APPENDIX H Aerial Survey for Marine Mammals and Sea Turtles during SCC February 2010

Aerial Survey Monitoring for Marine Mammals and Sea Turtles in the Hawaii Range Complex in Conjunction with a Navy Training Event

SCC February 16 – 21, 2010

Final Field Report

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NAVFAC Pacific
EV2 Environmental Planning
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Pearl Harbor, HI 96860-3134

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Cover Photo: Humpback whales (*Megaptera novaeangliae*) photographed with a telephoto lens from the aircraft during an aerial monitoring survey in Hawaii. Photograph by J. Mobley taken under NOAA Permit No. 642-1536-03 issued to Joseph R. Mobley, Jr. Graphic: K. Lomac-MacNair.

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Section 1 Introduction

Aerial surveys to monitor marine mammals and sea turtles (MM/ST) were conducted in conjunction with the February 2010 US Navy Submarine Commander's Course (SCC) naval training event in the Hawaii Range Complex (HRC) on the Pacific Missile Range Facility (PMRF) instrumented range between Kauai and Niihau, Hawaii (

Figure 3). Surveys occurred on six consecutive days from 16-21 February 2010 in waters where the guided missile frigate (FFG) *USS Crommelin* and other ships were operating ~100 km (50 nm) west or northwest of Kauai. The survey methods and sampling design were submitted and approved in advance, per the statement of work (SOW), to the Navy Technical Representative (NTR) and followed previously established protocol implemented for monitoring of SCC training events off Kauai in February and August 2009 (Smultea and Mobley 2009a,b).

Prior to the training event the co-Principal Investigator (JM) and pilot (JW) attended pre-planning sessions with the NTR and other Navy staff at Pearl Harbor, Honolulu, Oahu, Hawaii, to coordinate survey efforts with the SCC February 2010 operations.

Per the SOW, the goal of the aerial survey was to monitor and report the presence/absence, distribution/redistribution, reaction/no reaction, injury, and/or mortality of MM/ST before, during and after the training event. This involved monitoring and reporting the surface behavior of MM/ST. In particular, we were to monitor for any changes in the near-surface behavior, orientation, occurrence, and location of animals relative to the FFG's activities using a systematic search and focal follow method.
Since mid-frequency active sonar (MFAS) locations and transmission times were unknown to the observers during this field survey effort, no effort was made to determine types or level of response of MM/ST to these transmissions. Rather, as stated in the SOW, survey data collected during this monitoring effort will be compiled with previous (e.g., Smultea and Mobley 2009a,b) and subsequent data, and analyzed by the Navy.

Survey effort during this training event was of three types (Table 1): a) line transects—following the guidelines of distance sampling theory (Buckland et al., 2001); b) ship follows—flying elliptical orbits in front of the FFG per previous training events (Smultea and Mobley 2009a,b); and c) circumnavigation of islands—flying along the coastlines of Kauai, Niihau and Kaula Island to search for stranded or near stranded MMs. In all cases the mission was to document the presence of MM/STs including species identity, group composition, behavior and any obvious reactions.

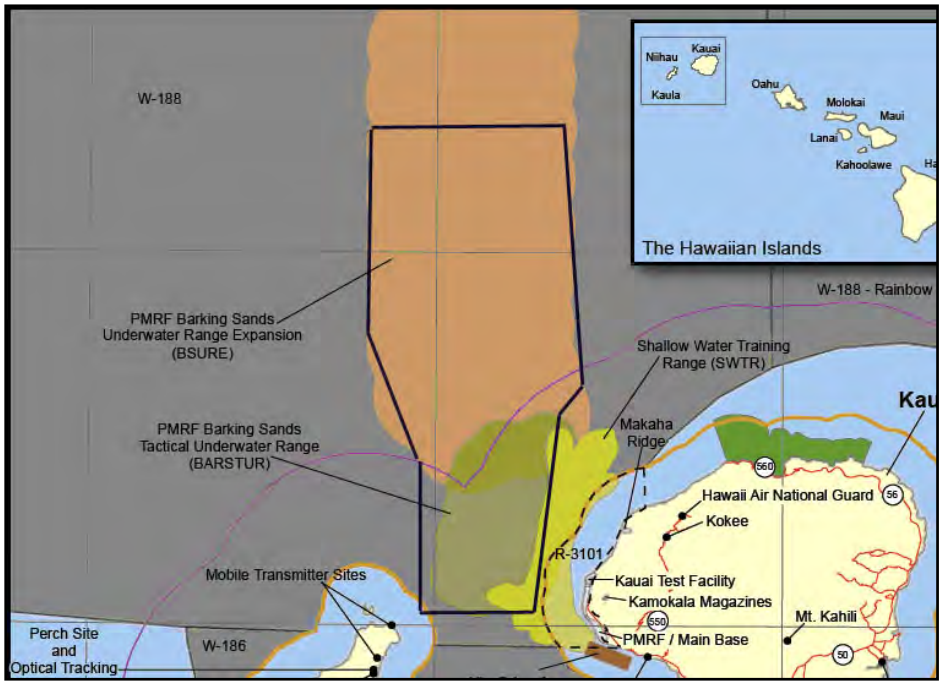

Figure 6. Location of the aerial survey monitoring area in and near the US Navy Pacific Missile Range Facility (PMRF) Range west and northwest of Kauai, Hawaii.

Table 1. Summary of Effort Type, Hours and Seastate by Date

Date	Type of Effort	No. Hrs Effort	Mean Beaufort Sea State
2/15/10	Transit from HNL to Kauai	1.00 hr	4.5
2/16/10	Transects	5.36 hrs	4.0
2/17/10	AM: Transects PM: the FFG	3.61 hrs 3.26 hrs	6.0 6.0
2/18/10	the FFG	5.83 hrs	5.0
2/19/10	the FFG	6.26 hrs	4.9
2/20/10	Transects	4.90 hrs	3.5
2/21/10	Circumnavigate Kauai, Niihau & Kaula Island	2.80 hrs	2.1
	TOTAL:	**32.99 hrs**	**Mean: 4.5**

Section 2 Methods

Monitoring effort followed protocol first implemented in previous SCC training events (see Smultea and Mobley 2009a,b for details). The approach involved flying elliptical-shaped patterns in advance of the Navy vessel (FFG) that extended from the front of the ship (~200 m) out to ~2500 m) over a width of ~4 km. When range and/or safety conditions precluded accompanying the FFG, focal follows were conducted opportunistically when target species were sighted off range.

> Surveys were conducted from a small fixed-wing Partenavia P68 Observer flying at 100 knots (kt) groundspeed and an altitude of ~305m (1000 ft), unless the pilot was directed to fly at alternate altitudes by flight controllers for safety reasons. Observations from the monitoring aircraft involved five personnel including the pilot and copilot, plus two biologist observers and one data recorder/videographer. Survey crew and pilot were not informed as to the status of MFAS transmissions which minimized potential for observational bias. When target species were detected, the angle to the sighting was recorded 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 by the data recorder to assist in species identification using a Canon 5D digital camera with Canon 100-400mm telephoto lens with image stabilizer. Environmental data (Beaufort seastate, glare, visibility) were taken at the start of each transect leg and when conditions changed. Positional data via GPS were automatically recorded every 10-sec and manually when sightings occurred.

When candidate pods were suitable (i.e., were visible at the surface for extended periods) focal follows were performed using accepted methods (Altmann, 1974). The aircraft ascended to 457m (1500 ft), an altitude shown to minimize reactivity to fixed wing aircraft (Smultea, Kieckhefer & Bowles, 1995), and the pod was orbited and behavior videotaped for as long as possible. A high-definition (HD) Canon Vixia HF10 camcorder with 12-power optical zoom was used to videotape 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, as well as digital photos, will be made available to the Navy for subsequent behavioral analysis.

Overall survey effort was divided into three modalities as summarized below:

a) transect surveys (16-20 Feb 2010)—predetermined transects (Figure 3) were followed using accepted distance sampling methods (Buckland et al., 2001) with the goal of determining incidence, distribution and relative abundance of target species in the area;

b) ship follows (17-19 Feb 2010)—involved flying elliptical orbits in front of the FFG (Figure 4) with the goal of finding target species in the vicinity of the FFG and observing and recording their behavior using focal follow methods (Altmann, 1974);

c) circumnavigation surveys (21 Feb 2010)—following the SCC event, the aircraft flew along the coastlines of Kauai, Niihau and Kaula islands (Figure 5) looking for target species along the shoreline as well as any stranded or near stranded marine mammals.

Section 3 Results

Effort

The survey aircraft accompanied the FFG for 7.8 hours (24%) of the total 33 hrs of flight time (Table 2). The remaining 25.2 hrs (76%) while not with the FFG involved performing survey transects, circumnavigating Kauai, Niihau and Kaula Island, as well as transiting between the FFG's location and Lihue, Kauai (see Figures 3-5). The aircraft was considered "with the FFG" upon commencement of elliptical orbits around the ship's location (Figure 4). These ship follows occurred on Feb. 17-19 at distances of approximately 25-70 km offshore of Kauai where the highest Beaufort sea state conditions were encountered (Table 1). As a result, sighting probabilities were low. Thus the fact that only one pod of humpback whales was seen in the vicinity of the ship (Table 2, Figure 4) should not be construed as evidence of absence of MM/ST in the area.

Effects of Sea State on Sighting Probabilities

Effects of seastate. The majority of overall effort (63%) was spent in poor sea state conditions (i.e., Beaufort 5-6) (Figure 2). The majority of sightings (61%), on the other hand, tended to occur in more favorable sea state conditions (i.e., Beaufort 1-4). This pattern is consistent with known effects of sea state on sighting probabilities (Buckland et al., 2001).

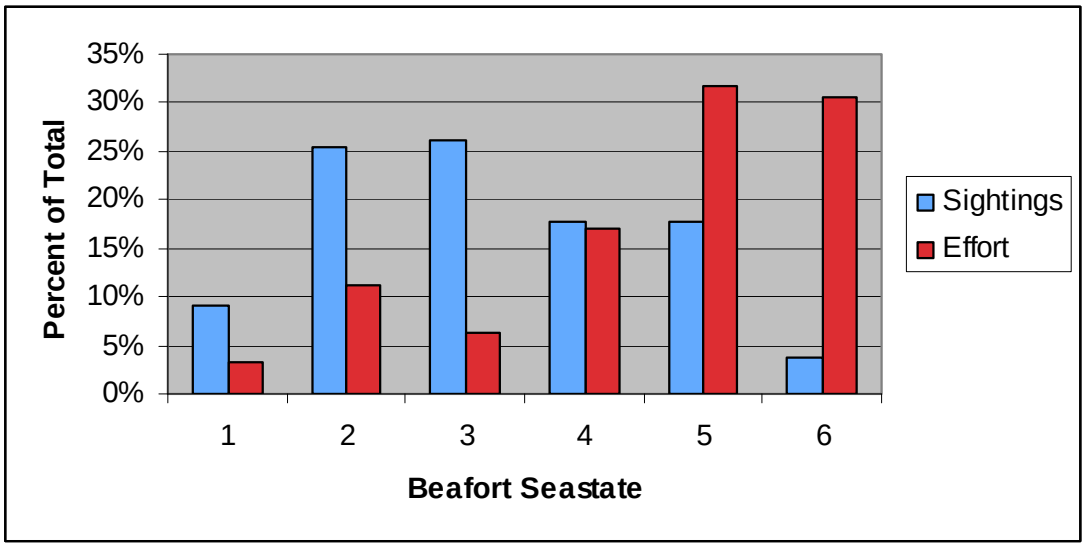

Figure 2. Beaufort sea state conditions for total effort and for sightings.

Table 2. Effort with and not with FFG

Date	Time Wheels Up	Time Wheels Down	Total Flight Hours	Period not with FFG	Total Hours not with FFG	Period with FFG	Total Hours with FFG	No. Sightings With FFG (# groups)	No. Sightings Away from FFG (# groups)
2/15/2010	15:20:30	16:20:30	1:00:00	15:20:30-16:20:30	1:00:00	n/a	n/a	n/a	7
2/16/2010	7:30:30 12:00:00	10:40:00 14:12:00	3:09:30 2:12:00	7:30:30-10:40:00 12:00:00-14:12:00	5:21:30	n/a	n/a	n/a	71
2/17/2010	7:18:30 12:35:00	10:55:00 15:50:30	3:36:30 3:15:30	7:18:30-10:55:00 12:35:00-13:13:30 15:22:30-15:50:30	4:43:00	13:13:30-15:22:30	2:09:00	0	7
2/18/2010	7:30:30 12:35:00	10:55:00 15:00:00	3:24:30 2:25:00	7:30:30-8:17:30 10:19:30-10:55:00 12:35:30-13:13:30 14:39:30-15:00:00	2:21:30	8:17:30-10:19:30	2:02:00	0	16
2/19/2010	7:29:30 12:43:00	11:25:00 15:02:30	3:55:30 2:19:30	7:30:00-7:59:59 10:56:36-11:25:00 12:43:30-13:22:45 14:11:30-15:02:30	2:28:38	7:59:59-10:56:36 13:22:45-14:11:30	3:35:22	1	30
2/20/2010	7:33:00	12:27:00	4:54:00	7:33:00-12:27:00	4:54:00	n/a	n/a	n/a	58
2/21/2010	8:57:34	11:45:20	2:47:46	8:57:34-11:45:20	2:47:46	n/a	n/a	n/a	115
Total			**32:59:46**		**25:13:24**		**7:46:22**	**1**	**304**

Sightings

A total of 304 sightings were made during the six days of surveys (Table 3). The majority (88%) of these sightings were of humpback whales. Most of the latter were observed in shallower areas (<1000 fathoms) shown to be preferred habitat of humpbacks based on past survey results (e.g., Mobley 2004). Of the 265 sightings of humpback whales (Table 3), 115 were seen during transect surveys. When converted to sighting rates, the result is .044 humpback sightings/km effort. This represents more than twice the sighting rate for humpbacks seen north of Kauai during the 2006 NPAL surveys, .020 humpback sightings / km effort (Mobley, 2006). The greater rate of humpback whale sightings recorded during the present surveys is consistent with previous reports of increases in the Hawaii wintering population (Mobley, Bauer & Herman 1999; Mobley 2004; Calambokidis et al. 2008).

The remaining sightings of positively identified species consisted of odontocete species, specifically spinner dolphins, spotted dolphins, bottlenose dolphins, striped dolphins, pilot whales and false killer whales. All of these are typically found in Hawaiian waters (Mobley et al. 2000; Barlow 1996), though false killer whales may be decreasing in numbers (Reeves, Leatherwood & Baird 2009). The total of 17 odontocete sightings recorded during the transect survey portion converts to a sighting rate of .007 odontocete sightings / km effort. This is approximately the same as the .006 sightings/km effort reported for the same region during 2002 surveys on the PMRF instrumented range (Mobley 2004).

A total of 12 sightings of unidentified sea turtles were recorded, all of which were observed in the shallow coastal waters of Kauai, where the animals could be readily observed against the light sandy bottom. Although Hawaiian monk seals were recorded on previous surveys in this region (e.g., Smultea, Mobley & Lomac-MacNair, 2009a), no monk seals were seen during this survey series either swimming or hauled out onshore.

Only one sighting, consisting of a pod of two humpback whales, was sighted in the vicinity of the FFG (Figure 4). This pod became the subject of a focal follow session described in the next section.

Observations across the six days of survey effort revealed no evidence of injury or mortality among target species before, during and after the event. There were no behavioral indications of distress (e.g., tight aggregations of pod members) or unusual near-shore aggregations of marine mammals. The circumnavigation of islands (Feb. 21) similarly revealed no stranded or near stranded animals. Evidence regarding possible effects is further summarized in the next section.

Table 3. Summary of Sightings by Species With and Away From *USS* the FFG

	With *USS* the FFG		**Away from *USS* the FFG**		**Total**	
Species	**No. Grps**	**No. Indiv.**	**No. Grps**	**No Indiv.**	**No. Grps**	**No. Indiv.**
Humpback Whale (*Megaptera novaeangliae*)	1	2	264	465 (9 calves)	265	467 (9 calves)
Bottlenose Dolphin (*Tursiops truncatus*)	0	0	2	10	2	10
False Killer Whale (*Pseudorca crassidens*)	0	0	1	12	1	12
Pilot Whale (*Globicephala macrorynchus)*	0	0	1	2	1	2
Spinner Dolphin (*Stenella longirostris*)	0	0	4	179	4	179
Spotted Dolphin (*Stenella attenuata*)	0	0	1	1	1	1
Striped Dolphin (*Stenella coeruleoalba*)	0	0	1	60	1	60
Unidentified Blackfish	0	0	1	6	1	6
Unidentified Cetacean	0	0	2	5	2	5
Unidentified Dolphin (*Delphinidae*)	0	0	7	163	7	163
Unidentified Whale	0	0	3	3	3	3
Unidentified Sea Turtle	0	0	12	31	12	31
Total	**1**	**2**	**304**		**304**	

*includes transits, circumnavigation, & transect surveys

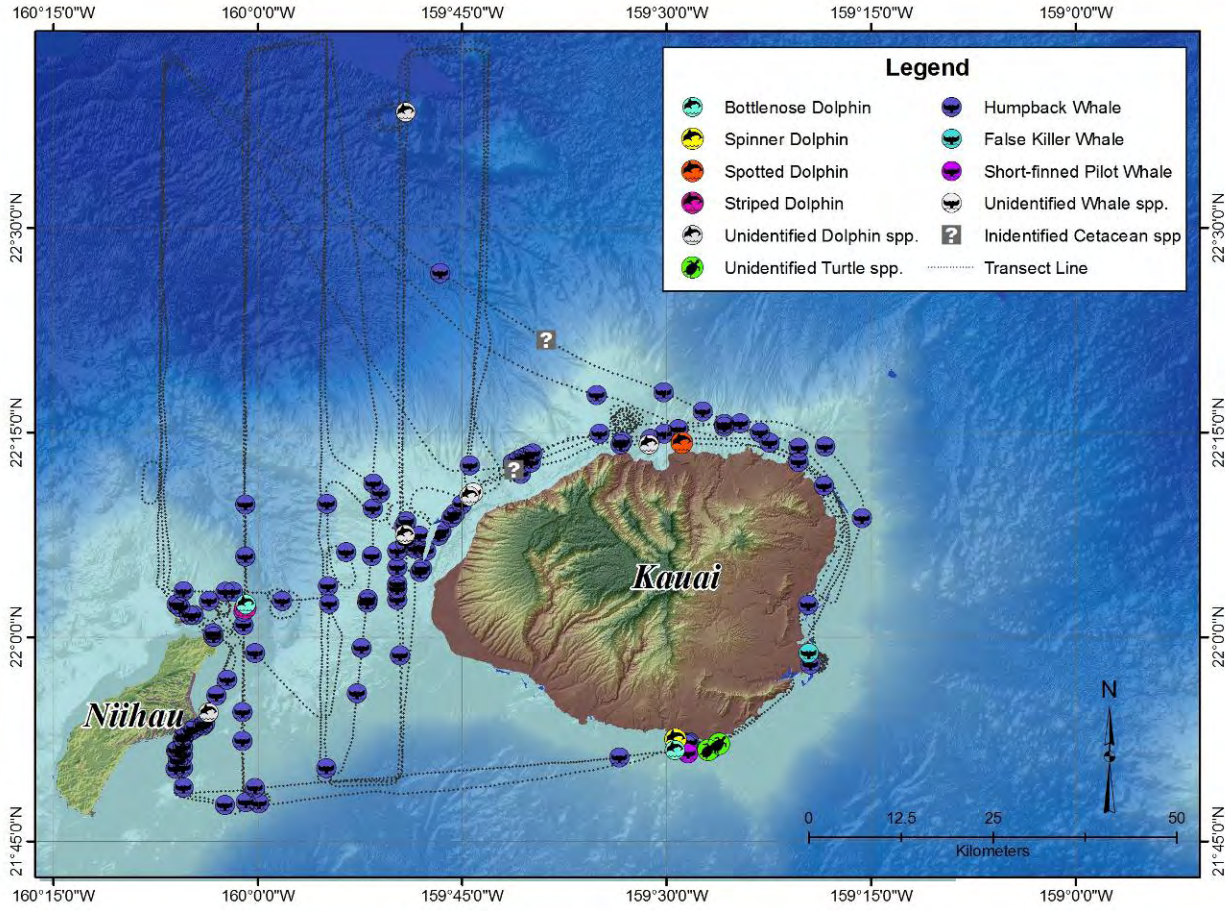

Figure 3. Effort and locations of sightings made during transect portions of MM/ST survey (16-20 Feb 2010) SCC aerial monitoring survey off Kauai, Hawaii. On these days, the survey aircraft followed predetermined transects consisting of north-south systematic lines ~10km apart with random lines connecting the endpoints. Area of coverage is approximately 1,344 sq nm or 4,610 sq km. Lighter shading indicates shallower water (<1000 fathoms).

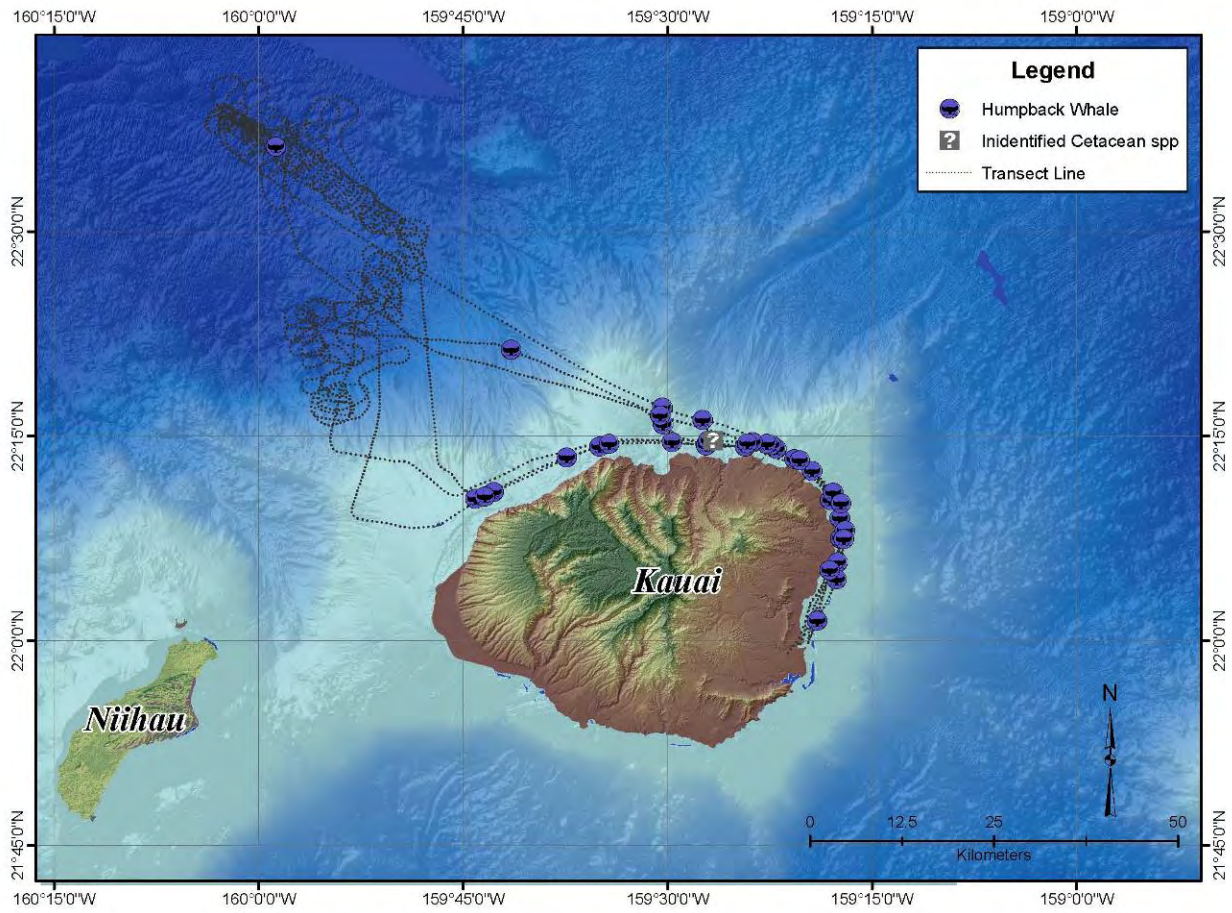

Figure 4. Effort and sighting locations during days involving ship follows with the FFG (17-19 Feb 2010). Nearly all sightings occurred during transits between Lihue and the ship's position. One sighting of a pod of two humpback whales occurred in the vicinity of the FFG (19 Feb 2010; shown in northwest corner) which became the target of a focal follow session with videotape.

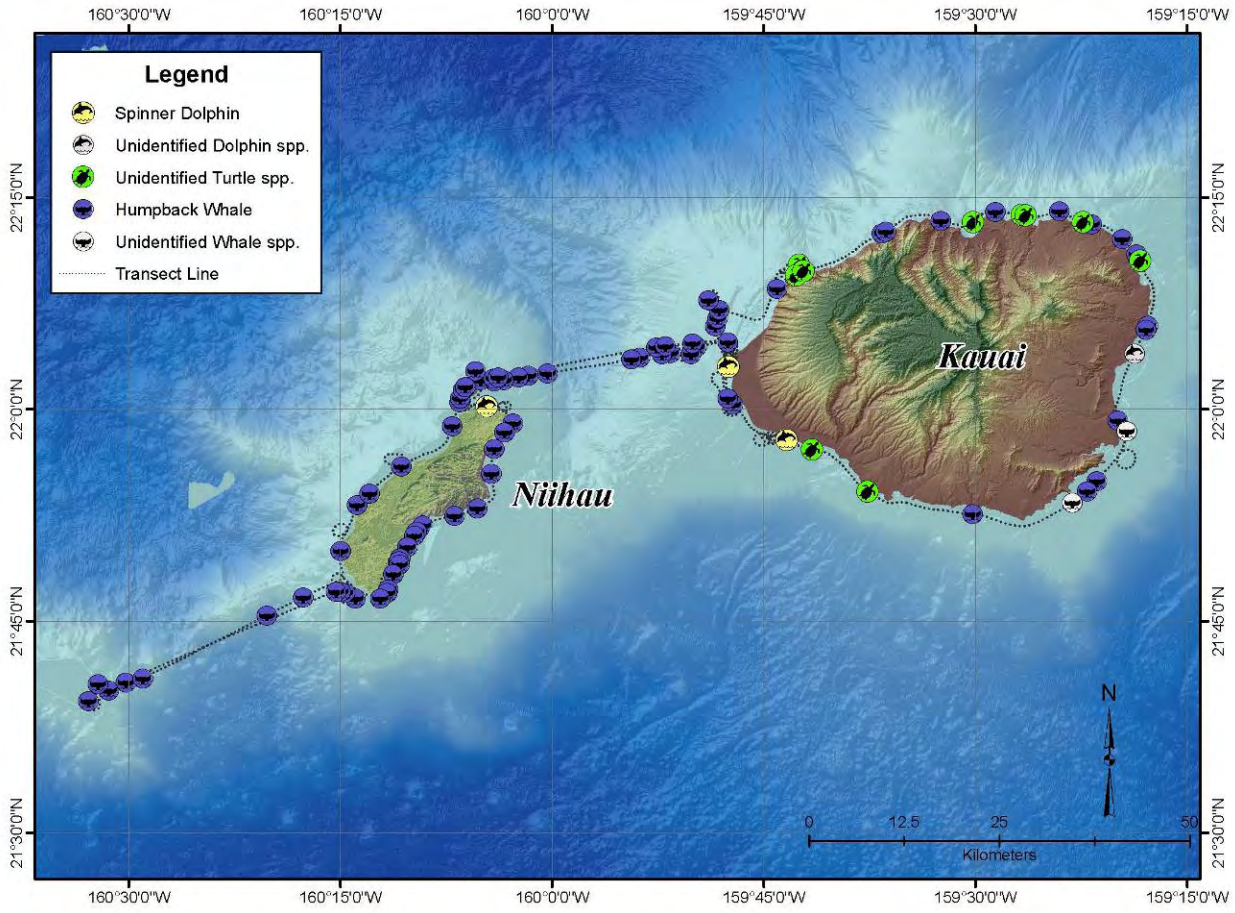

Figure 5. Effort and sighting locations during circumnavigation of the islands of Kauai, Niihau and Kaula Island (west southwest of Niihau) (21 Feb 2010). Species positive identified included spinner dolphins and humpback whales, in addition to unidentified turtle, whale and delphinid species.

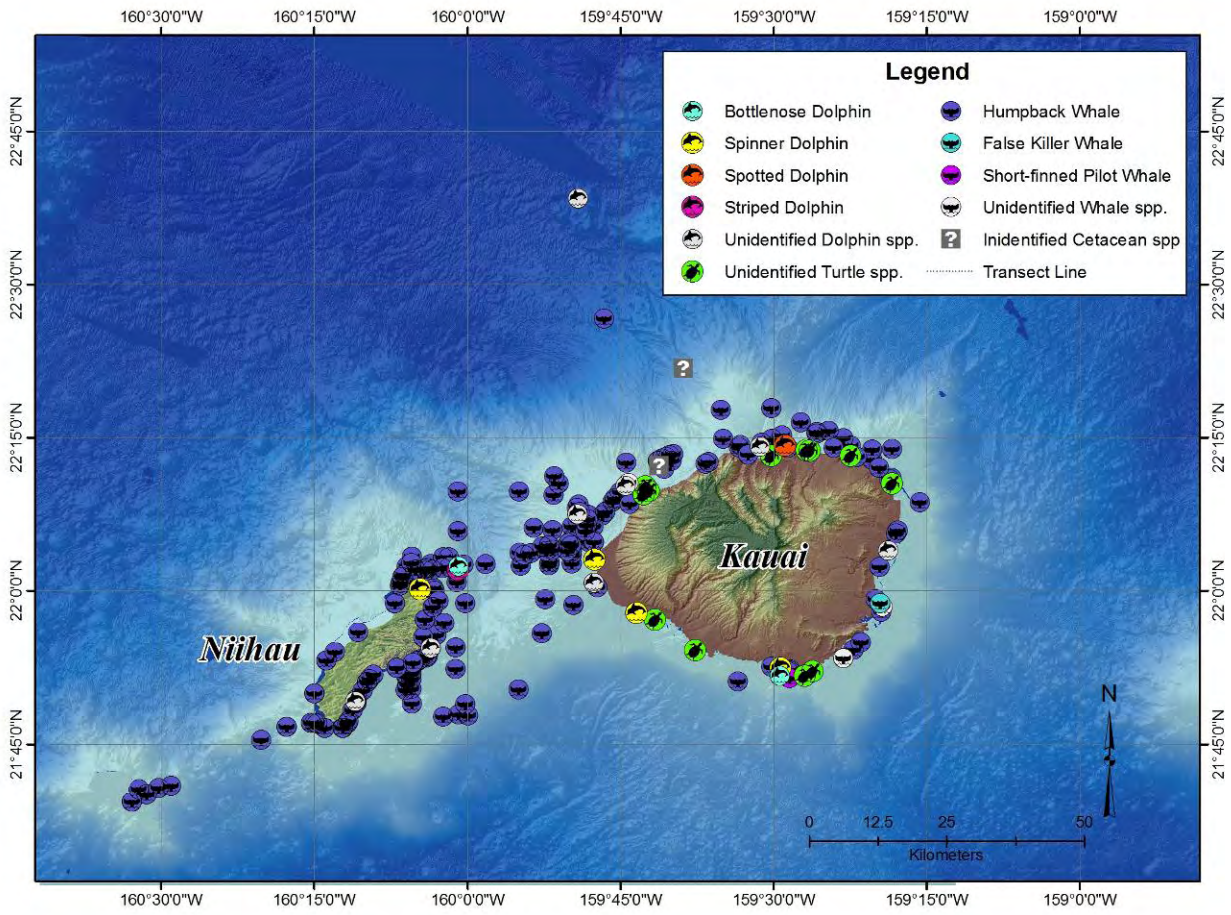

Figure 6. All sightings combined. Locations of sightings from all three survey modalities combined (transect, ship follow and circumnavigation).

Focal Follows

Focal follows were conducted while circling at an altitude of ~1000-1500 ft and a lateral distance of ~1 km (summarized in Table 4). Only one focal behavioral follow was conducted while monitoring near the FFG (Feb 19) involving a pod of two humpback whales. At closest proximity, the pod was located within 1-2 km of the ship, and was observed for a total period of approximately 46 min; however the whales were not in view the entire time due to either high sea state or when traveling underwater. During surface observations, no obvious indications of stress were seen; i.e., the animals did not assume a defensive posture nor did they dive quickly; though, as noted earlier, any specific response to MFAS could not be determined since the observers were unaware of sonar transmission status throughout the event.

Two additional focal follows were initiated, including a surface active pod of 8-9 humpbacks off the northwest Kauai coast engaged in competitive behavior that were observed for a total of 11 min. A third focal follow involved a pod of approx 12 false killer whales sighted immediately upon take-off from Lihue Airport, Kauai. This session had to be curtailed after two minutes for safety reasons since the survey plane was in the path of approaching aircraft.

In all cases, behavior was called out in real time and recorded onto the audio of the digital videocam. The digital video files (as well as still photos) will be made available to the Navy for subsequent behavioral analysis.

Table 4. Summary of Video Log for Focal Follows (see detailed behavior summary in Appendix C)

Date	Near the FFG?	Time Start	Time End	Total Length (min)	Behavior	Species	Comp (# indiv)	Quality
18-Feb	No	10:31:21	10:42:15	~11:00	Surface active, Affiliation, competitive, travelling	Humpback whales	8-9	Fair
19-Feb	Yes	10:07:00	10:53	~46:00	Surface active, Travel NW	Humpback whales	2	Fair
20-Feb	No	7:40	7:42	~2:00	fast travel	False killer whales	~12	Poor

Communications

Communications were reliably established between the survey aircraft and the FFG using aviation band VHF radios broadcasting on 123.45 MHz. The NTR used a handheld aviation VHF radio while on the bridge wing of the FFG. This system proved to be reliable whenever the aircraft was in the vicinity of the ship (i.e., <10 km); whereas communications at greater distances were possible via radio communications with PMRF Range Control or Outrider Bravo, with the exception of Kaula Island, which was beyond the range of communications (see Recommendations). Daily locations of the FFG were usually communicated via cell phone from Navy POCs to the PI (JM) before the observer aircraft left the Lihue airport and/or once in the air via PMRF Range Control or Outrider Bravo.

Section 4 Discussion

As stated in the SOW, the survey mission was to "monitor and report the presence/absence, distribution/redistribution, reaction/no reaction, injury, and/or mortality of marine mammals and sea turtles before, during and after the event." Evidence regarding each of these points is summarized below:

a) Presence/absence—this category is best dealt with using an aggregate index such as "overall sightings per km" reported earlier. The observed sighting rates for humpbacks (.044 sightings/km) suggest that humpbacks were present in the target area at higher densities than previously reported for this area (Mobley, 2006), consistent with reports of an increasing winter population (Calambokidis et al. 2008; Mobley 2004). The sighting rate for odontocetes (.007 sightings/km) was slightly higher than that reported earlier for the same region with no training events ongoing (Mobley 2004) implying that odontocetes were present in the area consistent with previous baseline densities. It is recommended

that the presence/absence criterion not be applied on a species-by-species basis due to the normal variability of species seen from survey to survey; i.e., the presence or absence of a given species for all except the most abundant species (i.e., humpbacks) is uninformative.

b) Distribution/redistribution—the same principle described above applies to assessing changes in distribution as well; i.e., changes in distribution can only be reliably detected for the most abundant species, e.g., seasonally present humpbacks in this case. If one examines the locations of humpbacks observed in this survey series (Figure 6), it is clear that they were seen throughout their normal preferred habitat of shallow, coastal regions. In contrast, since the distribution of odontocetes is typically sparse, particularly for tropical waters such as Hawaii (Barlow, 2006), discerning distribution change is made difficult. Sea turtles as well are sparsely distributed, and only seen occasionally along primarily sand-bottom coastal regions (see Recommendations), so it is similarly difficult to discern changes in distribution for these species.

c) Reaction/no reaction—for this category one must be able to distinguish reactions to the observation platform (survey aircraft in this case) from reactions related to the training event (e.g., MFAS). For that reason, the best source of data would be to aggregate the focal follow observations across multiple trials based on observations from non-reactive platforms (e.g., aircraft ≥ 457 m). In that way one can discern changes in respiration rates, dive times, etc., that may correlate with MFAS transmissions with little or no reactivity to the platform itself. To that end, we will continue to provide Navy sponsors with videotaped results of focal follows, as well as detailed behavioral logs (Appendix C).

d) Injury and/or mortality—Injury and/or mortality is readily discernible for each of the target species due to marked reduction or cessation of locomotion as well as via other cues, such as visible wounds or blood. As such it is arguably the most detectible of the four categories listed here. There was no evidence of injury and/or mortality for any of the target species observed before, during or after the training event.

Given the caveats noted above, overall there were no direct observations of adverse effects of the training event. As concerns the effects of sonar, since the status of MFAS transmissions throughout the survey period were unknown, any specific response of the animals observed to such transmissions would require more detailed behavioral analyses by the Navy. The time-stamped audio/video files from the focal follows will be provided to the Navy in order to enable such detailed analyses. Per the SOW, the data obtained in this study are meant to contribute to a growing baseline of information on the distribution, occurrence, and behavior of MM/ST near Navy training events in the HRC per the HRC marine species monitoring plan (DoN 2009a) and as revised in the Pacific Fleet Annual Monitoring Report (DoN 2009b).

Section 5 Recommendations

In light of the issues summarized in this report, the following recommendations are offered:

1) Continue focal follow approach at non-reactive altitudes (e.g., > 457 m)—In contrast to ship-based platforms (other than sailboats) where engine noise can be

detectible over relatively large distances, survey aircraft can be flown at altitudes sufficient to attenuate engine noise to non-reactive levels. Altitudes of 457 m (1500 ft) or higher have been shown to be effective in this regard (e.g., Smultea, Kieckhefer and Bowles, 1995). Thus any observed effects can be attributed to sources other than the observation platform itself.

2) Promote development of baseline behavior and density database for more abundant species (e.g., humpback whales; spinner dolphins). Discerning effects of MFAS or any other training event-related stimulus requires comparisons with baseline behavior and densities particularly for the more abundant species where sufficient statistical power can be more readily obtained. For the Hawaii Range Complex (HRC) the more abundant species include the seasonally present humpbacks, as well as spinner dolphins that are present year-round (Mobley 2004). It is recommended that the Navy consider promoting the development of these databases to facilitiate such comparisons.

3) Consider limiting sea turtles as target species for coastal surveys only since they can only be reliably detected along coastlines with primarily sandy bottoms. Sea turtles are rarely observed during open ocean surveys.

4) Consider revising goal of detecting "presence/absence" to focus primarily on aggregate indices such as sighting rates (e.g., sightings/km). For reasons noted above, applying a presence/absence criterion on a species by species basis, except for the most abundant species (e.g., wintering humpbacks), is not a defendable approach.

5) Consider revising goal of detecting "redistribution" to focus similarly on more abundant species (e.g., humpbacks) where changes in distribution are more readily discernible.

6) For aircraft surveys, remove Kaula Island from the list of regions to be surveyed—Communications were reliably established throughout the survey range, with the exception of Kaula Rock located 25 nmi southwest of Niihau. For safety reasons it is recommended that this location not be included in future aircraft survey SOWs.

Section 6 Acknowledgements

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Appendices—Guide to Species:

Species Code	Species (Latin name)
GM	short-finned pilot whale (*Globicephala macrorhynchus*)
MN	humpback whale (*Megaptera novaeangliae*)
PC	false killer whale (*Pseudorca crassidens*)
SA	spotted dolphin (*Stenella attenuata*)
SC	striped dolphin (*Stenella coeruleoalba)*
SL	spinner dolphin (*Stenella longirostris*)
TT	bottlenose dolphin (*Tursiops truncatus)*
UB	unidentified blackfish spp
UC	unidentified cetacean spp.
UD	unidentified dolphin spp.
UW	unidentified whale spp.
UT	unidentified sea turtle spp.

Appendix A: Summary of Sightings with Positions (GPS)

Date	Time	Species	Composition (# Indivs)	Latitude (degrees)	Latitude (minutes)	Longitude (degrees)	Longitude (minutes)
2/15/2010	15:38:30	MN	2		GPS malfunction		
2/15/2010	15:51:30	MN	1		GPS malfunction		
2/15/2010	15:52:40	MN	1		GPS malfunction		
2/15/2010	16:09:30	MN	1		GPS malfunction		
2/15/2010	16:13:30	MN	1		GPS malfunction		
2/15/2010	16:18:50	MN	2		GPS malfunction		
2/15/2010	16:19:06	MN	2		GPS malfunction		
2/16/2010	7:44:30	MN	2	22	14.244	159	20.983
2/16/2010	7:45:30	MN	2	22	14.983	159	23.149
2/16/2010	7:46:35	MN	2	22	15.410	159	25.781
2/16/2010	7:50:40	MN	1	22	14.922	159	34.931
2/16/2010	7:52:50	MN	3	22	13.435	159	39.817
2/16/2010	7:53:00	MN	1	22	13.273	159	40.188
2/16/2010	7:53:10	MN	1	22	13.107	159	40.558
2/16/2010	7:53:12	MN	1	22	12.937	159	40.926
2/16/2010	7:53:20	MN	1	22	12.937	159	40.926
2/16/2010	7:53:23	MN	1	22	12.758	159	41.290
2/16/2010	7:53:24	MN	1	22	12.758	159	41.290
2/16/2010	7:53:30	MN	2	22	12.758	159	41.290
2/16/2010	7:55:00	UW	1	22	10.600	159	44.195
2/16/2010	7:55:10	UD	1	22	10.312	159	44.481
2/16/2010	7:55:30	MN	1	22	9.698	159	45.012
2/16/2010	7:55:50	MN	1	22	9.053	159	45.528
2/16/2010	7:56:00	MN	1	22	8.736	159	45.785
2/16/2010	7:56:30	MN	2	22	7.735	159	46.505
2/16/2010	7:56:35	MN	3	22	7.402	159	46.748
2/16/2010	7:57:30	MN	1	22	6.468	159	48.448
2/16/2010	7:58:30	MN	1	22	8.137	159	49.266
2/16/2010	7:58:40	MN	1	22	8.448	159	49.088
2/16/2010	8:28:25	UD	20	22	37.356	159	49.385
2/16/2010	8:50:30	MN	4	22	6.277	159	49.755
2/16/2010	8:51:00	MN	2	22	5.088	159	49.771
2/16/2010	8:51:30	MN	2	22	3.890	159	49.770
2/16/2010	8:51:40	MN	1	22	3.495	159	49.767
2/16/2010	8:52:00	MN	1	22	2.702	159	49.759
2/16/2010	8:53:40	MN	2	21	56.152	159	49.490
2/16/2010	9:04:30	MN	1	21	55.842	159	52.719
2/16/2010	9:06:25	MN	4	21	59.187	159	52.368
2/16/2010	9:08:30	MN	4	22	2.497	159	51.984
2/16/2010	9:08:40	MN	2	22	2.775	159	51.939
2/16/2010	9:10:30	MN	3	22	5.937	159	51.650
2/16/2010	9:12:30	MN	1	22	9.403	159	51.551
2/16/2010	9:13:30	MN	1	22	11.231	159	51.510

Appendix A: (cont.)

Date	Time	Species	Composition (# Indivs)	Latitude (degrees)	Latitude (minutes)	Longitude (degrees)	Longitude (minutes)
2/16/2010	9:52:40	MN	1	22	9.715	160	0.903
2/16/2010	9:56:50	MN	1	22	1.832	160	1.041
2/16/2010	9:57:20	MN	1	22	0.862	160	1.027
2/16/2010	10:01:40	MN	1	21	52.351	160	1.128
2/16/2010	10:19:30	MN	5	21	51.756	159	29.790
2/16/2010	10:25:30	GM	2	21	52.312	159	28.763
2/16/2010	10:27:30	MN	2	21	52.277	159	28.357
2/16/2010	10:30:30	MN	1	21	52.013	159	29.137
2/16/2010	10:30:30	TT	2	21	52.013	159	29.137
2/16/2010	10:34:30	SL	50	21	52.539	159	28.966
2/16/2010	12:07:30	UT	1	21	52.135	159	26.139
2/16/2010	12:07:45	MN	2	21	51.798	159	26.661
2/16/2010	12:08:00	UT	1	21	51.687	159	26.947
2/16/2010	12:11:50	MN	1	21	51.148	159	33.463
2/16/2010	12:28:25	MN	12	21	48.908	160	0.193
2/16/2010	12:29:30	MN	4	21	47.885	160	0.854
2/16/2010	12:30:30	MN	2	21	48.421	159	59.432
2/16/2010	12:37:30	MN	2	21	50.332	160	5.791
2/16/2010	12:37:50	MN	1	21	50.853	160	5.869
2/16/2010	12:38:15	MN	2	21	51.641	160	5.914
2/16/2010	12:40:00	MN	1	21	53.641	160	3.853
2/16/2010	12:44:30	MN	5	21	58.791	160	0.200
2/16/2010	12:53:30	MN	1	22	2.442	159	54.766
2/16/2010	12:55:40	MN	1	22	2.652	159	58.227
2/16/2010	13:04:15	MN	1	22	3.297	160	1.836
2/16/2010	13:04:35	MN	2	22	3.306	160	2.385
2/16/2010	13:06:30	MN	2	22	3.325	160	5.428
2/16/2010	13:55:30	MN	2	22	14.324	159	33.247
2/16/2010	13:56:30	MN	2	22	14.539	159	31.171
2/16/2010	13:57:00	MN	3	22	14.897	159	30.172
2/16/2010	13:57:30	MN	3	22	15.237	159	29.153
2/16/2010	13:59:00	MN	1	22	15.595	159	25.762
2/16/2010	13:59:30	MN	1	22	15.671	159	24.598
2/16/2010	14:02:30	MN	1	22	13.931	159	18.374
2/16/2010	14:05:30	MN	2	22	8.689	159	15.671
2/17/2010	9:43:06	MN	1	21	47.674	160	2.397
2/17/2010	9:46:39	MN	1	21	50.306	160	6.027
2/17/2010	9:47:36	MN	1	21	51.656	160	5.974
2/17/2010	10:41:56	MN	1	22	17.735	159	35.124
2/17/2010	12:46:30	MN	1	22	14.248	159	24.826
2/17/2010	12:52:24	MN	3	22	15.004	159	33.586
2/17/2010	15:44:30	MN	1	22	4.909	159	18.048
2/18/2010	7:36:50	MN	3	22	7.903	159	16.949
2/18/2010	7:40:12	MN	4	22	13.094	159	20.251
2/18/2010	7:42:27	MN	1	22	14.492	159	23.954

Appendix A: (cont.)

Date	Time	Species	Composition (# Indivs)	Latitude (degrees)	Latitude (minutes)	Longitude (degrees)	Longitude (minutes)
2/18/2010	7:43:48	MN	3	22	14.702	159	26.489
2/18/2010	7:49:05	MN	3	22	13.525	159	36.361
2/18/2010	7:49:18	MN	1	22	13.371	159	36.648
2/18/2010	7:51:02	MN	2	22	11.974	159	40.107
2/18/2010	8:01:00	MN	1	22	15.954	159	50.068
2/18/2010	10:30:19	MN	8	22	13.543	159	38.272
2/18/2010	12:43:05	MN	5	22	8.976	159	17.384
2/18/2010	12:53:44	MN	1	22	14.223	159	35.037
2/18/2010	12:58:15	MN	1	22	10.409	159	44.144
2/18/2010	14:45:30	MN	2	22	19.354	159	40.221
2/18/2010	14:48:56	MN	1	22	15.632	159	30.153
2/18/2010	14:52:53	MN	2	22	10.308	159	18.126
2/18/2010	14:54:30	MN	1	22	7.142	159	17.416
2/19/2010	7:43:29	MN	1	22	14.251	159	26.477
2/19/2010	7:44:39	MN	3	22	14.498	159	28.976
2/19/2010	10:00:10	MN	2	22	36.802	159	57.876
2/19/2010	11:13:30	MN	5	22	17.577	159	31.465
2/19/2010	11:14:52	MN	1	22	16.461	159	28.592
2/19/2010	11:17:23	MN	3	22	14.614	159	23.104
2/19/2010	11:18:04	MN	3	22	13.901	159	21.725
2/19/2010	11:18:49	MN	2	22	12.878	159	20.073
2/19/2010	11:20:52	MN	1	22	9.249	159	17.228
2/19/2010	11:21:52	MN	1	22	6.862	159	17.125
2/19/2010	12:46:03	MN	3	22	0.984	159	19.234
2/19/2010	12:48:07	MN	3	22	3.721	159	17.931
2/19/2010	12:49:54	MN	2	22	6.640	159	17.153
2/19/2010	12:53:42	MN	2	22	12.572	159	19.605
2/19/2010	12:54:55	MN	2	22	13.946	159	21.476
2/19/2010	12:55:06	MN	1	22	14.108	159	21.776
2/19/2010	12:55:07	MN	2	22	14.108	159	21.776
2/19/2010	12:55:32	MN	1	22	14.430	159	22.761
2/19/2010	12:57:00	MN	2	22	14.610	159	25.967
2/19/2010	12:57:01	MN	1	22	14.610	159	25.967
2/19/2010	13:00:30	MN	1	22	14.567	159	33.602
2/19/2010	13:01:58	MN	3	22	13.760	159	36.380
2/19/2010	13:04:38	MN	2	22	11.438	159	41.824
2/19/2010	13:05:00	MN	1	22	10.919	159	42.793
2/19/2010	14:42:31	MN	1	22	21.673	159	42.354
2/19/2010	14:48:32	MN	2	22	16.944	159	31.520
2/19/2010	14:52:05	MN	1	22	14.670	159	24.759
2/19/2010	14:56:00	MN	1	22	11.371	159	18.313
2/19/2010	14:56:28	MN	1	22	10.862	159	17.886
2/19/2010	14:58:40	MN	1	22	5.935	159	17.771
2/20/2010	7:34:34	PC	12	21	58.698	159	20.580
2/20/2010	7:34:34	MN	2	21	58.698	159	20.580

Appendix A: (cont.)

Date	Time	Species	Composition (# Indivs)	Latitude (degrees)	Latitude (minutes)	Longitude (degrees)	Longitude (minutes)
2/20/2010	8:13:50	SA	1	22	14.257	159	28.866
2/20/2010	8:15:00	UD	6	22	14.133	159	31.318
2/20/2010	8:16:00	MN	1	22	14.099	159	33.359
2/20/2010	8:43:39	MN	2	22	12.764	159	39.968
2/20/2010	8:45:36	MN	1	22	11.943	159	40.678
2/20/2010	8:45:58	UC	3	22	12.236	159	41.198
2/20/2010	8:48:00	MN	2	22	12.564	159	44.432
2/20/2010	9:27:30	UD	4	22	7.501	159	49.181
2/20/2010	9:27:48	MN	1	22	6.901	159	49.145
2/20/2010	9:29:30	MN	2	22	4.769	159	48.114
2/20/2010	9:29:41	MN	2	22	5.236	159	47.773
2/20/2010	9:30:28	MN	1	22	6.315	159	47.658
2/20/2010	9:32:46	MN	1	22	7.439	159	48.150
2/20/2010	9:33:13	MN	1	22	6.552	159	48.027
2/20/2010	9:36:40	MN	1	22	0.540	159	48.657
2/20/2010	9:45:24	MN	2	21	50.356	159	54.974
2/20/2010	9:53:00	MN	1	22	3.732	159	54.846
2/20/2010	9:55:20	MN	1	22	6.210	159	53.489
2/20/2010	10:00:38	MN	1	22	9.767	159	54.920
2/20/2010	10:05:50	MN	1	22	10.521	159	51.015
2/20/2010	10:47:38	MN	1	22	5.861	160	0.919
2/20/2010	10:49:30	TT	8	22	2.393	160	0.877
2/20/2010	10:49:31	SC	60	22	2.075	160	0.912
2/20/2010	10:52:11	MN	2	22	2.640	160	3.574
2/20/2010	10:55:15	MN	1	22	1.580	160	4.677
2/20/2010	10:56:29	MN	2	22	0.023	160	3.226
2/20/2010	11:06:50	MN	2	21	55.699	160	1.117
2/20/2010	11:07:22	MN	1	21	54.486	160	1.137
2/20/2010	11:13:57	MN	1	21	48.946	160	5.453
2/20/2010	11:14:49	MN	2	21	50.413	160	5.491
2/20/2010	11:15:20	MN	1	21	51.323	160	5.496
2/20/2010	11:15:37	MN	1	21	51.920	160	5.497
2/20/2010	11:15:52	MN	1	21	52.523	160	5.484
2/20/2010	11:16:04	MN	1	21	52.790	160	5.384
2/20/2010	11:16:22	MN	2	21	53.124	160	4.899
2/20/2010	11:16:40	MN	1	21	53.280	160	4.661
2/20/2010	11:20:54	MN	1	21	53.487	160	4.051
2/20/2010	11:20:55	MN	1	21	53.487	160	4.051
2/20/2010	11:21:35	UD	50	21	54.431	160	3.606
2/20/2010	11:21:36	MN	1	21	54.431	160	3.606
2/20/2010	11:22:29	MN	3	21	55.698	160	3.029
2/20/2010	11:23:13	MN	1	21	56.860	160	2.256
2/20/2010	11:25:40	MN	2	22	0.281	160	3.301
2/20/2010	11:26:44	MN	1	22	1.609	160	4.992
2/20/2010	11:26:45	MN	1	22	1.609	160	4.992

Appendix A: (cont.)

Date	Time	Species	Composition (# Indivs)	Latitude (degrees)	Latitude (minutes)	Longitude (degrees)	Longitude (minutes)
2/20/2010	11:27:18	MN	2	22	2.185	160	5.703
2/20/2010	11:27:30	MN	1	22	2.386	160	5.935
2/20/2010	12:05:59	MN	1	22	26.676	159	46.598
2/20/2010	12:10:03	UC	2	22	21.786	159	38.832
2/20/2010	12:14:29	MN	1	22	17.921	159	30.213
2/20/2010	12:15:58	MN	1	22	16.534	159	27.330
2/20/2010	12:18:24	MN	1	22	14.243	159	22.434
2/20/2010	12:19:40	MN	3	22	12.844	159	20.318
2/20/2010	12:20:46	MN	2	22	11.075	159	18.432
2/20/2010	12:24:55	MN	1	22	2.328	159	19.594
2/21/2010	8:58:54	MN	2	21	59.210	159	19.956
2/21/2010	8:59:50	UW	1	21	58.447	159	19.303
2/21/2010	9:04:23	MN	1	21	54.936	159	21.449
2/21/2010	9:04:59	MN	1	21	54.212	159	22.119
2/21/2010	9:05:35	UW	1	21	53.401	159	23.159
2/21/2010	9:09:14	MN	1	21	52.570	159	30.213
2/21/2010	9:13:02	UT	1	21	54.198	159	37.652
2/21/2010	9:15:47	UT	2	21	57.167	159	41.609
2/21/2010	9:16:50	SL	100	21	57.843	159	43.403
2/21/2010	9:29:23	MN	1	22	0.331	159	47.240
2/21/2010	9:29:48	MN	2	22	0.790	159	47.602
2/21/2010	9:29:48	UD	4	22	0.790	159	47.602
2/21/2010	9:33:03	SL	14	22	3.049	159	47.529
2/21/2010	9:44:37	MN	2	22	4.770	159	47.574
2/21/2010	9:44:40	MN	1	22	4.770	159	47.574
2/21/2010	9:45:58	MN	1	22	4.454	159	49.792
2/21/2010	9:47:50	MN	2	22	3.909	159	50.200
2/21/2010	9:48:35	MN	2	22	4.011	159	51.643
2/21/2010	9:49:00	MN	1	22	3.903	159	52.251
2/21/2010	9:49:49	MN	1	22	3.594	159	54.114
2/21/2010	9:50:07	MN	2	22	3.533	159	54.427
2/21/2010	9:53:10	MN	2	22	2.557	160	0.364
2/21/2010	9:53:50	MN	1	22	2.369	160	1.740
2/21/2010	9:54:07	MN	1	22	2.265	160	2.425
2/21/2010	9:54:39	MN	2	22	2.086	160	3.446
2/21/2010	9:54:58	MN	2	22	1.966	160	4.123
2/21/2010	9:55:23	MN	1	22	2.057	160	5.104
2/21/2010	9:56:20	MN	1	22	2.721	160	5.477
2/21/2010	10:00:07	SL	15	22	0.207	160	4.655
2/21/2010	10:03:47	MN	9	21	59.026	160	2.825
2/21/2010	10:04:14	MN	1	21	58.383	160	3.390
2/21/2010	10:04:15	MN	2	21	58.383	160	3.390
2/21/2010	10:04:17	MN	1	21	58.383	160	3.390
2/21/2010	10:05:05	MN	1	21	57.193	160	4.125

Appendix A: (cont.)

Date	Time	Species	Composition (# Indivs)	Latitude (degrees)	Latitude (minutes)	Longitude (degrees)	Longitude (minutes)
2/21/2010	10:05:07	MN	1	21	57.193	160	4.125
2/21/2010	10:06:08	MN	1	21	55.451	160	4.327
2/21/2010	10:07:43	MN	12	21	52.975	160	5.343
2/21/2010	10:08:38	MN	1	21	52.447	160	6.953
2/21/2010	10:08:39	MN	1	21	52.447	160	6.953
2/21/2010	10:09:49	MN	1	21	51.803	160	9.189
2/21/2010	10:10:09	MN	1	21	51.339	160	9.624
2/21/2010	10:10:15	MN	1	21	51.075	160	9.798
2/21/2010	10:10:16	MN	1	21	51.075	160	9.798
2/21/2010	10:10:41	MN	2	21	50.253	160	10.286
2/21/2010	10:11:15	MN	1	21	49.461	160	10.817
2/21/2010	10:11:30	SL	80	21	49.184	160	10.965
2/21/2010	10:17:52	MN	2	21	49.253	160	10.879
2/21/2010	10:18:06	MN	1	21	49.001	160	10.858
2/21/2010	10:18:08	MN	3	21	49.001	160	10.858
2/21/2010	10:18:36	MN	1	21	48.319	160	11.288
2/21/2010	10:19:20	MN	3	21	47.261	160	11.637
2/21/2010	10:19:21	MN	3	21	46.989	160	11.737
2/21/2010	10:19:41	MN	1	21	46.599	160	12.204
2/21/2010	10:19:42	MN	2	21	46.599	160	12.204
2/21/2010	10:19:43	MN	3	21	46.599	160	12.204
2/21/2010	10:19:44	MN	2	21	46.599	160	12.204
2/21/2010	10:19:45	MN	2	21	46.599	160	12.204
2/21/2010	10:19:47	MN	2	21	46.599	160	12.204
2/21/2010	10:19:48	MN	3	21	46.599	160	12.204
2/21/2010	10:23:30	MN	2	21	46.592	160	13.987
2/21/2010	10:23:56	MN	1	21	47.017	160	14.693
2/21/2010	10:24:10	MN	1	21	47.074	160	15.009
2/21/2010	10:24:11	MN	2	21	47.077	160	15.323
2/21/2010	10:24:12	MN	2	21	47.077	160	15.323
2/21/2010	10:32:25	MN	3	21	46.999	160	15.625
2/21/2010	10:33:01	MN	1	21	40.075	160	31.444
2/21/2010	10:34:36	MN	2	21	39.351	160	32.901
2/21/2010	10:34:37	MN	1	21	39.351	160	32.901
2/21/2010	10:36:10	MN	1	21	40.546	160	32.205
2/21/2010	10:38:29	MN	2	21	40.931	160	29.041
2/21/2010	10:43:49	MN	1	21	45.412	160	20.225
2/21/2010	10:45:20	MN	5	21	46.699	160	17.685
2/21/2010	10:45:21	MN	4	21	46.832	160	17.388
2/21/2010	10:47:58	MN	2	21	49.982	160	14.998
2/21/2010	10:47:59	MN	1	21	49.982	160	14.998
2/21/2010	10:51:30	MN	2	21	53.211	160	13.833
2/21/2010	10:51:31	MN	2	21	53.443	160	13.660
2/21/2010	10:52:02	MN	3	21	54.031	160	12.968
2/21/2010	10:55:48	MN	3	21	55.962	160	10.711

Appendix A: (cont.)

Date	Time	Species	Composition (# Indivs)	Latitude (degrees)	Latitude (minutes)	Longitude (degrees)	Longitude (minutes)
2/21/2010	10:58:30	MN	3	21	58.809	160	7.113
2/21/2010	10:59:30	MN	1	22	0.504	160	6.576
2/21/2010	10:59:35	MN	2	22	0.798	160	6.533
2/21/2010	10:59:57	MN	1	22	1.365	160	6.361
2/21/2010	11:00:10	MN	2	22	1.589	160	6.182
2/21/2010	11:01:15	MN	1	22	2.206	160	4.162
2/21/2010	11:01:28	MN	3	22	2.253	160	3.854
2/21/2010	11:07:22	MN	2	22	4.376	159	52.625
2/21/2010	11:07:42	MN	1	22	4.470	159	51.996
2/21/2010	11:07:43	MN	2	22	4.470	159	51.996
2/21/2010	11:08:49	MN	1	22	4.694	159	50.083
2/21/2010	11:08:50	MN	1	22	4.694	159	50.083
2/21/2010	11:10:20	MN	2	22	5.872	159	48.450
2/21/2010	11:10:37	MN	4	22	6.456	159	48.302
2/21/2010	11:10:52	MN	3	22	7.045	159	48.187
2/21/2010	11:12:15	MN	2	22	7.743	159	48.967
2/21/2010	11:15:33	MN	1	22	8.533	159	44.105
2/21/2010	11:21:01	UT	12	22	10.013	159	42.495
2/21/2010	11:20:11	UT	1	22	10.247	159	42.534
2/21/2010	11:22:53	MN	3	22	9.675	159	42.683
2/21/2010	11:23:16	UT	1	22	9.818	159	42.186
2/21/2010	11:26:50	MN	1	22	12.457	159	36.667
2/21/2010	11:27:00	MN	2	22	12.605	159	36.395
2/21/2010	11:29:16	MN	2	22	13.360	159	32.474
2/21/2010	11:30:31	UT	1	22	13.257	159	30.181
2/21/2010	11:31:38	MN	2	22	13.993	159	28.611
2/21/2010	11:32:40	UT	2	22	13.775	159	26.747
2/21/2010	11:32:42	UT	3	22	13.740	159	26.448
2/21/2010	11:34:08	MN	1	22	14.043	159	24.078
2/21/2010	11:35:10	UT	1	22	13.243	159	22.399
2/21/2010	11:35:28	MN	2	22	13.103	159	21.789
2/21/2010	11:36:44	MN	1	22	12.079	159	19.647
2/21/2010	11:37:35	MN	1	22	10.988	159	18.627
2/21/2010	11:37:56	UT	5	22	10.530	159	18.360
2/21/2010	11:40:41	MN	4	22	5.925	159	17.838
2/21/2010	11:41:00	MN	2	22	5.640	159	17.960
2/21/2010	11:42:00	UD	4	22	3.940	159	18.745

APPENDIX B: Summary of Sightings and Behavior MN = humpback whale; UW = unidentified whale; UD = unidentified dolphin spp.

Date	Time	Grp #	Focal Follow	Grp Size (calf)	Species	Behavior	Animal Bearing (degrees)	Comments
2/15/2010	15:38:30	1	No	2	MN	N/A	N/A	GPS malfunction
2/15/2010	15:51:30	2	No	1	MN	N/A	N/A	GPS malfunction
2/15/2010	15:52:40	3	No	1	MN	N/A	N/A	GPS malfunction
2/15/2010	16:09:30	4	No	1	MN	N/A	N/A	GPS malfunction
2/15/2010	16:13:30	5	No	1	MN	N/A	N/A	GPS malfunction
2/15/2010	16:18:50	6	No	2	MN	N/A	N/A	GPS malfunction
2/15/2010	16:19:06	7	No	2	MN	N/A	N/A	GPS malfunction
2/16/2010	7:44:30	8	No	2	MN	N/A	N/A	
2/16/2010	7:45:30	9	No	2	MN	N/A	N/A	
2/16/2010	7:46:35	10	No	2	MN	N/A	N/A	
2/16/2010	7:50:40	11	No	1	MN	N/A	N/A	
2/16/2010	7:52:50	12	No	3	MN	N/A	N/A	
2/16/2010	7:53:00	13	No	1	MN	N/A	N/A	
2/16/2010	7:53:10	14	No	1	MN	N/A	N/A	
2/16/2010	7:53:12	15	No	1	MN	N/A	N/A	
2/16/2010	7:53:20	16	No	1	MN	N/A	N/A	
2/16/2010	7:53:23	17	No	1	MN	N/A	N/A	
2/16/2010	7:53:24	18	No	1	MN	N/A	N/A	
2/16/2010	7:53:30	19	No	2	MN	N/A	N/A	
2/16/2010	7:55:00	20	No	1	UW	N/A	N/A	
2/16/2010	7:55:10	21	No	1	UD	N/A	N/A	
2/16/2010	7:55:30	22	No	1	MN	N/A	N/A	

APPENDIX B (cont.) MN = humpback whale; UD = unidentified dolphin spp.

Date	Time	Grp #	Focal Follow	Grp Size (calf)	Species	Behavior	Animal Bearing (degrees)	Comments
2/16/2010	7:55:50	23	No	1	MN	N/A	N/A	
2/16/2010	7:56:00	24	No	1	MN	N/A	N/A	
2/16/2010	7:56:30	25	No	2	MN	N/A	N/A	
2/16/2010	7:56:35	26	No	3	MN	N/A	N/A	
2/16/2010	7:57:30	27	No	1	MN	N/A	N/A	
2/16/2010	7:58:30	28	No	1	MN	N/A	N/A	
2/16/2010	7:58:40	29	No	1	MN	N/A	N/A	
2/16/2010	8:28:25	30	No	20	UD	N/A	N/A	
2/16/2010	8:50:30	31	No	4	MN	Fast Travel N	0	
2/16/2010	8:51:00	32	No	2	MN	W	270	
2/16/2010	8:51:30	33	No	2	MN	Slow Travel N	0	
2/16/2010	8:51:40	34	No	1	MN	Slow Travel S	180	
2/16/2010	8:52:00	35	No	1	MN	Dive	N/A	
2/16/2010	8:53:40	36	No	2	MN	Slow SE	135	
2/16/2010	9:04:30	37	No	1	MN	Slow S	180	
2/16/2010	9:06:25	38	No	4	MN	SW	225	
2/16/2010	9:08:30	39	No	4	MN	N/A	N/A	
2/16/2010	9:08:40	40	No	2	MN	N/A	N/A	
2/16/2010	9:10:30	41	No	3	MN	N/A	N/A	
2/16/2010	9:12:30	42	No	1	MN	SE	135	
2/16/2010	9:13:30	43	No	1	MN	Breach W	270	
2/16/2010	9:52:40	44	No	1	MN	Tail Slapping	N/A	
2/16/2010	9:56:50	45	No	1	MN	Slow S	180	
2/16/2010	9:57:20	46	No	1	MN	Breach	N/A	

APPENDIX B (cont.): MN = humpback whale; GM = short-finned pilot whale; TT = bottlenose dolphin; UT = unid sea turtle; SL = spinner dolphin

Date	Time	Grp #	Focal Follow	Grp Size (calf)	Species	Behavior	Animal Bearing (degrees)	Comments
2/16/2010	10:01:40	47	No	1	MN	Surface Active NE	45	
2/16/2010	10:19:30	48	No	5 (1)	MN	Slow Travel NE/Milling	45	Initially group of 2 MN (slow Travel NE) that joined with 3 other MN's apprx. 1 min after the 1st sighting of the 2 MN's.
2/16/2010	10:25:30	49	No	2	GM	N/A	N/A	
2/16/2010	10:27:30	50	No	2	MN	Slow UW	N/A	
2/16/2010	10:30:30	51	No	1	MN	N/A	N/A	
2/16/2010	10:30:30	52	No	2	TT	Slow with MN above	N/A	
2/16/2010	10:34:30	53	No	50	SL	N/A	N/A	
2/16/2010	12:07:30	54	No	1	UT	Slow Swim SE	135	
2/16/2010	12:07:45	55	No	2	MN	N/A	N/A	
2/16/2010	12:08:00	56	No	1	UT	Slow Swim	N/A	
2/16/2010	12:11:50	57	No	1	MN	Slow Swim W	270	
2/16/2010	12:28:25	58	No	12	MN	Slow Swim W	270	
2/16/2010	12:29:30	59	No	4	MN	Slow Swim SW	225	
2/16/2010	12:30:30	60	No	2	MN	E	90	
2/16/2010	12:37:30	61	No	2	MN	SE, bubbling	135	
2/16/2010	12:37:50	62	No	1	MN	SW	225	
2/16/2010	12:38:15	63	No	2	MN	Milling	N/A	
2/16/2010	12:40:00	64	No	1	MN	SA	N/A	
2/16/2010	12:44:30	65	No	5	MN	Slow Travel E	90	

APPENDIX B (cont):					MN = humpback whale			
Date	**Time**	**Grp #**	**Focal Follow**	**Grp Size (calf)**	**Species**	**Behavior**	**Animal Bearing (degrees)**	**Comments**
2/16/2010	12:53:30	66	No	1	MN	N/A	N/A	
2/16/2010	12:55:40	67	No	1	MN	SE	135	
2/16/2010	13:04:15	68	No	1	MN	Slow W	270	
2/16/2010	13:04:35	69	No	2	MN	Slow SW	225	
2/16/2010	13:06:30	70	No	2	MN	SA, N	0	
2/16/2010	13:55:30	71	No	2	MN	N/A	N/A	
2/16/2010	13:56:30	72	No	2	MN	NW	315	
2/16/2010	13:57:00	73	No	3	MN	W	270	
2/16/2010	13:57:30	74	No	3	MN	Head Lunge, W	270	
2/16/2010	13:59:00	75	No	1	MN	SA, NW	315	
2/16/2010	13:59:30	76	No	1	MN	E	90	
2/16/2010	14:02:30	77	No	1	MN	N/A	N/A	
2/16/2010	14:05:30	78	No	2	MN	N/A	N/A	
2/17/2010	9:43:06	79	No	1	MN	N/A	N/A	
2/17/2010	9:46:39	80	No	1	MN	Slow Travel NE	45	
2/17/2010	9:47:36	81	No	1	MN	Slow Travel NE	45	
2/17/2010	10:41:56	82	No	1	MN	Breach	N/A	
2/17/2010	12:46:30	83	No	1	MN	UW Swim E	90	
2/17/2010	12:52:24	84	No	3	MN	Slow Travel N	0	
2/17/2010	15:44:30	85	No	1	MN	Breach	N/A	
2/18/2010	7:35:46	86	No	3 (1)	MN	Slow Travel SE	135	
2/18/2010	7:40:12	87	No	4	MN	Under Water Travel NW	315	
2/18/2010	7:42:27	88	No	1	MN	Slow Travel E	90	

APPENDIX B (cont.):					MN = humpback whale			
Date	**Time**	**Grp #**	**Focal Follow**	**Grp Size (calf)**	**Species**	**Behavior**	**Animal Bearing (degrees)**	**Comments**
2/18/2010	7:43:48	89	No	3	MN	Travel ENE	68	
2/18/2010	7:49:05	90	No	3	MN	Fast Travel NE	45	
2/18/2010	7:49:18	91	No	1	MN	Fast Travel NE	45	
2/18/2010	7:51:02	92	No	2	MN	Slow Travel NE	45	
2/18/2010	8:01:00	93	Attempted	1	MN	N/A	N/A	Attempted focal follow but could not recapture
2/18/2010	10:30:19	94	Yes	8	MN	competition with affiliation	N/A	
2/18/2010	12:43:05	95	No	5	MN	Slow Swim SE	135	
2/18/2010	12:53:44	96	No	1	MN	Slow Swim E	90	
2/18/2010	12:58:15	97	No	1	MN	Slow Swim W	270	
2/18/2010	14:45:30	98	No	1	MN	Breach	N/A	
2/18/2010	14:48:56	99	No	2	MN	Slow Swim W	270	
2/18/2010	14:52:53	100	No	2	MN	Slow Swim NW	315	
2/18/2010	14:54:30	101	No	1	MN	Blow	N/A	
2/19/2010	7:43:29	102	No	1	MN	Slow E	90	
2/19/2010	7:44:39	103	No	3	MN	E	90	
2/19/2010	10:00:10	104	Yes	2	MN	SA, Travel NW	315	Near the FFG, wpts 17-22 on Colorado
2/19/2010	11:13:30	105	No	5	MN	Slow Swim E	90	
2/19/2010	11:14:52	106	No	1	MN	N/A	N/A	
2/19/2010	11:17:23	107	No	3	MN	SA; N	0	
2/19/2010	11:18:04	108	No	3	MN	Tail Slap; NE	45	
2/19/2010	11:18:49	109	No	2	MN	Slow N	0	

APPENDIX B (cont.): MN = humpback whale								
Date	**Time**	**Grp #**	**Focal Follow**	**Grp Size (calf)**	**Species**	**Behavior**	**Animal Bearing (degrees)**	**Comments**
2/19/2010	11:20:52	110	No	1	MN	Breach	N/A	
2/19/2010	11:21:52	111	No	1 (1)	MN	N/A	N/A	
2/19/2010	12:46:03	112	No	3	MN	Slow Swim N	0	
2/19/2010	12:48:07	113	No	3	MN	Slow Swim N	0	
2/19/2010	12:49:54	114	No	2	MN	Slow Swim N	0	
2/19/2010	12:53:42	115	No	2	MN	Slow Swim NW	315	
2/19/2010	12:54:55	116	No	2	MN	SE	135	
2/19/2010	12:55:06	117	No	1	MN	N/A	N/A	
2/19/2010	12:55:07	118	No	2	MN	N/A	N/A	
2/19/2010	12:55:32	119	No	1	MN	Milling	N/A	
2/19/2010	12:57:00	120	No	2	MN	N/A	N/A	
2/19/2010	12:57:01	121	No	1	MN	Breach	N/A	
2/19/2010	13:00:30	122	No	1	MN	Breach	N/A	
2/19/2010	13:01:58	123	No	3	MN	Breach; NE	45	
2/19/2010	13:04:38	124	No	2	MN	Milling	N/A	
2/19/2010	13:05:00	125	No	1	MN	N/A	N/A	
2/19/2010	14:42:31	126	No	1	MN	Slow Swim E	90	
2/19/2010	14:48:32	127	No	2	MN	Slow Travel WSW	248	
2/19/2010	14:52:05	128	No	1	MN	Slow Swim	N/A	
2/19/2010	14:56:00	129	No	1	MN	Breach-E	90	
2/19/2010	14:56:28	130	No	1	MN	Slow Swim-S	180	
2/19/2010	14:58:40	131	No	1	MN	Breach; E	90	
2/20/2010	7:34:34	132	Yes	12	PC	Fast Travel N	0	Orbit 25 min; still photos
2/20/2010	7:34:34	133	No	2	MN	N/A	N/A	(near PC) Orbit 25 min; still photos

APPENDIX B (cont.): MN=humpback whale; UC=unid cetacean; UD=unid. dolphin spp. TT=bottlenosed dolphin; SC = striped dolphin

Date	Time	Grp #	Focal Follow	Grp Size (calf)	Species	Behavior	Animal Bearing (degrees)	Comments
2/20/2010	8:13:50	134	No	1	SA	Fast Swim E	90	
2/20/2010	8:15:00	135	No	6	UD	N	0	Unid Blackfish
2/20/2010	8:16:00	136	No	1	MN	W	270	
2/20/2010	8:43:39	137	No	2	MN	Slow Swim NE	45	
2/20/2010	8:45:36	138	No	1	MN	Slow Swim N	0	
2/20/2010	8:45:58	139	No	3	UC	Under Water	N/A	
2/20/2010	8:48:00	140	No	2	MN	Slow Swim SE	135	
2/20/2010	9:27:30	141	No	4	UD	S	180	
2/20/2010	9:27:48	142	No	1	MN	SW	225	
2/20/2010	9:29:30	143	No	2	MN	Slow N	0	
2/20/2010	9:29:41	144	No	2	MN	Slow N	0	
2/20/2010	9:30:28	145	No	1	MN	N/A	N/A	
2/20/2010	9:32:46	146	No	1	MN	Slow S	180	
2/20/2010	9:33:13	147	No	1	MN	N/A	N/A	
2/20/2010	9:36:40	148	No	1	MN	Slow Travel NW	315	
2/20/2010	9:45:24	149	No	2	MN	Slow Travel E	90	
2/20/2010	9:53:00	150	No	1	MN	Slow Travel N	0	
2/20/2010	9:55:20	151	No	1	MN	Slow Travel N	0	
2/20/2010	10:00:38	152	No	1 (1)	MN	Milling	N/A	
2/20/2010	10:05:50	153	No	1	MN	Milling	N/A	
2/20/2010	10:47:38	154	No	1	MN	Breach	N/A	
2/20/2010	10:49:30	155	No	8	TT	N/A	N/A	
2/20/2010	10:49:31	156	No	60	SC	Very Scattered	N/A	min 50/ best 60/ max 75
2/20/2010	10:52:11	157	No	2	MN	N/A	N/A	

APPENDIX B (cont.): MN = humpback whale; UC = unid cetacean; UD = unid dolphin								
Date	**Time**	**Grp #**	**Focal Follow**	**Grp Size (calf)**	**Species**	**Behavior**	**Animal Bearing (degrees)**	**Comments**
2/20/2010	10:55:15	158	No	1	MN	E	90	
2/20/2010	10:56:29	159	No	2	MN	Dove NW	315	
2/20/2010	11:06:50	160	No	2	MN	Slow NW	315	
2/20/2010	11:07:22	161	No	1	MN	SSE	158	
2/20/2010	11:13:57	162	No	1	MN	S	180	
2/20/2010	11:14:49	163	No	2	MN	N/A	N/A	
2/20/2010	11:15:20	164	No	1	MN	Breach	N/A	
2/20/2010	11:15:37	165	No	1	MN	E	90	
2/20/2010	11:15:52	166	No	1	MN	E	90	
2/20/2010	11:16:04	167	No	1	MN	Dove	N/A	
2/20/2010	11:16:22	168	No	2	MN	N/A	N/A	
2/20/2010	11:16:40	169	No	1	MN	N/A	N/A	
2/20/2010	11:20:54	170	No	1	MN	S, Tail Slap	180	
2/20/2010	11:20:55	171	No	1	MN	SW	225	
2/20/2010	11:21:35	172	No	50	UD	Scattered, with MN & dispersed	N/A	
2/20/2010	11:21:36	173	No	1	MN	Slow S	180	
2/20/2010	11:22:29	174	No	3	MN	Slow Travel W	270	
2/20/2010	11:23:13	175	No	1	MN	Slow Travel S	180	
2/20/2010	11:25:40	176	No	2	MN	Slow Travel NW	315	
2/20/2010	11:26:44	177	No	1	MN	Slow Travel SW	225	
2/20/2010	11:26:45	178	No	1	MN	Slow Travel SW	225	
2/20/2010	11:27:18	179	No	2	MN	N	0	
2/20/2010	11:27:30	180	No	1	MN	N	0	

APPENDIX B (cont.): MN = humpback whale; SL = spinner dolphin; UD = unid dolphin UW = unid whale; UT = unid sea turtle								
Date	**Time**	**Grp #**	**Focal Follow**	**Grp Size (calf)**	**Species**	**Behavior**	**Animal Bearing (degrees)**	**Comments**
2/20/2010	12:05:59	181	No	1	MN	N	0	
2/20/2010	12:10:03	182	No	2	UC	E	90	
2/20/2010	12:14:29	183	No	1	MN	N/A	N/A	
2/20/2010	12:15:58	184	No	1	MN	NE	45	
2/20/2010	12:18:24	185	No	1	MN	NW	315	
2/20/2010	12:19:40	186	No	3	MN	NW	315	
2/20/2010	12:20:46	187	No	2	MN	NW	315	
2/20/2010	12:24:55	188	No	1	MN	NE	45	
2/21/2010	8:58:54	189	No	2	MN	Slow Swim NE	45	Circumnav of Kauai
2/21/2010	8:59:50	190	No	1	UW	Slow Swim S	180	
2/21/2010	9:04:23	191	No	1	MN	Slow Swim SW	225	
2/21/2010	9:04:59	192	No	1	MN	SW	225	
2/21/2010	9:05:35	193	No	1	UW	Dove	N/A	
2/21/2010	9:09:14	194	No	1	MN	Milling	N/A	
2/21/2010	9:13:02	195	No	1	UT	N/A	N/A	
2/21/2010	9:15:47	196	No	2	UT	Slow Swim	N/A	
2/21/2010	9:16:50	197	No	100	SL	Milling	N/A	
2/21/2010	9:29:23	198	No	1	MN	Milling	N/A	
2/21/2010	9:29:48	199	No	2 (1)	MN	UW	N/A	
2/21/2010	9:29:48	200	No	4	UD	N/A	N/A	possible Tt
2/21/2010	9:33:03	201	No	14	SL	UW Mill	N/A	
2/21/2010	9:44:37	202	No	2	MN	Slow N	0	
2/21/2010	9:44:40	203	No	1	MN	W, bubble trail	270	
2/21/2010	9:45:58	204	No	1	MN	Dive	N/A	

APPENDIX B (cont.):					MN = humpback whale; SL = spinner dolphin			
Date	**Time**	**Grp #**	**Focal Follow**	**Grp Size (calf)**	**Species**	**Behavior**	**Animal Bearing (degrees)**	**Comments**
2/21/2010	9:47:50	205	No	2	MN	Travel W	270	
2/21/2010	9:48:35	206	No	2	MN	Slow E	90	
2/21/2010	9:49:00	207	No	1	MN	Head Slap, W	270	
2/21/2010	9:49:49	208	No	1	MN	N/A	N/A	
2/21/2010	9:50:07	209	No	2	MN	NE	45	
2/21/2010	9:53:10	210	No	2	MN	Slow Travel ESE	113	
2/21/2010	9:53:50	211	No	1	MN	Slow Travel E	90	
2/21/2010	9:54:07	212	No	1	MN	Slow Travel SE	135	
2/21/2010	9:54:39	213	No	2	MN	Slow Travel SE	135	
2/21/2010	9:54:58	214	No	2	MN	Slow Travel W	270	
2/21/2010	9:55:23	215	No	1	MN	Dive	N/A	
2/21/2010	9:56:20	216	No	1	MN	UW Slow NE	45	
2/21/2010	10:00:07	217	No	15	SL	Fast Swim, dispersed	N/A	photos, min 11/ best 15/ max/ 20
2/21/2010	10:03:47	218	No	9	MN	Slow Swim N	0	
2/21/2010	10:04:14	219	No	1	MN	Slow Swim N	0	
2/21/2010	10:04:15	220	No	2	MN	Slow Swim SE	135	
2/21/2010	10:04:17	221	No	1	MN	Slow Swim SE	135	
2/21/2010	10:05:05	222	No	1	MN	Slow Swim S	180	
2/21/2010	10:05:07	223	No	1	MN	Slow Swim S	180	
2/21/2010	10:06:08	224	No	1	MN	Slow Swim	N/A	
2/21/2010	10:07:43	225	No	2	MN	NE	45	
2/21/2010	10:08:38	226	No	1	MN	Diving NE	45	
2/21/2010	10:08:39	227	No	1	MN	Slow Swim W	270	
2/21/2010	10:09:49	228	No	1	MN	Tail Slap	N/A	

APPENDIX B (cont.):					MN = humpback whale; UD = unid dolphin			
Date	**Time**	**Grp #**	**Focal Follow**	**Grp Size (calf)**	**Species**	**Behavior**	**Animal Bearing (degrees)**	**Comments**
2/21/2010	10:10:09	229	No	1	MN	Logging	N/A	
2/21/2010	10:10:15	230	No	1	MN	N/A	N/A	
2/21/2010	10:10:16	231	No	1	MN	Slow Swim	N/A	
2/21/2010	10:10:41	232	No	2	MN	Slow Swim W	270	
2/21/2010	10:11:15	233	No	1	MN	Slow Swim	N/A	
2/21/2010	10:11:30	234	No	80	UD	N/A	N/A	Min 70/ Best 80/ Max 90, probable SL
2/21/2010	10:17:52	235	No	2	MN	Slow Swim NE	45	
2/21/2010	10:18:06	236	No	1	MN	Slow Swim W	270	
2/21/2010	10:18:08	237	No	3	MN	Slow Swim N	0	
2/21/2010	10:18:36	238	No	1	MN	Diving W	270	
2/21/2010	10:19:20	239	No	3 (1)	MN	SE	135	
2/21/2010	10:19:21	240	No	3	MN	NW	315	
2/21/2010	10:19:41	241	No	1	MN	Milling	N/A	
2/21/2010	10:19:42	242	No	2	MN	Milling	N/A	
2/21/2010	10:19:43	243	No	3	MN	Milling	N/A	
2/21/2010	10:19:44	244	No	2	MN	Milling	N/A	
2/21/2010	10:19:45	245	No	2	MN	Milling	N/A	
2/21/2010	10:19:47	246	No	2	MN	Milling	N/A	
2/21/2010	10:19:48	247	No	3	MN	Milling	N/A	
2/21/2010	10:23:30	248	No	2	MN	SE	135	
2/21/2010	10:23:56	249	No	1	MN	SE	135	no observer or position recorded
2/21/2010	10:24:10	250	No	1	MN	Slow Swim S	180	

APPENDIX B (cont.):					MN = humpback whale			
Date	**Time**	**Grp #**	**Focal Follow**	**Grp Size (calf)**	**Species**	**Behavior**	**Animal Bearing (degrees)**	**Comments**
2/21/2010	10:24:11	251	No	2	MN	Slow Swim NE	45	
2/21/2010	10:24:12	252	No	2	MN	Slow Swim SW	225	
2/21/2010	10:32:25	253	No	3	MN	Slow Swim	N/A	
2/21/2010	10:33:01	254	No	1	MN	Slow Swim S	180	
2/21/2010	10:34:36	255	No	2	MN	Slow Swim SE	135	
2/21/2010	10:34:37	256	No	1	MN	Slow Swim	N/A	
2/21/2010	10:36:10	257	No	1	MN	Slow Swim E	90	
2/21/2010	10:38:29	258	No	2	MN	Slow Swim SW	225	
2/21/2010	10:43:49	259	No	1	MN	Slow Swim SW	225	
2/21/2010	10:45:20	260	No	5	MN	Slow Swim	N/A	
2/21/2010	10:45:21	261	No	4	MN	Slow Swim	N/A	
2/21/2010	10:47:58	262	No	2 (1)	MN	N/A	N/A	
2/21/2010	10:47:59	263	No	1	MN	N/A	N/A	
2/21/2010	10:51:30	264	No	2	MN	NE	45	
2/21/2010	10:51:31	265	No	2	MN	NE	45	
2/21/2010	10:52:02	266	No	3 (1)	MN	Calf Breach	N/A	
2/21/2010	10:55:48	267	No	3 (1)	MN	NE	45	
2/21/2010	10:58:30	268	No	3	MN	NE Surface Active	45	
2/21/2010	10:59:30	269	No	1	MN	N/A	N/A	
2/21/2010	10:59:35	270	No	2	MN	NE	45	
2/21/2010	10:59:57	271	No	1	MN	N/A	N/A	
2/21/2010	11:00:10	272	No	2	MN	NE	45	
2/21/2010	11:01:15	273	No	1	MN	W	270	
2/21/2010	11:01:28	274	No	3	MN	N/A	N/A	

APPENDIX B (cont.) MN = humpback whale; UT = unid. sea turtle								
Date	**Time**	**Grp #**	**Focal Follow**	**Grp Size (calf)**	**Species**	**Behavior**	**Animal Bearing (degrees)**	**Comments**
2/21/2010	11:07:22	275	No	2	MN	Slow Swim W	270	
2/21/2010	11:07:42	276	No	1	MN	W	270	
2/21/2010	11:07:43	277	No	2	MN	N/A	N/A	
2/21/2010	11:08:49	278	No	1	MN	N/A	N/A	
2/21/2010	11:08:50	279	No	1	MN	Slow Swim	N/A	
2/21/2010	11:10:20	280	No	2	MN	S	180	
2/21/2010	11:10:37	281	No	4	MN	N/A	N/A	
2/21/2010	11:10:52	282	No	3	MN	S	180	
2/21/2010	11:12:15	283	No	2	MN	N/A	N/A	
2/21/2010	11:15:33	284	No	1	MN	N/A	N/A	
2/21/2010	11:20:11	285	No	1	UT	N/A	N/A	
2/21/2010	11:21:01	286	No	12	UT	N/A	N/A	ca. 12 turtles sighted, no angle, position, or observer recorded
2/21/2010	11:22:53	287	No	3	MN	Pec Slap	N/A	
2/21/2010	11:23:16	288	No	1	UT	Slow Swim	N/A	
2/21/2010	11:26:50	289	No	1	MN	Slow Swim	N/A	
2/21/2010	11:27:00	290	No	2	MN	W	270	
2/21/2010	11:29:16	291	No	2	MN	W	270	
2/21/2010	11:30:31	292	No	1	UT	N/A	N/A	
2/21/2010	11:31:38	293	No	2	MN	N	0	
2/21/2010	11:32:40	294	No	2	UT	N/A	N/A	
2/21/2010	11:32:42	295	No	3	UT	N/A	N/A	
2/21/2010	11:34:08	296	No	1	MN	Slow Travel W	270	

APPENDIX B (cont.): UT = unid. sea turtle; MN = humpback whale; UD = unid. dolphin spp.

Date	Time	Grp #	Focal Follow	Grp Size (calf)	Species	Behavior	Animal Bearing (degrees)	Comments
2/21/2010	11:35:10	297	No	1	UT	N/A	N/A	
2/21/2010	11:35:28	298	No	2	MN	Slow Travel W	270	
2/21/2010	11:36:44	299	No	1	MN	NW	315	
2/21/2010	11:37:35	300	No	1	MN	Slow Travel W	270	
2/21/2010	11:37:56	301	No	5	UT			
2/21/2010	11:40:41	302	No	4	MN	NW Competitive	0	
2/21/2010	11:41:00	303	No	2	MN		315	
2/21/2010	11:42:00	304	No	4	UD			

Appendix C: Focal Follow Behavior Summary						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 18	6	10:31	0:02	3 humpbacks (Mn's) surface (this is 1st visible on the mid-top of frame). There are other Mn's that come into view that are visible under the surface: approximately 5 body lengths from the first Mn's observed at the surface and are just behind and to the left of the initial Mn's sighted. There are 3 Mn's visible below the surface heading at an angle towards 4 Mn's ahead. There is one Mn with white pecs in each of the closely grouped Mn's. The video continues with all Mn's in view below the surface until they are out of view. 8-9 animals were reported by observers verbally on video. (-10 animals in view on video.		y
	6	10:31	0:37	Time verbally stamped on video as 10:31:21	y	n
	6	10:32	0:37	At least 1 Mn visible at the surface in the center of the frame		y
	6	10:32	0:40	Another Mn is visible by a Mn with white pecs (WP), positioned ahead and to the left of it.		y
	6	10:32	0:42	The Mn that on left is at the surface.		y
	6	10:32	0:44	The left Mn went under.		y
	6	10:32	0:51	No animals are visible.		y
	6	10:32	0:59	Mn with WP observed below the surface but not yet visible on video.	y	n
	6	10:32	1:05	1 Mn with WP surfacing - visible on bottom-middle of frame		y
	6	10:32	1:08	That WP Mn is down, puka is visible and another puka is also visible to the right of the WP Mn's puka, approximately 5-6 body lengths away.		y
	6	10:32	1:14	Pukas no longer in frame		
	6	10:32	1:25	Mn with WP observed under the surface but not visible in frame yet.	y	n
	6	10:33	1:33	2 Mn with WP's under the surface, seen by observer but not visible in frame.	y	n
	6	10:33	1:34	Surfacing by one of the WP Mn's (from last entry), seen by observer but not visible in frame.	y	n

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 18 (cont.)	6	10:33	1:42	Another Mn observed that is about to surface with the WP Mn from last entry. Not visible in frame.	y	n
	6	10:33	2:03	puka out of frame		
	6	10:33	2:03	Observer reports that there is another sighting approximately 500 meters to the north of the current focal follow. Not visible in frame.	y	n
	6	10:33	2:13	There is a puka visible on the bottom left of frame.		y
	6	10:33	2:14	Puka no longer visible in frame		
	6	10:33	2:17	Puka visible again.		y
	6	10:34	2:21	Observer reports surface activity and then at least one animal visible below surface with WP- slow swimming under surface (not visible in frame). Altitude is approximately 1500 ft.	y	n
	6	10:34	2:34	1 Mn surfaced less than one body length to left of WP Mn swimming under surface.		y
	6	10:34	2:39	The Mn from the last entry went under, puka is still visible in frame, then 2 Mn's with WP's are visible below the surface less than one body length from the animal that just dove. They are swimming in a vertical line, head to peduncle and both have WP.		y
	6	10:34	2:44	The lead WP Mn surfaced with a bubble trail, the lagging WP Mn is still visible below the surface and the Mn that was on the left is no longer visible.		y
	6	10:34	2:50	The lead WP Mn went under. Both Mn with WP still visible under the surface, they are positioned rostrum to tail fluke.		y
	6	10:34	2:57	Both Mn's with WP still visible underwater. They are no longer swimming vertically with each other. Now the Mn that was lagging is veering a little left of the lead Mn.		y
	6	10:34	3:02	Lead Mn is no longer visible, the Mn that was lagging is still visible below the surface.		y

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 18 (cont.)	6	10:34	3:07	The Mn that was lagging is still visible and another Mn surfaced just ahead and to the left, 1/2 a body length from WP Mn from last entry.		y
	6	10:34	3:13	The last Mn to surface in previous entry went under as the Mn with WP, that was lagging, surfaced. The Mn's are less than 1 body length from each other.		y
	6	10:34	3:18	Both Mn's now under the surface but only the Mn with WP is visible.		y
	6	10:35	3:25	4 Mn's observed approaching area - not visible in frame.	y	n
	6	10:35	3:45	1 Mn with WP surfaced.		y
	6	10:35	3:55	Another Mn surfaced ahead of and to the left of the WP Mn in previous entry. There are other Mn's visible below the surface and 2 body lengths away, that are swimming in the same direction of the Mn with WP.		y
	6	10:35	3:58	3 Mn's now at the surface, 1-2 body lengths from each other.		y
	6	10:35	4:00	4 Mn's at the surface plus 1-2 visible below the surface, all 1-3 body lengths from each other and swimming in the same direction. The positioning of the Mn's at the surface: One Mn in the center, two are ahead of the center MN- on the left and on the right, there is one that is lagging behind the center Mn and has WP and is on the left.		y
	6	10:35	4:05	There are approximately 9 Mn's visible above and below the surface and are in the same general orientation as described in the previous entry.		y
	6	10:35	4:39	Some of the Mn's are diving.		y
	6	10:35	4:53	All Mn's are underwater and at least 3 of them can still be seen.		y
	6	10:36	4:56	A Mn that is positioned at the rear of the group and has WP surfaced and dove.		y
	6	10:36	5:01	A lead Mn with WP surfaced and went under.		y

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 18 (cont.)	6	10:36	5:09	There is only one Mn still visible and it is under the surface and has WP and is diving deep.		y
	6	10:36	5:19	No animals are visible.		
	6	10:37	5:21	GPS Location: N' 22.12 W' 159.37	y	n
	6	10:37	5:35	Mn observed below the surface but not visible in frame.	y	n
	6	10:37	5:37	1 puka visible in the top middle of the frame.		y
	6	10:37	5:43	Another puka is visible to the left of the puka (from last entry) in the frame.		y
	6	10:37	5:44	Approximately 2 surfacings observed, but not visible in frame. The pukas from the last entry are no longer visible in frame.	y	n
	6	10:37	5:49	2 Mn observed at the surface by observer but only a puka is visible in frame.	y	y
	6	10:37	5:55	2 Mn visible in frame, one is below the surface and the other is at the surface, they are approximately 1.5 body lengths from each other.		y
	6	10:37	6:01	Only one of the Mn's from the last entry in visible in frame and it went down and is visible below the surface.		y
	6	10:37	6:06	Both Mn's are now visible below the surface in the frame.		y
	6	10:37	6:12	At least 6 Mn's are now visible below the surface and are all less than 1 body length from the other and are all swimming in the same direction.		y

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 18 (cont)	6	10:37	6:13	One Mn surfaced.		y
	6	10:37	6:17	The Mn from the last entry went under and one Mn ahead of it surfaced.		y
	6	10:37	6:20	The last Mn to surface (from previous entry) went under and one that was just behind it surfaced.		y
	6	10:38	6:25	The last Mn to surface (from previous entry) went under and several others are still visible under the surface.		y
	6	10:38	6:37	Now there are only pukas visible in frame.		y
	6	10:38	6:43	No animals or pukas are visible.		
	6	10:38	6:45	1 Mn surfaced and is visible on the top left of the frame.		y
	6	10:38	6:51	The Mn from the last entry went under, puka is still visible in frame.		y
	6	10:38	7:08	No animals or pukas are visible.		
	6	10:38	7:12	There is a Mn with WP visible under the surface on the top left of frame.		y
	6	10:38	7:12	There are 2 Mn's with WP visible under the surface and a blow from another Mn is visible. All Mn's are within 1-2 body lengths from each other.		y
	6	10:38	7:15	2 Mn's just surfaced and 4-5 others are visible below the surface - the 2 that surfaced are in the middle and all others are ahead and to the left and also behind. At least 2 Mn's with WP are visible.		y

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 18 (cont.)	6	10:38	7:21	Other Mn's are beginning to surface.		y
	6	10:39	7:24	Other Mn's are reported at a distance from the ones that we are following and are not visible in video.	y	n
	6	10:39	7:32	Several of the Mn's that we are following are diving. The Mn in the middle position performed a high-arch fluke-up dive and it appears to chase a Mn with a possible charge strike.		y
	6	10:39	7:35	All Mn's are under the surface, some still visible.		y
	6	10:39	7:40	One Mn at the surface.		y
	6	10:39	7:46	The Mn from the last entry dove and is still visible under the surface as well as one Mn with WP who is 2-3 body lengths ahead.		
	6	10:39	7:57	A trailing Mn is observed surfacing but not visible in frame. The Mn with WP is still visible in frame.	y	y
	6	10:39	8:06	There are only dissapating pukas visible in frame.		y
	6	10:39	8:09	1 Mn surfaced in the mid-right of frame.		y
	6	10:39	8:17	The left Mn from the last entry went under.		y
	6	10:39	8:17	There is a Mn with WP visible under the surface.		y
	6	10:40	8:26	The WP Mn from last entry surfaced and there are at least 2 Mn visible behind and approximately 1 body length away that are beginning to surface.		y

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 18 (cont.)	6	10:40	8:43	Several Mn's visible surfacing and going under, 1-2 body lengths from each other.		y
	6	10:40	9:06	Several Mn's still visible surfacing and going under, swimming just below the surface. 7-8 Mn's are visible, some less than one body length from another and at the farthest 2 body lengths from another.		
	6	10:40	9:20	Mn's still surfacing and going under. They are in the same orientation as last entry, however one surfaced approximately 5 body lengths behind the main group.		y
	6	10:41	10:00	All Mn's are now below the surface - one of the lead animals was the last to go under and is now the only Mn still visible, there are also several pukas visible.		y
	6	10:41	10:04	No animals or pukas are visible. One Mn was observed at a distance heading in our pod's direction and performing a breach- not visible in video.	y	n
	6	10:42	10:28	Our pod observed but not visible in frame.	y	n
	6	10:42	11:10	Verbal time stamp: 10:42:15, altitude of 1500ft. End observation.	y	
Feb. 19	7	10:07		We are with FFG and have sighted Mn's twice but have no video of them yet.	y	n
	7	10:08		video off		
	8	10:09	0:08	Mn's resighted at the surface but not visible in frame.	y	n
	8	10:09	0:26	There is a puka visible on the bottom right corner of frame that is visible for approximately 5 seconds. We are at about 1600 ft and the way point is 18.		y
	8	10:13	4:07	video off		

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 19 (cont.)	9	10:13	0:01	Mn's sighted but not yet visible in video. They are approximately .25 miles from the FFG.	y	n
	9	10:15	1:54	The FFG is at an angle of 19 from the right side of the plane; N'22 37.29 W'160 00.28	y	y
	9	10:17		Verbal report: Mn's are heading NNW according to the direction of the way points recorded so far.	y	n
	9	10:17	4:00	Mn's observed surfacing- not visible in frame.	y	n
	9	10:17	4:05	2 Mn's visible at the surface on the bottom right of frame.		y
	9	10:18	4:15	Pukas are visible at the top middle of the frame.		y
	9	10:18	5:01	Mn's sighted at the surface and then are visible on the video only after they already went below the surface.		y
	9	10:19	5:14	Now there is only a puka visible in the frame.		y
	9	10:19	5:18	The puka disappeared.		
	9	10:20	6:29	Mn observed underwater and began to surface but not visible in frame.	y	n
	9	10:20	6:39	Mn observed surfacing, but not in frame.	y	n
	9	10:20	6:43	1 Mn visible blowing at the surface in video (This individual is Mn_A).		y

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 19 (cont.)	9	10:20	6:47	A second Mn (Mn_B) is visible under the surface, just to the right of Mn_A.		y
	9	10:20	6:47	A third animal is verbally reported but is not visible in video, however, upon analyzing the video, it seems there is a blow visible that looks as though it has drifted from the position of Mn_A.	y	n
	9	10:20	6:49	Mn_B surfaced.		y
	9	10:20	6:50	Mn_B performed a peduncle slap.		y
	9	10:20	6:57	Both Mn's visible under the surface.		y
	9	10:20	7:01	Mn_B traveling at the surface.		y
	9	10:20	7:04	Mn_B went below the surface.		y
	9	10:20	7:06	Mn_A is surfacing on the left of Mn_B.		y
	9	10:21	7:10	Both Mn's are traveling below the surface.		y
	9	10:21	7:18	Mn_A surfaced.		y
	9	10:21	7:25	Mn_A dove. Puka visible after the dive.		y
	9	10:21	7:41	The puka is no longer visible in frame. A waypoint was taken at this time but the number was not reported verbally- possibly waypoint 20.	y	

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 19 (cont.)	9	10:21	7:46	A blow was observed by eye but not seen in video. Immediately after a back is visible at the surface.		y
	9	10:21	7:49	The Mn that surfaced (from last entry) is now visible below the surface.		y
	9	10:21	7:55	Only a puka is visible in frame.		y
	9	10:21	8:04	Now there are two pukas clearly visible from 2 Mn's, one puka is behind and to the left of the puka from the last Mn to surface.		y
	9	10:22	8:09	A breach was performed by the Mn on the right- immediately after the breach neither Mn is visible. Water disturbance is the only thing that is visible.		y
	9	10:23	9:31	No longer any animals or water disturbance visible in frame.		
	9	10:23	9:44	Mn's observed heading up to the surface but not visible in frame.	y	n
	9	10:23	9:45	1 Mn visible at the surface with a blow.		y
	9	10:23	9:50	The Mn from the last entry is now below the surface and only the puka is visible.		y
	9	10:23	10:03	The puka is no longer visible.		
	9	10:24	10:38	1 Mn is diving- this is visible at the bottom middle of frame.		y
	9	10:24	10:42	Only a puka is visible in frame.		y

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 19 (cont.)	9	10:24	10:55	The puka is no longer visible.		
	9	10:25	11:33	There is a small part of a back that is visible at the surface on the bottom right of the frame and it comes in and out of view on frame due to obstruction by the wing of the plane.		y
	9	10:25	12:00	Observers report that Mn is still in view however the wing prevents the videographer from capturing it on video.	y	n
	9	10:26	12:16	Mn surfaced, blow is visible on the top right of frame.		y
	9	10:26	12:24	There is a puka visible in the middle of the frame.		y
	9	10:26	12:34	Puka is no longer visible. At an altitude of 1600 ft.	y	n
	9	10:26	12:55	There is 1 Mn's back visible at the surface.		y
	9	10:26	13:00	There is no longer any Mn visible in frame.		
	9	10:27	13:42	The pilot reports that the FFG is w/in 250 yds of last Mn sighting.	y	
	9	10:28	14:20	Observer reports a blow but it not visible in frame.	y	n
	9	10:29	15:54	Mobley verbally reports direction of travel as NNW after reviewing waypoints.	y	
	9	10:31	17:09	FFG observed heading in the direction of where we are circling (presumed Mn's current location).	y	

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 19 (cont.)	9	10:31	17:44	Mn's observed but not visible in video, 3 blows were reported and the 3 Mn's were reported.	y	n
	9	10:32	18:33	1 Mn is visible at the surface.		y
	9	10:32	18:37	Only a puka is visible in frame.		y
	9	10:32	18:55	Puka is no longer visible.		y
	9	10:32	19:00	1 Mn is visible at the surface and diving.		y
	9	10:32	19:05	1 Mn is at the surface.		y
	9	10:32	19:05	Mn is no longer visible in frame.		
	9	10:32	19:21	2 surfacings observed but not visible in video.	y	n
	9	10:33	19:24	2 backs observed but not visible in video.	y	n
	9	10:33	19:30	A shallow dive is observed but not visible in video.	y	n
	9	10:36	23:00	FFG in video.		y
	9	10:40	26:27	FFG visible again.		y

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 19 (cont.)	9	10:42	28:32	FFG visible again.		y
	9	10:42	28:46	A blow was observed but not visible in video.	y	n
	9	10:42	28:52	Verbal time stamp: 10:42:09	y	n
	9	10:42	29:04	Another blow observed but not visible in video.	y	n
	9	10:44	30:08	Mn observed at the surface but not visible in frame.	y	n
	9	10:44	30:14	1 Mn visible just below the surface on the mid-left of frame.		y
	9	10:44	30:16	A blow and a Mn body is visible in frame.		y
	9	10:44	30:23	The Mn from the last entry went down and now only puka is visible.		y
	9	10:44	30:39	No longer any Mn or Puka visible.		
	9	10:44	31:04	waypoint 22 recorded, no animals visible.	y	
	9	10:45	31:12	Mobley reports that the Mn's have been traveling at a pretty consistent NNW direction after reviewing waypoints. The FFG is visible in video w/in a couple hundred yards of where our plane was circling above the sighting.	y	y
	9	10:46	32:36	Mn's observed at the surface but not visible in video.	y	n

Appendix C (cont.):						
Date	**Episode No.**	**Clock Begin**	**Elapsed Begin**	**Description**	**Verbal Confirm Only (Y/N)**	**On Video (Y/N)**
Feb. 19 (cont.)	9	10:46	32:45	Verbal time stamp: 10:46:03	y	
	9	10:47	33:16	FFG visible in frame.		y
	9	10:48	34:18	FFG changed direction and is now heading away from our general location.	y	
	9	10:50	36:14	FFG is visible in frame.		y
	9	10:53	39:59	End of video.		
Feb. 20	10	7:40	00:01	There is a blow visible on the right middle of the frame.		y
	10	7:40	00:14	There are 2 backs and 2 blows visible on the top right of frame.		y
	10	7:40	00:17	There are at least 2 pukas visble in frame- but no animals at surface.		y
	10	7:40	00:28	There are 2 backs and blows visible at the surface.		y
	10	7:40	00:39	Only pukas are visible in frame.		y
	10	7:40	00:48	No pukas or animals are visible in video.		
	10	7:42		End of video.		