U.S. DEPARTMENT OF COMMERCE
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CRUISE REPORT

VESSEL: *Oscar Elton Sette*, Cruise 10-04 (SE-80)

CRUISE PERIOD: April 19 to May 4, 2010

AREA OF OPERATION: Transit from Guam to Oahu via Wake Island

TYPE OF OPERATION: In support of a Pacific Islands Fisheries Science Center research project to conduct cetacean surveys, make ecosystem observations, and recover a High Frequency Acoustic Recording Package (HARP) and deploy a HARP at Wake Island.

ITINERARY:

19 APRIL — Embarked scientists Hill, Henderson, Ligon, Cummins, U, Barkley, Baldwin, Olson, Morse, Matsumoto, Bendlin, and Barlow. Departed Guam at 1500.

20–25 APRIL — Conducted daytime visual and acoustic surveys for cetaceans as outlined in Section 4.3. Periodically conducted conductivity-temperature-depth (CTD) casts at dawn. Collected water temperature profiles using Expendable Bathythermograph (XBT) launches at apparent noon, sunset, and when a CTD was not cast at sunrise. Deployed sonobuoys at 0900, 1300 and 1700 in order to acoustically monitor calling baleen whales. Continuously recorded acoustic data, through the day and night, using a 4-element towed hydrophone array.

26 APRIL — Arrived at Wake Island at 0500. Conducted a CTD cast prior to sunrise. Recovered a HARP from the following location at 19°13″ N, 166°41″ E. Deployed a HARP at the following location:

[1] PIFSC Cruise Report CR-10-005
Issued 4 June 2010

	19°13.21 N, 166°41.52 E. Conducted visual and acoustic surveys for cetaceans along the eastern side of Wake Island.
27 APRIL–MAY 3	Conducted daytime visual and acoustic surveys for cetaceans as outlined in Section 4.3. Photos were taken during sightings when possible. Periodically conducted CTD casts at dawn. Collected water temperature profiles using XBT launches at apparent noon, sunset, and when a CTD was not cast at sunrise. Deployed sonobuoys at 0900, 1300 and 1700 in order to acoustically monitor calling baleen whales. Continuously recorded acoustic data, through the day and night, using a 4-element towed hydrophone array.
4 MAY	Arrived in Honolulu at 0800. Disembarked scientists Hill, Henderson, Ligon, Cummins, U, Barkley, Baldwin, Olson, Morse, Matsumoto, Bendlin, and Barlow.

MISSIONS AND RESULTS:

A. Collect data on cetacean presence and group abundance along transit line.

1. *Methods*

A daily watch for cetaceans was maintained by scientific observers on the flying bridge during daylight hours (approximately 0600 to 1830), except when the ship stopped to conduct sampling operations, or was precluded by weather. Two teams of three observers worked in 1.5-hour rotations, scanning for cetaceans using 25 × and, 7 × magnification binoculars, and unaided eyes from the beam to the front of the ship. A fourth (independent) observer worked for 30 minutes scanning 180º to the aft of the ship using 7 × magnification binoculars and unaided eye. This observer kept track of sightings separately from the primary team and informed them of the presence of cetacean groups only when such groups approached the ship from behind. Sighting conditions, watch effort, sightings, and other required information were entered into a computer attached to the ship's Global Positioning System (for course, speed, and position information).

During most of the transit, the ship was operating in "passing mode" in which groups of cetaceans were not approached for further investigation when they were sighted. During 5 of the 16 days the ship operated in "closing mode" and in the event of sighting a cetacean group or other feature of biological interest, the Chief Scientist or marine mammal observer team on watch requested that the vessel be maneuvered to approach the group or feature for investigation. When the ship approached a group of cetaceans, the observers made independent estimates of group size. Photographic operations occasionally commenced from the bow,

based on directions from the Chief Scientist or Senior Marine Mammal Observers. On one occasion, the Chief Scientist requested the deployment of a small boat for biopsy and photographic operations.

At times, during the cruise, visual survey operations were not possible because of high winds or seas. Usually, survey operations were suspended at Beaufort Sea State 7 or higher. Also, if rain made visibility 1 nautical mile or less, visual observations were suspended until visibility increased. During these times, a single observer maintained a weather watch in order to notify the rest of the observer team when conditions improved.

2. *Results*

The *Oscar Elton Sette* covered 2380 km (1285 nmi) of trackline over 16 days. On-effort, surveys were completed during 14.5 days (Table 1). The visual observer teams encountered 21 cetacean groups (Table 2; Figs. 1 and 2) and obtained abundance estimates for all groups. One of the sightings was made by an independent observer. Sixteen of the 21 cetacean groups were identified to species. Time and weather limitations prevented the ship's approach of more of the sighted cetacean groups.

B. Collect biopsy samples and photo-identification data from cetaceans for studies on population structure and abundance.

1. *Methods*

Biopsy sample attempts were made on an opportunistic basis. The animals were either approached by the research vessel during normal survey operations, approached the vessel on their own, or were approached by a small boat. Necessary permits were present on the vessel.

Photographs of cetaceans were taken on an opportunistic basis. These will be used to study social behavior and movement patterns of identified individuals and to study geographic variation. The photographed animals were either approached by the research vessel during normal survey operations, approached the vessel on their own, or were approached by a small boat. Necessary permits were present on the vessel.

Deployment of the PIFSC Coral Reef Division's Safeboat was requested by the Chief Scientist on an opportunistic basis when the Commanding Officer concurred that operating conditions were safe. The small boat remained within radar and radio contact at all times while deployed.

2. *Results*

The PIFSC Coral Reef Division's Safeboat was launched on one occasion for biopsy sampling and photography of a group of pilot whales. Time and weather limitations prevented more small boat launch events. Two biopsy sampling attempts were made, but no samples were collected.

Photographs were collected during 10 of the 21 cetacean group encounters. A total of 8.16 GB of photo data were collected. Most of the photos were collected from flying bridge or bow of the *Sette*. Over 200 photos were taken from the small boat during the pilot whale encounter. Most of these photos will be used for individual identification (Fig. 3).

Sightings of bird species were recorded opportunistically during the transit (Table 3).

C. Collect passive acoustics data on cetaceans to aid in species-identification and vocalization studies.

1. *Methods*

Towed Array

A 4-element hydrophone array was towed 270 m behind the vessel. Each element in the hydrophone has the same frequency capability of 2 kHz – 200 kHz. Two hydrophones were routed through the MAGREC high pass filter, then through the MOTU Traveler connected to the desktop, which was operating Ishmael. The two additional hydrophone channels lead directly through the MOTU Traveler; no filter was applied to these two channels. Ishmael was used to both record the four hydrophone channels at a 192 kHz sampling rate and localize on acoustic detections. To reduce problems with recording while simultaneously obtaining bearings from calls, a 60-second buffer was applied to alleviate program stalls. Logger and Whaltrak operated on a separate laptop, and Logger functioned solely as a database.

Sonobuoys

Sonobuoys transmit acoustic data over a radio carrier frequency received by a VHF radio on the ship. A VHF antenna was mounted on the trawl house on the 02 deck for reception of the sonobuoy signals. Incoming signals were monitored using a scrolling spectrogram display in *Ishmael*, and cetacean sounds were noted. The sonobuoys were programmed for an omnidirectional setting, with hydrophones deployed to a depth of 1000 ft, which provide high-quality acoustic data for approximately one hour as the ship steams away from the deployment location. Sonobuoys were deployed at regular intervals during the day (0900, 1300, and 1700 local).

New sonobuoys were provided by Operational Navy (CNO-N45) and with assistance from NAVAIR at Pearl Harbor.

2. *Results*

Towed Array

Over 150 hours of clean acoustic data were recorded from the four hydrophones. Sixty-seven acoustic detections were noted (Table 4), consisting primarily of sperm and minke whales. Other acoustic detections include pilot whales (*Globicephala macrorhynchus)*, melon-headed whales (*Peponocephala electra)* (Fig. 4), and false killer whales (*Pseudorca crassidens)* (Fig. 5). In addition, 6 acoustic detections matched the sightings of the visuals team.

During nighttime hours, unmonitored surveys were conducted by recording on two channels through an NI USB-6251 sound card. During the night of 25 April, the *Sette* made a circuit around Wake Island, approximately 10 nmi offshore while making acoustic recordings on the towed array.

Sonobuoys

Thirty-seven sonobuoys were deployed over 15 days (Table 5). Cetacean vocalizations detected on the sonobuoys included delphinid whistles and sperm, minke, humpback, and sei whales.

D. Collect fisheries acoustic data to assess changes in relative abundance and distribution of potential prey species for cetaceans along the transit line.

1. *Methods*

The scientific EK-60 echosounder was operated continuously at 38 and 120 KHz and was interfaced to a data acquisition system to estimate micronekton biomass between 0 and 500 m.

2. *Results*

Over 60GB of data were collected during the 16 day transit. All data were saved to an external hard drive for future analysis.

E. Recovery and deployment of High-frequency Acoustic Recording Packages (HARPs), used for long-term monitoring of cetacean occurrence off Wake Island.

1. *Methods*

A High-frequency Acoustic Recording Package (HARP) designed at the University of California San Diego, Scripps Institute of Oceanography was deployed off of Wake Island (19°13″ N, 166°41″ E) during the January transit

(SE 10-01) from Honolulu to Guam. Recovery of the HARP was conducted from the ship. An acoustic transducer, attached to a 10-m long cable, was deployed over the side of the ship. Signals were sent to the acoustic releases, attached to the HARP, in order to release it from its mooring.

Another HARP was deployed in an adjacent location and will remain there for approximately one year. The location for deployment off of Wake Island was selected prior to departure based on the local bathymetry.

2. *Results*

On the morning of April 26, 2010 the first HARP was successfully recovered. The second HARP was subsequently deployed in an adjacent location approximately 3 nmi off of the southeast side of Wake Island (19°13.21 N, 166°41.52 E).

F. Collect oceanographic data along the transit line.

1. *Methods*

XBTs
In order to measure the temperature of the water with depth at varying locations, Expendable Bathythermograph probes were launched from the aft deck while the *Sette* was moving at 8 knots or greater. Three different probe models were used and have varying terminal depths (T6, T7, and Fast Deep).

CTDs
Conductivity, temperature, salinity and fluorescence were measured opportunistically using the *Sette*'s seabird CTD. Casts were made to varying depths dependent upon location.

2. *Results*

XBTs
A total of 22 XBTs were deployed between 20 April and 3 May at regular intervals throughout the day (at sunrise when no CTD cast was conducted, noon local time and sunset). The sea surface temperature ranged between 27.9°C just east of Guam and 25.9°C just south of Wake Island; 26.7°C just east of Wake and 24.2°C at 150 nmi due south of Mokumanamana (Necker). At 1000 m depth, the temperature was approximately 4°C at all locations. There was a thermocline at approximately 100 m at all locations.

CTDs
The hydrographic survey started with a CTD cast on 20 April at 05:25 (local time). Due to time constraints, only 4 CTD casts were conducted during the transit. All were conducted prior to sunrise. The first two and the last casts were

deployed to 1000 m, while the third (at Wake Island) was deployed to 600 m. Water samples were taken for comparison with the chlorophyll measurements made by the fluorometer. All four profiles were similar and showed a chlorophyll maximum between approximately 125 and 150 m (Fig. 6).

SCIENTIFIC PERSONNEL:

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Laura Morse, Marine Mammal Observer, National Marine Mammal Laboratory, National Marine Fisheries Service (NMFS)
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Approved by: _____
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Attachments:
Figures 1-6
Tables 1-5

Figures

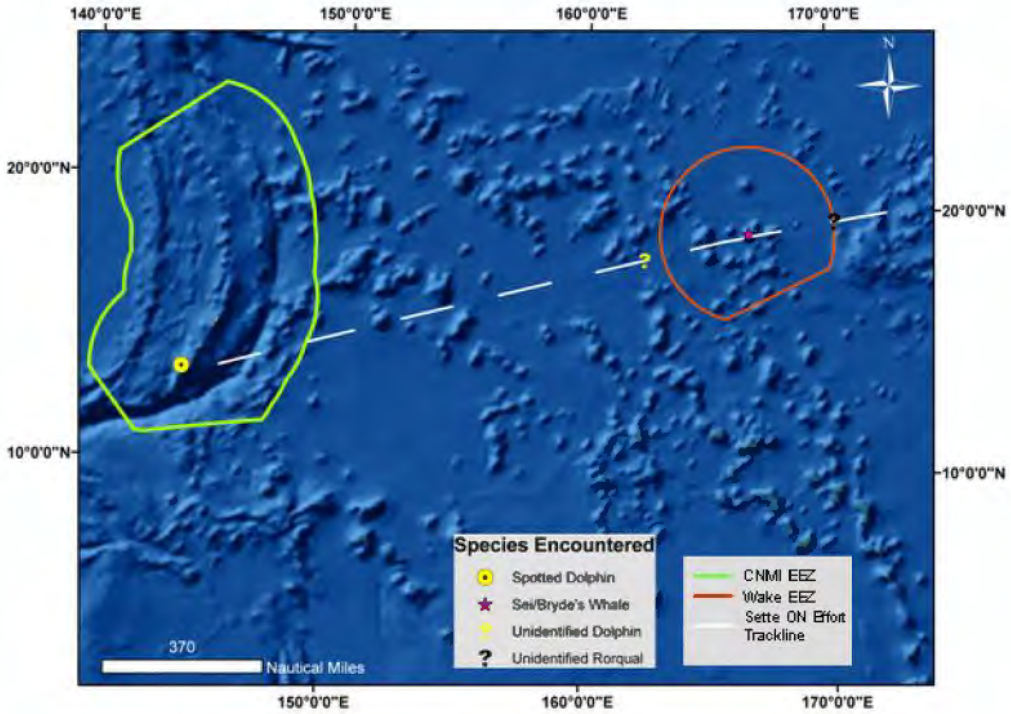

Figure 1.--On effort trackline of the *Oscar Elton Sette* and cetacean sighting locations between Guam and Wake.

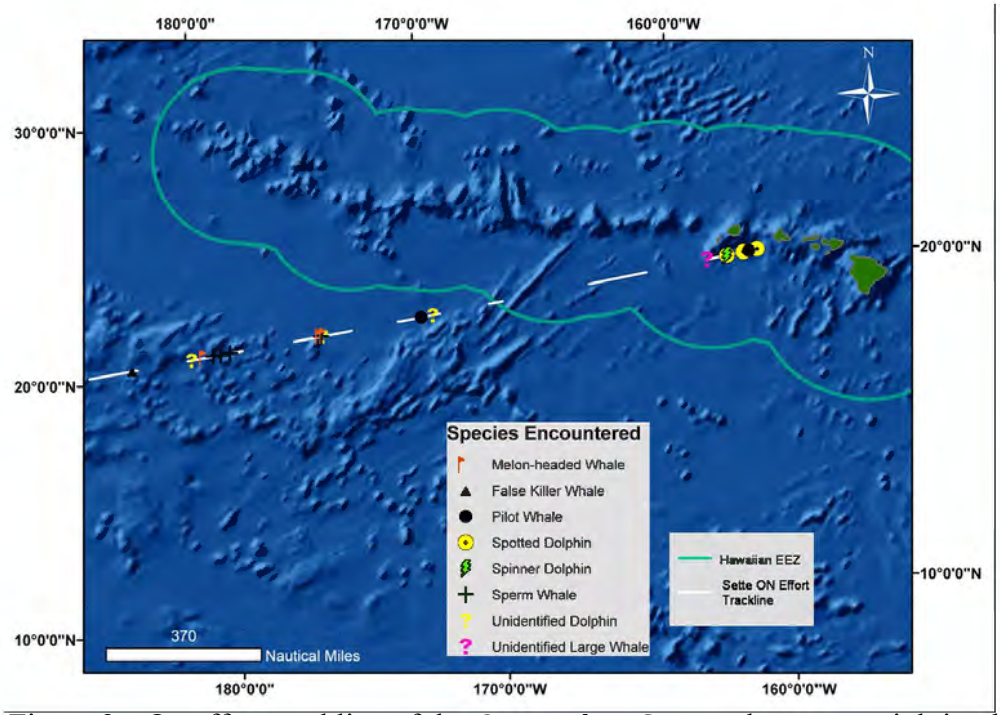

Figure 2.--On effort trackline of the *Oscar Elton Sette* and cetacean sighting locations between Wake and Oahu.

Figure 3.--Adult male pilot whale with a uniquely identifiable dorsal fin. Photo: Paula Olson

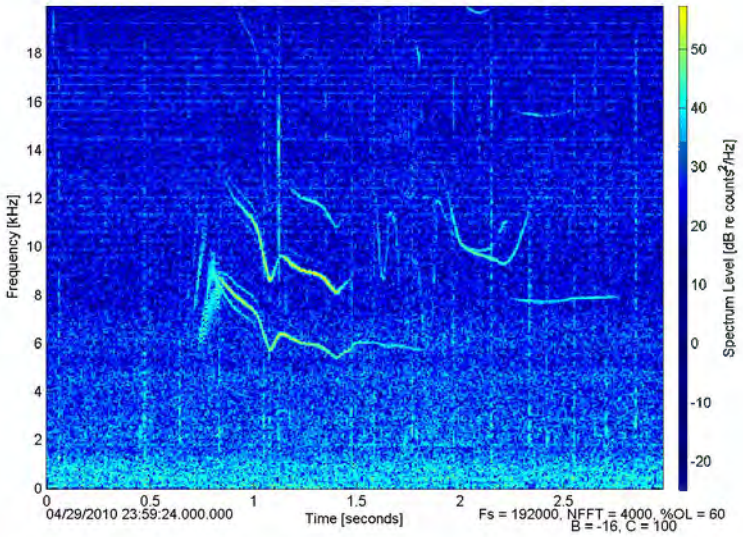

Figure 4.--Melon-headed whale whistles recorded on the towed array.

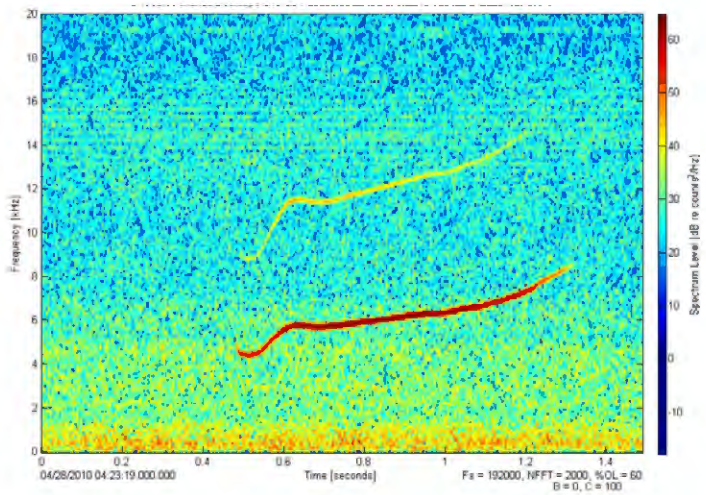

Figure 5.--False killer whale whistles recorded on the towed array.

Figure 6.--Profile of the second CTD cast conducted on 25 April at 04:40 at location 18.7189 N, 164.2904 E.

Tables

Table 1.-- Summary of daily survey effort and average Beaufort sea state during SE-10-04. Dates and times are local (April 29 was repeated after crossing the International Dateline).

Date	Start time	Start location		End time	End location		Distance surveyed	Average Beaufort
20-Apr	6:27	N13:35.53	E146:00.84	18:15	N14:04.66	E147:30.24	73.8	5.9
21-Apr	6:02	N14:39.33	E149:19.67	18:00	N15:10.74	E151:01.75	85	5.9
22-Apr	5:36	N15:43.55	E152:51.55	17:44	N16:17.48	E154:49.05	115	5.4
23-Apr	6:19	N16:48.44	E156:40.41	17:30	N17:20.79	E158:41.40	120.1	5.6
24-Apr	6:07	N17:48.99	E160:32.50	18:17	N18:19.38	E162:35.49	107.9	4.9
25-Apr	5:42	N18:43.94	E164:20.82	18:09	N19:09.83	E166:31.62	126.4	5.4
26-Apr	7:48	N19:15.01	E166:41.57	17:51	N19:25.20	E167:59.06	74.4	4.3
27-Apr	6:27	N19:43.68	E170:04.77	18:30	N20:01.62	E172:18.02	125	3.8
28-Apr	6:06	N20:16.90	E174:22.81	18:30	N20:30.23	E176:23.62	108.2	4.2
29-Apr_a	5:39	N20:42.63	E178:30.67	18:20	N20:54.28	W179:12.26	110.9	2.4
29-Apr_b	5:29	N21:03.59	W177:02.90	17:53	N21:11.71	W174:43.93	119.8	2.5
30-Apr	6:20	N21:17.49	W172:45.92	18:30	N21:20.69	W171:06.42	78	2.5
1-May	5:59	N21:23.57	W169:07.74	9:11	N21:24.16	W168:35.68	29.9	4.5
2-May	5:37	N21:25.23	W165:11.01	18:00	N21:23.77	W163:01.15	120.7	5
3-May	6:25	N21:20.50	W160:45.25	18:30	N21:16.43	W158:54.10	73.7	3.2

Table 2.-- Summary of cetacean species encountered during cruise SE-10-04.

Code	Species	Common name	TOT#
002	*Stenella attenuata*	Spotted dolphin	5
031	*Peponocephala electra*	Melon-headed whale	3
033	*Pseudorca crassidens*	False killer whale	1
036	*Globicephala macrorhynchus*	Short-finned pilot whale	1
046	*Physeter macrocephalus*	Sperm whale	4
070	*Balaenoptera sp.*	Unidentified rorqual	1
077	Unidentified dolphin	Unidentified dolphin	4
099	Balaenoptera borealis/edeni	Sei/Bryde's whale	1
102	*Stenella longirostris*	Spinner dolphin	1
	TOTAL		21

Table 3.--Summary of bird species encountered during cruise SE-10-04.

Common name	Scientific name
Brown noddy	*Anous stolidus*
Black noddy	*Anous tenuirostris minutus*
Bulwer's petrel	*Bulweria bulwerii*
Short-tailed albatross	*Diomedea albatrus*
Laysan albatross	*Diomedea immutabilis*
Black-footed albatross	*Diomedea nigripes*
Great frigate bird	*Fregata minor*
Lesser frigate bird	*Fregata ariel*
Frigate bird	*Fregata spp.*
White tern	*Gygis alba*
Wilson's storm petrel	*Oceanites oceanicus*
Matsudaira's storm petrel	*Oceanodroma matsudairae*
White-tailed tropic bird	*Phaethon lepturus*
Red-tailed tropic bird	*Phaethon rubricauda*
Grey noddy	*Procelsterna cerulea*
Juan Fernandez petrel	*Pterodroma externa*
Bonin petrel	*Pterodroma hypoleuca*
Hawaiian petrel	*Pterodroma phaeopygia*
Hawaiian shearwater	*Puffinus newelli*
Pink-footed shearwater	*Puffinus creaptopus*
Sooty shearwater	*Puffinus griseus*
Wedge-tailed shearwater	*Puffinus pacificus*
Pomarine Jaeger	*Stercorarius pomarinus*
Jaeger	*Stercorarius spp.*
South Polar Skua	*Stercorarius maccormicki*
Sooty tern	*Sterna fuscata*
Masked booby	*Sula dactylatra*
Brown booby	*Sula leucogaster*
Red-footed booby	*Sula sula*

Table 4:--Acoustic detections of cetaceans on towed array during SE-10-04.

	Minke whale (*Balaenoptera acutorostrata)*	*Sperm whale (Physeter macrocephalus)*	*Unidentified delphinid*	*False killer whale (Pseudorca crassidens)*	*Short-finned pilot whale (Globicephala macrorhynchus)*	*Melon-headed whale (Peponocephala electra)*
Total by Species	23	37	4	1	1	1
Overall Total Detections	67					

Table 5:--Acoustic detections of cetaceans on sonobuoys during SE-10-04.

SB #	Ch. #	Date (Local)	Time (Local)	Sonobuoy location		Water depth (m)	Species heard				Signal end
				Lat	Long		Minke	Sperm Whale	Call X (probable Sei)	Delphinid	Time (Local)
SB 01	6	20-Apr	12:18	13.808N	146.673E	n/a					12:53
SB 02	6	20-Apr	15:17	13.930N	147.049E	8047	x		x		16:11
SB 03	6	20-Apr	18:45	14.100N	147.577E	5852	x				19:47
SB 04	7	21-Apr	09:11	14.799N	149.796E	7315					10:11
SB 05	6	21-Apr	12:15	14.910N	150.148E	7315	x	x			13:14
SB 06	6	21-Apr	17:07	15.137N	150.891E	7315	x			x	18:14
SB 07	6	22-Apr	08:56	15.890N	153.400E	5669	x				09:57
SB 08	6	22-Apr	13:13	16.088N	154.100E	5940			x		14:14
SB 09	6	22-Apr	17:09	16.265N	154.724E	5000			x		18:09
SB 10	6	23-Apr	09:07	16.930N	157.130E	6000	x				10:07
SB 11	6	23-Apr	13:12	17.114N	157.809E	6200	x		x		14:13
SB 12	6	23-Apr	17:21	17.296N	158.496E	6000	x		x		18:21
SB 13	6	24-Apr	09:05	17.945N	161.046E	6000	x				10:07
SB 14	6	24-Apr	13:23	18.127N	161.789E	6000	x				14:24
SB 15	6	24-Apr	17:11	18.279N	162.406E	5000	x				18:11
SB 16	6	25-Apr	09:02	18.867N	164.934E	4000	x				10:07
SB 17	6	25-Apr	13:06	19.024N	165.643E	5800	x				14:15
SB 18	88	25-Apr	17:16	19.139N	166.368E	5700	x				18:16
SB 19	6	26-Apr	09:04	19.029N	166.675E	820	x	x			11:08
SB 20	6	26-Apr	17:05	19.400N	167.847E	5600	x				18:06
SB 21	6	27-Apr	09:04	19.796N	170.555E	5000	x	x			10:04
SB 22	6	27-Apr	16:57	19.990N	172.012E	1300	x				17:57
SB 23	6	28-Apr	08:59	20.341N	174.905E	4000	x				09:59
SB	6	28-Apr	12:59	20.423N	175.635E	4200	x		x		13:59

SB #	Ch. #	Date (Local)	Time (Local)	Sonobuoy location		Water depth (m)	Species heard				Signal end
				Lat	Long		Minke	Sperm Whale	Call X (probable Sei)	Delphinid	Time (Local)
24 SB											
25 SB	6	28-Apr	17:20	20.485N	176.231E	4000	x				18:21
26 SB	6	29a-Apr	09:00	20.764N	179.096E	3700	x	x			10:00
27 SB	6	29a-Apr	13:10	20.811N	179.789E	2600	x				14:10
28 SB	6	29a-Apr	17:04	20.884N	179.469W	3200	x	x			18:01
29 SB	6	29b-Apr	08:58	21.102N	176.376W	4000	x	x			09:58
30 SB	6	29b-Apr	12:46	21.129N	175.867W	6000					13:35
31 SB	6	30-Apr	17:00	21.186N	174.907W	5980	x	x			18:00
32 SB	6	30-Apr	09:28	21.308N	172.214W	5500	x	x			10:28
33 SB	88	30-Apr	17:09	21.338N	171.349W	5450					17:12
34 SB	6	1-May	09:09	21.402N	168.608W	5000	x				10:09
35 SB	88	1-May	17:13	21.418N	167.271W	5200	x				18:13
36 SB	6	2-May	09:00	21.417N	164.643W	5230	x		x		10:00
37	88	2-May	17:13	21.399N	163.167W	5200	x			x	18:14