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CRUISE REPORT¹

VESSEL: *Oscar Elton Sette*, Cruise SE-10-01 (SE-77)

CRUISE PERIOD: January 20–February 6, 2010

AREA OF OPERATION: Transit from Oahu to Guam via Wake Island (Fig. 1)

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

ITINERARY:

20 JANUARY Embarked scientists Oleson, Kobayashi, Ligon, Hill, Cummins, Deakos, U, Zele, Barkley, Sirovic, Beder, Bower, Cammarata, Knoss, Love, Smith, Jeffrey, and Provost. Departed Honolulu at 1400.

21-29 JANUARY Conducted daytime visual and acoustic surveys for cetaceans as outlined in Section 4.3. Photos were taken during sightings when possible. 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. Periodically deployed sonobuoys in order to acoustically monitor calling baleen whales. Continuously recorded acoustic data, through the night, using a 4-element towed hydrophone array. Collected surface plankton along the trackline using a towed Continuous Plankton Recorder (CPR). Periodic Neuston plankton tows were conducted for real-time evaluation of surface plankton assemblages.

¹ PIFSC Cruise Report CR-10-006
Issued 11 June 2010



- 30 JANUARY Arrived at Wake Island at 1530. Deployed a HARP at the following location: 19°13" N, 166°41" E. Conducted visual and acoustic surveys for cetaceans in a circuit around Wake Island. Launched the *Sette's* Safeboat to conduct nearshore surveys in the lee of the island. Photos and biopsy samples were taken during a sei whale sighting.
- 31 JANUARY-5 FEBRUARY Conducted daytime visual and acoustic surveys for cetaceans as outlined in Section 4.3. Photos were taken during sightings when possible. 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. Periodically deployed sonobuoys in order to acoustically monitor calling baleen whales. Continuously recorded acoustic data, through the night, using a 4-element towed hydrophone array. Collected surface plankton along the trackline using a towed Continuous Plankton Recorder (CPR). Periodic Neuston plankton tows were conducted for real-time evaluation of surface plankton assemblages.
- 6 FEBRUARY Arrived in Guam at 1400. Disembarked scientists Oleson, Kobayashi, Ligon, Deakos, U, Sirovic, Beder, Bower, Cammarata, Knoss, Love, Smith, Jeffrey, and Provost.
- 7 FEBRUARY Disembarked scientists Hill, Cummins, Zele, and Barkley.

MISSIONS AND RESULTS:

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

a. *Methods*

A daily watch for cetaceans was maintained by scientific observers on the flying bridge during daylight hours (approximately 0700 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 25x and, 7x magnification binoculars, and unaided eyes from the beam to the front of the ship. A fourth (independent) observer worked for 30 minutes scanning 180° to the aft of the ship using 7x 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 four of the sixteen 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 two occasions, 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.

b. 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 25 cetacean groups (Table 2; Figs. 2 and 3) and obtained abundance estimates for all groups. Two of the sightings were made by an independent observer. Eight of the 25 cetacean groups were identified to species. Time and weather limitations prevented the ship’s approach of more of the sighted cetacean groups.

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

a. Methods

Biopsy sample attempts were made on an opportunistic basis. The genetic data will be used to study the population structure of the sampled cetacean groups. 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 *Sette*'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.

b. Results

The *Sette*'s Safeboat was launched on two occasions for biopsy sampling and photography of sighted animals. Time and weather limitations prevented more small boat launch events. A single biopsy sample was collected from a sei whale in the waters off of Wake Island. The sample was collected from the Safeboat using a dart fired from a crossbow.

Photographs were collected during 10 of the 25 cetacean group encounters. A total of 5.83 GB of photo data were collected. Most of the photos were collected from flying bridge or bow of the *Sette*. Some of these photos will be used for individual identifications.

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

a. Methods

Towed Array

A 4-element hydrophone array was towed 350 m behind the vessel. The original setup called for two hydrophones to be used for recording by first passing through a MAGREC high-pass filter, then a NI USB-6251 sound card and into a desktop computer fitted with 1 TB hard drives to store acoustic files created by Logger 2000. A second stream of all four hydrophone channels was intended to be used for localizing detections; this stream would first pass through a Mackie mixer, then a MOTU Traveler and into a laptop operating the real-time spectrogram program Ishmael 1.0, which transmits bearings to Whaltrak II (a program designed to plot the bearings). Due to the NI USB-6251 introducing electrical noise, gain issues with the Mackie mixer and software incompatibilities, the original setup was altered to allow data collection and localization to both occur.

Additionally, the newly obtained deck cable was incorrectly configured by the manufacturers, and did not match the wiring of the acoustic array. The inability to re-wire this cable due to the potted connectors resulted in leading the connector end of the array directly into the lab, and spooling both ends onto the winch when the array is brought in for CTD operations.

Two hydrophones were routed through the MAGREC high pass filter, then through the MOTU Traveler and connecting it 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 01 deck for reception of the sonobuoy signals. Incoming signals were monitored using a scrolling spectrogram display in *Ishmael*, and cetacean sounds were noted. Sonobuoys were deployed at regular intervals during the day (0900 and 1500 local), with an occasional additional deployment in late afternoon before sunset.

In contrast with previous sonobuoy efforts which have used surplus sonobuoys provided by the Navy once they've passed their shelf life, this trip new sonobuoys were provided by Operational Navy (CNO-N45) and with assistance from NAVAIR at Pearl Harbor.

b. Results

Towed Array

The towed-array was deployed throughout the cruise collecting nearly continuous high-frequency clean acoustic data from the four hydrophones. Over 100 acoustic detections were noted, consisting primarily of sperm and minke whales.

Initial problems with overnight recordings were eliminated by recording on only two hydrophone channels during the night surveying.

Sonobuoys

Thirty-seven sonobuoys were deployed over 15 days. Cetacean vocalizations detected on the sonobuoys included humpback, sperm, minke, fin, and sei whales, and possible delphinid clicks and whistles.

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

a. *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.

b. *Results*

Readings of the EK60 echosounder were observed occasionally. The EK60 echosounder was showing dense backscatter patches at depths between 200 and 400 m around Wake. All data were saved to an external hard drive for later analysis.

5. Deploy a High-frequency Acoustic Recording Package (HARP), used for long-term monitoring of cetacean occurrence off Wake Island.

a. *Methods*

A High-frequency Acoustic Recording Package (HARP) was designed and assembled at the University of California San Diego, Scripps Institute of Oceanography prior to the departure of the cruise. The location for deployment off of Wake Island was selected prior to departure based on the local bathymetry.

b. *Results*

On January 30, 2010 a HARP was successfully deployed at Wake Island (19°13" N, 166°41" E) and will be retrieved during the return transit from Guam in April 2010.

6. Deploy a Continuous Plankton Recorder to assess surface plankton distribution and composition along the transit.

a. *Methods*

A continuous plankton recorder (CPR) was deployed from the port J-frame while underway. The CPR was towed continuously for sections of the transit, then brought aboard for replacement of the internal storage cassette, and then redeployed. Seven cassettes were available for use during the transit from Hawaii to the Mariana Islands. For each tow, the CPR was deployed by the ship's crew with assistance from the scientific party. The wire was paid out until the CPR unit was fishing approximately 6-10 meters in depth as

determined by wire angle and/or visual estimation. The CPR unit was deployed and retrieved when necessary to accommodate other scientific operations. Conventional plankton net sampling was conducted opportunistically using both a small ring net and a larger Neuston net.

b. Results

The CPR was towed continuously for sections of the transit ranging between 216 and 450 nautical miles. Based on silk media usage it was determined that the CPR was not using media at the normal rate of 1 cm per nautical mile, but at a slightly slower rate. With all CPR catches, the silk was unrolled from the machine, rolled with retrieved specimens in the core, and placed into a marked bag with 95% ethyl alcohol. The samples will be split, one set for visual examination under a microscope and a second sample saved for future genetics-related work. Both types of processing will occur post-cruise.

A small ring net was deployed on 22 January, collecting specimens of *Doliolum* salps, *Lucifer* shrimp, and various other shrimp. The larger Neuston net was deployed on the mornings of 24 and 28 January for twenty minutes, collecting a diverse catch of Myctophid fishes, *Atlantid* gastropods, and a variety of shrimp, copepods, and chaetognaths. Ctenophores, amphipods, and fish eggs in various stages of development were also found in both samples. Two additional Neuston tows were conducted on 2 and 4 February. The composition of plankton changed markedly from the previous tows with fewer shrimp, copepods, or fish eggs, and larger numbers of amphipods in the samples.

7. Collect oceanographic data along the transit line.

a. 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.

b. Results

XBTs

A total of 22 XBTs were deployed between 21 January and 2 February. The first two XBT's only reached 500 meters, but subsequent XBTs were reaching 1,000

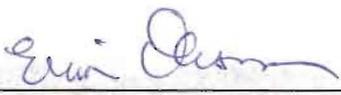
m. Sea surface temperature was approximately 25° C with a thermocline at approximately 100 m. At 1000 m the temperature was around 4° C. Approaching Guam the SST slowly increased and was 27.3° C on the final cast.

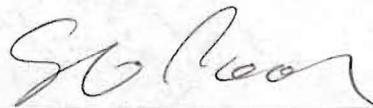
CTDs

The first CTD cast attempt occurred prior to sunrise on 22 January. A problem with the sensors returned inaccurate data. The following day was spent troubleshooting the problem, which after replacing the ‘fish’ was isolated to faulty wiring of the pumps. A deck test and wet test were performed before deployment prior to sunrise on 24 January. There were still some software problems with the system because the data were graphed accurately, but the information in the spreadsheet was not correct. A third CTD cast was conducted on 27 January, collecting accurate data to 500m. A CTD cast was conducted at Wake Island on 30 January. Two additional CTD casts were conducted on 2 and 4 February prior to the arrival at Guam.

SCIENTIFIC PERSONNEL:

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Attachments:

Figure 1: Trackline of the *Oscar Elton Sette*.

Figure 2: Cetacean sighting locations between Hawaii and Wake.

Figure 3: Cetacean sighting locations between Wake and Guam.

Table 1: Summary of daily survey effort and average Beaufort sea state.

Table 2: Summary of cetacean species encountered during SE-10-01.

Figures

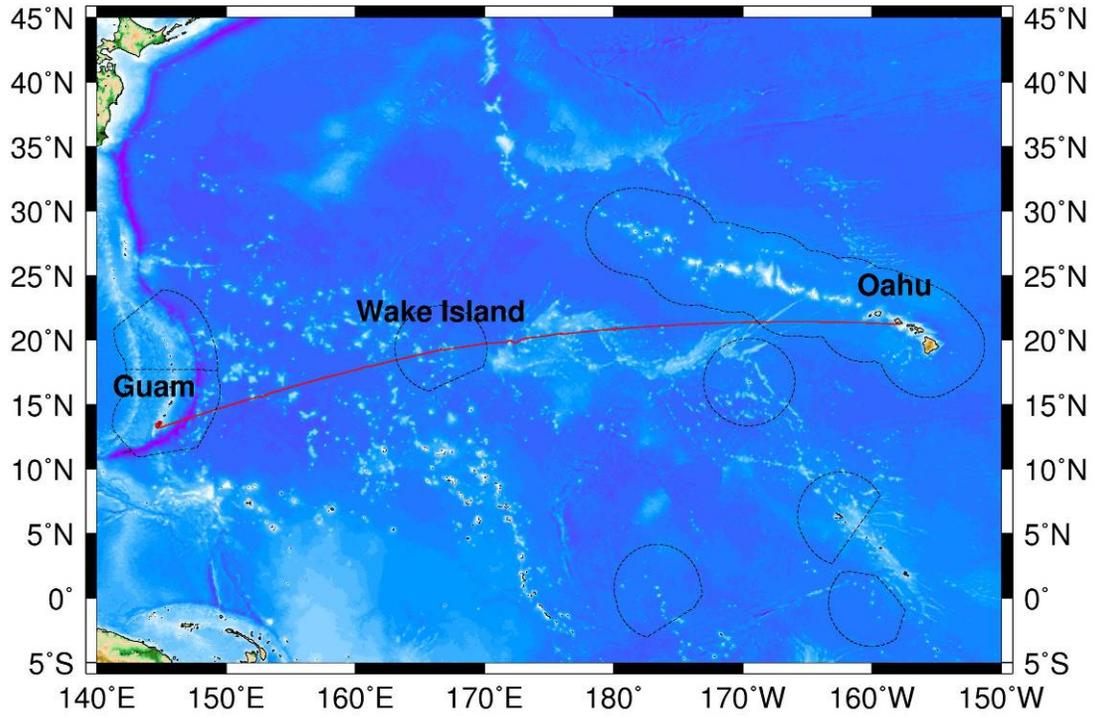


Figure 1.--Trackline of *Oscar Elton Sette* during SE-10-01.

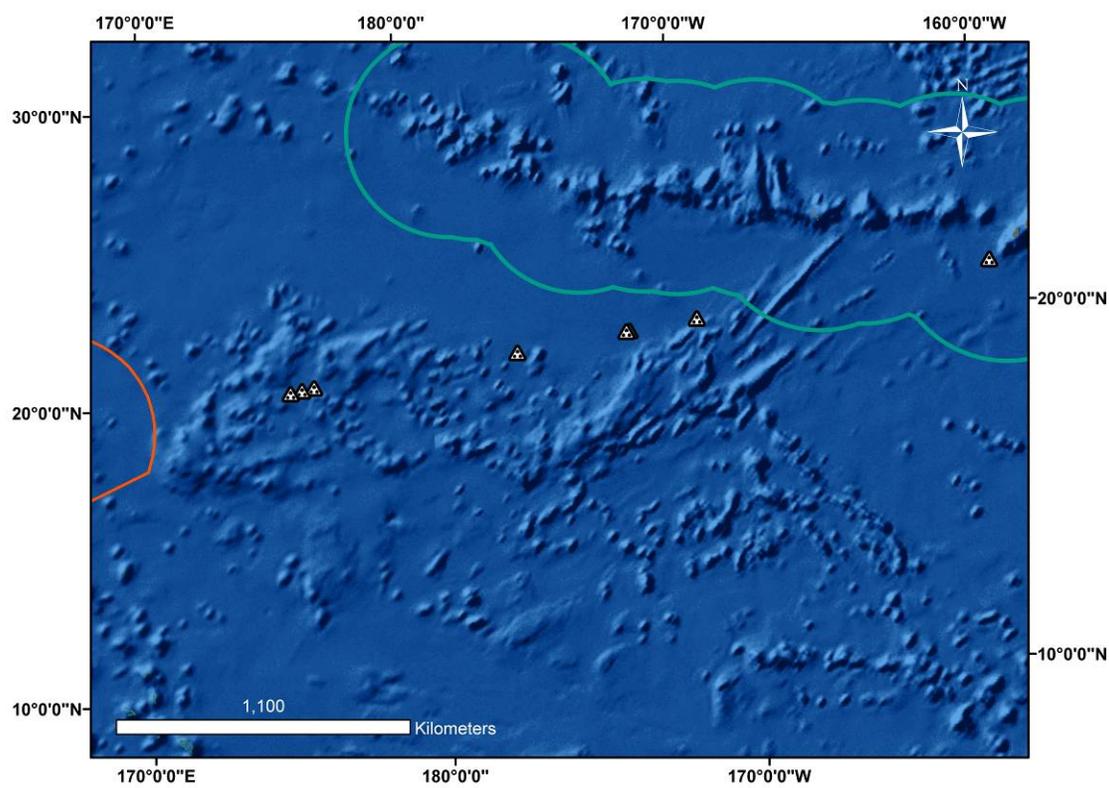


Figure 2.-- Cetacean sighting locations between Hawaii and Wake.

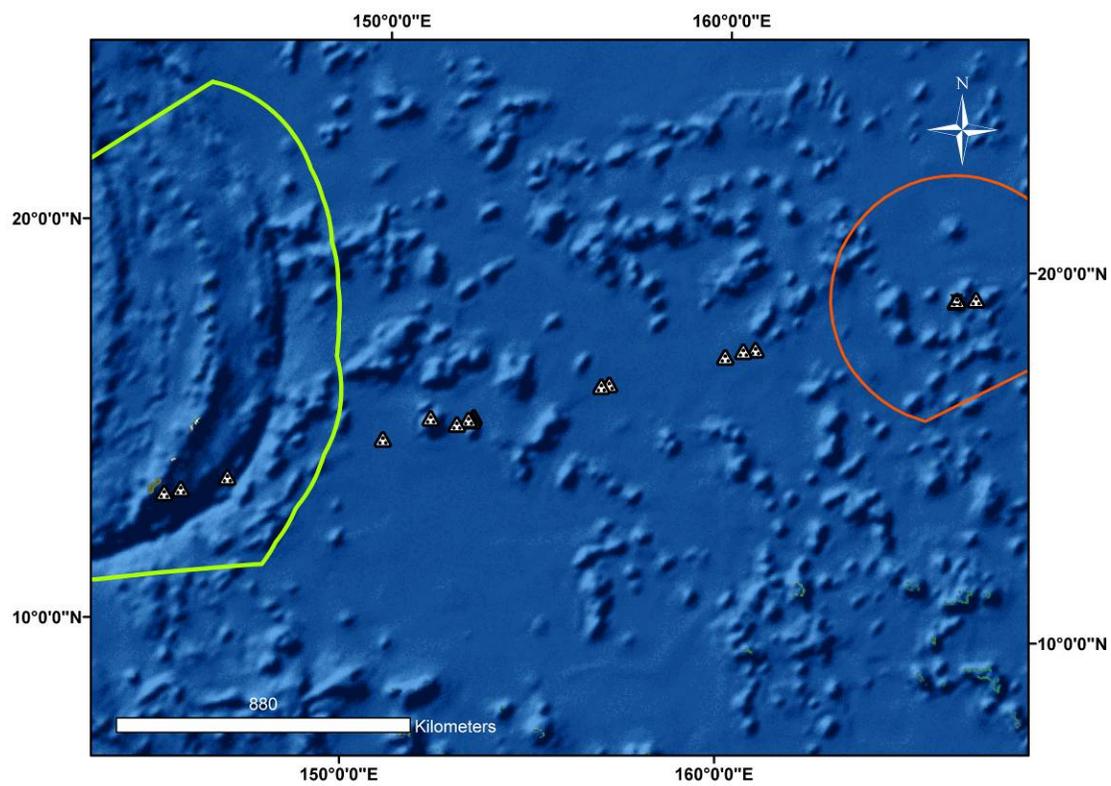


Figure 3.--Cetacean sighting locations between Wake and Guam.

Tables

Table 1.--Summary of daily survey effort and average Beaufort sea state.

Date	Start Time	Start Lat	Start Long	End Time	End Lat	End Long	Distance Surveyed (nmi)	Average Beaufort
1/21/2010		802 N21:20.19	W160:33.72	1825 N21:23.28	W162:33.2		99.3	4.3
1/22/2010		736 N21:25.21	W164:47.15	1852 N21:25.33	W166:44.8		109.6	4
1/23/2010		759 N21:24.02	W168:51.69	1905 N21:21.21	W170:50.9		111.1	3.3
1/24/2010		831 N21:18.44	W172:51.72	1915 N21:11.90	W174:40.2		98.4	4.2
1/25/2010		836 N21:04.10	W176:54.52	1412 N21:00.55	W177:47.5		45.4	6
1/26/2010	No Effort							7+
1/27/2010		749 N20:49.33	E179:44.20	1848 N20:39.61	E177:57.8		99.5	4.8
1/28/2010		758 N20:31.38	E175:57.09	1910 N20:14.31	E174:00.2		105.7	3.3
1/29/2010	No Effort							7+
1/30/2010		827 N19:24.76	E167:56.16	1837 N19:16.94	E166:40.0		73.6	5.1
1/31/2010		743 N18:55.31	E165:11.14	1855 N18:30.17	E163:21.1		105.9	4.8
2/1/2010		748 N17:58.81	E161:11.65	1912 N17:34.39	E159:34.0		87.7	4
2/2/2010		1132 N16:55.06	E157:04.32	1822 N16:38.84	E156:05.3		53.2	4.3
2/3/2010		719 N16:01.68	E153:53.61	1747 N15:36.04	E152:43.1		56.6	2.6
2/4/2010		736 N15:06.46	E150:47.62	1900 N14:31.32	E148:53.8		114.9	4.6
2/5/2010		648 N13:50.38	E146:46.18	1729 N13:16.64	E145:03.6		102	4.8
2/6/2010		657 N13:15.45	E144:51.69	1021 N13:26.43	E144:32.3		22.4	3.9

Table 2.--Summary of species encountered during cruise SE-10-01.

CODE	SPECIES	TOTAL SIGHTING #
013	Stenella coeruleoalba	1
031	Peponocephala electra	1
033	Pseudorca crassidens	1
046	Physeter macrocephalus	3
051	Mesoplodon sp.	1
070	Balaenoptera sp.	6
071	Balaenoptera acutorostrata	1
073	Balaenoptera borealis	3
077	Unidentified dolphin	1
099	Balaenoptera borealis/edeni	3
177	Unidentified small delphinid	2
277	Unidentified medium delphinid	1
377	Unidentified large delphinid	1
TOTAL		25