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MARINE MAMMAL DATA COLLECTED DURING THE OREGON, CALIFORNIA AND WASHINGTON LINE-TRANSECT EXPEDITION (ORCAWALE) CONDUCTED ABOARD THE NOAA SHIPS M*cARTHUR* AND *DAVID STARR JORDAN*, JULY - DECEMBER 2001

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NOAA-TM-NMFS-SWFSC-359

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center

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INTRODUCTION

In 1996 the National Marine Fisheries Service (NMFS), Southwest Fisheries Science Center (SWFSC) sponsored the first comprehensive survey of marine mammals fully encompassing the exclusive economic zone and adjacent waters out to 300 nautical miles from shore along the West Coast of the contiguous United States (VonSaunder and Barlow 1999).

In continuation of the work begun with that survey, and in an effort to better understand the ecosystems involved, the SWFSC sponsored another marine mammal survey of this area in 2001, titled the Oregon, California, and Washington Line Transect Expedition (ORCAWALE). The information collected from these endeavors is summarized in this report.

SURVEY OBJECTIVES

The primary goal of this expedition was to estimate the abundance and distribution of cetaceans by visual and acoustic methods. Concurrent with the abundance estimation, the expedition collected oceanographic data, as well as other forms of biological data, to contribute to a more thorough understanding of the environment in which these species are found.

STUDY AREA

The survey tracklines for the expedition were designed to uniformly cover the waters of the eastern Pacific Ocean extending from the U.S. western coasts of Washington, Oregon, and California, out to a distance of approximately 300 nautical miles. Tracklines covered are shown in Figure 1.

ITINERARY

The survey began on 30 July and ended on 8 December, 2001. It was composed of five legs on the NOAA Ship *David Starr Jordan* and one leg on the NOAA Ship *McArthur*. Scheduled survey legs varied between 19 and 29 days in length, separated by three to five days in port. Equipment malfunctions on the NOAA Ship *David Starr Jordan* resulted in a loss of 27 days of survey effort, and an additional 18 days were lost to foul weather. The itineraries for the ships are listed below.

NOAA Ship *David Star Jordan*:

LEG 1: 30 July – Depart San Diego, CA	09 August – Arrive Astoria, OR
Repair: 12 August – Depart Astoria, OR	17 August – Arrive Newport, OR
Repair: 24 August – Depart Newport, OR	24 August – Arrive Portland, OR
LEG 2: 30 August – Depart Portland, OR	16 September – Arrive Eureka, CA
LEG 3: 19 September – Depart Eureka, CA	04 October – Arrive San Diego, CA
LEG 4: 08 October – Depart San Diego, CA	27 October – Arrive Astoria, OR
LEG 5: 01 November – Depart Astoria, OR	10 November – Arrive San Diego, CA

NOAA Ship *McArthur*:

LEG 1: 15 Nov – Depart San Francisco, CA	08 December – Arrive San Diego, CA

SCIENTIFIC PERSONNEL

The scientific complement per leg included 13 to 14 scientists aboard the *Jordan*, and 11 aboard the *McArthur*. Appendix A lists the scientists and survey legs on which they participated.

EQUIPMENT AND PROCEDURES

Line-Transect Study

The survey component of this expedition was conducted according to line-transect methods (Buckland *et al*., 1993) that have been used consistently by the Southwest Fisheries Science Center for estimating abundance of cetaceans (Kinzey *et al*., 2001). These methods required the survey vessels, the NOAA Ships *McArthur* and *David Starr Jordan*, to follow predetermined tracklines at a cruising speed of approximately 10 kts speed over ground (SOG). As the ship traveled along the trackline, a team of marine mammal observers maintained a watch for signs of marine mammals during all times when visibility and weather conditions allowed. This watch was stationed on the flying bridge of the ship: 10.4 meters above water on the *McArthur* and 10.7 meters above water on the *David Starr Jordan*. Observers used Fujinon[1] 25x150 power pedestal mounted binoculars to scan the area forward of the ship's beam.

There were three marine mammal observer stations: a data recording station in the center of the flying bridge with a view from beam to beam, and port and starboard binocular stations, where the binoculars were mounted such that there were clear fields of view from 90˚ directly abeam the ship to 10º across the opposite bow. Observers obtained sighting angles from an azimuth incorporated into the binocular's mount. This azimuth was calibrated to zero along the ship's midline at each port call. The observers entered a watch rotation at the port binocular station and, during a 120 minute watch, moved to the center recorder station, then finally to the starboard binocular station, such that 40 minutes were spent at each location.

While in the center station, the observers scanned the full 180˚ forward of the beam using 7x50 binoculars and unaided eye. This allowed them to concentrate on the area from the ship to approximately 400 meters out, which was difficult to see with the large binoculars used at the other two stations.

This rotation was continued through all daylight hours when weather (sea state of Beaufort five or calmer), mechanical performance, and light conditions were such that the ship could maintain ~10 kts SOG, and observers had sufficient visibility to consistently discern signs of marine mammals in the field of view. At the discretion of the cruise leader, there was occasionally a fourth observer on watch, called the independent observer, who scanned from any forward location on the flying bridge using 7x50 binoculars and unaided eye.

The act of scanning for marine mammals while moving along the trackline is termed "effort", and observers on watch were considered "on-effort" when the observer team determined that conditions

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[1]Mention of brand names does not imply endorsement by the National Marine Fisheries Service.

were adequate for sightings. Cues or other information about possible sightings noted by off-effort individuals were not shared with on-effort observers.

The watch team typically went off-effort following a sighting of cetaceans that were within three nautical miles of the trackline, and guided the ship at various courses and speeds to approach the animals. This was done to identify the animals to species/stock, and for all observers to make independent estimates of the number of individuals seen. After the independent estimates had been made, and when conditions were appropriate, small boats were used to gather biopsy samples for genetic analysis, and photographs for photo-ID. Sightings of new animals made while closing on an existing sighting were recorded as "off-effort sightings".

After completing the estimates and small boat operations, and provided that closing on a sighting had not taken the ship more than five nautical miles from the trackline, the ship would resume effort on a parallel course to the trackline. If the ship had strayed more than five nautical miles from the trackline, effort would resume on a course angled at 20 degrees towards the trackline until within five nautical miles of it. If a school that had been previously recorded as an off-effort sighting during closing mode was re-sighted during searching, it was recorded as an on-effort sighting.

The survey was occasionally conducted in passing mode. During such times, the ship did not alter course from the survey trackline to close on sightings.

At all times during survey operations, a record of effort and sightings was kept by the center observer with the use of a laptop computer. This computer ran a program called WinCruz, written by Robert Holland of the SWFSC, which kept track of progress along the trackline (via GPS input), as well as weather and sighting data. These data were backed up to floppy disc, printed, and reviewed by the Cruise Leader at the close of effort each day.

Acoustics

There were three main goals of the acoustic program for the ORCAWALE 2001 Line-transect Expedition: to determine whether acoustics can add significantly to the estimation of dolphin abundance, to gather additional information on the range of acoustic detection of sperm whales, and to examine vocal characteristics of killer whales and large baleen whales for which genetic information was obtained. To this end, there were two distinct acoustics procedures: continuous monitoring and recording of dolphin and sperm whale vocalizations obtained from a towed hydrophone array on the *Jordan*, and opportunistic deployment of Navy surplus sonobuoys for recording baleen whales from both the *McArthur* and the *Jordan*.

Three different hydrophone arrays were used, each towed at a distance of 200 m behind the *Jordan* at an approximate depth of six meters and a speed of 10 kts. Initially, the primary array was a high-frequency three-element Norris array with sensitivity from 500 Hz to 150 kHz. The secondary array was a five-element Norris array with sensitivity from 15 Hz to 40 kHz. The third array, borrowed from Southeast Fisheries Science Center, was a five-element Norris array with sensitivity from 15 Hz to 40 kHz.

Signals received from the array were amplified and were monitored by an acoustic technician. Two acoustic technicians rotated on three-hour shifts during daylight hours. Clear cetacean sounds were

recorded on a Tascam DA-38 multi-channel recorder, and, occasionally, high-frequency vocalizations were recorded directly to the computer hard disk. A record was kept of acoustic effort, comments, and five-minute acoustic updates using the program WHALTRAK. Real-time visual displays of sounds were monitored using ISHMAEL software, which also was used to estimate bearing angles to a sound source via beamforming and phone-pair (cross-correlation) algorithms. These angles were plotted on the WHALTRAK display and saved to file.

Information regarding sperm whale detections was not shared between visual and acoustic teams until the animals had clearly passed abeam of the vessel; therefore, the visual and acoustic detections of this species can be considered to be independent. Visual observers frequently relayed information about delphinid sightings to the acoustic team to aid them in their documentation of delphinid whistle recordings.

Sonobuoys were deployed from the *Jordan* and the *McArthur* to record low-frequency cetacean sounds that could not be successfully recorded from the hydrophone array. The focus of these efforts was to obtain recordings of blue and fin whales, especially for animals from which genetic samples were obtained. Sonobuoys (type 53 or type 57) were typically deployed within ½ nmi of a baleen whale that had been sighted by the visual team. The high-frequency type 57 sonobuoys were occasionally deployed in the proximity of killer whales to record their vocalizations. Sonobuoy signals were recorded on a DAT recorder and were monitored using a scrolling spectrographic display.

Photo-Identification

Photographs of cetacean schools and individuals were taken with 35 mm SLR cameras using 300 and 400 mm lenses to assist with stock delineations and studies utilizing identifiable individuals to determine stock movement or, for some whale species, as an alternative means of estimating population sizes.

Biopsy

Two different types of biopsy tip were propelled from two different crossbows. A 25 mm long tip was used to sample smaller odontocete species, while larger odontocete species and all mysticete species were sampled with a 40 mm tip. For sampling some species, a small piece of rubber vacuum hose was added to the tips as a bumper to reduce the depth of tip penetration and to increase the probability that the tip would rebound. The sampling tips were mounted on modified crossbow arrow shafts, which have a threaded adapter to allow tips to be easily fitted and removed, and were propelled by either a Barnett Wildcat crossbow or a Barnett Quad 300 compound crossbow.

Behavior Studies

When time permitted, data on behavioral responses of cetaceans to the survey ships were collected. The observer priority was to record behavior of all odontocete species. Data included both a written narrative as well as seventeen categorical questions on the SWFSC Marine Mammal Sighting Form regarding individual and school behavior (front and back of NOAA Form 88-208).

RESULTS AND DISCUSSION

Sightings and Search Effort

At least 20 species of cetaceans were seen during the ORCAWALE 2001 survey (Table 1, including off-effort sightings). Most species were found in single-species groups, but striped dolphins (*Stenella coeruleoalba*) and bottlenose dolphins (*Tursiops truncatus*) were more often seen in association with other species (Table 1). Striped dolphins were usually seen with short-beaked common dolphins (*Delphinus delphis*), and bottlenose dolphins were most often seen with Risso's dolphins (*Grampus griseus*) (Table 2). Rigorously defined search effort included 7,432 km on the *David Starr Jordan* during 59 actual survey days (Table 3), for an average of 126 km per day. On the *McArthur*, the on-effort total was 2,325 km during 19 actual survey days (Table 3), for an average of 122 km per day. In total, 391 sightings were made during 9,757 km of search effort (Table 4). Search effort did not cover the entire planned survey grid (Figure 1), largely because of sea-days lost due to mechanical breakdowns on the *Jordan*. However, the overall distribution of search effort was nearly uniformly distributed across the study area. Very little search effort (< three percent) was achieved in calm weather conditions (Beaufort sea state zero or one). Approximately 10% of search effort was in Beaufort two conditions, 15% in Beaufort three, 45% in Beaufort four, and the remainder in Beaufort five to six (Table 4). Sighting rates (per 1000 km) were only moderate in Beaufort zero conditions (Table 4), probably this is an artifact of small sample size. Sighting rates declined, as is normal, with increasing sea state between Beaufort one and Beaufort five (Table 4). Detailed information on each sighting is presented in Table 5. The locations of sightings for each species (or higher taxonomic category) are illustrated in Figures 2-29.

Line-Transect Studies

This is the second complete survey of the ORCAWALE study area. The first ORCAWALE survey was 18 July to 4 November 1996 (VonSaunder and Barlow, 1999). That survey included 30 additional scheduled sea days (25% more than in 2001) and covered approximately 14,591 km of on-effort transects (50% more than in 2001). The fewer on-effort kilometers covered per scheduled sea-day in 2001 were largely due to mechanical breakdowns on the *Jordan*, which limited the number of effective sea days. The species composition of sightings in 2001 was very similar to that seen in previous years; however, the one notable absence in 2001 was species in the genus *Mesoplodon*. There were fewer sightings of blue whale in 2001 and proportionately more sightings of fin whales. Blue whales were seen farther north in 2001, including three sightings off southern Oregon. Bottlenose dolphins were also less common in the recent survey and were seen only in the Southern California Bight. Overall sighting rates were lower in 2001 compared to 1996, and the distributions of searching effort were skewed towards higher sea states, indicating rougher weather on average.

Acoustics

The hydrophone array was towed and monitored for approximately 8,132 km (4,391 nmi). The array use varied during the cruise based on weather conditions and equipment malfunctions (Table 6). The high-frequency three-element array was preferred during calm sea states for the broadband frequency characteristics until it broke during leg two. During high sea states, the Norris five-

element array was used, and this became the primary array after the leg two equipment failures. The SEFSC array was tested and used briefly during leg four.

The acoustics team detected 132 of a total of 188 dolphin schools (including both sighted and non-sighted schools). All non-sighted acoustic detections, with the exception of sperm whales, were "unidentified dolphins". There were a total of 65 non-sighted acoustic detections, of which 43 were unidentified dolphins.

Sperm whales accounted for 22 of these non-sighted acoustic detections, with all but one of these detections outside of the search range of the visual observers. The acoustic team detected many of the sperm whales that were seen by the visual team and information regarding animal location was relayed to the visual team according to independent detection protocol (after the animals passed aft of the beam).

Recordings of visually detected sightings from the towed hydrophone array included vocalizations from short-beaked common dolphins (*Delphinus delphis*), long-beaked common dolphins (*Delphinus capensis*), striped dolphins (*Stenella coeruleoalba*), Pacific white-sided dolphins (*Lagenorhyinchus obliquidens*), northern right whale dolphins (*Lissodelphis borealis*), bottlenose dolphins (*Tursiops truncatus*), Risso's dolphin (*Grampus griseus*), killer whales (*Orcinus orca*), and sperm whales (*Physeter macrocephalus*) (Table 7). No acoustic vocalizations from Dall's porpoise (*Phocoenoides dalli*), harbor porpoise (*Phocoena phocoena*), beaked whales or baleen whales were detected with this equipment.

A total of 38 sonobuoys was deployed from the ships, including both high-frequency (type 57A) and low-frequency (type 53) sonobuoys (Table 8). Recordings from two groups of killer whales and one fin whale were obtained from the high-frequency sonobuoys (with three functional sonobuoys of a total of 13). Recordings of humpback, fin, and blue whales were obtained from the low-frequency sonobuoys (with 18 functional sonobuoys of a total of 25). One humpback recording was of a singing animal, the recording appeared to contain a complete song.

Photo-Identification

Eleven cetacean species were photographed in the 80 sightings that the photo-ID team was able to sample. The species and sighting numbers are listed in Table 9.

Biopsy Sampling

The biopsy team collected 235 biopsy samples (Table 10) from four mysticete and 10 odontocete species during the cruise.

Behavior

Notes on marine mammal behavior were recorded on the behavior section of the marine mammal sighting form used by the observers. These data are being analyzed in conjunction with behavioral data from several other SWFSC cruises.

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For further information about these data contact the following:
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Genetics: Barb Taylor (Barb.Taylor@noaa.gov).

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VonSaunder, A and J. Barlow. 1999. A Report of the Oregon, California and Washington Line-Transect Experiment (ORCAWALE) conducted in West coast waters during summer/fall 1996. NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-264.

Table 1. Sightings summary – A summary of all species sighted and number of times each species was sighted during the expedition.

Species Code	Name	No. Schools Sighted Pure	Mixed	Total	Average School size
005	*Delphinus* sp.	4	0	4	9.8
013	*Stenella coeruleoalba*	1	5	6	44.2
016	*Delphinus capensis*	1	1	2	307.3
017	*Delphinus delphis*	79	6	85	83.6
018	*Tursiops truncatus*	5	6	11	10.4
021	*Grampus griseus*	20	8	28	8.4
022	*Lagenorhynchus obliquidens*	15	9	24	12.3
027	*Lissodelphis borealis*	28	8	36	10.5
037	*Orcinus orca*	7	2	9	2.5
040	*Phocoena phocoena*	31	0	31	2.0
044	*Phocoenoides dalli*	103	1	104	2.9
046	*Physeter macrocephalus*	19	0	19	1.7
049	*ziphiid* whale	5	0	5	1.4
061	*Ziphius cavirostris*	7	0	7	1.4
063	*Berardius bairdii*	3	0	3	3.0
069	*Eschrichtius robustus*	1	0	1	1.1
070	*Balaenoptera* sp.	12	1	13	1.1
071	*Balaenoptera acutorostrata*	7	0	7	1.1
073	*Balaenoptera borealis*	1	0	1	1.0
074	*Balaenoptera physalus*	40	5	45	2.0
075	*Balaenoptera musculus*	11	2	13	1.4
076	*Megaptera novaeangliae*	33	5	38	1.6
077	unid. dolphin	19	0	19	5.3
078	unid. small whale	7	0	7	1.0
079	unid. large whale	8	0	8	1.0
080	*Kogia* sp.	1	0	1	1.0
097	unid. object	1	0	1	1.0
098	unid. whale	1	0	1	1.5
177	unid. small *delphinid*	1	0	1	4.0

Table 2. Schools of mixed species composition – A list of sightings that included more than one species.

Species 1	Species 2	Species 3	Species 4	Total
017 SHRTB_COMM	013 STRIPED			5
017 SHRTB_COMM	022 P_WHT_SIDE			1
018 TURSIOPS	016 LONGB_COMM	021 GRAMPUS		1
018 TURSIOPS	021 GRAMPUS			5
021 GRAMPUS	022 P_WHT_SIDE	027 LISSO_BOR		1
021 GRAMPUS	027 LISSO_BOR			1
022 P_WHT_SIDE	*MISSING*			1
022 P_WHT_SIDE	027 LISSO_BOR			3
037 KILLER_WHA	074 FIN_WHALE			1
037 KILLER_WHA	076 HUMPBACK_W			1
074 FIN_WHALE	027 LISSO_BOR			1
074 FIN_WHALE	070 UNID_RORQL			1
075 BLUE_WHALE	074 FIN_WHALE			2
076 HUMPBACK_W	022 P_WHT_SIDE			1
076 HUMPBACK_W	022 P_WHT_SIDE	027 LISSO_BOR		2
076 HUMPBACK_W	044 DALLS_PORP			1

Table 3. Kilometers of effort per ship per day – Includes 59 days of on-effort observation conducted by *David Starr Jordan*, and 19 days of on-effort observation conducted by *McArthur*.

Date	*Jordan*	*McArthur*
31 Jul	133.7	0.0
1 Aug	27.7	0.0
2 Aug	174.3	0.0
3 Aug	146.5	0.0
4 Aug	114.3	0.0
5 Aug	185.4	0.0
6 Aug	189.0	0.0
12 Aug	117.4	0.0
13 Aug	224.3	0.0
14 Aug	142.7	0.0
15 Aug	233.4	0.0
16 Aug	23.4	0.0
31 Aug	182.2	0.0
1 Sep	202.0	0.0
2 Sep	149.4	0.0
3 Sep	180.6	0.0
4 Sep	100.1	0.0
5 Sep	103.4	0.0
6 Sep	177.1	0.0
7 Sep	85.8	0.0
10 Sep	223.6	0.0
11 Sep	190.8	0.0
12 Sep	213.2	0.0
13 Sep	121.3	0.0
14 Sep	149.7	0.0
15 Sep	161.3	0.0
20 Sep	144.9	0.0
21 Sep	118.4	0.0
22 Sep	19.8	0.0
23 Sep	171.1	0.0
24 Sep	161.6	0.0
25 Sep	134.7	0.0
26 Sep	111.8	0.0
27 Sep	168.9	0.0
28 Sep	132.2	0.0
29 Sep	165.1	0.0
30 Sep	154.8	0.0
1 Oct	44.1	0.0
2 Oct	52.2	0.0
3 Oct	151.6	0.0
9 Oct	123.0	0.0
10 Oct	168.3	0.0
11 Oct	56.7	0.0
12 Oct	8.5	0.0
14 Oct	10.1	0.0
15 Oct	179.4	0.0
16 Oct	22.5	0.0
18 Oct	51.6	0.0
19 Oct	92.8	0.0
20 Oct	102.8	0.0
21 Oct	87.7	0.0
22 Oct	105.3	0.0
24 Oct	83.6	0.0
25 Oct	150.9	0.0
26 Oct	93.6	0.0
2 Nov	98.9	0.0
3 Nov	112.6	0.0
4 Nov	117.4	0.0
9 Nov	82.4	0.0
15 Nov	0.0	27.8
16 Nov	0.0	121.3
17 Nov	0.0	176.5
18 Nov	0.0	129.9
19 Nov	0.0	149.7
20 Nov	0.0	110.4
21 Nov	0.0	139.7
22 Nov	0.0	104.9
23 Nov	0.0	92.7
25 Nov	0.0	126.5
26 Nov	0.0	129.6
27 Nov	0.0	125.1
28 Nov	0.0	121.6
30 Nov	0.0	178.8
1 Dec	0.0	140.3
2 Dec	0.0	165.1
3 Dec	0.0	46.1
5 Dec	0.0	153.2
7 Dec	0.0	85.4
Total	**7432.1**	**2324.6**

Table 4. ORCAWALE survey effort by sea state and observer number – A list of the number of sightings and kilometers of effort by sea state and by observer number.

	Kilometers of effort	No. of sightings	Sightings per 1000 km
Total	**9756.7**	**391**	**40.08**
By sea state (Beaufort)			
0	89.4	6	67.10
1	175.0	26	148.53
2	970.1	106	109.27
3	1590.6	64	40.24
4	4508.8	139	30.83
5	2278.3	47	20.63
6	144.4	3	20.78
By observer number			
7	4216.0	50	11.86
15	272.3	1	3.67
34	361.0	3	8.31
71	332.7	0	.00
73	4940.5	68	13.76
99	9.9	0	.00
104	.6	0	.00
106	861.1	4	4.64
120	47.3	0	.00
126	4806.5	69	14.36
149	4831.4	76	15.73
159	108.0	0	.00
184	1169.5	13	11.12
190	65.8	0	.00
199	1696.8	0	.00
200	4884.2	59	12.08
201	3675.0	44	11.97
203	542.0	4	7.38

Table 5. Marine mammal sightings during ORCAWALE 2001

"Other Codes" column indicates the other sighting-categories in a mixed-species school. Times are local. School size is the uncalibrated mean of the observers' best estimates of school size. Bft. = Beaufort.

Total No. of Sightings (on+off) = 499

Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Effort
***Delphinus* sp.**										
005		1	30 Jul	1745	N32:37.77	W117:51.94	4	7	20	On
005		257	30 Sep	939	N34:57.94	W123:37.08	5	106	12	Off
005		270	2 Oct	1457	N34:00.23	W119:05.50	4	200	1	Off
005		281	3 Oct	1015	N32:59.94	W118:02.01	3	201	6	On
Stenella coeruleoalba										
013	17	15	2 Aug	1351	N33:58.15	W125:40.10	4	200	74	On
013	17	251	29 Sep	855	N35:52.06	W127:32.62	4	200	135	On
013	17	417	18 Nov	1544	N32:48.52	W126:18.20	4	200	508	On
013	17	422	19 Nov	1340	N32:10.72	W124:21.89	3	73	86	On
013	17	430	21 Nov	1408	N31:11.70	W119:54.23	5	7	309	On
013		482	2 Dec	1652	N30:18.17	W123:46.77	4	200	18	On
Delphinus capensis										
016	18 21	396	9 Nov	833	N34:03.58	W119:24.82	3	7	35	On
016		398	9 Nov	1024	N33:56.01	W119:21.85	4	200	613	On
Delphinus delphis										
017		2	30 Jul	1931	N32:37.00	W118:08.30	5	73	38	On
017		3	31 Jul	1230	N32:49.33	W120:36.24	4	126	1	On
017		5	31 Jul	1655	N32:57.86	W121:12.39	4	200	7	Off
017		6	1 Aug	649	N33:17.97	W122:44.44	5	200	3	On
017		9	1 Aug	1702	N33:27.26	W123:06.05	4	126	27	Off
017		10	2 Aug	737	N33:47.28	W124:50.66	4	201	2	Off
017		11	2 Aug	846	N33:49.96	W125:02.77	4	149	6	On
017		12	2 Aug	922	N33:49.83	W125:06.66	4	200	49	On
017		14	2 Aug	1337	N33:57.74	W125:37.73	4	149	7	On
017	13	15	2 Aug	1351	N33:58.15	W125:40.10	4	200	74	On
017		16	2 Aug	1425	N33:55.15	W125:41.38	4	149	38	On
017		18	3 Aug	753	N34:18.55	W127:14.78	3	73	165	On
017		20	3 Aug	1121	N34:40.22	W127:20.59	2	7	22	On
017		22	3 Aug	1342	N35:00.55	W127:17.12	2	149	37	On
017		23	3 Aug	1435	N35:08.57	W127:14.35	2	126	40	On
017		25	3 Aug	1540	N35:18.07	W127:10.20	2	73	67	On
017		26	3 Aug	1600	N35:19.85	W127:12.45	2	73	49	On
017		27	3 Aug	1645	N35:26.25	W127:12.20	2	73	17	On
017		31	4 Aug	1128	N36:06.26	W126:52.61	2	126	40	On
017		244	28 Sep	859	N38:06.41	W127:49.47	4	200	3	On
017		247	28 Sep	1510	N37:26.43	W128:03.87	4	126	20	On
017		248	28 Sep	1639	N37:14.14	W128:08.65	4	200	20	On
017		249	29 Sep	726	N35:56.80	W127:48.52	4	149	7	Off
017		250	29 Sep	743	N35:56.23	W127:45.45	4	200	25	On
017	13	251	29 Sep	855	N35:52.06	W127:32.62	4	200	135	On
017		252	30 Sep	708	N35:05.29	W123:57.31	5	7	2	Off
017		253	30 Sep	747	N35:03.62	W123:50.33	5	200	8	On
017		254	30 Sep	830	N35:01.79	W123:42.50	5	126	163	On
017		258	30 Sep	945	N34:57.72	W123:36.02	5	201	91	Off
017		259	30 Sep	1203	N34:52.17	W123:09.54	4	126	63	On
017		260	30 Sep	1529	N34:44.68	W122:32.02	4	200	5	On
017		265	1 Oct	1816	N34:14.58	W120:13.62	5	73	223	On
017		266	2 Oct	1213	N33:54.88	W118:42.90	4	149	27	On
017		267	2 Oct	1304	N33:56.13	W118:51.37	4	73	164	On

Table 5. ORCAWALE 2001 Marine Mammal Sightings (continued)

Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
017		268	2 Oct	1329	N33:58.22	W118:53.70	4	149	24	On
017		273	2 Oct	1606	N34:01.96	W119:09.43	4	73	6	Off
017		274	2 Oct	1611	N34:02.22	W119:10.28	4	149	126	On
017		276	2 Oct	1727	N34:05.46	W119:19.26	4	73	41	On
017		277	2 Oct	1759	N34:07.81	W119:20.13	4	7	18	On
017		280	3 Oct	744	N33:20.95	W117:52.93	3	201	62	On
017		282	3 Oct	1037	N32:56.84	W118:02.70	3	201	83	On
017		284	3 Oct	1148	N32:46.36	W118:05.81	1	201	321	On
017		285	3 Oct	1226	N32:41.73	W118:08.66	2	73	83	On
017		287	3 Oct	1645	N31:59.48	W118:18.68	3	149	54	On
017		288	3 Oct	1747	N31:50.92	W118:24.45	3	200	37	On
017		289	9 Oct	802	N32:21.22	W118:27.69	3	73	443	On
017		292	9 Oct	1335	N32:22.13	W118:59.76	4	201	73	On
017		293	9 Oct	1427	N32:23.88	W119:05.70	4	126	8	On
017		296	12 Oct	1457	N34:34.56	W125:47.87	5	200	6	On
017		297	12 Oct	1712	N34:43.57	W125:41.60	5	73	400	Off
017		298	14 Oct	746	N37:11.60	W126:36.51	5	126	27	Off
017		300	14 Oct	1738	N37:19.20	W127:41.07	5	149	85	Off
017		301	15 Oct	1245	N37:43.16	W129:01.43	4	73	87	On
017		302	15 Oct	1718	N38:01.33	W129:31.10	4	106	9	On
017		303	18 Oct	1651	N42:26.89	W130:43.36	4	73	3	On
017		319	22 Oct	858	N40:50.21	W129:57.27	5	73	953	On
017		320	22 Oct	1156	N40:44.81	W129:23.58	5	126	16	On
017		321	22 Oct	1229	N40:43.16	W129:16.87	5	126	10	On
017		322	22 Oct	1531	N40:34.05	W128:39.20	6	126	45	Off
017		323	22 Oct	1751	N40:22.20	W128:15.08	5	73	50	Off
017		324	22 Oct	1807	N40:22.52	W128:11.76	5	200	20	On
017		364	3 Nov	1013	N41:05.65	W128:29.59	3	149	5	On
017		366	3 Nov	1128	N40:55.38	W128:30.54	4	7	60	On
017		369	3 Nov	1632	N40:26.40	W128:42.24	3	126	58	On
017		370	3 Nov	1710	N40:21.17	W128:44.75	3	149	16	On
017		372	4 Nov	830	N38:57.54	W128:06.74	1	149	36	On
017		375	4 Nov	1255	N38:50.92	W127:27.59	2	73	5	On
017		414	17 Nov	1020	N35:35.31	W125:23.53	4	184	15	On
017		416	18 Nov	1232	N33:16.81	W126:09.41	4	149	4	On
017	13	417	18 Nov	1544	N32:48.52	W126:18.20	4	200	508	On
017		420	19 Nov	927	N32:20.28	W125:07.64	3	73	63	On
017		421	19 Nov	1125	N32:14.46	W124:47.79	3	149	41	On
017	13	422	19 Nov	1340	N32:10.72	W124:21.89	3	73	86	On
017		424	19 Nov	1553	N32:05.79	W123:56.44	2	149	14	On
017		425	19 Nov	1611	N32:02.99	W123:55.13	2	184	4	On
017		426	19 Nov	1635	N32:00.41	W123:53.41	2	126	71	On
017		429	21 Nov	907	N31:22.40	W120:50.77	4	149	5	On
017	13	430	21 Nov	1408	N31:11.70	W119:54.23	5	7	309	On
017		433	22 Nov	1532	N32:58.17	W119:38.80	6	200	9	On
017		434	22 Nov	1601	N33:02.64	W119:37.77	6	126	33	On
017		480	30 Nov	1629	N32:34.04	W123:05.11	2	184	13	On
017		481	2 Dec	1615	N30:24.74	W123:44.60	4	184	12	On
017		485	5 Dec	1158	N32:36.98	W121:24.02	5	126	2	On
017		496	7 Dec	1045	N31:57.21	W118:18.34	3	200	3	On
017	22	499	7 Dec	1239	N32:12.98	W118:11.38	4	7	1267	On
Tursiops truncatus										
018	21	271	2 Oct	1457	N34:00.25	W119:05.54	4	201	19	On
018		395	9 Nov	806	N34:04.15	W119:28.79	3	7	17	On
018	16 21	396	9 Nov	833	N34:03.58	W119:24.82	3	7	35	On
018	21	397	9 Nov	920	N34:01.87	W119:20.59	4	149	9	On
018		399	9 Nov	1203	N33:50.50	W119:23.19	4	201	10	On
018	21	400	9 Nov	1223	N33:48.42	W119:23.95	4	201	37	On
018		402	9 Nov	1312	N33:43.93	W119:25.11	3	73	10	On

Table 5. ORCAWALE 2001 Marine Mammal Sightings (continued)

Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
018		403	9 Nov	1355	N33:40.88	W119:29.47	3	201	6	On
018	21	404	9 Nov	1356	N33:40.81	W119:29.57	3	149	6	On
018		405	9 Nov	1443	N33:38.84	W119:31.96	3	7	15	On
018	21	407	9 Nov	1515	N33:36.01	W119:31.12	2	7	4	On
Grampus griseus										
021		17	2 Aug	1924	N34:08.51	W126:32.06	4	7	8	On
021		21	3 Aug	1219	N34:49.46	W127:18.21	1	149	16	On
021		34	4 Aug	1931	N37:01.19	W126:33.28	3	149	13	On
021	27	77	13 Aug	1901	N46:23.57	W128:02.63	3	201	20	On
021		96	1 Sep	817	N44:37.99	W126:35.13	4	126	8	On
021		121	5 Sep	1329	N47:18.10	W125:02.08	5	126	3	On
021		145	6 Sep	1505	N46:26.46	W124:58.24	4	200	4	On
021		180	21 Sep	1044	N42:50.08	W124:39.60	4	201	12	On
021		184	21 Sep	1132	N42:54.97	W124:41.52	4	126	10	On
021	22 27	187	21 Sep	1224	N43:01.26	W124:35.21	2	149	29	On
021		190	21 Sep	1346	N43:07.24	W124:36.99	2	149	10	On
021		192	21 Sep	1353	N43:08.30	W124:36.60	2	7	12	On
021		264	1 Oct	1748	N34:15.47	W120:19.09	5	149	2	On
021		269	2 Oct	1441	N34:00.08	W119:02.74	4	126	9	On
021	18	271	2 Oct	1457	N34:00.25	W119:05.54	4	201	19	On
021		275	2 Oct	1632	N34:03.56	W119:13.56	4	149	11	On
021		279	2 Oct	1834	N34:08.65	W119:26.69	4	126	5	Off
021		315	21 Oct	1344	N42:03.52	W128:47.95	5	73	7	On
021	18 16	396	9 Nov	833	N34:03.58	W119:24.82	3	7	35	On
021	18	397	9 Nov	920	N34:01.87	W119:20.59	4	149	9	On
021	18	400	9 Nov	1223	N33:48.42	W119:23.95	4	201	37	On
021		401	9 Nov	1257	N33:45.24	W119:24.04	3	73	5	On
021	18	404	9 Nov	1356	N33:40.81	W119:29.57	3	149	6	On
021		406	9 Nov	1514	N33:36.07	W119:31.12	2	149	3	On
021	18	407	9 Nov	1515	N33:36.01	W119:31.12	2	7	4	On
021		408	9 Nov	1535	N33:33.98	W119:31.70	1	126	5	On
021		409	9 Nov	1546	N33:32.74	W119:31.79	1	126	3	On
021		469	28 Nov	915	N36:21.97	W121:58.05	4	73	5	On
Lagenorhynchus obliquidens										
022	27	41	5 Aug	1815	N40:04.50	W125:32.10	2	73	75	On
022		56	6 Aug	1058	N41:06.74	W125:11.32	2	200	12	On
022	27	82	15 Aug	1435	N45:19.58	W130:10.09	3	126	24	On
022	76	102	4 Sep	1120	N47:26.92	W126:01.40	4	7	7	Off
022	27	114	5 Sep	1005	N47:22.90	W125:35.83	5	149	43	On
022		117	5 Sep	1133	N47:22.78	W125:16.76	5	149	10	On
022		119	5 Sep	1231	N47:19.91	W125:13.48	5	7	10	On
022	76 27	122	5 Sep	1344	N47:16.40	W125:00.04	5	73	10	Off
022		144	6 Sep	1227	N46:51.24	W124:50.10	4	7	13	On
022		167	20 Sep	911	N41:15.57	W124:37.90	3	149	4	On
022		169	20 Sep	955	N41:17.24	W124:46.55	4	73	1	On
022	76 27	171	20 Sep	1312	N41:34.77	W125:01.27	4	149	80	On
022	21 27	187	21 Sep	1224	N43:01.26	W124:35.21	2	149	29	On
022		340	26 Oct	924	N44:19.30	W125:03.59	5	126	4	On
022		345	1 Nov	1209	N46:01.83	W124:24.78	5	126	5	On
022		346	1 Nov	1309	N45:56.32	W124:32.32	5	126	2	On
022		347	1 Nov	1330	N45:54.57	W124:35.14	5	201	2	On
022		348	1 Nov	1340	N45:53.68	W124:36.64	5	73	3	On
022		350	1 Nov	1406	N45:51.49	W124:40.28	4	149	5	On
022		410	9 Nov	1552	N33:32.02	W119:31.82	1	126	6	On
022		495	7 Dec	1028	N31:54.92	W118:19.73	4	126	16	On
022		497	7 Dec	1058	N31:59.32	W118:17.85	3	73	1	On
022	ZC	498	7 Dec	1208	N32:09.05	W118:14.94	4	73	16	On
022	17	499	7 Dec	1239	N32:12.98	W118:11.38	4	7	1267	On

Table 5. ORCAWALE 2001 Marine Mammal Sightings (continued)

Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
Lissodelphis borealis										
027	22	41	5 Aug	1815	N40:04.50	W125:32.10	2	73	75	On
027	21	77	13 Aug	1901	N46:23.57	W128:02.63	3	201	20	On
027	22	82	15 Aug	1435	N45:19.58	W130:10.09	3	126	24	On
027		89	31 Aug	1155	N45:13.93	W125:27.47	4	7	4	On
027		103	4 Sep	1641	N47:38.92	W126:06.52	5	200	6	On
027		108	5 Sep	843	N47:30.62	W125:46.20	5	126	7	Off
027	22	114	5 Sep	1005	N47:22.90	W125:35.83	5	149	43	On
027	76 22	122	5 Sep	1344	N47:16.40	W125:00.04	5	73	10	Off
027		146	7 Sep	905	N45:12.30	W127:59.18	5	73	4	On
027	76 22	171	20 Sep	1312	N41:34.77	W125:01.27	4	149	80	On
027	21 22	187	21 Sep	1224	N43:01.26	W124:35.21	2	149	29	On
027		305	19 Oct	1239	N43:28.94	W130:55.58	4	200	4	On
027		306	19 Oct	1304	N43:32.16	W130:54.37	4	200	7	On
027		314	21 Oct	1251	N42:02.11	W128:38.79	4	201	3	On
027		318	21 Oct	1751	N42:15.27	W129:18.96	5	203	2	On
027		331	24 Oct	1109	N41:49.79	W128:11.18	3	149	7	Off
027		337	25 Oct	857	N44:02.88	W127:27.06	2	73	15	On
027		362	3 Nov	1002	N41:07.23	W128:29.03	3	200	5	On
027		363	3 Nov	1007	N41:06.47	W128:29.30	3	7	5	On
027		365	3 Nov	1031	N41:03.21	W128:30.59	3	7	14	On
027		368	3 Nov	1613	N40:29.18	W128:41.27	3	73	2	On
027	74	374	4 Nov	1147	N38:51.15	W127:36.53	2	4	11	Off
027		379	4 Nov	1349	N38:47.34	W127:19.33	2	7	4	On
027		380	4 Nov	1355	N38:47.50	W127:18.22	2	7	6	Off
027		381	4 Nov	1402	N38:47.49	W127:16.98	2	149	21	On
027		382	4 Nov	1422	N38:45.92	W127:13.96	2	126	14	On
027		385	4 Nov	1519	N38:45.12	W127:02.91	2	7	8	On
027		386	4 Nov	1542	N38:43.09	W126:59.29	3	73	48	On
027		387	7 Nov	1544	N36:24.45	W123:41.28	5	149	3	On
027		391	8 Nov	1031	N34:50.18	W121:59.41	2	201	8	On
027		393	8 Nov	1545	N34:34.94	W121:37.83	3	7	45	On
027		431	22 Nov	1226	N32:29.86	W119:46.18	5	73	4	On
027		440	25 Nov	659	N36:08.16	W121:46.15	3	149	4	On
027		449	26 Nov	1208	N37:10.41	W126:29.09	2	7	36	On
027		464	27 Nov	1521	N36:40.24	W124:08.50	2	7	12	On
027		491	6 Dec	1002	N32:40.98	W119:38.38	5	7	4	Off
Orcinus orca										
037	76	76	12 Aug	1113	N45:41.86	W124:08.06	4	126	4	On
037		141	6 Sep	1038	N47:03.33	W124:45.52	3	200	3	On
037	74	164	14 Sep	1339	N39:48.26	W127:17.23	4	73	3	On
037		311	20 Oct	844	N43:41.17	W129:25.43	4	149	2	On
037		360	2 Nov	1523	N43:15.40	W127:47.46	3	200	7	On
037		367	3 Nov	1209	N40:51.10	W128:34.25	4	149	2	On
037		392	8 Nov	1209	N34:42.21	W121:49.00	2	200	1	On
037		412	15 Nov	1626	N37:56.60	W123:03.96	2	73	2	On
037		454	27 Nov	1216	N36:48.97	W124:37.20	3	184	1	On
Phocoena phocoena										
040		83	17 Aug	928	N44:35.11	W124:19.12	4	98	2	Off
040		84	17 Aug	954	N44:31.84	W124:18.42	4	73	1	Off
040		86	17 Aug	1104	N44:33.64	W124:11.13	4	73	1	Off
040		87	17 Aug	1111	N44:34.29	W124:10.09	4	73	2	Off
040		123	5 Sep	1458	N47:15.62	W124:49.09	4	73	2	On
040		125	5 Sep	1636	N47:14.87	W124:27.65	5	200	2	On
040		126	6 Sep	657	N47:35.22	W124:27.85	2	149	2	On
040		127	6 Sep	717	N47:32.08	W124:29.09	2	149	1	On
040		128	6 Sep	730	N47:29.90	W124:29.92	2	200	2	On

Table 5. ORCAWALE 2001 Marine Mammal Sightings (continued)

Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
040		129	6 Sep	745	N47:27.51	W124:30.87	2	200	1	On
040		130	6 Sep	757	N47:25.57	W124:31.60	2	126	2	On
040		131	6 Sep	800	N47:25.07	W124:31.79	2	200	5	On
040		132	6 Sep	802	N47:24.66	W124:31.95	2	201	2	On
040		133	6 Sep	805	N47:24.18	W124:32.14	2	7	2	On
040		134	6 Sep	806	N47:24.09	W124:32.17	2	201	5	On
040		135	6 Sep	807	N47:23.95	W124:32.22	2	7	2	On
040		136	6 Sep	808	N47:23.70	W124:32.32	2	201	1	On
040		137	6 Sep	828	N47:20.53	W124:33.42	2	201	2	On
040		175	21 Sep	724	N42:50.30	W125:02.69	2	126	2	On
040		182	21 Sep	1129	N42:54.55	W124:41.71	4	126	4	On
040		197	21 Sep	1605	N43:21.64	W124:30.51	2	201	2	On
040		208	21 Sep	1830	N43:43.31	W124:20.93	1	126	3	On
040		209	21 Sep	1834	N43:43.75	W124:20.70	1	200	2	On
040		211	21 Sep	1858	N43:45.41	W124:21.82	1	201	2	On
040		212	21 Sep	1901	N43:45.71	W124:21.67	1	7	1	On
040		213	21 Sep	1903	N43:46.00	W124:21.54	1	7	2	On
040		214	21 Sep	1903	N43:46.11	W124:21.48	1	7	2	On
040		215	21 Sep	1906	N43:46.43	W124:21.33	1	201	1	On
040		216	21 Sep	1909	N43:46.83	W124:21.12	1	7	2	On
040		239	26 Sep	1203	N39:50.90	W123:56.74	1	106	1	On
040		343	26 Oct	1334	N44:10.90	W124:14.02	4	201	2	On
Phocoenoides dalli										
044		38	5 Aug	1526	N39:41.73	W125:42.17	3	73	2	On
044		39	5 Aug	1644	N39:53.62	W125:36.72	3	126	1	On
044		40	5 Aug	1735	N40:00.93	W125:33.45	2	201	1	On
044		42	6 Aug	642	N40:28.16	W125:24.07	2	73	2	On
044		43	6 Aug	700	N40:30.77	W125:23.30	2	200	2	On
044		44	6 Aug	713	N40:32.55	W125:22.66	2	149	2	On
044		45	6 Aug	719	N40:33.51	W125:22.34	1	200	1	On
044		46	6 Aug	748	N40:37.93	W125:20.99	1	149	1	On
044		47	6 Aug	825	N40:43.58	W125:19.20	1	126	3	On
044		49	6 Aug	924	N40:51.96	W125:16.05	2	15	1	On
044		50	6 Aug	937	N40:53.95	W125:15.45	2	126	3	On
044		51	6 Aug	944	N40:55.09	W125:15.15	2	201	4	On
044		52	6 Aug	956	N40:56.89	W125:14.66	2	126	1	On
044		53	6 Aug	956	N40:56.91	W125:14.65	2	201	2	On
044		54	6 Aug	958	N40:57.22	W125:14.57	2	15	3	Off
044		55	6 Aug	1041	N41:04.15	W125:12.21	2	200	1	On
044		57	6 Aug	1128	N41:10.12	W125:10.12	2	149	1	On
044		58	6 Aug	1131	N41:10.61	W125:09.87	2	7	1	On
044		59	6 Aug	1142	N41:12.26	W125:08.96	2	149	3	On
044		60	6 Aug	1203	N41:15.71	W125:07.40	2	126	1	On
044		61	6 Aug	1209	N41:16.63	W125:07.07	2	201	2	On
044		62	6 Aug	1213	N41:17.36	W125:06.79	2	201	1	On
044		63	6 Aug	1216	N41:17.80	W125:06.63	2	201	1	On
044		64	6 Aug	1221	N41:18.63	W125:06.30	2	7	5	On
044		65	6 Aug	1227	N41:19.55	W125:05.96	2	200	5	On
044		66	6 Aug	1227	N41:19.65	W125:05.94	2	126	1	On
044		67	6 Aug	1238	N41:21.13	W125:06.36	2	126	3	On
044		69	6 Aug	1355	N41:22.22	W125:18.25	4	73	3	On
044		71	9 Aug	806	N45:41.83	W124:31.01	4	7	1	On
044		74	9 Aug	1037	N45:55.13	W124:21.57	4	200	3	On
044		75	9 Aug	1109	N45:58.10	W124:19.71	4	200	2	On
044		78	14 Aug	827	N46:04.71	W129:58.63	3	200	2	On
044		91	31 Aug	1607	N44:38.48	W125:38.18	4	126	2	On
044		92	31 Aug	1630	N44:35.07	W125:39.13	4	126	3	On
044		93	31 Aug	1649	N44:32.15	W125:39.91	4	73	2	On
044		95	1 Sep	814	N44:37.88	W126:34.57	4	73	3	On

Table 5. ORCAWALE 2001 Marine Mammal Sightings (continued)

Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
044		115	5 Sep	1104	N47:22.61	W125:23.31	5	149	3	On
044		116	5 Sep	1112	N47:22.64	W125:21.45	5	73	1	On
044		139	6 Sep	928	N47:12.92	W124:39.49	3	73	6	Off
044		140	6 Sep	930	N47:12.89	W124:39.95	3	73	5	Off
044		153	13 Sep	1607	N39:01.93	W128:22.75	4	200	3	On
044		166	20 Sep	909	N41:15.49	W124:37.50	3	201	2	On
044		168	20 Sep	942	N41:16.73	W124:44.06	4	149	1	On
044		170	20 Sep	1225	N41:28.07	W125:03.42	4	73	3	On
044		173	20 Sep	1825	N42:14.61	W124:48.26	4	200	2	On
044		174	21 Sep	711	N42:50.91	W125:05.42	4	73	9	Off
044		176	21 Sep	817	N42:46.98	W124:51.62	2	73	3	On
044		181	21 Sep	1128	N42:54.43	W124:41.76	4	201	2	On
044		183	21 Sep	1131	N42:54.88	W124:41.56	4	126	1	On
044		188	21 Sep	1227	N43:01.67	W124:35.13	2	73	2	Off
044		191	21 Sep	1351	N43:07.92	W124:36.74	2	200	1	On
044		193	21 Sep	1354	N43:08.44	W124:36.55	2	34	3	On
044		194	21 Sep	1423	N43:12.39	W124:37.31	2	99	2	Off
044		196	21 Sep	1443	N43:15.37	W124:37.00	2	200	1	Off
044		199	21 Sep	1616	N43:23.39	W124:29.70	2	201	2	On
044		201	21 Sep	1712	N43:31.86	W124:25.92	2	73	5	On
044		202	21 Sep	1725	N43:33.66	W124:25.23	2	149	1	On
044		203	21 Sep	1738	N43:35.56	W124:24.41	2	7	1	On
044		204	21 Sep	1742	N43:36.20	W124:24.08	2	7	1	On
044		205	21 Sep	1749	N43:37.18	W124:23.59	2	201	5	On
044		206	21 Sep	1804	N43:39.53	W124:22.54	2	126	4	On
044		207	21 Sep	1824	N43:42.40	W124:21.38	1	200	2	On
044		218	22 Sep	1643	N44:26.83	W125:35.54	0	149	2	On
044		220	22 Sep	1738	N44:24.01	W125:38.17	0	73	4	Off
044		221	23 Sep	1129	N43:36.11	W125:54.71	0	73	4	On
044		223	23 Sep	1356	N43:12.50	W126:04.55	0	201	3	On
044		224	23 Sep	1407	N43:10.70	W126:05.35	0	73	5	On
044		226	23 Sep	1627	N42:47.78	W126:10.19	2	149	2	On
044		227	23 Sep	1652	N42:43.79	W126:11.87	2	34	3	On
044		237	25 Sep	1706	N39:59.36	W125:52.18	4	200	3	On
044		241	26 Sep	1615	N39:13.68	W124:08.84	4	201	1	On
044		262	1 Oct	1737	N34:15.87	W120:21.23	5	73	3	On
044		263	1 Oct	1748	N34:15.50	W120:19.26	5	73	6	On
044		308	19 Oct	1509	N43:45.53	W130:48.40	4	73	5	On
044		328	24 Oct	835	N41:48.48	W128:14.25	3	73	10	On
044		333	24 Oct	1344	N42:01.76	W128:09.68	3	200	5	On
044		335	24 Oct	1458	N42:11.76	W128:06.11	3	126	3	On
044		338	25 Oct	912	N44:02.73	W127:24.47	2	73	9	Off
044		341	26 Oct	944	N44:18.04	W124:59.88	4	126	4	On
044		342	26 Oct	1111	N44:15.03	W124:42.98	4	203	3	On
044		344	1 Nov	1048	N46:09.35	W124:14.44	4	200	4	On
044		349	1 Nov	1401	N45:51.98	W124:39.61	4	200	4	On
044		351	1 Nov	1416	N45:50.43	W124:41.61	4	200	15	On
044		352	1 Nov	1428	N45:49.24	W124:43.13	4	149	5	On
044		353	2 Nov	821	N44:05.97	W127:18.93	3	201	5	On
044		354	2 Nov	835	N44:04.57	W127:21.00	3	126	3	On
044		355	2 Nov	851	N44:02.90	W127:23.54	3	73	3	On
044		356	2 Nov	939	N43:56.54	W127:28.36	4	149	3	On
044		359	2 Nov	1353	N43:28.32	W127:45.54	3	73	2	On
044		373	4 Nov	1030	N38:52.91	W127:48.77	1	200	3	On
044		450	26 Nov	1213	N37:10.21	W126:28.15	2	149	2	On
044		451	26 Nov	1332	N37:07.05	W126:13.54	2	7	2	On
044		455	27 Nov	1321	N36:46.02	W124:30.28	3	73	3	Off
044		459	27 Nov	1440	N36:42.25	W124:17.29	2	149	5	On
044		460	27 Nov	1451	N36:41.67	W124:14.92	2	73	2	On
044	76	461	27 Nov	1500	N36:41.26	W124:13.03	2	184	13	On

Table 5. ORCAWALE 2001 Marine Mammal Sightings (continued)

Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
044		462	27 Nov	1504	N36:41.08	W124:12.22	2	184	2	On
044		467	28 Nov	831	N36:30.46	W122:00.19	4	126	1	On
044		468	28 Nov	836	N36:29.51	W122:00.12	4	7	1	On
044		471	28 Nov	1134	N35:59.97	W121:59.89	4	7	3	Off
044		477	28 Nov	1433	N35:32.63	W122:10.79	4	149	2	On
044		484	5 Dec	1016	N32:22.19	W121:28.54	5	149	4	On
044		486	5 Dec	1304	N32:47.72	W121:20.46	4	149	2	On
044		500	7 Dec	1248	N32:14.46	W118:11.08	4	184	4	Off
Physeter macrocephalus										
046		4	31 Jul	1532	N32:55.81	W121:06.81	4	149	4	On
046		7	1 Aug	734	N33:19.46	W122:52.16	4	200	2	On
046		8	1 Aug	1503	N33:21.30	W123:04.21	4	149	7	On
046		13	2 Aug	1109	N33:50.93	W125:15.62	4	99	1	Off
046		29	3 Aug	1836	N35:42.18	W127:04.48	2	126	1	Off
046		81	14 Aug	1650	N45:26.27	W130:46.53	4	149	1	On
046		150	13 Sep	912	N39:12.75	W129:18.96	4	200	1	On
046		219	22 Sep	1711	N44:25.25	W125:39.25	0	99	1	Off
046		243	27 Sep	1822	N38:39.74	W126:30.68	1	126	1	On
046		245	28 Sep	1157	N37:41.58	W127:57.47	4	34	1	Off
046		256	30 Sep	932	N34:58.69	W123:37.42	5	184	1	Off
046		295	11 Oct	1441	N33:40.85	W124:28.19	5	73	1	Off
046		304	19 Oct	845	N43:17.95	W130:57.95	4	106	1	Off
046		317	21 Oct	1619	N42:11.20	W129:08.03	5	149	1	On
046		327	24 Oct	832	N41:48.10	W128:14.33	3	201	1	On
046		329	24 Oct	854	N41:50.31	W128:13.61	3	200	2	On
046		418	18 Nov	1556	N32:46.60	W126:18.90	4	149	1	Off
046		427	20 Nov	1127	N31:43.94	W122:22.08	4	184	2	On
046		445	25 Nov	1341	N36:24.59	W122:55.97	3	7	1	On
ziphiid whale										
049		217	22 Sep	1617	N44:25.68	W125:30.29	1	73	3	On
049		309	19 Oct	1545	N43:50.70	W130:47.03	4	106	1	On
049		310	19 Oct	1650	N43:56.51	W130:41.57	4	126	1	On
049		483	5 Dec	935	N32:15.95	W121:30.52	5	73	1	On
049		487	5 Dec	1530	N33:11.29	W121:14.27	5	200	1	Off
Ziphius cavirostris										
061		19	3 Aug	825	N34:18.45	W127:16.84	3	149	3	On
061		37	5 Aug	1307	N39:26.08	W125:46.90	3	199	1	Off
061		80	14 Aug	1502	N45:20.86	W130:23.07	3	126	1	On
061		97	3 Sep	808	N46:35.09	W129:02.32	4	200	2	On
061		411	9 Nov	1621	N33:28.60	W119:31.63	1	7	1	On
061		488	6 Dec	755	N32:54.13	W119:36.91	5	73	1	On
061		494	6 Dec	1353	N32:14.54	W119:10.73	4	7	1	On
Berardius bairdii										
063		88	31 Aug	836	N45:30.70	W125:15.78	4	7	3	On
063		147	10 Sep	1002	N43:32.28	W129:20.18	5	7	6	On
063		148	10 Sep	1210	N43:11.35	W129:18.72	5	73	1	On
Eschrichtius robustus										
069		178	21 Sep	926	N42:47.33	W124:41.17	4	149	1	On
***Balaenoptera* sp.**										
070		36	4 Aug	2018	N37:07.87	W126:34.07	3	149	1	On
070		109	5 Sep	849	N47:29.70	W125:45.43	5	126	1	Off
070		120	5 Sep	1243	N47:19.62	W125:10.74	5	7	1	On
070		159	13 Sep	1812	N38:58.54	W128:09.09	4	126	1	On
070		161	13 Sep	1822	N38:58.00	W128:07.34	4	126	1	On

Table 5. ORCAWALE 2001 Marine Mammal Sightings (continued)

Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
070		210	21 Sep	1837	N43:44.17	W124:20.48	1	7	1	On
070		233	25 Sep	1001	N40:18.17	W127:08.44	4	149	1	Off
070		235	25 Sep	1026	N40:15.24	W127:06.21	4	34	1	Off
070	74	238	25 Sep	1844	N39:55.94	W125:32.39	4	200	2	On
070		246	28 Sep	1410	N37:36.08	W128:02.80	4	106	1	On
070		326	24 Oct	820	N41:46.43	W128:14.71	3	201	2	On
070		413	16 Nov	1514	N37:35.45	W124:43.05	4	126	1	On
070		435	23 Nov	907	N33:49.04	W121:01.16	5	7	1	On
Balaenoptera acutorostrata										
071		73	9 Aug	957	N45:51.60	W124:23.92	4	99	1	Off
071		225	23 Sep	1538	N42:56.13	W126:08.88	0	149	1	On
071		229	23 Sep	1817	N42:32.76	W126:16.05	3	73	1	Off
071		339	25 Oct	1735	N45:13.92	W126:56.15	5	203	1	On
071		371	4 Nov	716	N39:01.48	W128:19.70	1	4	1	Off
071		465	27 Nov	1608	N36:40.27	W123:58.71	2	184	2	On
071		466	27 Nov	1642	N36:38.43	W123:54.78	2	7	1	On
Balaenoptera borealis										
073		30	4 Aug	724	N35:53.93	W126:56.62	2	201	1	On
Balaenoptera physalus										
074	75	32	4 Aug	1335	N36:26.30	W126:46.22	2	126	6	On
074		33	4 Aug	1836	N36:53.06	W126:36.59	3	201	2	On
074		35	4 Aug	2000	N37:05.46	W126:34.13	3	200	1	On
074		68	6 Aug	1324	N41:23.03	W125:15.19	4	73	1	On
074		70	6 Aug	1724	N41:30.60	W126:00.52	5	73	1	On
074		79	14 Aug	1142	N45:33.38	W130:09.86	3	201	3	On
074		98	3 Sep	1635	N47:03.00	W127:56.78	3	200	1	On
074		100	4 Sep	1045	N47:29.24	W126:05.93	4	149	1	Off
074		106	5 Sep	751	N47:31.81	W125:53.34	5	7	1	On
074		107	5 Sep	831	N47:32.18	W125:47.82	5	126	1	On
074		110	5 Sep	852	N47:29.36	W125:45.02	5	199	1	Off
074		111	5 Sep	927	N47:26.03	W125:42.50	5	73	1	On
074		112	5 Sep	937	N47:25.72	W125:40.87	5	201	1	On
074		113	5 Sep	938	N47:25.60	W125:40.66	5	126	1	On
074		152	13 Sep	1507	N39:04.14	W128:32.13	4	149	1	On
074		155	13 Sep	1714	N39:01.52	W128:19.97	4	200	1	Off
074		156	13 Sep	1720	N39:01.39	W128:18.91	4	126	1	On
074		157	13 Sep	1731	N39:00.84	W128:16.85	4	126	1	On
074		158	13 Sep	1751	N38:59.76	W128:13.15	4	201	1	On
074		160	13 Sep	1815	N38:58.38	W128:08.62	4	126	2	On
074		162	13 Sep	1837	N38:57.13	W128:04.43	4	73	2	On
074	37	164	14 Sep	1339	N39:48.26	W127:17.23	4	73	3	On
074	75	200	21 Sep	1701	N43:30.05	W124:26.66	2	200	2	On
074		228	23 Sep	1713	N42:40.46	W126:13.28	3	7	2	On
074		230	24 Sep	722	N41:58.08	W126:31.90	4	149	1	On
074		231	24 Sep	902	N41:48.62	W126:36.08	4	7	2	On
074		234	25 Sep	1023	N40:15.21	W127:06.92	4	73	1	On
074	70	238	25 Sep	1844	N39:55.94	W125:32.39	4	200	2	On
074		242	27 Sep	1627	N38:35.47	W126:11.81	2	149	1	On
074		255	30 Sep	859	N35:00.00	W123:43.18	5	98	1	Off
074		294	9 Oct	1528	N32:28.04	W119:14.72	4	200	30	On
074		299	14 Oct	835	N37:12.68	W126:43.93	5	126	2	On
074		312	20 Oct	1815	N43:27.64	W128:14.12	4	203	1	On
074		330	24 Oct	932	N41:54.00	W128:13.26	3	159	2	Off
074		332	24 Oct	1252	N41:54.48	W128:11.88	3	73	4	On
074		334	24 Oct	1413	N42:05.82	W128:08.23	4	149	1	On
074		358	2 Nov	1112	N43:43.09	W127:33.49	4	149	2	Off
074		361	2 Nov	1538	N43:14.07	W127:49.44	3	4	2	Off

Table 5. ORCAWALE 2001 Marine Mammal Sightings (continued)

Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
074	27	374	4 Nov	1147	N38:51.15	W127:36.53	2	4	11	Off
074		389	8 Nov	837	N34:58.72	W122:10.90	3	126	1	On
074		432	22 Nov	1508	N32:54.85	W119:39.49	6	126	1	Off
074		448	26 Nov	1109	N37:18.04	W126:28.91	2	149	2	On
074		490	6 Dec	835	N32:48.22	W119:36.31	5	199	1	Off
074		492	6 Dec	1038	N32:36.18	W119:34.37	5	184	1	On
074		493	6 Dec	1133	N32:32.04	W119:26.30	5	73	1	On
Balaenoptera musculus										
075	74	32	4 Aug	1335	N36:26.30	W126:46.22	2	126	6	On
075		179	21 Sep	939	N42:48.08	W124:39.11	4	200	1	On
075		189	21 Sep	1308	N43:05.20	W124:36.07	2	149	1	On
075	74	200	21 Sep	1701	N43:30.05	W124:26.66	2	200	2	On
075		232	24 Sep	1726	N41:56.46	W128:07.14	4	73	1	On
075		240	26 Sep	1437	N39:27.46	W124:04.15	2	7	1	On
075		261	30 Sep	1825	N34:38.59	W122:03.42	4	149	2	On
075		272	2 Oct	1527	N34:01.43	W119:05.79	4	126	1	On
075		291	9 Oct	1136	N32:27.03	W118:55.05	4	200	2	On
075		313	21 Oct	854	N41:59.15	W128:20.84	4	126	2	On
075		325	22 Oct	1828	N40:22.89	W128:07.55	5	73	1	On
075		415	18 Nov	759	N33:53.99	W125:57.15	4	200	1	On
075		452	26 Nov	1510	N37:02.96	W125:54.41	2	149	1	On
Megaptera novaeangliae										
076		72	9 Aug	835	N45:44.31	W124:29.06	5	7	1	On
076	37	76	12 Aug	1113	N45:41.86	W124:08.06	4	126	4	On
076		85	17 Aug	1003	N44:30.72	W124:18.15	4	99	2	Off
076		99	4 Sep	930	N47:33.46	W126:11.28	4	126	1	On
076		101	4 Sep	1109	N47:27.19	W126:04.02	4	98	2	Off
076	22	102	4 Sep	1120	N47:26.92	W126:01.40	4	7	7	Off
076		105	5 Sep	708	N47:31.81	W125:58.98	5	200	1	On
076		118	5 Sep	1134	N47:22.78	W125:16.55	5	200	1	Off
076	22 27	122	5 Sep	1344	N47:16.40	W125:00.04	5	73	10	Off
076		138	6 Sep	910	N47:13.69	W124:35.74	3	126	2	On
076		143	6 Sep	1149	N46:55.31	W124:50.92	3	200	1	On
076		165	20 Sep	753	N41:13.19	W124:22.95	3	7	1	Off
076	22 27	171	20 Sep	1312	N41:34.77	W125:01.27	4	149	80	On
076		172	20 Sep	1537	N41:53.76	W124:54.43	4	7	1	On
076		177	21 Sep	837	N42:44.91	W124:48.42	3	149	1	On
076		185	21 Sep	1150	N42:57.51	W124:39.92	4	126	1	On
076		186	21 Sep	1159	N42:58.40	W124:38.79	4	99	1	Off
076		198	21 Sep	1607	N43:21.92	W124:30.38	2	149	2	On
076		388	7 Nov	1629	N36:20.35	W123:36.60	5	149	2	On
076		436	23 Nov	1145	N34:08.39	W120:54.94	6	149	1	On
076		438	23 Nov	1534	N34:39.59	W120:46.47	5	149	1	On
076		439	23 Nov	1619	N34:42.66	W120:46.17	5	73	1	On
076		443	25 Nov	1153	N36:21.47	W122:42.30	3	184	2	On
076		444	25 Nov	1156	N36:21.62	W122:42.99	3	184	1	On
076		446	25 Nov	1417	N36:26.08	W122:58.05	3	7	1	Off
076		456	27 Nov	1354	N36:44.41	W124:27.07	2	126	1	On
076		457	27 Nov	1421	N36:43.16	W124:21.26	2	73	1	On
076		458	27 Nov	1431	N36:42.67	W124:19.07	2	149	4	On
076	44	461	27 Nov	1500	N36:41.26	W124:13.03	2	184	13	On
076		463	27 Nov	1512	N36:40.70	W124:10.57	2	73	3	On
076		470	28 Nov	1023	N36:10.12	W121:56.60	4	184	2	On
076		472	28 Nov	1159	N35:56.84	W122:00.92	4	184	3	On
076		473	28 Nov	1308	N35:46.26	W122:07.26	4	200	1	On
076		474	28 Nov	1313	N35:45.38	W122:07.85	4	126	2	On
076		475	28 Nov	1335	N35:42.15	W122:10.05	4	149	1	On
076		476	28 Nov	1428	N35:33.55	W122:10.79	4	73	1	On

Table 5. ORCAWALE 2001 Marine Mammal Sightings (continued)

Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
076		478	28 Nov	1513	N35:26.08	W122:10.82	4	149	1	On
076		479	28 Nov	1607	N35:22.93	W122:11.26	5	126	1	Off
unid. dolphin										
077		24	3 Aug	1535	N35:17.39	W127:10.44	2	73	2	On
077		28	3 Aug	1817	N35:39.20	W127:04.44	2	126	2	On
077		90	31 Aug	1459	N44:47.02	W125:36.60	4	200	1	On
077		104	4 Sep	1714	N47:43.04	W126:05.27	4	200	1	Off
077		124	5 Sep	1514	N47:15.75	W124:45.33	5	184	4	Off
077		142	6 Sep	1129	N46:58.06	W124:48.48	3	149	2	On
077		222	23 Sep	1238	N43:25.32	W125:59.48	0	34	3	On
077		278	2 Oct	1820	N34:08.46	W119:24.04	4	126	1	On
077		283	3 Oct	1146	N32:46.61	W118:05.74	1	149	1	On
077		286	3 Oct	1416	N32:23.66	W118:13.38	2	201	7	On
077		377	4 Nov	1328	N38:48.11	W127:23.05	2	7	15	On
077		378	4 Nov	1345	N38:47.46	W127:20.20	2	7	6	On
077		383	4 Nov	1452	N38:45.46	W127:08.22	2	201	10	On
077		394	9 Nov	800	N34:04.15	W119:29.68	3	126	14	On
077		419	19 Nov	800	N32:24.14	W125:24.77	4	7	15	On
077		428	20 Nov	1204	N31:39.11	W122:18.45	4	149	1	Off
077		437	23 Nov	1335	N34:20.77	W120:51.83	6	98	12	Off
077		489	6 Dec	812	N32:51.36	W119:36.89	5	149	1	On
077		501	7 Dec	1337	N32:19.64	W118:04.48	4	126	3	On
unid. small whale										
078		154	13 Sep	1622	N39:01.36	W128:19.73	4	200	1	Off
078		357	2 Nov	944	N43:55.76	W127:28.68	4	201	1	On
078		376	4 Nov	1323	N38:48.35	W127:23.94	2	149	1	On
078		384	4 Nov	1515	N38:45.17	W127:03.69	2	7	1	On
078		423	19 Nov	1538	N32:06.90	W123:59.30	2	7	1	On
078		447	26 Nov	1044	N37:22.17	W126:27.55	1	200	1	On
078		453	27 Nov	1006	N36:52.70	W124:59.12	4	73	1	On
unid. large whale										
079		149	11 Sep	918	N41:41.10	W129:53.48	4	73	1	On
079		151	13 Sep	1407	N39:06.43	W128:44.37	4	73	1	On
079		163	14 Sep	950	N39:17.36	W127:26.57	5	126	1	On
079		236	25 Sep	1323	N40:08.62	W126:32.49	4	201	1	On
079		290	9 Oct	946	N32:23.55	W118:40.00	3	126	1	On
079		307	19 Oct	1420	N43:40.31	W130:51.14	4	201	1	On
079		316	21 Oct	1513	N42:06.99	W129:03.95	5	73	1	On
079		442	25 Nov	1120	N36:20.11	W122:35.80	4	149	1	On
***Kogia* sp.**										
080		390	8 Nov	1017	N34:51.24	W122:00.82	2	201	1	On
unid. object										
097		94	31 Aug	1827	N44:30.11	W125:55.15	4	73	1	On
unid. whale										
098		441	25 Nov	822	N36:12.47	W122:00.82	3	199	2	Off
unid. small *delphinid*										
177		195	21 Sep	1438	N43:14.69	W124:36.58	2	126	4	On
Callorhinus ursinus										
CU		48	6 Aug	923	N40:51.86	W125:16.08	2	126	1	On
Zalophus californianus										
ZC	22	498	7 Dec	1208	N32:09.05	W118:14.94	4	73	16	On

Table 6. Hydrophone Array Characteristics and Dates Used.

Array Name	# of Elements	Frequency Sensitivity Low (Hz)	Frequency Sensitivity High (kHz)	Quality	Dates Used
Norris	5	15	40	good	8/04; 9/03; 9/10-10/19; 10/24-11/09
High-Frequency	3	500	150	good	7/30-8/02; 8/05-9/02; 9/04-9/09
SEFSC	5	15	40	good	10/20-10/23

Table 7. Hydrophone Array Recordings by Species - Acoustic recordings of cetacean sightings obtained using the towed hydrophone array on the *McArthur* during ORCAWALE 2001, listed in order of the number of recordings obtained.

Species	Leg 1	Leg 2	Leg 3	Leg 4	Leg 5
Delphinus delphis	13	0	25	10	6
Grampus griseus	3	3	5	0	5
Lissodelphis borealis	2	3	1	0	6
Physeter macrocephalus	3	1	3	4	0
Lagenorhynchus obliquidens	2	3	3	1	1
Tursiops truncatus	0	0	1	0	5
Delphinus capensis	0	0	0	0	2
Stenella coeruleoalba	1	0	1	0	0
Unidentified dolphins	1	0	1	0	0
Orcinus orca	0	1	0	0	0
Total	**25**	**11**	**40**	**15**	**25**

Table 8. Sonobuoy Recordings by Species - Acoustic recordings of cetaceans obtained using sonobuoys on both ships during ORCAWALE 2001, listed in decreasing order of recordings obtained. A total of 38 sonobouys were launched, of which 21 were functional.

Species	Vocals	No Vocals
Balaenoptera musculus	7	4
Megaptera noviangliae	2	3
Balaenoptera physalus	2	0
Orcinus orca	2	0
Total	**13**	**7**

Table 9. Sightings Photographed by Species – Lists the species and corresponding sightings for 35mm photo-ID pictures taken.

Species Code	Species	# of Sightings Photgraphed	Sighting #s
073	*B. borealis*	2	30,3
075	*B. musculus*	12	32,179,189,200,232,240,261,272,291,313,415,452
074	*B. physalus*	9	32,33,70,79,98,100,228,332,389
016	*D. Capensis*	1	398
017	*D. delphis*	9	27,31,251,258,265,266,324,370,417
069	*E. robustus*	5	1,2,3,4,178
021	*G. griseus*	2	34,187
076	*M. novaeangliae*	22	3,76,85,99,100,102,105,122,138,143,171,172,177, 185,186,438,439,443,457,461,472,476
037	*O. orca*	7	76,141,311,367,392,412,454
046	*P. macrocephalus*	10	4,8,13,81,219,243,245,304,329,418
013	*S. coeruleulba*	1	251

Table 10. Biopsies Taken by Species – Lists the species and corresponding numbers of biopsy samples obtained.

Species	Number of samples
Balaenoptera (unid. to species)	1
Balaenoptera musculus	12
Balaenoptera physalus	13
Delphinus capensis	5
Delphinus delphis	104
Eschrictius robustus	3
Grampus griseus	5
Lagenorhyncus obliquidens	11
Lissodelphis borealis	32
Megaptera novaeangliae	15
Orcinus orca	4
Phocoenoides dalli	9
Physeter macrocephalus	10
Tursiops truncatus	10
Ziphius cavirostris	1
Total	**235**

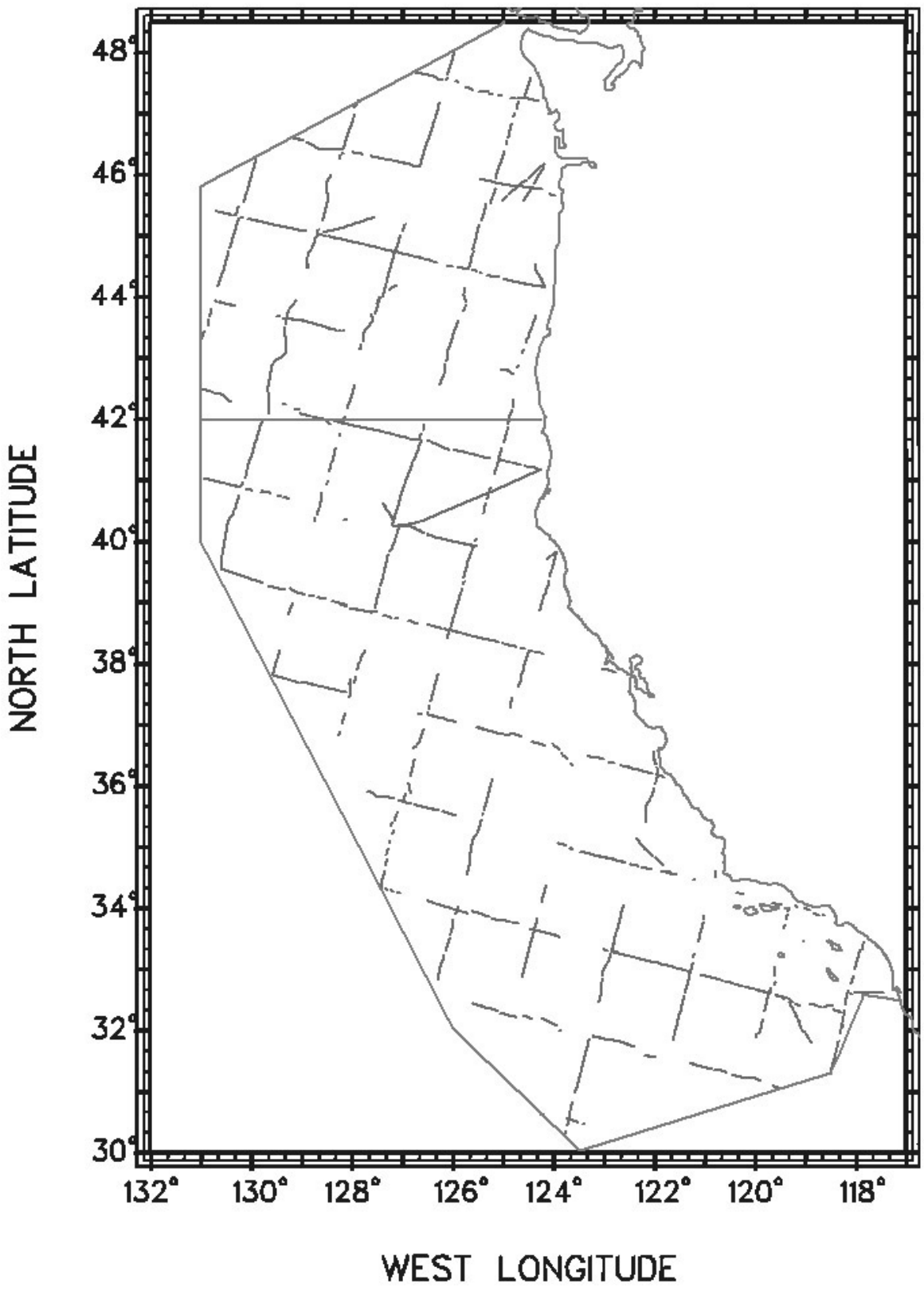

Figure 1. Coverage of survey tracklines during ORCAWALE 2001, including unplanned segments such as departures from ports and returns for repair.

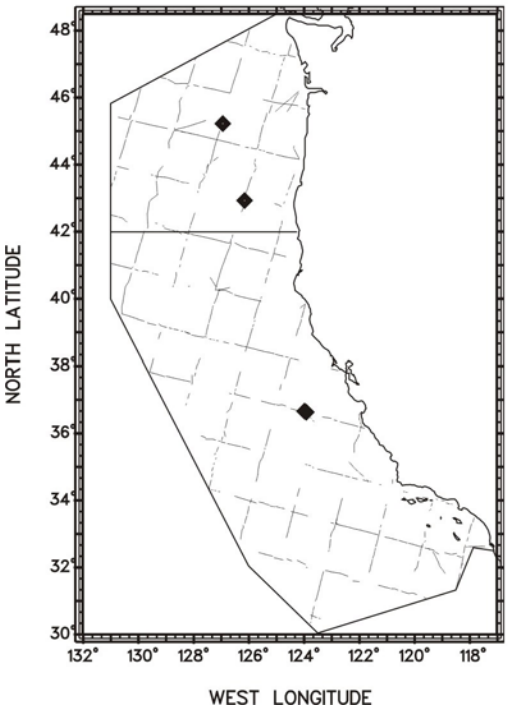

Figure 2. On-effort sightings of *Balaenoptera acutorostrata* Species Code 071, n=4

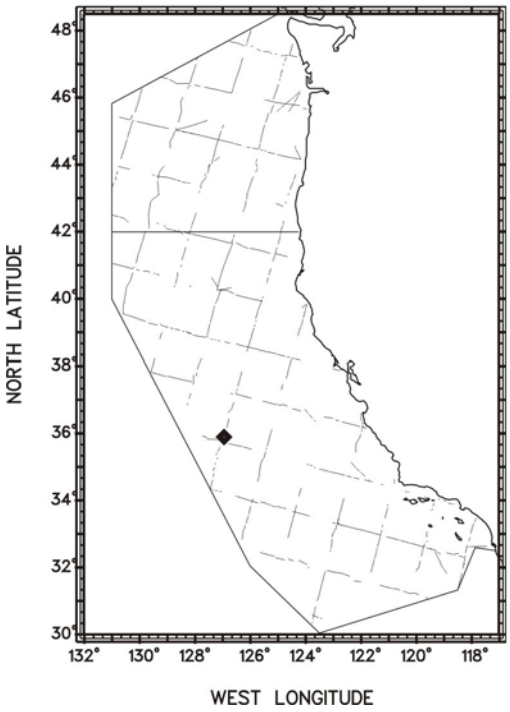

Figure 3. On-effort sightings of *Balaenoptera borealis* Species Code 073, n=1

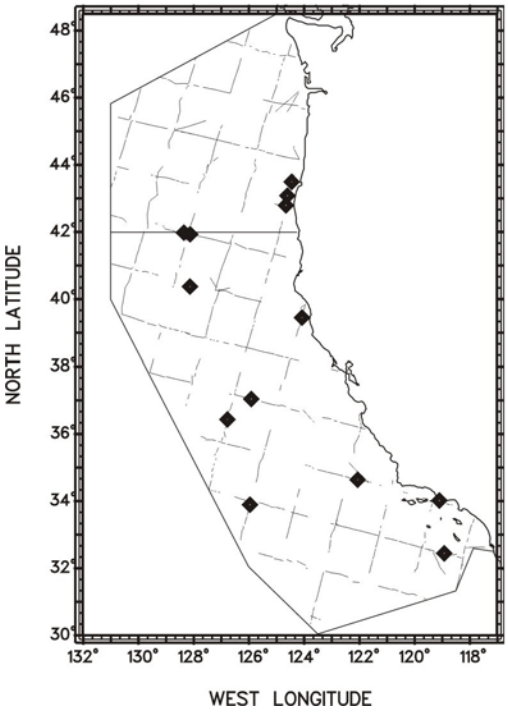

Figure 4. On-effort sightings of *Balaenoptera musculus* Species Code 075, n=13

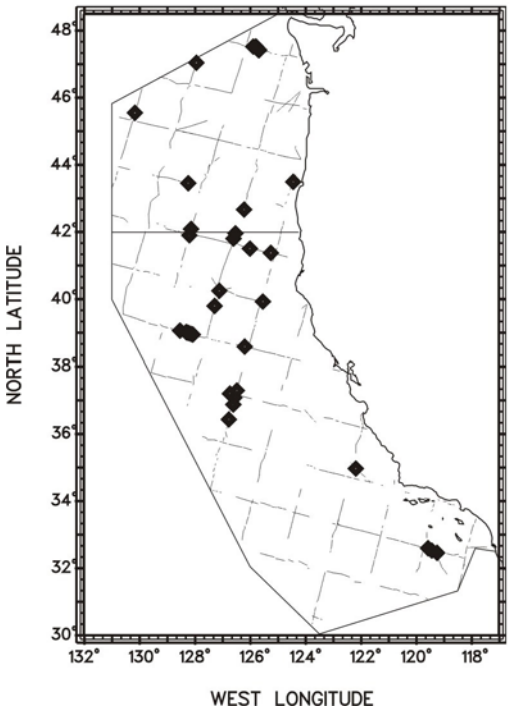

Figure 5. On-effort sightings of *Balaenoptera physalis* Species Code 074, n=35

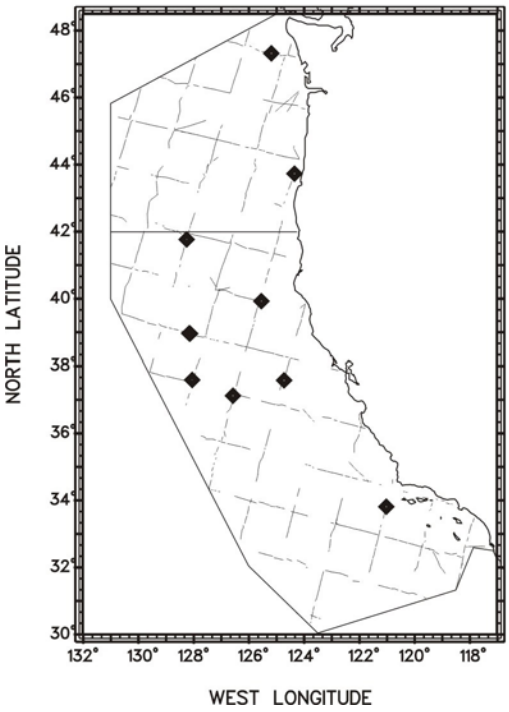

Figure 6. On-effort sightings of *Balaenoptera spp.*
Species Code 070, n=10

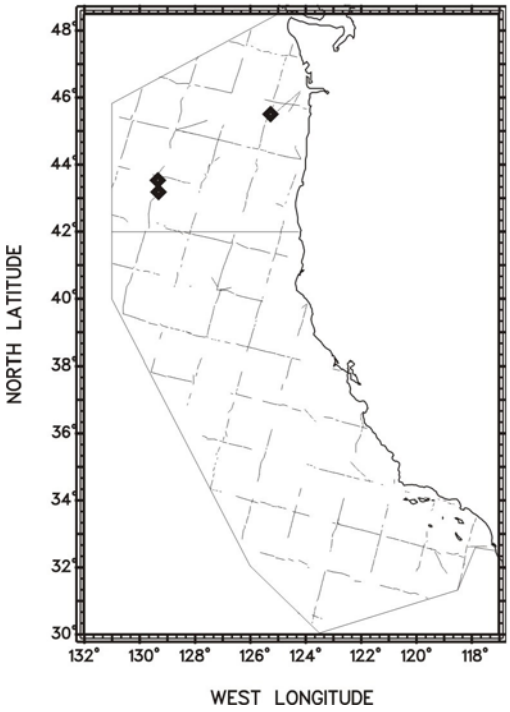

Figure 7. On-effort sightings of *Berardius bairdi*
Species Code 063, n=3

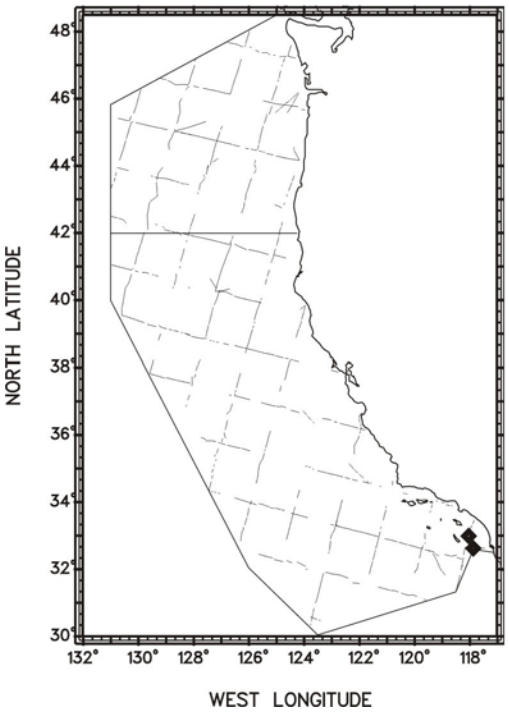

Figure 8. On-effort sightings of *Delphinus spp.*
Species Code 005, n=2

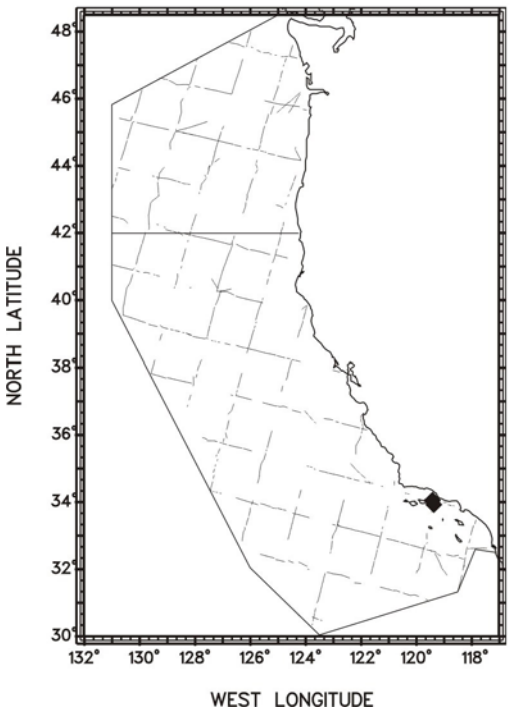

Figure 9. On-effort sightings of *Delphinus capensis*
Species Code 016, n=2

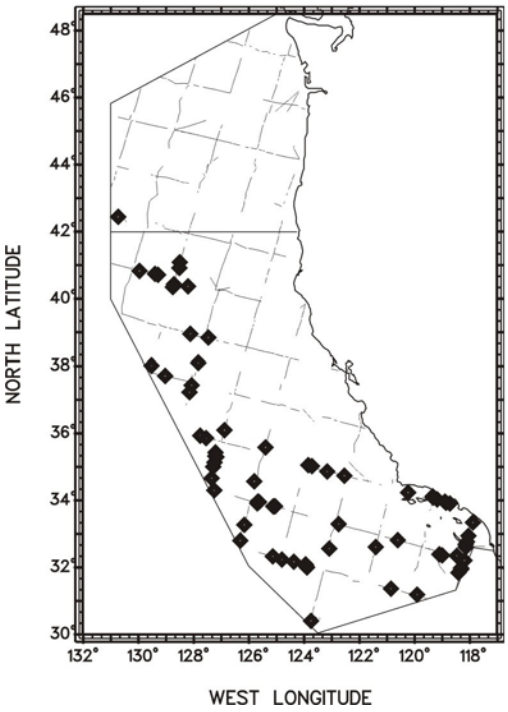

Figure 10. On-effort sightings of *Delphinus delphis*
Species Code 017, n=71

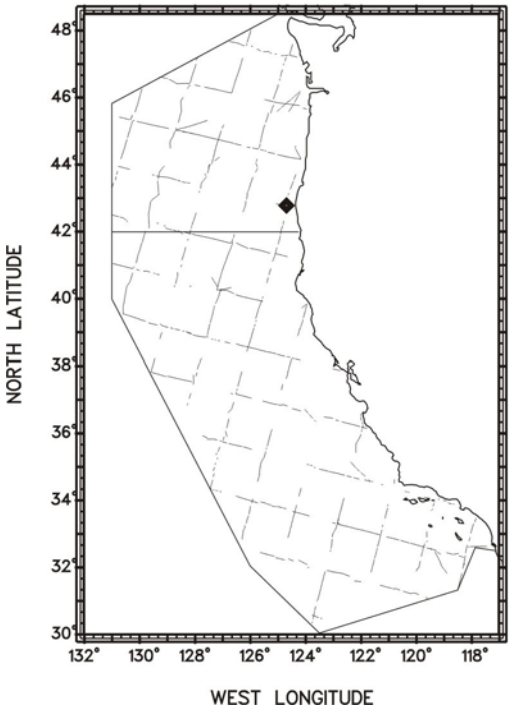

Figure 11. On-effort sightings of *Eshrictius robustus*
Species Code 069, n=1

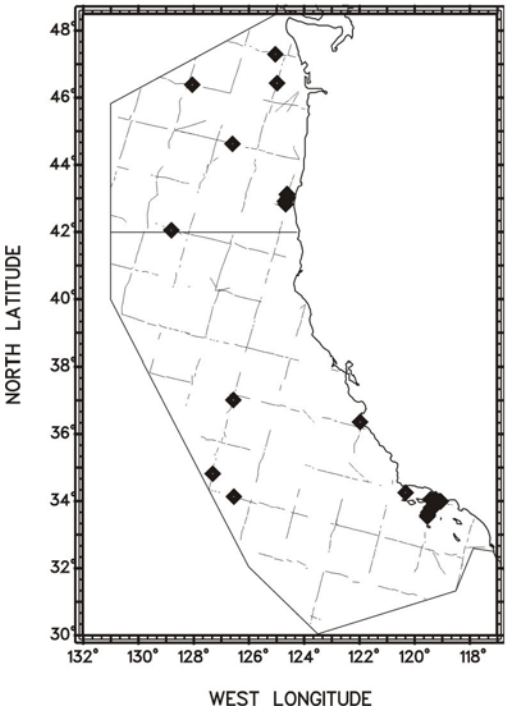

Figure 12. On-effort sightings of *Grampus griseus*
Species Code 021, n=27

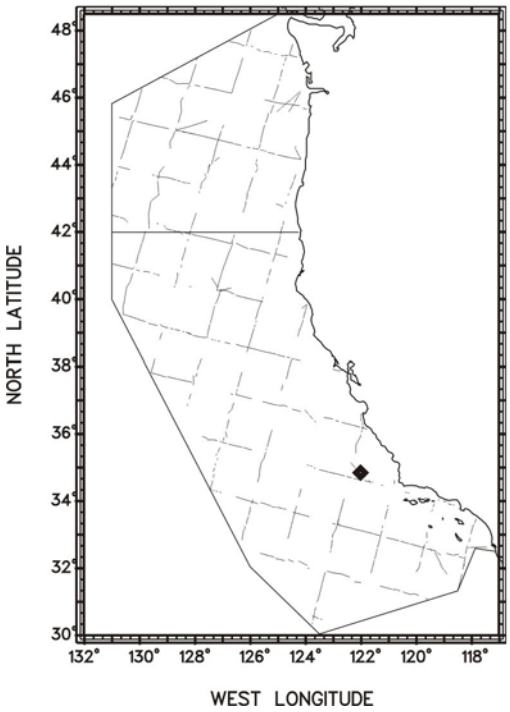

Figure 13. On-effort sightings of *Kogia spp.*
Species Code 080, n=1

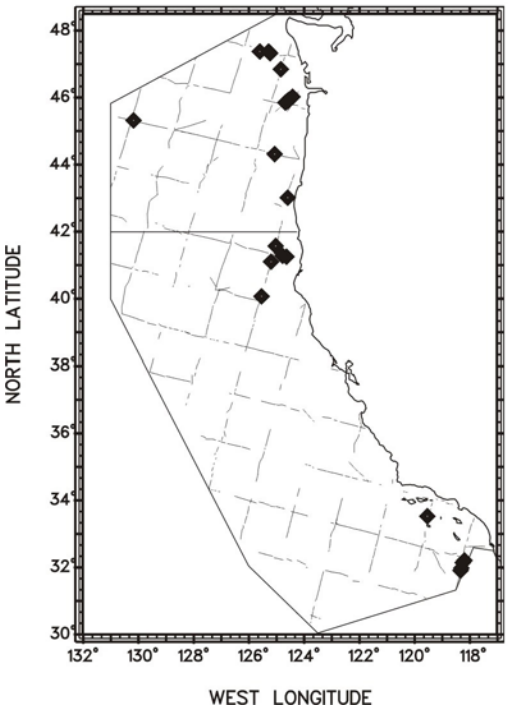

Figure 14. On-effort sightings of *Lagenorhyncus obliquidens* Species Code 022, n=22

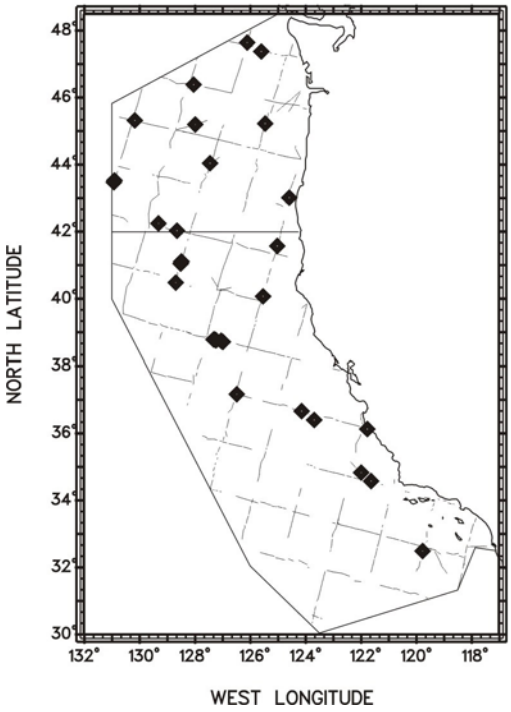

Figure 15. On-effort sightings of *Lissodelphis borealis* Species Code 027, n=30

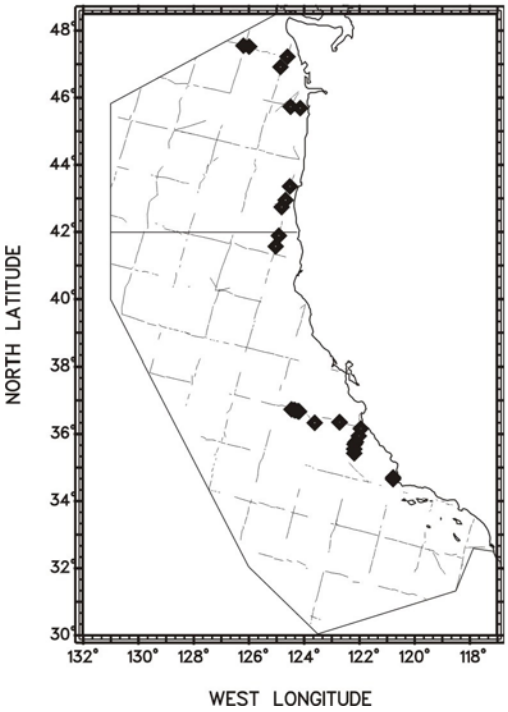

Figure 16. On-effort sightings of *Megoptera novaeangliae* Species Code 076, n=28

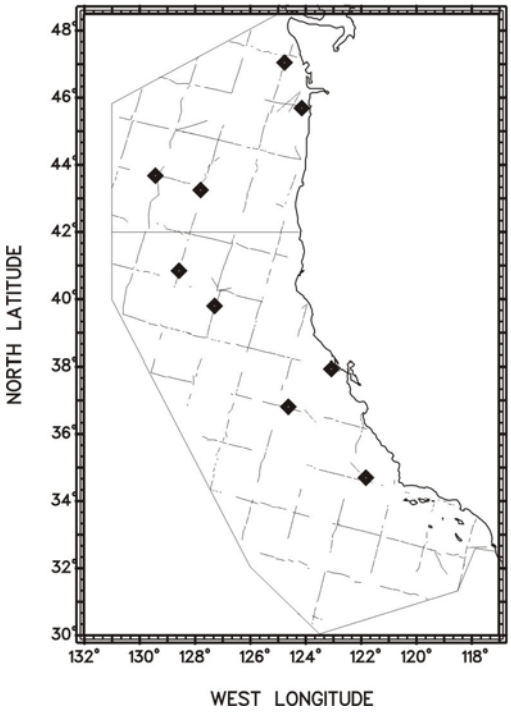

Figure 17. On-effort sightings of *Orcinus orca* Species Code 037, n=9

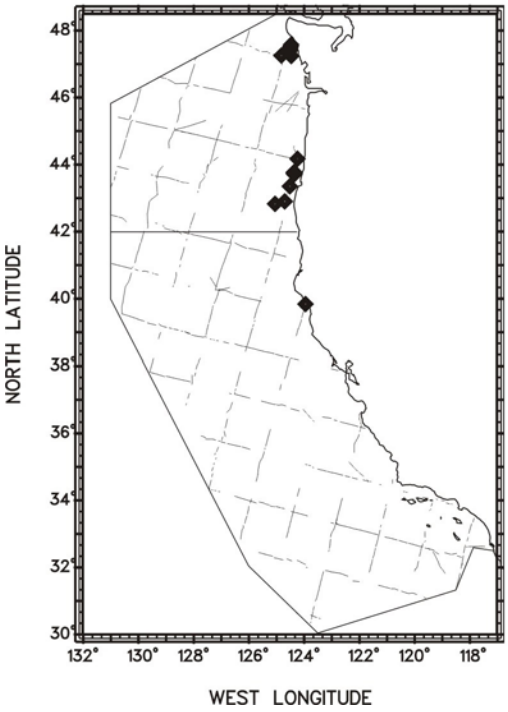

Figure 18. On-effort sightings of *Phocoena phocoena*
Species Code 040, n=27

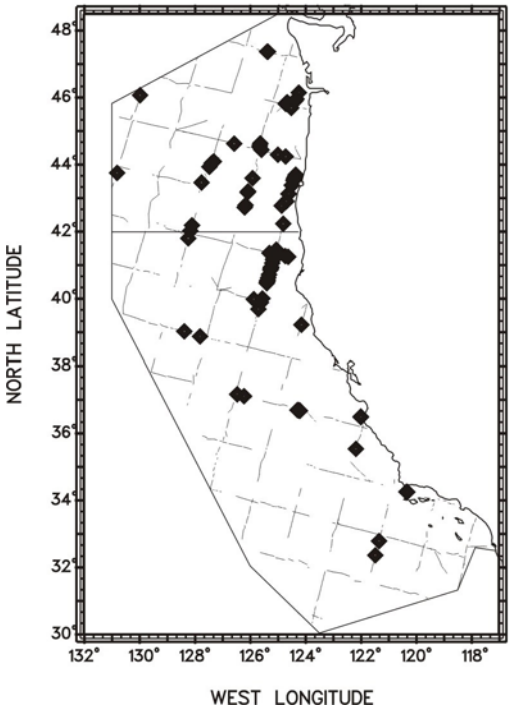

Figure 19. On-effort sightings of *Phocoenoides dalli*
Species Code 044, n=92

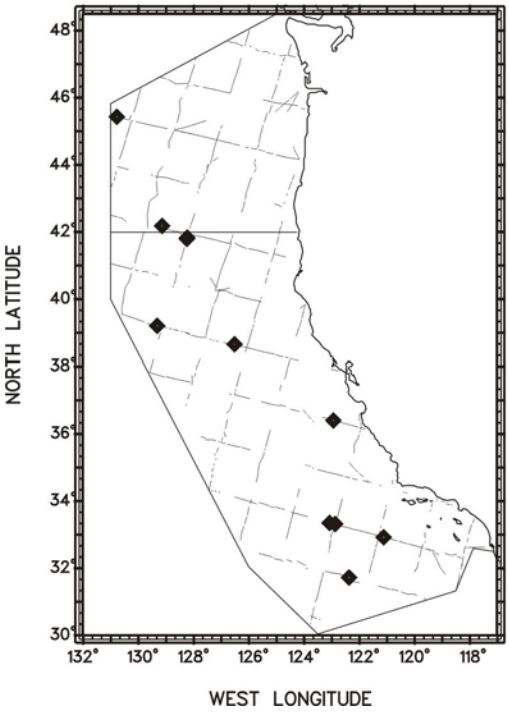

Figure 20. On-effort sightings of *Physeter macrocephalus*
Species Code 046, n=11

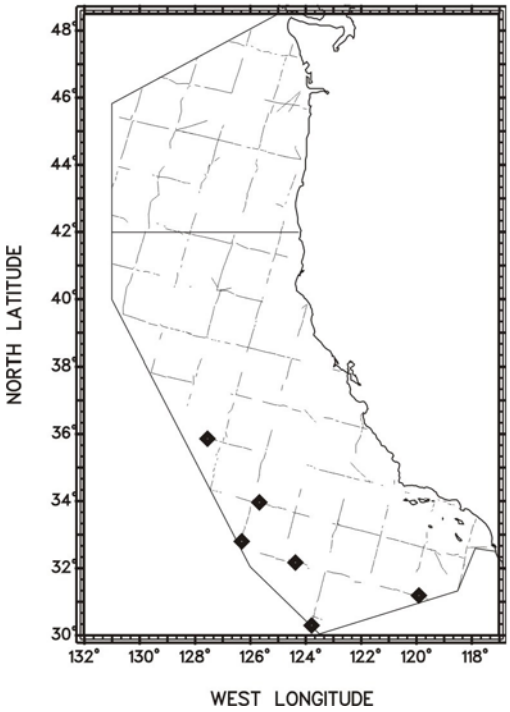

Figure 21. On-effort sightings of *Stenella coeruleoalba*
Species Code 013, n=6

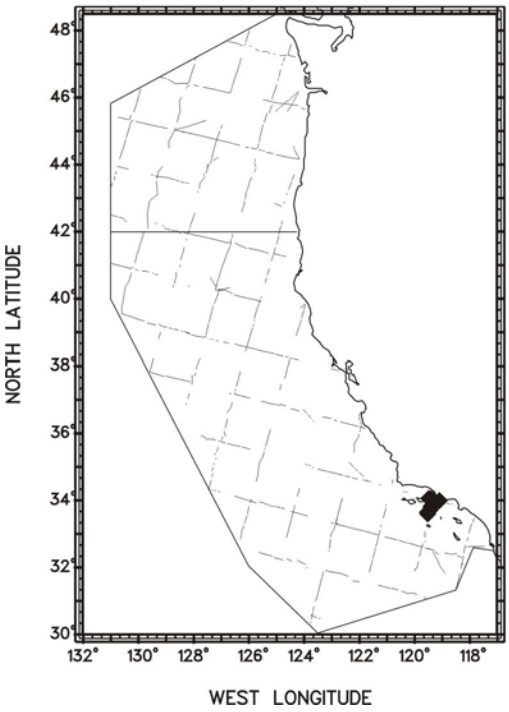

Figure 22. On-effort sightings of *Tursiops truncatus* Species Code 018, n=11

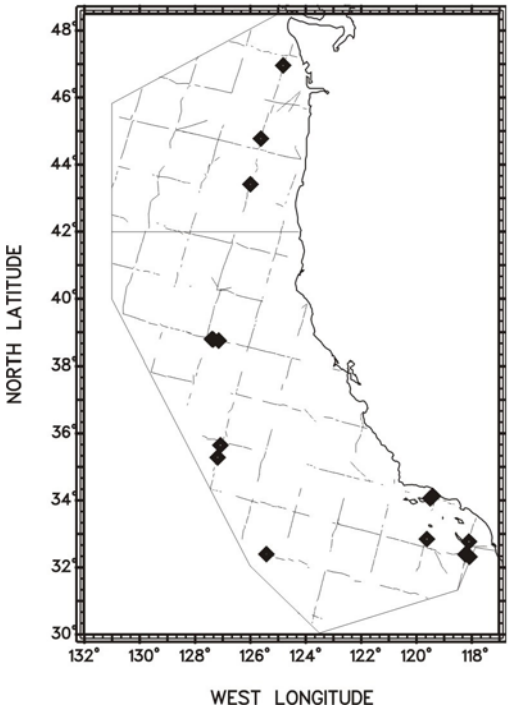

Figure 23. On-effort sightings of *Unidentified Dolphin* Species Code 077, n=15

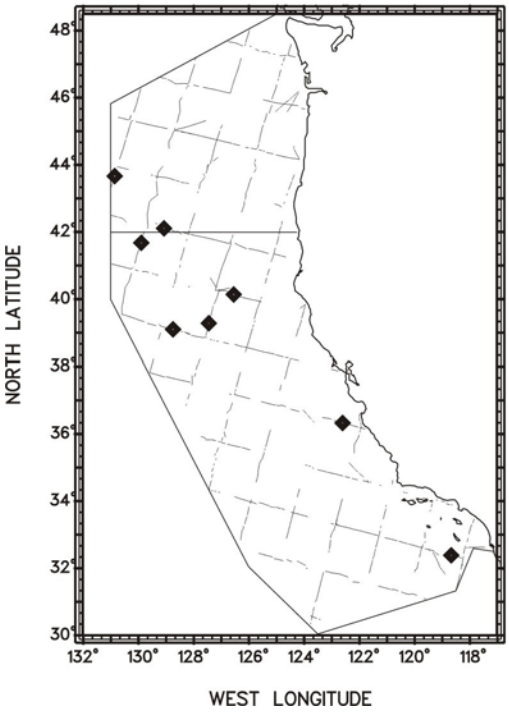

Figure 24. On-effort sightings of *Unidentified Large Whales* Species Code 079, n=8

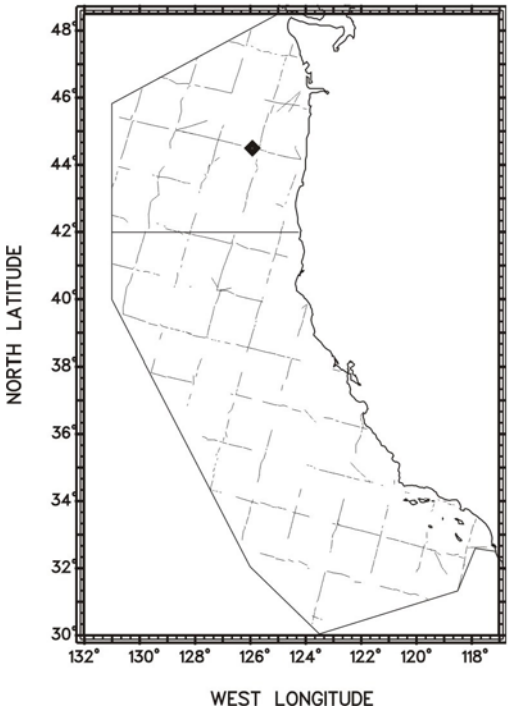

Figure 25. On-effort sightings of *Unidentified Objects* Species Code 097, n=1

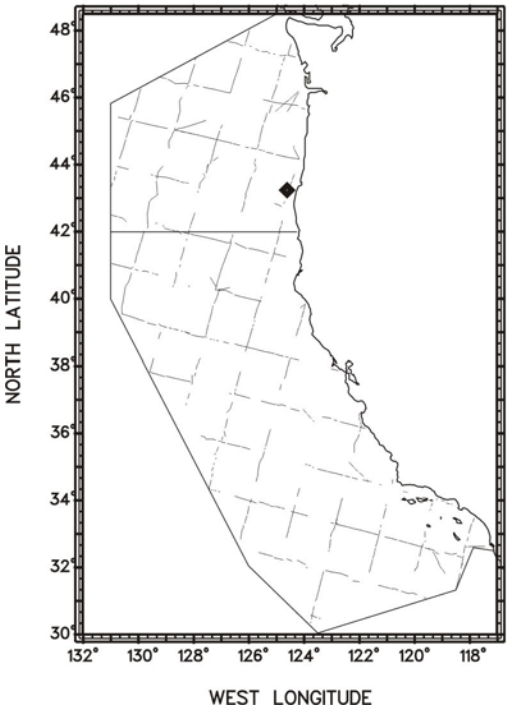

Figure 26. On-effort sightings of *Unidentified Small Delphinids* Species Code 177, n=1

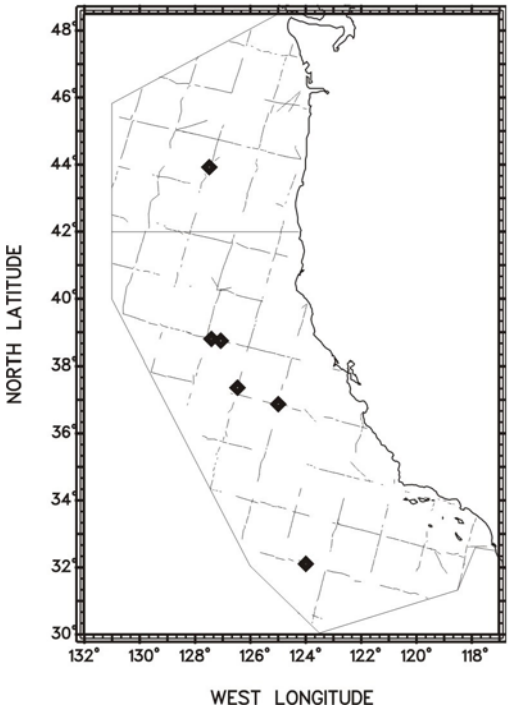

Figure 27. On-effort sightings of *Unidentified Small Whales* Species Code 078, n=6

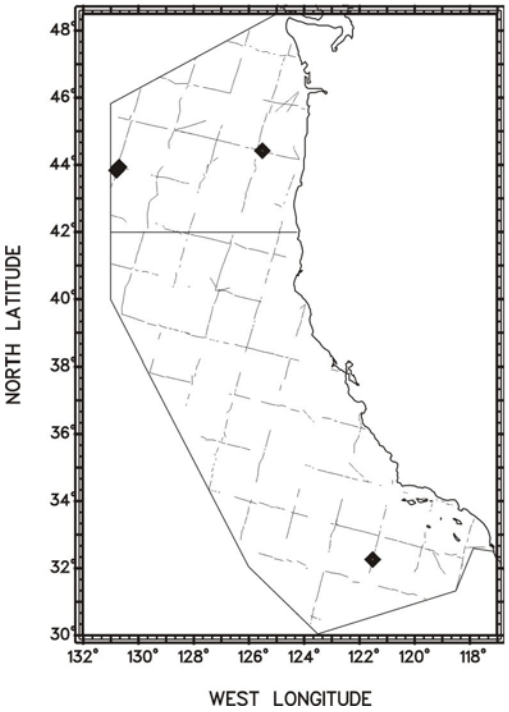

Figure 28. On-effort sightings of *Ziphiid Whales* Species Code 049, n=4

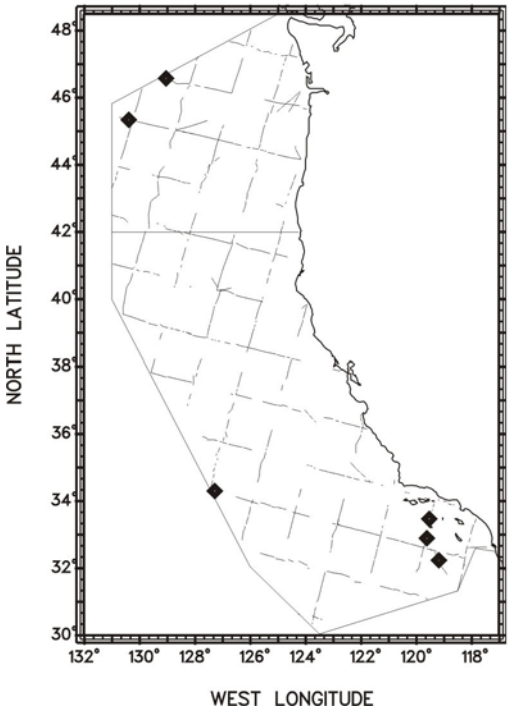

Figure 29. On-effort sightings of *Ziphius cavirostrus* Species Code 061, n=6

Leg 1:

Name[1]	Position
Jay Barlow	Cruise Leader
James Cotton	ID Specialist
Richard Rowlett	ID Specialist
Juan Carlos Salinas	Mammal Observer
Laura Morse	Mammal Observer
Erin LaBrecque	Mammal Observer
Leigh Torres	Mammal Observer
Michael Force	Seabird Observer
Cornelia Oedekoven	Seabird Observer
Candice Hall	Oceanographer
Shannon Rankin	Acoustician
Megan Ferguson	Acoustician
Annie Douglas	Photo-ID Specialist
Valerie Philbrick	Oceanographer

Leg 2:

Name[1]	Position
Lisa Ballance	Cruise Leader
James Cotton	ID Specialist
Richard Rowlett	ID Specialist
Juan Carlos Salinas	Mammal Observer
Laura Morse	Mammal Observer
Erin LaBrecque	Mammal Observer
Leigh Torres	Mammal Observer
Michael Force	Seabird Observer
Cornelia Oedekoven	Seabird Observer
Candice Hall	Oceanographer
Shannon Rankin	Acoustician
Julie Oswald	Acoustician
Annie Douglas	Photo-ID Specialist
Josh Fluty	Visiting Scientist

Leg 3:

Name[1]	Position
Barb Taylor	Cruise Leader
James Cotton	ID Specialist
Richard Rowlett	ID Specialist
Juan Carlos Salinas	Mammal Observer
Laura Morse	Mammal Observer
Erin LaBrecque	Mammal Observer
Leigh Torres	Mammal Observer
Michael Force	Seabird Observer
Cornelia Oedekoven	Seabird Observer
Candice Hall	Oceanographer
Shannon Rankin	Acoustician
Julie Oswald	Acoustician
Todd Chandler	Photo-ID Specialist

Leg 4:

Name[1]	Position
Sarah Mesnick	Cruise Leader
Juan Carlos Salinas	ID Specialist
Richard Rowlett	ID Specialist
Christina Fahy	Mammal Observer
Laura Morse	Mammal Observer
Erin LaBrecque	Mammal Observer
Leigh Torres	Mammal Observer
Michael Force	Seabird Observer
Cornelia Oedekoven	Seabird Observer
Candice Hall	Oceanographer
Shannon Rankin	Acoustician
Tony Martinez	Acoustician
Todd Chandler	Photo-ID Specialist

Leg 5:

Name[1]	**Position**
Robert Pitman	Cruise Leader
James Cotton	ID Specialist
Richard Rowlett	ID Specialist
Juan Carlos Salinas	Mammal Observer
Laura Morse	Mammal Observer
Erin LaBrecque	Mammal Observer
Leigh Torres	Mammal Observer
Michael Force	Seabird Observer
Cornelia Oedekoven	Seabird Observer
Candice Hall	Oceanographer
Shannon Rankin	Acoustician
Paula Olson	Photo-ID Specialist
Jessica Burtenshaw	Visiting Scientist

Leg 6: (on the *McArthur*)

Name[1]	**Position**
James Carretta	Cruise Leader
James Cotton	ID Specialist
Richard Rowlett	ID Specialist
Juan Carlos Salinas	Mammal Observer
Laura Morse	Mammal Observer
Erin LaBrecque	Mammal Observer
Michael Force	Seabird Observer
Cornelia Oedekoven	Seabird Observer
Pierre Malan	Oceanographer
Annie Douglas	Photo-ID Specialist
Shannon Rankin	Mammal Observer