea turtle monitoring at Ka'ula, with some modifications. The priorities for the cruise were as follows:

- 1) A sea bird survey conducted by Naval Facilities Engineering Command – Pacific (NAVFAC-PAC) terrestrial division and not reported here.
- 2) A count of Hawaiian monk seals (*Monachus schauinslandi*) hauled out along the ledges of Ka'ula, or swimming nearby. If weather permitted, a crew would launch a RHIB and attempt to land a biologist (Wurth) on the ledge to collect data and photographs.
- 3) Conduct a non-systematic and opportunistic survey of cetaceans which approach the vessel to bow ride during the bird survey at Ka'ula, collection of dorsal fin photographs and opportunistic acoustic recordings.
- 4) Conduct a systematic line transect survey in passing mode during the transit from Ka'ula to Nawiliwili, weather permitting.

Specific monitoring questions which were asked in order to advance our understanding of marine mammals and sea turtles in support of the overarching goals outlined in the monitoring plan are as follows:

- Are there Hawaiian monk seals present (either hauled-out or in-water) at Ka'ula during the survey, and if so where are they located on or around the island?
- Are other marine mammals or sea turtle species present at Ka'ula, and in the transit lane to and from Ka'ula?
- Are there patterns of occurrence when compared to previous surveys to Ka'ula?

The scientific crew boarded the r/v Searcher at Nawiliwili Harbor, Kauai, on the evening of July 5, 2012. The vessel transited to Ka'ula overnight and arrived at Ka'ula at approximately 6:30 a.m. on the morning of July 6, 2012. The vessel approached the NW ledge (Figure 3) so that the Searcher captain and biologists could assess whether it was safe to launch the RHIB and attempt to land on the ledge. Survey protocol dictated that any RHIB landing would follow USGS biosecurity measures for Palmyra Atoll (Hathaway and Fisher 2010).



Figure 3. Aerial image of Ka'ula. The red arrow points to the northwest ledge which is the main site where monk seals have been documented.

Submitted in support of the 2012 Annual Marine Species Monitoring report for the U.S. Navy's Hawaii Range Complex

Due to high winds (20-30 knots) and rough seas (Beaufort Sea State (BSS) 5), it was decided that it was not safe to land. At approximately 8:00 a.m., the sea bird survey began and three circumnavigations of the island were completed. Due to prevailing wind and swell, it was determined that conducting the survey clockwise resulted in improved sighting conditions. While the sea bird biologists were conducting their survey, two biologists (Richie, Uyeyama) opportunistically collected sighting information and dorsal fin photographs of cetaceans which approached to bow ride. No cetaceans were intentionally approached. All off-effort sightings of cetaceans were recorded and animals which approached to bow ride were photographed from both the flying bridge and the bow sprit. At the conclusion of the sea bird survey, a thorough examination for the presence of monk seals was conducted of the NW ledge, with the r/v Searcher approaching as closely as safety would allow. Multiple observational passes were made. Two biologists (Uyeyama and Wurth) searched for monk seals through Canon Image Stabilized 10 x 42 binoculars and Fujinon 7 x 50 binoculars. Photographs were taken of each monk seal using a Canon EOS 20D with a 100 – 400 mm Image Stabilized (IS) lens and a Canon EOS 7D with a 100 – 400 mm IS lens. Photographs were also taken of the entire coastline of Ka'ula for later inspection for Hawaiian monk seals. During the monk seal survey one biologist (Richie) continued to opportunistically collect dorsal fin photographs using a Canon EOS 7D with a 100 – 400 mm IS lens of cetaceans which were bow riding or milling around the vessel. Upon conclusion of the monk seal survey, the Searcher motored to the concave side of the island. Two biologists (Richie and Uyeyama) dipped a RESON hydrophone and collected recordings with a Roland-44 digital recorder at 16 bits with a sampling rate of 192 kHz. After collecting acoustic recordings, the Searcher departed Ka'ula and passed over two Ecological Acoustic Recorders (EARs) deployed under the HRC monitoring program. The Searcher's closest point of approach (CPA) to the EAR near Ka'ula (21°40.870'N, 160°30.646'W; depth 538 m) occurred at 10:50:22 HST at a horizontal distance of approximately 280 m and bearing of 179 from the EAR to the Searcher's position at (21°40.675'N, 160°30.643'W). The Searcher's CPA to the EAR on the SW side of Ni'ihau (21°46.047'N, 160°17.466'W; depth 766 m) occurred at 12:51:58 HST at a horizontal distance of approximately 290 m and a bearing of 164 degrees from the EAR to the Searcher's position at (21°46.023'N, 160°17.511'W). Biologists (Richie, Uyeyama, and Rivers) searched 180 degrees forward for cetaceans while transiting in the vicinity of the EARs. Due to poor environmental conditions (BSS 6-7) prevailing during the entire transit from Ka'ula to Nawiliwili, which impeded the ability to sight marine mammals or use binoculars, it was not possible to conduct a meaningful systematic survey. However a non-systematic survey was conducted with at least two biologists on the flying bridge searching with naked eye for marine mammals and sea turtles, with the intent that at least highly salient groups such as large whales or bow riding animals would be recorded; one such sighting of bow riding animals was made. All of the scientific crew disembarked immediately upon arrival at Nawiliwili Harbor at the end of the day on July 6, 2012.

For photo-identification, high quality (in focus, unobscured, and with the dorsal fin relatively perpendicular to the plane of the photograph) (Baird et al. 2003) and highly identifiable (at least one notch or verifiable pigmentation) photographs were extracted. Each high quality image was rotated so that the dorsal fin was on a perpendicular plane and cropped. Individual dorsal fins were compared for matches with photographs of individuals taken on the survey of Ka'ula on July 30, 2011 based on the size, location and pattern of notches on the trailing edge of the dorsal fin and back directly behind the dorsal fin (Wursig and Jefferson 1990).

3. Results

A total of four marine mammal groups were sighted during the cruise (Table 2) across a total of 10 hours 19 minutes and 26 seconds of survey effort. While at Ka'ūla, the BSS was 5, although local conditions were variable depending on location of the vessel and wind direction. Of the total off-effort and on-effort survey time, approximately 25% was at BSS 5, 55% was at BSS 6, and 20% was at BSS 7. All of the sightings were confirmed to species and consisted of one group of spinner dolphins at Ka'ūla with at least four calves, one group of bottlenose dolphins at Ka'ūla, three individual monk seals which were hauled out along the NW ledge of Ka'ūla, and one group of bottlenose dolphins on the SW side of Ni'ihau (Figure 4 and Figure 5).

Species	Group size (min/max/best)	Vessel Location*	Date (2012)	Time (HST)	Behavior	BSS
Spinner dolphins	67/81/74	21°39.363'N 160°32.093'W	6 July	07:54:01	Bow riding	5
Resighting (spinner)		21°39.086'N 160°32.058'W**	6 July	08:48:36	Bow riding	5
Resighting (spinner)		21°38.7656'N 160°32.649'W***	6 July		Bow riding	5
Bottlenose dolphins	4/9/5	21° 39.057'N 160°32.059'W	6 July	08:06:42	Bow riding	5
Resighting (bottlenose)		21°39.655'N 160°32.120'W	6 July		Bow riding	5
Hawaiian monk seals	3/3/3	21° 39.587'N 160°32.658'W	6 July	09:02:44	Hauled out	5
Bottlenose dolphins	2/2/2	21° 45.573'N 160°13.597'W****	6 July	13:25:52	Bow riding	6

Table 2. Sightings

All sightings and their locations with reference to the survey tracks are depicted in figure 4 and 5.

* first sighting location

**resighted at approximately the same location on each of the two successive circumnavigations of the island (see Figure 5)

***resighted at approximately the same location on one successive circumnavigation of the island (see Figure 5)

****near Ni'ihau (Figure 4)

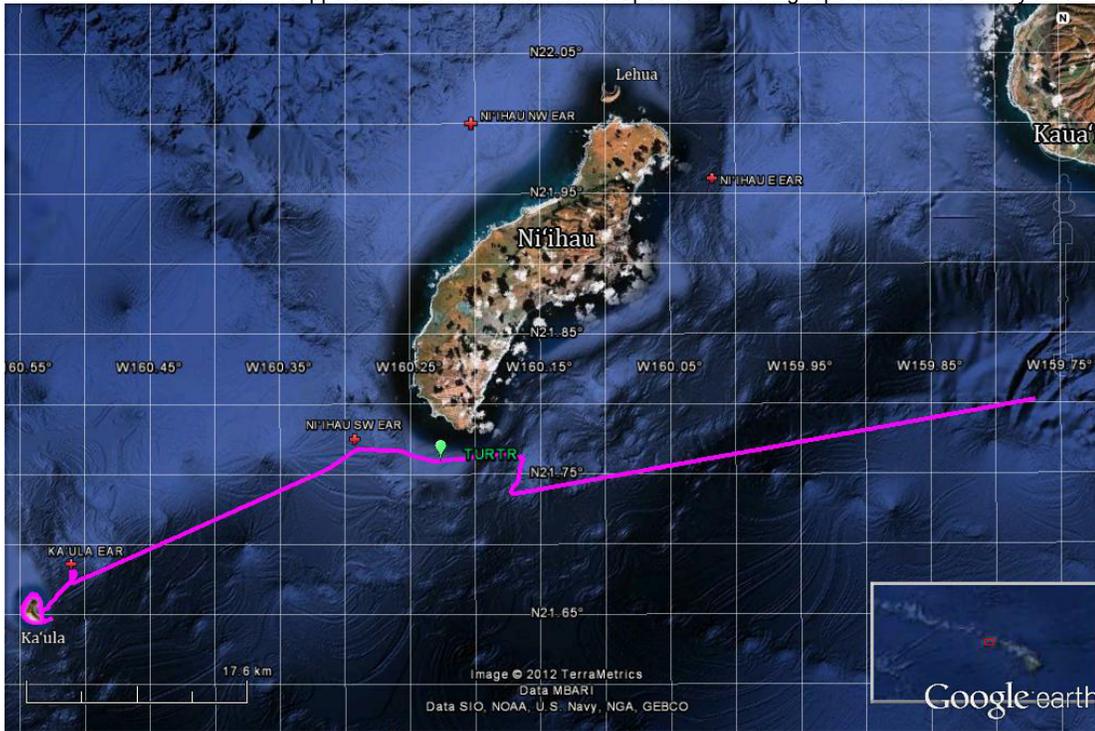


Figure 4. Entire survey track line with bottlenose dolphin (TURTR) sighting near Ni'ihau and EAR locations.

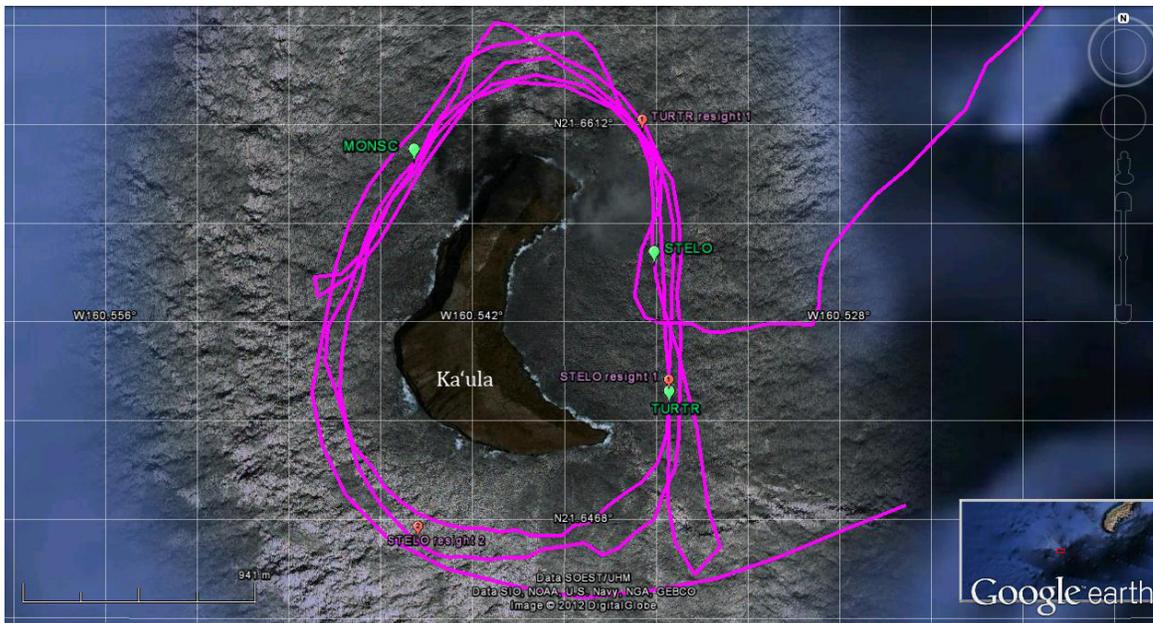


Figure 5. Track line, sightings, and resightings of spinner dolphin (STELO), bottlenose dolphin (TURTR) and monk seal (MONSC) at Ka'ula on July 6, 2012.

Five high quality photographs were collected of highly identifiable bottlenose dolphins at Ka'ula. Sixteen high quality photographs were collected of highly identifiable spinner dolphins at Ka'ula. Photographs were taken of the bottlenose dolphins at Ni'ihau, however none were suitable for individual identification. Each of the monk seals was photographed. No additional sightings of hauled out monk seals were made upon later inspection of the shoreline photographs. No monk seals were sighted in water. No sea turtles were sighted. One seven minute 37 second acoustic recording was taken at the concave side of the island in the vicinity of the spinner dolphins and possibly the bottlenose dolphins.

Submitted in support of the 2012 Annual Marine Species Monitoring report for the U.S. Navy's Hawaii Range Complex. The spinner dolphins were sighted on the concave of the island. They were resighted on each successive circumnavigation of the island. The spinner dolphins approached to bow ride and abandoned the vessel on the convex side of the island. On the third circumnavigation, a small group of four to five remained with the vessel for the entire loop. At least four juveniles were seen (Figure 6). It appeared that the dolphins were relatively close to shore and approached to bow ride upon detection of the vessel. The first sighting was at 21°39.363'N, 160°32.093'W which was north of resighting 1 at 21°39.086'N, 160°32.058 W and resighting 2 at 21°38.7656'N, 160°32.649 W. This may have been due to the location of the vessel, which entered the cove from the north at the beginning of the day. The vessel then turned and left the cove and proceeded in a counter-clockwise direction. As the vessel approached the concave side, from the south, resightings were made as the dolphins approached to bow ride.



Figure 6. Spinner dolphin adult and calf swimming abreast of the vessel on the concave side of Ka'ula on July 6, 2012.

The bottlenose dolphins were also sighted as they approached to bow ride while the Searcher was on the concave side of the island. The first sighting of the bottlenose dolphins was continuous with the first sighting of the spinner dolphins. They also abandoned the vessel as it transited to the convex side of the island. The bottlenose dolphins were resighted only on the second circumnavigation of the island. No calves or juveniles were seen. Some breaching occurred (Figure 7). Cookie cutter shark scars and wounds (Figure 8) and remoras were observed.



Figure 7. Breaching bottlenose dolphin.



Figure 8. Bottlenose dolphin with cookie cutter scar and wound.

3.1 Cetacean individual photo-identification

The monitoring questions which were asked were “Are other (other than Hawaiian monk seal) marine mammal and sea turtle species present at Ka’ula, and in the transit lane to and from Ka’ula?” and “Are there patterns of occurrence when compared to previous surveys to Ka’ula?”

Although the platform is not ideal for individual photo-identification data collection due to the height of the bow sprit above water, we collected five high quality and highly identifiable bottlenose dolphin dorsal fins (Figure 9). There was one match from the 13 bottlenose dolphins dorsal fins photographed in June 2011 (Figure 10). For comparison with existing libraries of marine mammals in Hawaiian waters, all photographs of bottlenose dolphins were provided to CRC and Pacific Islands Photo-identification Network (PIPIN). The bottlenose dolphin catalog held by NAVFAC-PAC for Ka’ula now totals 17 uniquely identifiable animals. Three other photographs of bottlenose dolphins dorsal fins were taken by CRC in 2003 (R. Baird, personal correspondence). Currently, analysis is underway to determine if any of the three dorsal fins from 2003 in the CRC catalog match the 17 animals in the NAVFAC-PAC catalog from 2011 and 2012. PIPIN contains no additional bottlenose dolphins photos (M. Hill, personal correspondence).

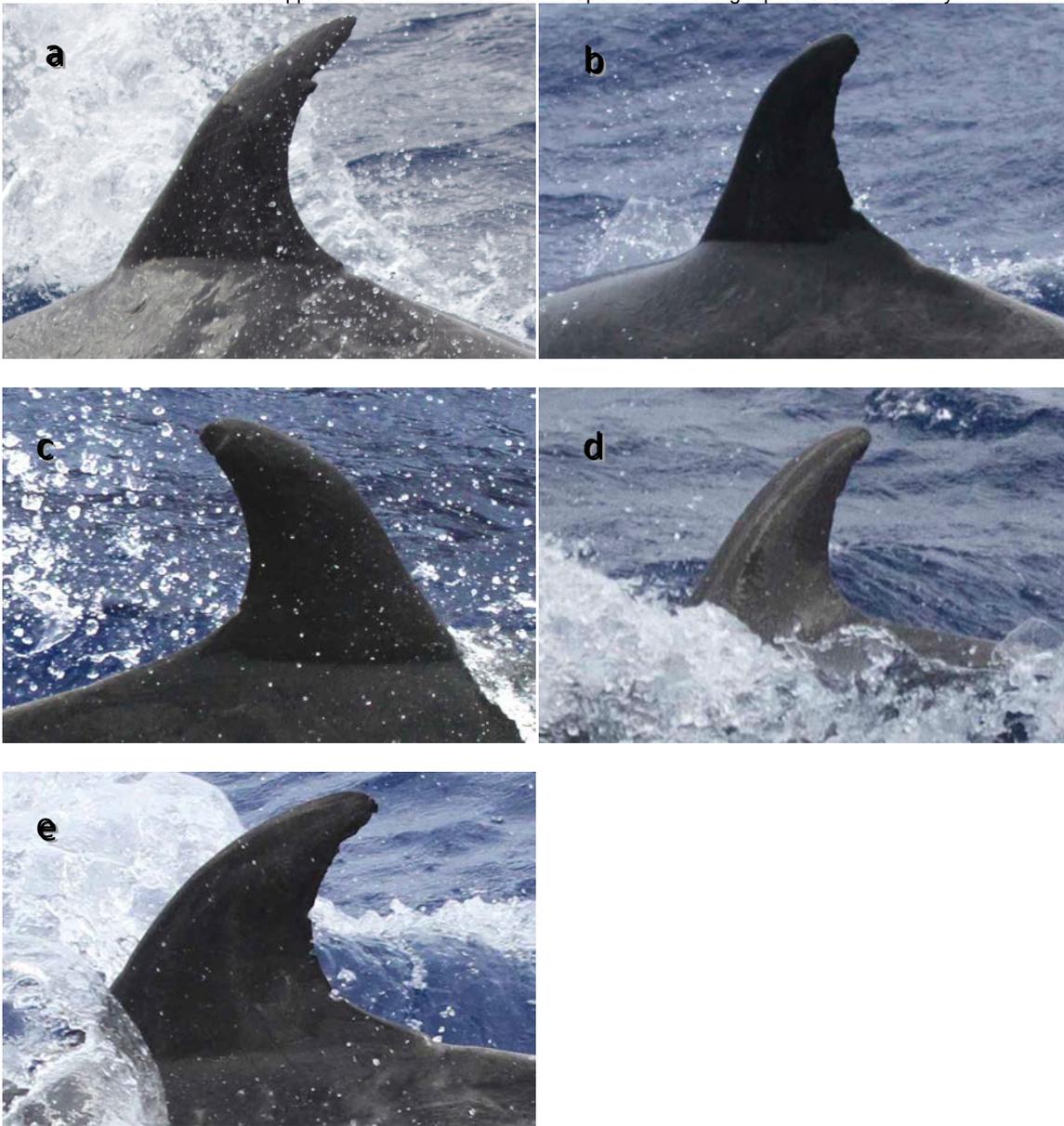
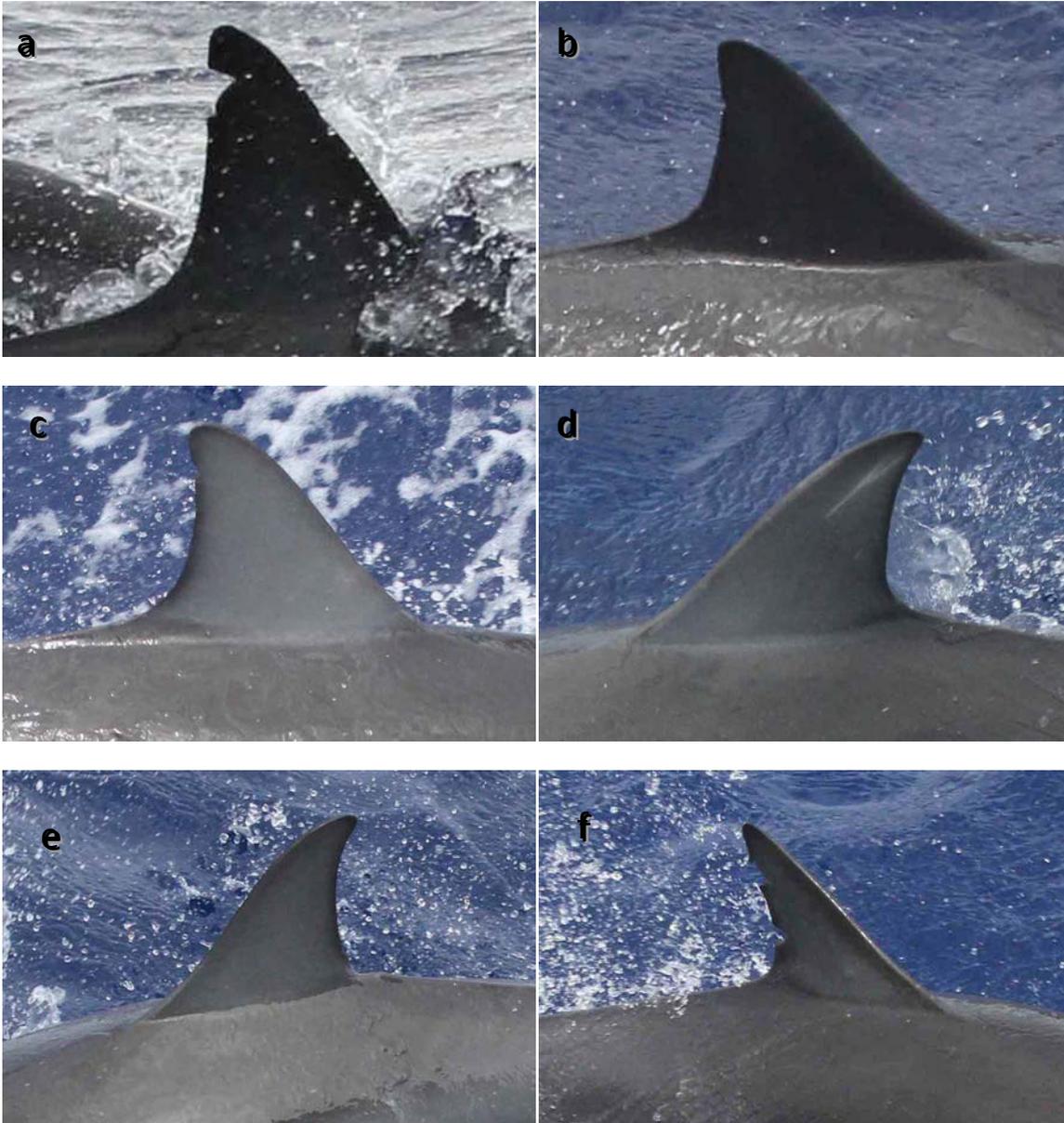


Figure 9. Five identifiable bottlenose dolphin dorsal fins photographed at Ka'ula on July 6, 2012.



Figure 10. Bottlenose dolphin dorsal fin previously photographed at Ka'ula on June 30, 2011 and matched to "e" from Fig. 9.

Submitted in support of the 2012 Annual Marine Species Monitoring report for the U.S. Navy's Hawaii Range Complex
We collected high quality dorsal fin photographs of 16 highly identifiable spinner dolphin individuals (Figure 11). There was one match from the four identifiable spinner dolphin photos taken in June 2011 (Figure 12). Notches on the dorsal peduncle were also photographed on two animals with marked dorsal fins (Figure 13). For comparison with existing libraries of marine mammals in Hawaiian waters, all photographs of spinner dolphins were provided to PIPIN. The spinner dolphins catalog held by NAVFAC-PAC for Ka'ula Island now totals 19 animals.





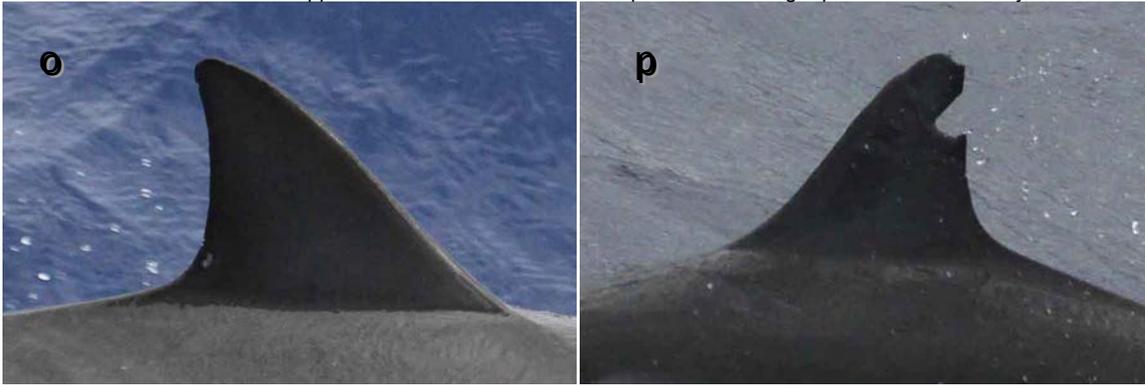


Figure 11. Sixteen identifiable spinner dolphin dorsal fins photographed at Ka'ula on July 6, 2012.



Figure 12. Spinner dolphin dorsal fin previously photographed at Ka'ula on June 30, 2011 and matched to "p" from Fig. 11.

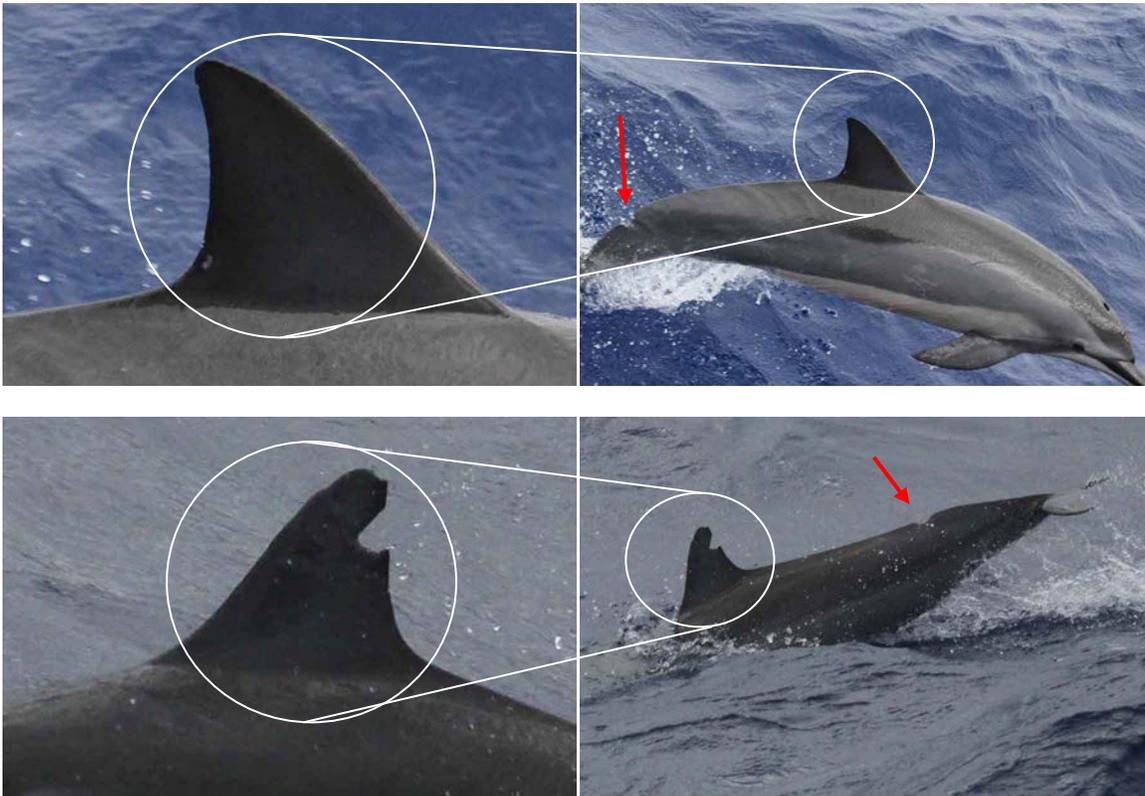


Figure 13. Two identifiable spinner dolphins also had notches on the dorsal peduncle. Top: "o" from Fig. 12. Bottom: "p" from Fig. 11.

3.2 Monk seal monitoring results

The monitoring question which was asked was “Are there Hawaiian monk seals present (either hauled-out or in-water) at Ka’ula during the survey, and if so, where are they located on or around the island?”

The entire shoreline of Ka’ula was scanned for monk seals including the SW shelf (which appears to be submerged at high tide) where monk seals were sighted in 2009 (Pepi et al. 2009). A total of three monk seals were sighted hauled out on the NW ledge of Ka’ula. No other monk seals were visible. Two adults of unknown sex were lying next to each other near the sea cave (Figure 14). On the initial circumnavigations of the island, only one seal was sighted in this location. Large ocean swells made observation conditions very challenging, so it is not known whether the second seal joined the first or just became visible later. One of these adult seals had an identifying scar from a cookie cutter shark bite on the right side back behind the pectoral flipper (Figure 15). A third seal with a yellow belly was sighted hauled out high along the cliff wall (Figure 16 and cover photo). This seal was determined to be a juvenile female and all seals appeared to be in good condition (T. Wurth, personal correspondence). It is possible that other seals may have gone undetected because it was not possible to see all areas of the rock ledge.



Figure 14. Two adult monk seals at Ka’ula Island.



Figure 15. Individually identifying cookie cutter shark scar on seal from Figure 14.



Figure 16. Juvenile female monk seal with a "yellow belly".

3.3 Acoustic ground-truthing and dipping hydrophone results

No visual validations of acoustic recordings were made in the transit over the EARs. The BSS 6 and strong wind were not conducive to sightings or use of binoculars. The use of the dipping hydrophone and digital recorder was intended to provide recordings of marine mammals with visual-validation of species identification, to provide further refinement of automated acoustic classifiers and detectors. However due to the presence of multiple species (spinner dolphins and bottlenose dolphins), the recordings that were collected are unlikely to be able to be used for this purpose.

4. Conclusions

4.1 Bottlenose dolphins

Evidence from photo-identification, mitochondrial DNA, and microsatellite markers indicate that there are demographically independent populations of bottlenose dolphins in the main Hawaiian Islands (Baird et al. 2009; Martien et al. 2012). Bottlenose dolphins have been documented around all of the main Hawaiian Islands (MHI) and the Northwest Hawaiian Islands (NWHI) out to Kure Atoll (Rice 1998).

Bottlenose dolphins have been sighted on five out of seven cruises to Ka'ula (including this one) in which it is certain that recording marine mammals was part of the protocol (Uyeyama et al. 2011; Mobley et al. 2000; Baird et al. 2003; Pepi et al. 2009 ; Uyeyama and Hanser 2010; Richie and Fujimoto 2011). The Baird et al. (2003) effort is the first known instance in which bottlenose dolphins have been photographed at Ka'ula Island. The match made between the June 2011 dorsal fins and July 2012 dorsal fins is the first evidence that suggests that some individuals may demonstrate site fidelity to Ka'ula Island and that both sightings were likely of island-associated animals rather than an oceanic population. Comparison with existing catalogs of the MHI will help determine if they are previously documented members of a known population.

4.2 Spinner dolphins

Spinner dolphins have been sighted at Ka'ula Island on six out of 7 cruises to Ka'ula (including this one) in which it is certain that recording marine mammals was part of the protocol (Uyeyama et al. 2011; Mobley et al. 2000; Baird et al. 2003; Pepi et al. 2009 ; Uyeyama and Hanser 2010; Richie and Fujimoto 2011). The Uyeyama et al. (2011) effort marked the start of extracting dorsal fin photographs in order to make a determination if the animals were the same individuals from one year to the next. The single match made between the June 2011 dorsal fins and July 2012 dorsal fins is the first direct evidence that that some individuals may demonstrate site fidelity to Ka'ula. Spinner dolphins in Hawai'i use

Submitted in support of the 2012 Annual Marine Species Monitoring report for the U.S. Navy's Hawaii Range Complex near-shore island habitats and for resting and socializing, particularly in areas where there is deep water nearby for foraging (Karczmarski et al. 2005). The bathymetry around Ka'ula has the desirable qualities described above. It is surrounded by a shallow bank of approximately 0-180 m in depth, beyond which is a slope which rapidly descends to depths of 2000+ m. Additionally, there is a shallow shoal (nine m in depth) known as Five Fathom Pinnacle approximately 3 nm to the NW.

In the MHI, spinner dolphins live in fission-fusion societies where they band together in large groups at night to forage and then split into smaller groups during the day to rest in coastal bays. There is a high degree of variability in group size and inter-individual associations (Norris and Dohl 1980; Wursig et al. 1994). In the NWHI, at Midway Atoll, spinner dolphins live in highly cohesive groups, which are stable over time, with little interaction with spinner dolphins from other groups. This difference is attributed to a higher degree of geographic isolation, greater risk of shark predation, and proximity to deep water compared to the MHI (Karczmarski et al. 2005). Ka'ula is in-between the MHI and the NWHI geographically, but also could be thought of as "in-between" in terms of relative isolation and food web-effects of fishing (inside vs. outside the monument and proximity to fishing harbors). As additional data are collected in each successive cruise, a clearer picture may emerge about the habitat use and population structure of Hawaiian spinner dolphins at Ka'ula.

4.3 Hawaiian monk seals

It is difficult to collect detailed identity, age class, and sex class data of monk seals hauled-out on Ka'ula from photos taken aboard the Searcher at the distance at which it must circumnavigate the island. It is also impossible to be certain that all of the monk seals were sighted due to obscured locations on the ledge. Hawaiian monk seals have been documented at Ka'ula, either hauled out or in-water, on at least 11 occasions. The northwest ledge appears to be a favored haul out site. However, on one occasion, monk seals were sighted on a ledge on the SW corner of the island (Pepi et al. 2009).

5. References

- Uyeyama RK, Richie MW, Winters K, Fujimoto J. 2011. Kaula Island ship-based marine mammal survey June 30, 2011 Field Report. Pearl Harbor, HI, Naval Facilities Engineering Command Pacific for Commander, U.S. Pacific Fleet.
- Palmer HS. 1936. Geology of Lehua and Kaula Islands. In: Bernice P Bishop Museum Occasional Papers, 11.
- Elmer JS, Swedburg G. 1971. Assessment of Environmental Impact, Kaula Island Target. DON, Commander Fleet Air Hawaii.
- DoN. 1976a. Environmental Impact Assessment, Kaula Island Target, Hawaii, 1 February 1976. NASBP.
- Walker RL. 1979. Report on trip to Kaula Island, March 6-8, 1979. Unpublished. On file, State of Hawaii Division of Forestry and Wildlife. Honolulu, HI: Department of Land and Natural Resources.
- Walker RL. 1983. Report on trip to Kaula Island, June 19-20, 1980. Unpublished. On file, State of Hawaii Division of Forestry and Wildlife. Honolulu, HI: Department of Land and Natural Resources.
- Walker RL. 1984. Kaula trip report, April 16-18, 1984. Unpublished, On file, State of Hawaii Division of Forestry and Wildlife. Honolulu, HI: Department of Land and Natural Resources.
- Walker RL. 1993. Kaula trip report, June 1-2, 1993. Unpublished. On file, State of Hawaii Division of Forestry and Wildlife. Honolulu, HI: Department of Land and Natural Resources.
- Mobley JR, Spitz SS, Forney KA, Grotiefendt RA, Forestall PH. 2000. Distribution and abundance of odontocete species in Hawaiian waters: preliminary results of 1993-98 aerial surveys (Admin Rep LJ-oo-14C). La Jolla, CA: Southwest Fisheries Science Center, NMFS.

- Baird RW, McSweeney DL, Webster DL, Gorgone AM, Ligon AD. 2003. Studies of odontocete population structure in Hawaiian waters: results of a survey through the main Hawaiian Islands in May and June 2003. Report prepared under Contract No. AB133F-02-CN-0106 from NOAA, 7600 Sand Point Way, NE Seattle, WA 98115 USA.
- Mobley JR, Mazzuca L, Craig AS, Newcomer MW, Spitz SS. 2001. Killer whales (*Orcinus orca*) sighted west of Ni'ihau, Hawaii. *Pacific Science* 55(3): 301-303.
- Baker JD, Johanos TC. 2004. Abundance of the Hawaiian monk seal in the main Hawaiian Islands. *Biological Conservation* 16: 103-110.
- Baker JD, Harting AL, Wurth TA, Johanos TC. 2011. Dramatic shifts in Hawaiian monk seal distribution predicted from divergent regional trends. *Marine Mammal Science* 27(1): 78-93.
- Pepi VE, Kumar A, Laut ME, Hallman J, Kim J, Anders AD. 2009 Kaula Island ship-based seabird and marine mammal surveys, 21-22 July 2009 Pearl Harbor, HI:Naval Facilities Engineering Command - Pacific for Commander, U.S. Pacific Fleet.
- Uyeyama RK, Hanser SF. 2010. Kaula Island ship-based marine mammal survey, Hawaii Range Complex. Field Report. Pearl Harbor, HI:Naval Facilities Engineering Command - Pacific for Commander, U.S. Pacific Fleet.
- Richie MW, Fujimoto J. 2011. Kaula/Kauai field report. HRC marine species monitoring. February 15-20, 2011. Pearl Harbor, HI:Naval Facilities Engineering Command - Pacific for Commander, Pacific Fleet.
- Hathaway SA, Fisher RN. 2010. Biosecurity plan for Palmyra Atoll: U.S. Geological Survey Open-File Report 2010-1097, 80 p.
- Wursig B, Jefferson TA. 1990. Methods of photo-identification for small cetaceans. *Rep Int Whal Comm Spec Issue*(12): 43-52.
- Baird RW, Gorgone AM, McSweeney DJ, Ligon AD, Deakos MH, Webster DL, et al. 2009. Population structure of island-associated dolphins: evidence from photo-identification of common bottlenose dolphins (*Tursiops truncatus*) in the main Hawaiian Islands. *Marine Mammal Science* 25(2): 251-274.
- Martien KK, Baird RW, Hedrick NM, Gorgone AM, Thieleking JL, McSweeney DJ, et al. 2012. Population structure of island-associated dolphins: evidence from mitochondrial and microsatellite markers for common bottlenose dolphins (*Tursiops truncatus*) around the main Hawaiian Islands. *Marine Mammal Science* 28(3): E208-E232.
- Rice D. 1998. *Marine mammals of the world: systematics and distribution*. Special publication No. 4, Society for Marine Mammology.
- Karczmarski L, Wursig B, Gailey G, Larson KW, Vanderlip C. 2005. Spinner dolphins in a remote Hawaiian atoll: social grouping and population structure. *Behav Ecol* 16(4): 675-685.
- Norris KS, Dohl TP. 1980. Behavior of the Hawaiian spinner dolphin, *Stenella longirostris*. *Fish Bull* 77(4): 821-849.
- Wursig B, Wells RS, Norris KS. 1994. A spinner dolphin day. In: *The Hawaiian Spinner Dolphin, Part 1*. Berkeley:University of California Press.