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A REPORT OF CETACEAN ACOUSTIC DETECTION AND DIVE INTERVAL STUDIES (CADDIS) CONDUCTED IN THE SOUTHERN GULF OF CALIFORNIA, 1995

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U.S. DEPARTMENT OF COMMERCE
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National Marine Fisheries Service
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A Report of Cetacean Acoustic Detection and Dive Interval Studies (CADDIS) Conducted in the Southern Gulf of California, 1995

(*McArthur* Cruise Number: AR-95-08, SWFSC Cruise Number: 1601)

Jay Barlow, Karin Forney, Alexandra Von Saunder, and Jorge Urban-Ramirez

INTRODUCTION

This report describes a study conducted in Mexico aboard the National Oceanographic and Atmospheric Administration (NOAA) research ship *McArthur* during two months in summer/fall 1995. The primary purpose of this research was to learn how to better estimate the abundance of long-diving whales during ship line-transect surveys. These whale species, including beaked whales and dwarf and pygmy sperm whales, dive for such long periods of time that there is a high probability that they will never surface within the visual range of observers searching from a moving survey vessel with 25X binoculars. The project was called CADDIS (Cetacean Acoustic Detection and Dive Interval Studies) and focused on two potential approaches to improve abundance estimates: 1) acoustic detection of diving animals, and 2) collecting dive interval data on those species to serve as a basis for a model-based abundance correction factor. This research was sponsored by the National Marine Fisheries Service (NMFS): both the Southwest Fisheries Science Center (SWFSC) and Office of Protected Resources.

The CADDIS research was conducted primarily in the southern Gulf of California, Mexico. The northern boundary of the survey was the 29th parallel; the southern boundary was a line extending from Cabo San Lucas, Baja California Sur to Cabo Corrientes, Jalisco (20° 22.0'N, 105° 40.3'W). This area was chosen for two main reasons: prior surveys showed the area to have a very high density of small long-diving whales of the genera *Mesoplodon*, *Ziphius* and *Kogia* (Mangels and Gerrodette 1994), and the area has consistently calm seas which enables dive intervals to be observed and accurately measured. The timing of the survey was similarly chosen as the season with the consistently lowest winds in the southern Gulf.

In addition to the primary mission of improving survey methods for long-diving whales, many ancillary projects were also included in the cruise plans. Faculty and students from two Mexican universities in the area collaborated on photo-identification studies of blue whales, pilot whales, killer whales, and sperm whales during the survey. Researchers from Mexico also aided in the collection of biopsy samples for genetic studies of whale population structure. Oceanographic data were collected to better understand the habitat of cetaceans in the southern Gulf and the physical environment. This report describes the experimental procedures and summarizes the cetacean observations made during this project. A separate report will be published which describes the oceanographic and other biological studies completed during the survey.

METHODS

Survey Methods

The survey vessel, NOAA Ship *McArthur*, was commissioned in 1966 and is 53.3 meters in length, 11.6 meters in breadth, and 3.7 meters in draft. During the survey, the ship maintained a cruising speed of approximately 10 knots. Methods consisted of first searching for species of whales that were of particular interest for the various projects: 1) beaked whales, dwarf and pygmy sperm whales, sperm whales, and blue whales for dive interval studies; 2) beaked whales, dwarf and pygmy sperm whales, and sperm whales for acoustic detection studies; and 3) blue whales, sperm whales, killer whales, pilot whales, fin whales and Bryde's whales for photo-identification and biopsy studies.

Search effort consisted of the typical rotation of visual observers through four observation stations that has been used on many previous SWFSC marine mammal surveys (Mangels and Gerrodette 1994; Hill and Barlow 1992) during daylight hours which were approximately 0630L to 1730L. The four observation stations were located on the flying bridge deck at a height of 10.7 meters above the sea surface, allowing a maximum ship-to-horizon sighting distance of about six nautical miles. The visual observer stations consisted of two observers searching for cetaceans with pedestal-mounted Fujinon[1] 25X binoculars (on the port and starboard sides), a data recorder position amidship (who searches by naked eye and 7X binoculars), and an independent observer. The "independent observer" also searched by naked eye and 7X binoculars but did not announce the presence of cetaceans until they were clearly missed by the other observers. The data recorder logged the sighting cue, bearing, distance from ship, and species for each sighting on a laptop computer linked to the *McArthur*'s GPS (Global Positioning System) for navigational data.

Once an individual of one of the target species was found, sea conditions, time of day, and other factors were evaluated to determine whether dive interval studies should be initiated or whether a small boat (a Rigid-Hulled Inflatable Boat - RHIB) could be launched from the ship to obtain acoustic recordings, individual-identification photographs, or biopsy samples. Black and white photographs of some cetaceans were taken with 35mm cameras with 100-400mm lenses for the ID work. Bolts with special tips were shot from crossbows to extract skin biopsy samples from animals, when possible, for genetic studies of stock structure.

The search for these species was not random or systematic, but was planned on a day-by-day basis to optimize the chances of encountering target species and of finding weather conditions that were good for conducting these studies. Although searching was conducted and data were recorded using line-transect survey methods, these data cannot be used to estimate marine mammal abundance in the southern Gulf of California because of this directed mode of search. For example, due to the disruptive nature of recording pinniped sightings in such a high-density area, pinnipeds were omitted

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

from search effort, for better cetacean effort. Transects should, however, provide a good measure of relative cetacean abundance along the transect lines that were surveyed.

Acoustic Methods

Little is known about the sounds made by beaked whales and dwarf and pygmy sperm whales, so we prepared for this cruise by obtaining hydrophones and recording equipment that spanned a wide range of frequencies. Hull-mounted (fin-shaped) hydrophones (5 KHz - 200KHz frequency range) were installed underneath the *McArthur* and were used to record nearby animals, including bow-riding dolphins. Hand-deployed (trout-shaped) hydrophones (500 Hz - 200 KHz) were deployed from small boats in the vicinity of beaked whales and pygmy sperm whales. A towed fish with a fin-shaped hydrophone (500 Hz - 100 KHz frequency range) was towed from the ship in the vicinity of pygmy sperm whales and sperm whales to determine the practical range of detection if a towed fish were deployed during a line-transect survey. When this hydrophone was towed, the ship surveyed at a reduced speed of 8 knots. All of these hydrophones (and integral pre-amplifiers) were designed and built by Don Norris of Biomon[2], Santa Barbara, CA. Signals were further amplified with custom-made amplifiers before recording. Sonobuoys were also deployed in the vicinity of some species, and signals were recorded on digital audio tape (DAT).

Acoustic data were recorded either on analog tape or were directly digitized and recorded on hard disk using custom software on two computer systems. The tape recording system was a Racal[2] Stor 4 provided by Steve Dawson (during Leg 1 only) and provided tape speeds up to 60 inches per second (with a frequency response above 200 KHz). Acoustic data were digitized with an external Ariel[2] ProPort Model 656 Analog I/O Module (operating in 12-bit High-speed Mode at 384k samples/s) and were stored on a Sun[2] SPARKstation 20 workstation (with a single 60 MHz processor, 1Mb cache and 64Mb of RAM). Acoustic data were also recorded on a Dolch[2] 100 MHz Pentium[1] computer (with a 2 Mbyte hard disk and a DataTranslation[2] DT-3908 analog-to-digital conversion board) at continuous rates of up to 400k samples per second.

Dive Interval Methods

Visual dive interval studies were conducted when whales of interest were sighted under acceptable viewing conditions, which were evaluated based on sea state, swell height, and light levels, as well as body size, behavior, and group size for the sighted animals (Table 1). Dive studies were only initiated if viewing conditions were judged to allow for a high probability of resighting the group. Dive studies were terminated if sighting conditions deteriorated to the extent that animals were not likely to be resighted reliably, or if a species-specific maximum time limit (Table 1) had been exceeded since the last sighting (and the animals were assumed to have been lost). The primary target species were Baird's beaked whale (*Berardius bairdii*), Cuvier's beaked whale (*Ziphius*

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cavirostris), *Mesoplodon* beaked whales, sperm whales (*Physeter macrocephalus*), pygmy sperm whales (*Kogia breviceps*), and dwarf sperm whales (*Kogia simus*). Dive studies were also conducted on blue whales (*Balaenoptera musculus*) and short-finned pilot whales (*Globicephala macrorhynchus*).

During the course of the dive interval studies, the vessel was held at a distance of 0.5 - 1.0 nmi from the last known position of the animals, depending on species (Table 1). Visual observers conducted the dive interval studies from the flying bridge of the *McArthur*. The number of active observers varied for each sighting, depending on the species and observation conditions. Unless there was a large degree of certainty that the animals would surface in front of, and not behind, the ship (based on distance to the last known position and travel direction of the animals), two additional observers were assigned to search by naked eye or with 7X binoculars within the two 90° quadrants behind the vessel. In some cases, 1-3 additional observers searched on an opportunistic basis, generally in the direction of the projected next surfacing location. To reduce the potential effects of fatigue during dive studies, the observers rotated through the 2-4 searching positions at 30-40 minute intervals, and each observer rested for 1.5-2 hours following each complete rotation. To maintain continuity, the data recorder generally recorded for 1.5-2 hours and then rested for 1.5-2 hours.

Dive data were recorded with a special computer program designed to record and display dive information. This program included a graphic display of the sighting locations, and the distance and bearing relative to the vessel. The display was continuously updated based on the vessel's GPS position and manually-entered heading. In the data record, the first observed sighting of a surface series was marked as the 'Up' time, and a terminal dive (based on a steeply arching roll or the raising of flukes) marked the 'Down' time. If more than one animal were present, these times indicated the first animal up and last animal down, respectively. An exception to this rule occurred if single individuals within a group were readily identifiable based on prominent scars or coloration, dorsal fin shape, or other highly distinctive features. In these cases, the distinguishable animals were assigned separate sighting numbers and tracked independently. Up to three different groups could be simultaneously followed and individually recorded using different sighting numbers and plot symbols.

Itinerary

The survey was conducted 06 September through 08 November, 1995. The cruise consisted of two legs, thirty days each. The main port call was in Mazatlan, Mexico with several other weekly stops in La Paz, Mexico to exchange scientific personnel at the Pichilingue Ferry Terminal. The personnel were transferred by small boat launched from the *McArthur*. The dates for these observer exchanges were September 12, 19, and 26, October 3, 10, 17, 24, and 31. The ship's itinerary is listed below with the port call arrival and departure dates.

Leg I:		Leg II:	
06 SEP	Depart San Diego, California	10 OCT	Depart Mazatlan, Mexico
05 OCT	Arrive Mazatlan, Mexico	08 NOV	Arrive San Diego, California

Participants

The survey was a joint research project between the United States and Mexico under the MEXUS-Pacifico agreements. Scientists from both countries participated in the survey. The scientific complement consisted of 13-15 scientists with different affiliations, as shown below, with the dates in which they participated. Week 1= 6-12 Sep., Week 2 =12-19 Sep., Week 3 = 19-26 Sep., Week 4= 26 Sep.-3 Oct., Week 5 = 3-10 Oct., Week 6 = 10-17 Oct., Week 7 = 17-24 Oct., Week 8 = 24-31 Oct., Week 9 = 31 Oct.-8 Nov.

Name	Affil.	Obs.#	Position	Week 1	2	3	4	5	6	7	8	9
Dr. Jay Barlow	SWFSC	015	Chief Scientist	x	x	x	x	x	x	x	x	x
James Cotton	SWFSC	007	ID Specialist	x	x	x	x	x	x	x	x	x
Richard Rowlett	SWFSC	073	ID Specialist	x	x	x	x	x	x	x	x	x
Wesley Armstrong	SWFSC	076	ID Specialist	x	x	x	x	x	x	x	x	x
Robert Pitman	SWFSC	004	ID Specialist	x	x	x	x	x	x	x	x	x
Valerie Philbrick	SWFSC	089	Oceanographer	x	x	x	x	x	x	x	x	x
Karin Forney	SWFSC	086	Dive Time Leader			x	x	x	x	x		
Dr. Barbara Taylor	SWFSC	034	Dive Time Leader								x	x
Luis Alberto Hurtado	ITESM	130	Observer			x	x	x				
Zully Ojeda	ITESM	131	Observer						x	x		
Oscar Cecena-Ojeda	INP	132	Observer		x	x	x	x				
Miguel Palmeros	UABCS	124	Observer			x					x	
Ernesto Vazquez	UABCS	125	Observer			x						
Juan Carlos Salinas	UABCS	126	Observer				x		x			
Isabel Hernandez	UABCS	127	Observer				x					
Jorge Urban Ramirez	UABCS	122	Observer					x				x
Alberto Guillen	UABCS	128	Observer					x				
Luis Enriquez	UABCS	129	Observer							x		
Dr. Susan Chivers	SWFSC	029	Observer								x	x
Alexandra VonSaunder	SWFSC	119	Observer									x
Dr. Peter Bromirski	SWFSC	---	Acoustic Researcher	x	x	x	x	x	x	x	x	x
Dr. Steve Dawson	SWFSC	---	Acoustic Researcher	x	x	x	x	x				
Don Ljungblad	SWFSC	115	Acoustic Researcher	x	x	x	x	x				
Todd Chandler	SWFSC	106	ID Photographer	x								

Note: Participant affiliation key: ITESM -Instituto Tecnologico y de Estudios Superiores de Monterey, Campus Guaymas, INP -Instituto Nacional de la Pesca in Mexico City, and UABCS - Universidad Autonoma de Baja California Sur, in La Paz, B.C. Sur.

RESULTS

Effort and Sightings

A total of 6,120 km of tracklines were surveyed in line-transect mode ("on-effort") during 56 actual survey days (Table 2). Less than 1/4 of this effort was in excellent survey conditions (Beaufort Sea State 2 or lower), but these conditions accounted for more than one third of the sightings (Table 3). Transect lines surveyed during Leg 1 and Leg 2 are shown in Figures 1 and 2 (respectively). A total of 504 "on-effort" and "off-effort" sightings were made during the survey. The complete sighting record is presented in Table 4, which includes the time, position, and estimated school size for all sightings listed by species. Figures 3 through 16 show the geographical locations of each sighting for each species. The sighting information is summarized in Table 5, which presents a breakdown of the pure and mixed schools and the average school size for each category sighted. Thirty-four different sighting categories (i.e., unidentified ziphiid, or species) of cetaceans were recorded during the CADDIS95 survey. The most commonly sighted delphinids were bottlenose dolphins, Risso's dolphins, spotted dolphins, and the two species of common dolphins (Table 5). The most common medium-sized whales were Cuvier's beaked whales, pygmy sperm whales, and various species of mesoplodont beaked whales (Table 5). Most unidentified dolphin sightings were of small groups seen very briefly and at a distance greater than 3.0 nautical miles. The most common large whales were sperm whales, Bryde's whales, and fin whales (Table 5). A variety of cetaceans were seen in mixed-species groups (38 of the total sightings were mixed school sightings), most notably spotted and spinner dolphins, bottlenose dolphins and Risso's dolphins, and bottlenose dolphins and short-finned pilot whales (Table 6).

Cetaceans were photographed during the survey when possible, for the purpose of stock and individual identification. Photographs were catalogued in a database at SWFSC for reference and analysis. The photographic record is available to other agencies and institutions by duplication through the SWFSC.

Acoustic Detection

Our attempts to acoustically detect members of the genera *Ziphius, Mesoplodon,* and *Kogia* were disappointing. We were not able to obtain any unambiguous recordings from these species. There were several signals received on hull-mounted hydrophones that could have been echo-location-type clicks from these species, but the ship itself produced sounds (probably from propeller cavitation) that were remarkably similar in wave-form and frequency to echo-location clicks, so it is difficult to be certain of what was recorded.

The most promising signals recorded in the vicinity of Cuvier's beaked whales (*Ziphius cavirostris*) were obtained on 23 October 1995 when three animals that we had been following for several hours surfaced within 100m of the ship. Three long (10 msec), reverberant echo-location-type signals were recorded at this time from a hull-mounted hydrophone (with periods of 4 s and 9 s between pulses). Frequencies extended from the lower range of this hydrophone (5 KHz) to approximately 45 KHz, with a peak frequency of approximately 15-20 KHz. Nothing was heard or recorded on many other occasions when we were in the close vicinity of this species. For example, on 20 September 1995, we encountered a group of three Cuvier's beaked whales, launched the RHIB, and lowered a hydrophone in the location where the animals were expected to surface. The three surfaced within 100m of the small vessel (oriented with their melons pointing toward the vessel), submerged, and resurfaced on the other side of the vessel. No acoustic signals were received or recorded during this encounter. Similarly, we had several close encounters with members of the genus *Mesoplodon* (probably all *M. peruvianus* and a yet-undescribed *Mesoplodon* spp. A), and nothing definitive was heard or recorded.

The most promising signals recorded in the vicinity of pygmy sperm whales (*Kogia simus*) were obtained on 29 October 1995. Observers sighted an unusually large group of 7-9 animals rafting at the surface. The group was relatively stationary, thus the ship was guided slowly to their close proximity. Several clear echo-location-type signals were recorded from a hull-mounted hydrophone when these animals were within 500 meters of the ship. The strongest signals were recorded at regular intervals of 1.2-1.5 seconds when the animals were approximately 200 meters away and oriented with their melons pointing toward the vessel. Frequencies extended from the lower range of this hydrophone (5 KHz) to approximately 75 KHz, with a peak frequency of approximately 15-40 KHz. Nothing was heard or recorded on many other occasions when we were in the close vicinity of this species.

We obtained several high-quality analog recordings of Baird's beaked whales using the hand-deployed hydrophones in their immediate vicinity on 7 September 1995. This group of approximately 11 individuals was seen approximately 40 nmi west of Isla Cedros on the eastern side of Baja California (28° 10'N, 115° 45'W). A wide variety of pulsed signals were recorded that varied from single echo-location-type clicks to long, rapid click sequences (Dawson, Barlow, and Ljungblad, in press). Almost all the signals showed a dominant frequency peak at 23KHz with a secondary peak at 42KHz. Whistles were also recorded from a sonobuoy during this time but were probably made by a group of common dolphins that passed through the area

We obtained very good signals from sperm whales using hull-mounted, hand-deployed and towed hydrophones. Our experience with this species showed that they could be reliably detected at ranges of 2-3 nmi using towed or hand-deployed hydrophones, but could only be detected at very close ranges (< 0.25 nmi) using the hull-mounted hydrophone. The hull-mounted hydrophones were also only effective when the ship was traveling relatively slowly (less than 6 knots). Limitations of the hull-mounted hydrophone were clearly related to high noise level of the ship, in particular, the impulsive sounds (clicks) that were probably caused by propeller cavitation.

Whistles and echo-location clicks were recorded from almost all of the delphinid species that were encountered: long-beaked and short-beaked common dolphins, spotted dolphins, spinner dolphins, bottlenose dolphins, killer whales, short-finned pilot whales, Risso's dolphins, rough-toothed dolphins, and (possibly) striped dolphins. These broad-banded signals (from 10KHz up to 200KHz) were primarily received on the ship's hull-mounted hydrophones and were recorded on the

Sun[3] workstation and on the Dolch[3] computer. Most of the smaller delphinids were recorded at very close range (<200 m) as they approached the vessel or were bow-riding. Pilot whale clicks could be heard at greater ranges, up to approximately 1 kilometer. These signals were archived by Dr. Peter Bromirski and will be analyzed and made available by him in the future.

Dive Interval Observations

Species for which dive data were collected included Baird's beaked whale, Cuvier's beaked whale, *Mesoplodon* beaked whales, pygmy/dwarf sperm whales (*Kogia* spp.), blue whale, and one large group of short-finned pilot whales (Table 8). Additional studies were attempted on sperm whales, but in the course of these studies it was determined that multiple groups of sperm whales were in the area and therefore it was not possible to follow a single group reliably. A summary of the dive and surface times is presented for all species in Table 9. Cuvier's beaked whales had the longest dives and spent the smallest percent of time at the surface. Histograms of observed dive durations for Cuvier's beaked whales, *Mesoplodon* spp. and *Kogia* spp. are presented in Figure 17. Groups with one or more calves are graphed separately from those without calves.

DISCUSSION

Acoustic Detection

Several conclusions can be drawn from our failed attempts to acoustically detect small long-diving whales (*Kogia, Ziphius,* and *Mesoplodon*). Our primary conclusion is that it is not feasible or practical to use acoustic detection to improve ship survey-based estimates of their abundance. Furthermore, we conclude that these species do not typically produce sounds (at least not during daylight hours and in the vicinity of boats) that are of sufficient amplitude to be detected by our diverse array of instruments. As we were able to record sounds from virtually all other odontocetes that we encountered, this group of species appears to be less acoustically active than most odontocetes. It is possible that the presence of our vessels changed their acoustic behavior and that they are normally as "vocal" as most cetaceans; however, this would be of little practical value for improving ship census methods. We do believe, however, that all these species are probably producing and using underwater sounds to some extent. Our visual observers frequently noted that groups that were previously separated by 1 kilometer or more would apparently aggregate underwater and surface together. It is difficult to understand how they could do this without some form of underwater communication via sound. Nonetheless, the sounds that they are (apparently) producing appear to be of no value to us in our efforts to acoustically detect them.

In contrast, the sounds produced by sperm whales are loud and easily recognizable at ranges of 2-3 nautical miles using a towed hydrophone. Hull-mounted hydrophones (which are logistically

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

much easier to use on a line-transect survey) do not appear to be practical due to the high levels of ship noise (but might be given further consideration for detecting submerged groups from a much quieter vessel). Sperm whales appear to produce sounds consistently when diving. As many others have suggested before, this species appears to be ideally suited to acoustic census methods. [Our laboratory applied many of the lessons learned during this CADDIS study and conducted a combined visual and acoustic census of sperm whales in the eastern temperate North Pacific in spring 1997.] Some potential may also exist for acoustically detecting Baird's beaked whales during ship surveys; however, they did not appear to be as consistent in producing sounds as are sperm whales, and the frequency range of their sounds (total range is 15-65 Khz, with a definite peak at 23 KHz) cannot be expected to propagate as far as sounds made by sperm whales (total frequency range is 500 Hz-20 Khz, with a peak at 2-4 KHz).

Dive Interval Data

The southern Gulf of California, with relatively high densities of beaked whales and *Kogia* spp. and frequently calm seas, has provided a unique opportunity to obtain dive interval data on these elusive and little-known animals. The data collected during these visual dive studies are the first step toward developing correction factors for animals missed during line-transect surveys (Barlow and Sexton, 1996). However, visual dive studies have some important potential problems that could affect the quality and accuracy of the data. To minimize the potential for errors in this study, a number of subjective judgements regarding the quality of the data were made, based primarily on the data record and on observations made in the field.

One serious problem is the potential for confusing groups of animals when multiple groups of one species are in an area (a large group with smaller subgroups). In particular, this is likely to be a problem for *Kogia*, Baird's beaked whales, and sperm whales, which often occur in loosely associated groups. During the course of the dive studies conducted on this cruise, an attempt was made to collect data only when a high degree of certainty regarding group identification was possible. In a number of cases, dive data were collected, but later discarded when it became clear that surfacings from different groups may have been recorded. When conducting visual dive interval studies, it is therefore extremely important to note group composition and any distinctive features of individuals in the group. The computerized data entry and tracking program also proved invaluable in distinguishing groups based on location.

A second important source of error in visual dive interval studies occurs when surfacings are missed. If the first surfacing of a surface series is missed, this causes an upward bias in the estimate of dive duration and a downward bias in the estimated time at the surface. A more serious error occurs if an entire surfacing series is missed, which would cause two dives plus the missed surface period to be counted as a single, longer dive. Although in this study an attempt was made to ensure that all surfacings would be detected (by conducting studies only in adequate conditions and by having a sufficient number of observers searching), it is nonetheless likely that some first surfacings were missed, and there may be small biases in the dive data presented here. Additionally, there are a number of dives of very long duration (Figure 17) that could possibly represent two dives with a missed surface period.

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Table 1. Sighting Conditions - Sighting condition criteria for species on which dive interval data were collected. Dive studies were initiated and terminated on the basis of the likelihood of resighting the animal(s) given the combined effects of sea state, swell height, species, group size, and body size.

Species	Sighting Cues for Species	Beaufort Sea State Criteria: Start	Max	Swell Height (ft)	Approach Distance (nmi)	Time Limit (mins)
Blue whale *Balaenoptera musculus*	Distinct blow, large size, highly visible.	0-5	5	0-5	0.5 - 1.0	30
Sperm whale *Physeter macrocephalus*	Distinct blow, large size, often raft at surface and are highly visible.	0-5	5	0-5	0.5 - 1.0	90
Dwarf sperm whale *Kogia simus*	No visible blow, small size, very inconspicuous.	0-2	2	0-2	0.5	60
Baird's beaked whale *Berardius bairdii*	Bushy blow, large size, often raft at surface and are highly visible.	0-4	5	0-5	0.5 - 1.0	90
Cuvier's beaked whale *Ziphius cavirostris*	No visible blow, medium size, low rolling behavior.	0-4	4	0-3	0.5 - 1.0	90
Mesoplodon beaked whales (*M. peruvianus, M.* spp.)	No blow, small body, low rolling behavior.	0-2	3-4	0-3	0.5 - 1.0	90
Short-finned pilot whale *Globicephala macrorhynchus*	No or small blow, medium body size, rafting or rolling behavior.	0-3	3	0-4	0.5 - 1.0	30

Table 2. Kilometers of effort by day - A list of distances per day during which visual observers were on watch for target species.

Leg 1 Effort

Date	Km
6 Sep 95	79.4
7 Sep 95	146.1
8 Sep 95	222.0
9 Sep 95	200.5
10 Sep 95	186.1
11 Sep 95	83.5
12 Sep 95	103.7
13 Sep 95	161.0
15 Sep 95	99.3
16 Sep 95	225.3
17 Sep 95	64.9
18 Sep 95	120.1
19 Sep 95	176.6
20 Sep 95	55.0
21 Sep 95	86.5
22 Sep 95	149.8
23 Sep 95	29.6
24 Sep 95	44.5
25 Sep 95	75.5
26 Sep 95	90.3
27 Sep 95	137.0
29 Sep 95	90.2
30 Sep 95	32.9
1 Oct 95	90.1
2 Oct 95	181.2
3 Oct 95	104.2
4 Oct 95	88.1

Leg 2 Effort

Date	Km
10 Oct 95	102.7
11 Oct 95	194.9
12 Oct 95	136.1
13 Oct 95	108.5
14 Oct 95	115.5
15 Oct 95	84.0
16 Oct 95	54.9
17 Oct 95	88.7
18 Oct 95	82.5
19 Oct 95	11.1
20 Oct 95	50.0
21 Oct 95	106.2
22 Oct 95	38.8
23 Oct 95	82.8
24 Oct 95	74.6
25 Oct 95	121.9
26 Oct 95	157.5
27 Oct 95	74.5
28 Oct 95	107.4
29 Oct 95	97.1
30 Oct 95	151.9
31 Oct 95	110.0
1 Nov 95	108.2
2 Nov 95	78.8
3 Nov 95	79.3
4 Nov 95	134.0
5 Nov 95	159.6
6 Nov 95	163.7
7 Nov 95	122.8
Total	6121.3

Table 3. On-effort sighting summary - A list of sightings made while visual observers were on watch, by Beaufort Sea State and by Observer Number.

	Kilometers of Effort	No. of Sightings	Sightings per 1000 Km
By Sea State (Beaufort)			
0	31.7	11	346.67
1	192.2	24	124.89
2	1226.5	127	103.54
3	1136.4	76	66.88
4	2657.9	153	57.56
5	761.6	50	65.65
6	115.0	4	34.79
By Observer Number			
4	3041.5	100	32.88
7	3012.8	72	23.90
15	29.1	0	0.00
73	3003.1	77	25.64
76	3085.6	105	34.03
86	688.7	18	26.14
106	25.8	0	0.00
119	487.6	5	10.25
122	727.4	16	22.00
123	587.8	4	6.81
124	356.0	3	8.43
125	346.9	7	20.18
127	247.7	4	16.15
128	147.1	3	20.39
129	205.3	3	14.61
130	849.0	12	14.13
131	708.7	8	11.29
132	40.0	0	0.00
133	191.4	4	20.90
134	342.6	2	5.84
135	351.4	2	5.69
Total	6121.3	445	72.70

Table 4. Sightings - A listing of all sightings (on- and off-effort) from the cruise, by species.

Species Name										
Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
Mesoplodon peruvianus										
01		259	4 Oct 95	832	N20:33.20	W105:23.69	1	4	2	On
Stenella attenuata (offshore)										
02		31	11 Sep 95	623	N23:03.38	W110:59.58	0	73	65	On
02	10	44	11 Sep 95	1624	N22:44.00	W110:26.15	2	73	275	On
02		49	12 Sep 95	646	N22:41.24	W110:06.36	3	123	39	On
02	10	71	13 Sep 95	756	N23:55.54	W109:31.73	3	4	68	On
02		77	13 Sep 95	1543	N24:44.72	W110:02.67	5	7	28	On
02		128	18 Sep 95	640	N27:08.19	W110:59.11	2	76	150	On
02		129	18 Sep 95	651	N27:06.07	W110:59.10	2	76	30	On
02		158	19 Sep 95	1720	N27:35.02	W111:12.49	3	86	200	On
02		172	21 Sep 95	1701	N24:54.20	W109:55.08	2	133	15	On
02		204	27 Sep 95	828	N25:18.22	W109:30.09	4	7	115	On
02		208	27 Sep 95	1414	N24:27.56	W109:29.87	2	4	125	On
02		244	2 Oct 95	801	N25:08.45	W110:23.94	4	7	115	On
02		248	2 Oct 95	1253	N24:28.94	W110:09.94	3	7	73	On
02	10	256	3 Oct 95	1119	N22:22.79	W107:22.76	4	7	925	On
02	10	257	3 Oct 95	1635	N22:14.49	W107:17.53	4	7	900	On
02		273	10 Oct 95	1512	N22:23.33	W106:40.56	4	73	30	On
02		278	11 Oct 95	620	N21:52.16	W106:53.16	3	73	6	On
02		280	11 Oct 95	712	N21:44.47	W106:50.22	2	7	40	On
02	10	282	11 Oct 95	1023	N21:14.68	W106:37.79	4	73	82	On
02		301	14 Oct 95	1047	N21:08.33	W106:25.51	4	73	75	On
02		302	14 Oct 95	1309	N21:14.37	W106:39.38	4	76	63	On
02	10	307	15 Oct 95	1322	N22:30.37	W109:31.72	2	76	125	On
02		312	16 Oct 95	736	N23:21.89	W109:17.39	3	7	88	On
02	16	374	22 Oct 95	1605	N24:16.05	W109:58.77	3	129	150	On
02	10	393	26 Oct 95	759	N22:42.96	W109:34.93	2	76	55	On
02	10	397	26 Oct 95	1412	N23:22.91	W109:07.89	4	73	645	On
02	18	411	27 Oct 95	821	N24:18.16	W108:24.91	4	4	119	On
02		412	27 Oct 95	950	N24:13.67	W108:32.78	4	73	6	On
02		446	30 Oct 95	1714	N24:14.69	W109:24.45	4	76	45	On
02		457	31 Oct 95	1621	N24:10.26	W109:55.87	4	7	225	On
02	10	461	1 Nov 95	1131	N22:52.17	W109:48.31	5	76	100	On
02	10	463	1 Nov 95	1344	N22:42.26	W109:59.90	5	73	190	On
02		466	1 Nov 95	1512	N22:38.25	W109:53.70	4	7	450	On
02	18	471	1 Nov 95	1717	N22:37.63	W109:42.50	5	4	33	On
Delphinus (unid. spp.)										
05		1	6 Sep 95	1852	N31:34.13	W117:02.83	2	7	30	On
05		9	8 Sep 95	658	N28:08.61	W115:42.15	5	76	200	On
05	22 77	10	8 Sep 95	723	N28:04.96	W115:38.12	4	4	915	On
05		23	9 Sep 95	1453	N23:43.62	W113:13.13	4	4	600	On
05		58	12 Sep 95	1503	N22:42.69	W109:32.18	2	73	35	On
05		100	16 Sep 95	1555	N26:50.72	W110:30.02	2	76	30	On
05		106	17 Sep 95	634	N27:48.18	W111:00.31	2	125	50	On
05		107	17 Sep 95	635	N27:48.09	W111:00.32	2	4	400	On
05	18	109	17 Sep 95	717	N27:41.36	W111:00.34	1	76	100	On
05		142	18 Sep 95	1450	N26:08.68	W111:00.49	4	76	160	On
05		214	29 Sep 95	906	N26:43.06	W111:17.30	4	76	75	On
05		360	21 Oct 95	948	N25:51.79	W111:05.51	2	76	500	On
05		369	21 Oct 95	1729	N25:19.69	W110:50.31	4	129	120	On
05		395	26 Oct 95	1015	N23:00.61	W109:26.80	2	73	400	On
05		436	30 Oct 95	827	N23:24.74	W109:20.67	3	76	100	On

Species Name										
Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
05		451	31 Oct 95	1133	N24:39.55	W110:27.17	3	73	15	On
05		477	2 Nov 95	1429	N23:40.71	W111:42.43	5	119	175	On
05		490	5 Nov 95	802	N26:20.39	W114:04.02	4	73	440	On
05		496	5 Nov 95	1725	N27:21.91	W115:11.94	3	4	35	On
Stenella longirostris orientalis										
10	02	44	11 Sep 95	1624	N22:44.00	W110:26.15	2	73	275	On
10		61	12 Sep 95	1556	N22:46.07	W109:23.35	2	76	6	On
10		62	12 Sep 95	1559	N22:46.23	W109:22.84	2	76	90	On
10		63	12 Sep 95	1625	N22:46.96	W109:19.59	1	76	50	On
10		64	12 Sep 95	1630	N22:47.44	W109:18.69	1	7	55	On
10	02	71	13 Sep 95	756	N23:55.54	W109:31.73	3	4	68	On
10	90	160	20 Sep 95	719	N27:20.76	W111:08.51	2	125	250	On
10		203	27 Sep 95	826	N25:18.57	W109:30.07	4	76	285	Off
10	02	256	3 Oct 95	1119	N22:22.79	W107:22.76	4	7	925	On
10	02	257	3 Oct 95	1635	N22:14.49	W107:17.53	4	7	900	On
10		262	4 Oct 95	1410	N20:31.55	W105:41.98	5	4	1	On
10	02	282	11 Oct 95	1023	N21:14.68	W106:37.79	4	73	82	On
10		303	14 Oct 95	1424	N21:15.16	W106:47.16	4	76	68	On
10	02	307	15 Oct 95	1322	N22:30.37	W109:31.72	2	76	125	On
10		314	16 Oct 95	910	N23:28.44	W109:19.43	2	128	40	On
10	02	393	26 Oct 95	759	N22:42.96	W109:34.93	2	76	55	On
10	02	397	26 Oct 95	1412	N23:22.91	W109:07.89	4	73	645	On
10		400	26 Oct 95	1530	N23:27.91	W108:58.28	4	76	30	On
10	02	461	1 Nov 95	1131	N22:52.17	W109:48.31	5	76	100	On
10	02	463	1 Nov 95	1344	N22:42.26	W109:59.90	5	73	190	On
Stenella coeruleoalba										
13		45	11 Sep 95	1632	N22:43.90	W110:24.56	2	4	15	On
13		309	15 Oct 95	1432	N22:33.45	W109:40.16	2	4	12	On
13	77	316	16 Oct 95	939	N23:30.69	W109:19.87	2	4	72	On
13		437	30 Oct 95	837	N23:26.28	W109:20.55	3	131	23	On
Steno bredanensis										
15		32	11 Sep 95	624	N23:03.28	W110:59.44	0	4	7	On
15		35	11 Sep 95	847	N23:02.36	W110:57.14	0	76	17	On
15		270	10 Oct 95	1244	N22:43.91	W106:31.05	4	76	9	On
15		318	16 Oct 95	1017	N23:32.66	W109:18.95	2	4	5	Off
15	18	417	27 Oct 95	1631	N24:02.97	W108:58.97	4	76	15	Off
15		439	30 Oct 95	941	N23:32.62	W109:23.18	2	76	12	Off
Delphinus capensis (long-beak)										
16		147	18 Sep 95	1558	N25:58.55	W111:02.02	2	4	650	Off
16		333	18 Oct 95	1417	N26:30.27	W111:23.34	3	7	630	On
16		334	18 Oct 95	1510	N26:33.61	W111:25.47	2	129	20	Off
16		339	18 Oct 95	1541	N26:37.94	W111:28.40	2	7	800	On
16		344	20 Oct 95	849	N28:30.12	W112:50.42	5	7	311	On
16		345	20 Oct 95	1028	N28:24.42	W112:45.95	6	7	345	On
16		346	20 Oct 95	1111	N28:21.17	W112:45.62	6	129	100	Off
16		373	22 Oct 95	1433	N24:05.76	W109:51.68	4	4	156	On
16	02	374	22 Oct 95	1605	N24:16.05	W109:58.77	3	129	150	On
16		380	24 Oct 95	948	N24:26.55	W110:29.81	5	76	50	On
16		385	25 Oct 95	1006	N23:06.40	W109:23.64	4	7	190	On
Delphinus delphis (short-beak)										
17		2	7 Sep 95	925	N28:53.48	W115:54.06	4	73	48	On
17		5	7 Sep 95	1159	N28:44.88	W115:51.32	4	86	40	On
17		14	8 Sep 95	1123	N27:36.47	W115:11.93	5	4	350	On

Species Name

Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
17		25	10 Sep 95	1421	N24:07.55	W113:02.81	4	4	45	On
17		27	10 Sep 95	1520	N24:03.91	W112:51.79	3	4	300	On
17		465	1 Nov 95	1436	N22:40.29	W109:55.00	4	122	410	Off
17		472	2 Nov 95	652	N23:24.47	W111:15.63	5	76	33	On
17		481	3 Nov 95	722	N25:13.45	W113:15.01	4	122	55	On
17		487	4 Nov 95	1350	N24:13.16	W112:30.51	2	76	1200	On
17		488	4 Nov 95	1352	N24:13.55	W112:30.65	2	4	25	Off
17		495	5 Nov 95	1651	N27:18.97	W115:06.85	4	76	235	On
17		501	6 Nov 95	1642	N28:38.13	W115:40.39	4	4	283	On
17		503	7 Nov 95	851	N29:19.46	W116:19.26	5	76	558	On
17		504	7 Nov 95	1308	N29:46.77	W116:46.63	5	76	500	On
17		506	7 Nov 95	1622	N29:58.29	W117:01.09	5	76	17	Off
Tursiops truncatus										
18		22	9 Sep 95	1203	N23:35.16	W113:32.68	4	123	20	On
18		54	12 Sep 95	1229	N22:40.97	W109:48.59	4	7	15	On
18		82	16 Sep 95	652	N25:17.58	W110:30.16	2	7	8	On
18		85	16 Sep 95	703	N25:19.63	W110:30.16	2	76	8	On
18		88	16 Sep 95	1000	N25:51.61	W110:30.14	3	73	14	On
18		93	16 Sep 95	1448	N26:39.39	W110:30.35	2	7	85	On
18		94	16 Sep 95	1458	N26:41.01	W110:30.28	2	76	36	On
18		95	16 Sep 95	1520	N26:44.82	W110:30.15	2	125	2	On
18		96	16 Sep 95	1527	N26:46.07	W110:30.12	2	4	15	On
18		97	16 Sep 95	1531	N26:46.58	W110:30.10	2	4	30	On
18		98	16 Sep 95	1546	N26:49.20	W110:30.05	2	125	25	On
18		99	16 Sep 95	1553	N26:50.46	W110:30.02	2	130	6	On
18		102	16 Sep 95	1607	N26:52.94	W110:29.97	2	76	3	On
18		103	16 Sep 95	1610	N26:53.47	W110:29.95	2	76	2	On
18	05	109	17 Sep 95	717	N27:41.36	W111:00.34	1	76	100	On
18		110	17 Sep 95	721	N27:40.63	W111:00.30	1	76	20	On
18		111	17 Sep 95	729	N27:39.31	W111:00.26	1	130	200	On
18		112	17 Sep 95	741	N27:37.30	W111:00.22	1	76	75	On
18	21	113	17 Sep 95	819	N27:31.09	W111:00.06	2	73	55	On
18	36	137	18 Sep 95	1300	N26:21.14	W111:00.04	3	73	54	On
18	21	149	19 Sep 95	850	N27:19.81	W111:30.06	5	7	80	On
18		151	19 Sep 95	1134	N27:44.62	W111:29.98	4	130	8	On
18		155	19 Sep 95	1543	N27:48.90	W111:22.47	3	7	10	On
18		156	19 Sep 95	1554	N27:47.25	W111:21.17	3	73	10	On
18		157	19 Sep 95	1634	N27:41.68	W111:17.12	3	76	3	On
18	46	180	24 Sep 95	658	N27:28.51	W111:39.95	4	133	170	On
18	36	183	24 Sep 95	1556	N27:18.51	W112:03.10	3	73	325	Off
18	36	187	25 Sep 95	1258	N27:28.85	W112:11.07	4	127	200	On
18	36	189	25 Sep 95	1430	N27:19.05	W112:01.90	4	127	105	On
18	21	194	26 Sep 95	647	N27:19.56	W111:12.57	3	73	90	On
18	21	199	27 Sep 95	735	N25:27.20	W109:29.88	4	130	40	On
18		201	27 Sep 95	755	N25:23.80	W109:29.94	4	7	120	On
18		211	29 Sep 95	641	N26:22.91	W111:00.60	4	73	35	On
18		212	29 Sep 95	717	N26:28.11	W111:04.60	4	76	22	On
18		217	29 Sep 95	1045	N26:49.59	W111:28.32	4	7	80	Off
18		220	29 Sep 95	1748	N27:07.80	W111:39.73	4	7	110	On
18		223	30 Sep 95	649	N27:33.45	W111:49.55	5	7	155	On
18		241	1 Oct 95	1554	N27:01.35	W111:37.23	4	4	23	On
18		243	1 Oct 95	1720	N26:49.33	W111:26.42	4	73	500	On
18		264	4 Oct 95	1607	N20:46.99	W105:46.55	5	76	19	On
18		277	10 Oct 95	1729	N22:00.77	W106:49.48	3	76	7	On
18		279	11 Oct 95	700	N21:46.12	W106:51.37	2	76	3	On
18		321	17 Oct 95	1023	N24:32.36	W110:30.07	4	4	28	On
18		326	18 Oct 95	1005	N26:02.21	W111:15.34	2	7	66	On
18		327	18 Oct 95	1030	N26:03.37	W111:14.86	3	73	75	On

Species Name										
Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Effort
18	46	340	19 Oct 95	701	N27:10.88	W111:35.71	5	76	112	On
18		350	21 Oct 95	706	N26:08.99	W111:08.88	2	76	27	On
18		356	21 Oct 95	853	N25:57.55	W111:01.96	2	73	16	On
18		357	21 Oct 95	900	N25:56.76	W111:02.78	2	131	40	On
18		362	21 Oct 95	953	N25:51.28	W111:04.73	2	4	35	On
18	36	365	21 Oct 95	1259	N25:47.27	W110:58.73	3	76	65	On
18		372	22 Oct 95	1308	N24:06.00	W109:42.06	3	7	304	On
18		382	24 Oct 95	1147	N24:38.53	W110:22.58	5	73	25	On
18		386	25 Oct 95	1048	N23:03.40	W109:26.41	2	73	9	On
18		387	25 Oct 95	1059	N23:03.61	W109:28.07	2	73	35	On
18		388	25 Oct 95	1101	N23:03.41	W109:28.36	2	73	65	On
18		390	25 Oct 95	1154	N22:58.43	W109:35.92	2	4	25	On
18		394	26 Oct 95	851	N22:51.32	W109:35.08	2	4	130	On
18	02	411	27 Oct 95	821	N24:18.16	W108:24.91	4	4	119	On
18	21	413	27 Oct 95	1006	N24:12.17	W108:35.36	4	131	157	On
18	15	417	27 Oct 95	1631	N24:02.97	W108:58.97	4	76	15	Off
18		441	30 Oct 95	1358	N24:03.07	W109:42.59	3	73	7	On
18		442	30 Oct 95	1509	N24:08.95	W109:31.95	4	124	20	On
18		448	31 Oct 95	1041	N24:31.57	W110:30.67	3	73	2	On
18		450	31 Oct 95	1049	N24:32.72	W110:30.23	3	7	45	On
18		458	31 Oct 95	1628	N24:09.37	W109:55.19	4	7	225	On
18		460	1 Nov 95	1013	N22:58.33	W109:35.70	2	122	148	On
18	02	471	1 Nov 95	1717	N22:37.63	W109:42.50	5	4	33	On
18	77	480	2 Nov 95	1646	N23:48.47	W111:51.67	4	4	75	On
18		484	3 Nov 95	1210	N24:45.18	W113:11.77	3	122	10	On
Grampus griseus										
21		41	11 Sep 95	1357	N22:44.59	W110:32.09	3	76	2	On
21		57	12 Sep 95	1439	N22:41.29	W109:36.21	2	7	12	On
21		59	12 Sep 95	1531	N22:44.45	W109:27.55	2	73	10	On
21		78	13 Sep 95	1551	N24:46.06	W110:02.98	4	86	22	On
21		79	13 Sep 95	1750	N24:57.98	W110:08.29	4	4	5	On
21		83	16 Sep 95	655	N25:18.32	W110:30.19	2	76	28	On
21		86	16 Sep 95	709	N25:20.71	W110:30.09	2	7	11	On
21		90	16 Sep 95	1424	N26:35.22	W110:30.51	2	73	85	On
21		91	16 Sep 95	1429	N26:36.05	W110:30.45	2	73	20	On
21	18	113	17 Sep 95	819	N27:31.09	W111:00.06	2	73	55	On
21		114	17 Sep 95	842	N27:27.36	W110:59.96	2	130	20	On
21		115	17 Sep 95	844	N27:26.91	W110:59.98	2	7	11	On
21		116	17 Sep 95	849	N27:26.14	W110:59.96	2	125	10	Off
21		117	17 Sep 95	858	N27:24.86	W110:59.82	1	7	19	Off
21		122	17 Sep 95	1228	N27:22.33	W110:59.96	0	76	1600	On
21		123	17 Sep 95	1247	N27:18.97	W110:59.66	0	7	10	On
21		131	18 Sep 95	837	N26:46.74	W110:59.34	2	73	90	On
21		132	18 Sep 95	838	N26:46.63	W110:59.34	2	73	20	On
21		134	18 Sep 95	857	N26:43.44	W110:59.42	2	7	12	On
21	18	149	19 Sep 95	850	N27:19.81	W111:30.06	5	7	80	On
21		152	19 Sep 95	1415	N27:54.07	W111:25.81	4	76	30	On
21		154	19 Sep 95	1537	N27:49.82	W111:23.08	3	7	5	On
21		161	20 Sep 95	743	N27:16.61	W111:08.53	2	73	5	On
21		175	22 Sep 95	1514	N27:17.45	W111:00.10	4	76	188	On
21		177	23 Sep 95	638	N27:21.96	W111:15.07	4	76	50	On
21		188	25 Sep 95	1327	N27:25.94	W112:07.73	4	76	26	On
21	18	194	26 Sep 95	647	N27:19.56	W111:12.57	3	73	90	On
21		197	26 Sep 95	1643	N26:52.86	W110:55.89	4	7	200	On
21	18	199	27 Sep 95	735	N25:27.20	W109:29.88	4	130	40	On
21		200	27 Sep 95	739	N25:26.52	W109:29.91	4	73	70	On
21		202	27 Sep 95	811	N25:21.21	W109:30.05	4	7	30	On
21		225	30 Sep 95	757	N27:44.57	W111:49.01	4	76	50	On

Species Name Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Effort
21	77	250	2 Oct 95	1339	N24:24.41	W110:08.05	3	76	425	On
21		299	14 Oct 95	846	N21:06.99	W106:21.05	3	76	30	Off
21		300	14 Oct 95	1003	N21:06.96	W106:22.24	4	131	45	On
21		322	17 Oct 95	1222	N24:51.82	W110:23.60	3	76	51	On
21	18	413	27 Oct 95	1006	N24:12.17	W108:35.36	4	131	157	On
21		418	28 Oct 95	729	N23:59.40	W108:56.90	2	4	6	On
21		443	30 Oct 95	1516	N24:09.58	W109:30.77	4	7	8	On
21		444	30 Oct 95	1518	N24:09.71	W109:30.54	4	73	15	On
21		445	30 Oct 95	1638	N24:11.13	W109:26.81	4	4	300	On
Lagenorhynchus obliquidens										
22	05 77	10	8 Sep 95	723	N28:04.96	W115:38.12	4	4	915	On
22		11	8 Sep 95	851	N27:59.23	W115:32.39	4	73	85	On
Globicephala macrorhynchus										
36		8	8 Sep 95	649	N28:09.12	W115:43.72	5	76	31	On
36		69	12 Sep 95	1825	N22:55.14	W109:17.83	1	73	25	Off
36		74	13 Sep 95	1314	N24:35.03	W109:58.24	5	4	40	On
36		136	18 Sep 95	1022	N26:30.25	W110:59.98	3	4	49	On
36	18	137	18 Sep 95	1300	N26:21.14	W111:00.04	3	73	54	On
36		170	21 Sep 95	1305	N24:40.34	W110:23.70	4	4	35	On
36	18	183	24 Sep 95	1556	N27:18.51	W112:03.10	3	73	325	Off
36	18	187	25 Sep 95	1258	N27:28.85	W112:11.07	4	127	200	On
36	18	189	25 Sep 95	1430	N27:19.05	W112:01.90	4	127	105	On
36		191	25 Sep 95	1625	N27:06.11	W111:54.06	4	7	50	On
36	18	365	21 Oct 95	1259	N25:47.27	W110:58.73	3	76	65	On
36		485	3 Nov 95	1213	N24:44.67	W113:11.86	3	4	43	On
36		492	5 Nov 95	1232	N26:53.89	W114:36.05	2	76	25	On
36		493	5 Nov 95	1331	N27:00.41	W114:44.35	2	119	15	On
36	77	499	6 Nov 95	1207	N28:12.36	W115:45.74	4	7	33	On
36		500	6 Nov 95	1246	N28:14.27	W115:42.63	4	4	25	On
Orcinus orca										
37		72	13 Sep 95	814	N23:58.56	W109:33.59	3	86	2	On
37		323	17 Oct 95	1516	N25:15.48	W110:29.49	4	129	14	On
37		366	21 Oct 95	1336	N25:43.91	W110:58.85	3	129	5	Off
37		424	28 Oct 95	1155	N23:47.51	W109:19.39	2	73	2	Off
37		426	28 Oct 95	1242	N23:44.30	W109:25.94	1	73	1	On
37		494	5 Nov 95	1448	N27:08.45	W114:54.38	4	4	3	On
37		502	6 Nov 95	1652	N28:39.42	W115:41.42	4	4	5	On
Physeter macrocephalus										
46		30	10 Sep 95	1719	N23:58.85	W112:29.40	3	7	2	On
46		50	12 Sep 95	701	N22:41.90	W110:03.59	4	7	13	On
46		173	22 Sep 95	835	N26:37.27	W110:59.17	4	4	1	On
46		179	23 Sep 95	922	N27:23.50	W111:31.14	4	127	20	On
46	18	180	24 Sep 95	658	N27:28.51	W111:39.95	4	133	170	On
46		216	29 Sep 95	1000	N26:51.01	W111:23.65	4	7	25	On
46		221	29 Sep 95	1751	N27:08.19	W111:40.04	4	7	18	On
46		222	30 Sep 95	642	N27:32.24	W111:49.58	5	7	39	On
46		224	30 Sep 95	711	N27:37.04	W111:49.47	4	4	15	On
46		227	1 Oct 95	659	N27:36.98	W111:48.70	4	122	3	On
46		228	1 Oct 95	701	N27:36.59	W111:48.59	4	122	1	On
46		229	1 Oct 95	707	N27:35.69	W111:48.33	4	122	1	On
46		230	1 Oct 95	710	N27:35.24	W111:48.18	4	122	1	On
46		231	1 Oct 95	718	N27:33.92	W111:47.69	4	130	1	On
46		232	1 Oct 95	802	N27:27.22	W111:44.69	4	4	1	On
46		233	1 Oct 95	806	N27:26.63	W111:44.36	4	4	3	On
46		235	1 Oct 95	1052	N27:10.60	W111:38.98	4	4	4	On

Species Name										
Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Effort
46		236	1 Oct 95	1058	N27:09.55	W111:39.21	4	122	18	On
46		237	1 Oct 95	1108	N27:07.78	W111:39.55	4	122	2	On
46		238	1 Oct 95	1532	N27:04.28	W111:40.21	5	122	1	Off
46		239	1 Oct 95	1538	N27:03.43	W111:39.35	5	122	3	Off
46		240	1 Oct 95	1540	N27:03.23	W111:39.15	5	122	10	Off
46		306	15 Oct 95	638	N22:25.05	W109:17.96	3	73	10	On
46	18	340	19 Oct 95	701	N27:10.88	W111:35.71	5	76	112	On
46		416	27 Oct 95	1357	N24:03.87	W108:48.17	4	76	15	On
46		421	28 Oct 95	936	N23:54.58	W109:04.67	2	76	7	On
46		429	28 Oct 95	1646	N23:54.12	W109:42.11	3	7	6	Off
Kogia simus										
48		39	11 Sep 95	1114	N22:51.44	W110:43.68	1	4	1	On
48		119	17 Sep 95	923	N27:22.81	W110:59.50	0	76	1	Off
48		120	17 Sep 95	951	N27:22.32	W110:59.24	0	76	2	Off
48		125	17 Sep 95	1249	N27:18.53	W110:59.66	0	7	2	On
48		126	17 Sep 95	1323	N27:17.43	W110:58.94	0	7	1	Off
48		166	20 Sep 95	1258	N26:52.80	W111:09.00	2	4	1	Off
48		186	25 Sep 95	719	N27:32.01	W112:08.47	2	4	3	On
48		210	27 Sep 95	1648	N24:26.40	W109:36.42	2	4	4	Off
48		247	2 Oct 95	1142	N24:34.14	W110:11.98	2	4	1	On
48		249	2 Oct 95	1300	N24:28.12	W110:09.45	3	73	2	On
48		260	4 Oct 95	947	N20:34.17	W105:25.14	1	130	1	Off
48	80	268	10 Oct 95	939	N22:45.89	W106:30.95	1	76	6	On
48		288	12 Oct 95	946	N20:34.18	W105:37.46	2	73	1	On
48		375	23 Oct 95	1021	N23:39.57	W109:26.92	2	4	1	On
48		420	28 Oct 95	835	N23:56.44	W109:01.05	2	7	1	Off
48		430	29 Oct 95	642	N24:01.45	W109:43.32	2	73	2	On
48		431	29 Oct 95	922	N23:54.97	W109:43.40	2	131	1	On
48		432	29 Oct 95	929	N23:54.03	W109:42.98	2	4	5	On
48		433	29 Oct 95	932	N23:53.61	W109:42.80	2	15	10	Off
48		435	29 Oct 95	1406	N23:44.22	W109:37.35	1	76	5	On
48		455	31 Oct 95	1424	N24:25.52	W110:08.97	4	73	2	On
ziphiid whale										
49		15	8 Sep 95	1426	N27:06.28	W114:47.33	6	73	1	On
49		153	19 Sep 95	1439	N27:50.62	W111:23.51	4	86	1	On
49		159	19 Sep 95	1801	N27:29.52	W111:08.22	2	86	4	On
49		171	21 Sep 95	1507	N24:48.48	W110:07.28	4	4	1	On
49		281	11 Oct 95	1005	N21:18.06	W106:37.73	4	73	1	On
49		396	26 Oct 95	1132	N23:12.19	W109:24.51	4	131	1	On
49		423	28 Oct 95	1100	N23:48.02	W109:18.13	2	124	3	On
49		434	29 Oct 95	1304	N23:52.07	W109:41.02	2	76	1	On
Mesoplodon spp.										
51		3	7 Sep 95	1000	N28:47.71	W115:52.74	4	7	4	On
51		73	13 Sep 95	855	N24:05.50	W109:37.77	3	123	1	On
51		205	27 Sep 95	906	N25:16.82	W109:31.77	4	4	1	On
51		206	27 Sep 95	1348	N24:31.90	W109:29.98	3	76	1	On
51		370	22 Oct 95	641	N24:08.88	W109:33.46	1	73	2	On
51		428	28 Oct 95	1554	N23:54.10	W109:40.96	3	73	3	Off
Ziphius cavirostris										
61		118	17 Sep 95	907	N27:23.19	W110:59.77	1	73	7	Off
61		124	17 Sep 95	1249	N27:18.53	W110:59.66	0	7	3	On
61		164	20 Sep 95	1001	N26:56.70	W111:06.61	1	73	1	On
61		165	20 Sep 95	1124	N26:54.27	W111:06.63	2	4	3	Off
61		176	22 Sep 95	1706	N27:21.59	W111:13.53	4	130	3	On
61		178	23 Sep 95	718	N27:23.46	W111:22.49	4	76	2	On

Species Name										
Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Effort
61		190	25 Sep 95	1457	N27:15.93	W112:00.07	4	130	2	On
61		195	26 Sep 95	800	N27:08.44	W111:05.43	3	73	3	On
61		196	26 Sep 95	1402	N27:03.26	W111:02.25	4	130	2	On
61		209	27 Sep 95	1547	N24:27.23	W109:36.01	2	133	2	On
61		261	4 Oct 95	1324	N20:33.55	W105:34.04	5	76	1	On
61		295	13 Oct 95	849	N20:31.38	W105:44.02	3	128	3	On
61		296	13 Oct 95	1328	N20:31.02	W105:46.79	3	134	1	On
61		297	13 Oct 95	1722	N20:52.18	W106:08.85	3	7	2	On
61		317	16 Oct 95	956	N23:32.91	W109:19.29	2	76	5	Off
61		320	16 Oct 95	1627	N23:39.27	W109:22.63	2	4	3	On
61		376	23 Oct 95	1050	N23:37.69	W109:26.78	2	73	3	Off
61		377	23 Oct 95	1112	N23:37.11	W109:26.79	2	34	1	Off
61		379	23 Oct 95	1553	N23:33.56	W109:13.33	0	73	2	Off
61		419	28 Oct 95	749	N23:57.78	W109:00.02	2	73	1	On
61		427	28 Oct 95	1445	N23:53.32	W109:38.40	3	124	2	On
Berardius bairdii										
63		6	7 Sep 95	1505	N28:10.38	W115:44.93	5	86	11	On
63		7	7 Sep 95	1533	N28:10.29	W115:44.78	5	4	3	Off
63		505	7 Nov 95	1451	N29:55.93	W116:55.68	5	119	10	On
Balaenoptera spp.										
70		18	9 Sep 95	812	N23:59.55	W113:51.88	5	99	1	Off
70		56	12 Sep 95	1335	N22:41.15	W109:43.97	1	76	1	On
70		75	13 Sep 95	1432	N24:38.00	W110:00.79	5	86	1	On
70		81	15 Sep 95	1555	N24:48.18	W110:28.33	4	4	1	On
70		141	18 Sep 95	1448	N26:09.12	W111:00.56	4	76	1	On
70		162	20 Sep 95	903	N27:03.27	W111:07.55	2	4	1	On
70		181	24 Sep 95	1454	N27:24.52	W111:58.65	4	76	1	On
70		182	24 Sep 95	1536	N27:18.41	W112:00.97	4	76	1	On
70		192	25 Sep 95	1632	N27:05.33	W111:53.56	4	133	2	On
70		198	26 Sep 95	1747	N26:43.26	W110:49.43	5	4	1	On
70		226	30 Sep 95	827	N27:49.57	W111:48.65	4	76	1	On
70		246	2 Oct 95	1120	N24:37.65	W110:13.55	2	4	2	On
70		253	2 Oct 95	1721	N24:05.22	W109:39.79	5	76	1	On
70		332	18 Oct 95	1341	N26:25.04	W111:20.44	3	73	1	On
70		342	20 Oct 95	654	N28:44.32	W113:02.86	5	4	1	On
70		343	20 Oct 95	721	N28:41.78	W112:59.57	5	4	2	On
70		358	21 Oct 95	938	N25:52.76	W111:06.92	2	131	1	On
70		367	21 Oct 95	1558	N25:33.72	W110:54.07	3	4	1	On
70		368	21 Oct 95	1628	N25:28.96	W110:52.98	3	4	1	On
70		399	26 Oct 95	1526	N23:27.49	W108:58.90	4	76	1	On
70	72	407	27 Oct 95	634	N24:26.96	W108:09.30	3	76	2	On
70		462	1 Nov 95	1315	N22:43.26	W109:58.85	6	4	1	On
70		464	1 Nov 95	1427	N22:41.54	W109:55.96	4	122	1	On
70		467	1 Nov 95	1512	N22:38.25	W109:53.70	4	7	1	On
70		468	1 Nov 95	1517	N22:38.01	W109:52.91	4	76	1	On
70	75	469	1 Nov 95	1538	N22:36.77	W109:49.03	4	119	4	On
70		475	2 Nov 95	830	N23:32.49	W111:29.24	5	4	1	On
Balaenoptera edeni										
72		36	11 Sep 95	849	N23:02.08	W110:56.79	0	4	2	Off
72		55	12 Sep 95	1328	N22:41.51	W109:45.26	1	76	1	On
72		76	13 Sep 95	1440	N24:39.50	W110:01.31	5	86	1	On
72		80	15 Sep 95	1443	N24:36.11	W110:29.23	4	125	1	On
72		145	18 Sep 95	1558	N25:58.55	W111:02.02	2	4	1	Off
72		163	20 Sep 95	924	N26:59.62	W111:08.02	1	130	1	On
72		310	16 Oct 95	728	N23:20.47	W109:17.28	3	76	1	On
72		324	18 Oct 95	728	N25:50.10	W111:16.83	4	76	1	Off

Species Name										
Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Effort
72		325	18 Oct 95	956	N26:01.31	W111:15.60	3	73	1	On
72		329	18 Oct 95	1117	N26:07.57	W111:10.17	3	76	1	On
72		331	18 Oct 95	1147	N26:11.99	W111:12.70	3	76	1	On
72		336	18 Oct 95	1531	N26:36.46	W111:27.42	2	76	1	On
72		337	18 Oct 95	1538	N26:37.52	W111:28.09	2	76	1	On
72		338	18 Oct 95	1540	N26:37.72	W111:28.25	2	76	2	On
72		359	21 Oct 95	944	N25:52.18	W111:06.06	2	76	2	On
72		364	21 Oct 95	1022	N25:48.83	W111:00.80	2	4	1	On
72	75	391	25 Oct 95	1508	N22:41.86	W109:39.72	4	73	4	On
72		403	26 Oct 95	1601	N23:30.77	W108:53.98	5	4	5	On
72	70	407	27 Oct 95	634	N24:26.96	W108:09.30	3	76	2	On
Balaenoptera borealis										
73		355	21 Oct 95	843	N25:58.35	W111:01.69	2	131	1	Off
Balaenoptera physalus										
74		127	17 Sep 95	1819	N27:09.32	W110:58.98	1	76	1	On
74		138	18 Sep 95	1309	N26:19.59	W111:00.45	3	73	1	On
74		144	18 Sep 95	1539	N26:01.07	W110:59.87	2	4	1	On
74		146	18 Sep 95	1558	N25:58.55	W111:02.02	2	4	4	Off
74		167	20 Sep 95	1321	N26:53.09	W111:11.17	2	7	1	Off
74		168	21 Sep 95	956	N24:25.04	W110:28.99	1	130	2	Off
74		184	24 Sep 95	1609	N27:18.36	W112:05.32	3	133	1	Off
74		308	15 Oct 95	1355	N22:31.40	W109:33.40	2	76	2	On
74		389	25 Oct 95	1110	N23:02.57	W109:29.72	2	76	1	On
74		456	31 Oct 95	1505	N24:20.14	W110:04.26	4	122	1	On
Balaenoptera musculus										
75		20	9 Sep 95	932	N23:49.33	W113:45.51	5	73	2	On
75		42	11 Sep 95	1401	N22:44.54	W110:31.47	3	123	2	On
75	72	391	25 Oct 95	1508	N22:41.86	W109:39.72	4	73	4	On
75	70	469	1 Nov 95	1538	N22:36.77	W109:49.03	4	119	4	On
75		470	1 Nov 95	1714	N22:37.54	W109:43.08	5	4	1	On
75		476	2 Nov 95	939	N23:37.89	W111:38.24	5	122	3	On
75		478	2 Nov 95	1448	N23:42.19	W111:45.28	5	7	1	On
75		482	3 Nov 95	730	N25:12.16	W113:15.08	4	122	1	On
75		486	3 Nov 95	1435	N24:38.29	W113:19.46	3	73	1	Off
Megaptera novaeangliae										
76		459	1 Nov 95	649	N23:06.41	W109:23.83	3	73	3	On
unid. dolphin										
77	22 05	10	8 Sep 95	723	N28:04.96	W115:38.12	4	4	915	On
77		12	8 Sep 95	902	N27:57.54	W115:30.86	4	4	2	On
77		13	8 Sep 95	906	N27:56.98	W115:30.37	4	4	8	On
77		16	8 Sep 95	1513	N27:04.22	W114:46.54	6	4	6	On
77		17	8 Sep 95	1843	N26:29.96	W114:18.18	5	76	3	On
77		19	9 Sep 95	841	N23:58.82	W113:50.18	5	7	40	On
77		26	10 Sep 95	1515	N24:04.12	W112:52.73	4	4	15	On
77		28	10 Sep 95	1532	N24:03.31	W112:49.51	3	4	30	On
77		29	10 Sep 95	1600	N24:02.17	W112:44.27	3	7	80	On
77		34	11 Sep 95	838	N23:03.38	W110:58.45	0	76	55	On
77		37	11 Sep 95	937	N23:00.20	W110:55.03	0	86	50	On
77		38	11 Sep 95	1059	N22:53.29	W110:45.89	1	73	6	On
77		40	11 Sep 95	1321	N22:46.16	W110:38.69	3	4	12	On
77		43	11 Sep 95	1622	N22:44.04	W110:26.63	2	86	3	On
77		46	11 Sep 95	1703	N22:43.35	W110:19.59	2	7	30	On
77		47	11 Sep 95	1721	N22:43.53	W110:15.97	2	86	50	On
77		48	11 Sep 95	1824	N22:42.38	W110:08.34	2	4	6	On

Species Name

Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
77		51	12 Sep 95	1054	N22:43.55	W110:05.94	4	76	10	On
77		52	12 Sep 95	1102	N22:43.31	W110:04.67	4	86	3	On
77		53	12 Sep 95	1146	N22:42.05	W109:56.68	4	76	5	On
77		60	12 Sep 95	1533	N22:44.60	W109:27.15	2	86	3	On
77		66	12 Sep 95	1704	N22:53.13	W109:17.84	1	4	20	On
77		67	12 Sep 95	1706	N22:53.34	W109:17.81	1	86	2	On
77		70	13 Sep 95	636	N23:42.65	W109:24.17	1	86	1	On
77		84	16 Sep 95	701	N25:19.30	W110:30.17	2	7	10	On
77		87	16 Sep 95	740	N25:26.42	W110:29.95	2	125	2	On
77		89	16 Sep 95	1111	N26:04.65	W110:29.91	3	7	20	On
77		92	16 Sep 95	1443	N26:38.45	W110:30.39	2	76	50	On
77		101	16 Sep 95	1559	N26:51.41	W110:29.99	2	76	15	On
77		104	16 Sep 95	1656	N27:01.34	W110:30.82	2	73	15	On
77		105	16 Sep 95	1819	N27:14.61	W110:39.15	2	73	15	On
77		130	18 Sep 95	656	N27:05.19	W110:59.12	2	130	1	On
77		133	18 Sep 95	848	N26:44.82	W110:59.40	2	125	12	On
77		135	18 Sep 95	949	N26:35.69	W110:59.45	2	76	1	On
77		139	18 Sep 95	1441	N26:10.19	W111:00.77	4	76	30	On
77		140	18 Sep 95	1446	N26:09.42	W111:00.63	4	76	20	On
77		143	18 Sep 95	1518	N26:04.14	W110:59.84	2	4	1	On
77		148	19 Sep 95	737	N27:08.51	W111:29.94	5	7	1	On
77		150	19 Sep 95	938	N27:25.99	W111:29.19	4	86	50	On
77		185	25 Sep 95	701	N27:33.87	W112:10.59	2	127	5	On
77		193	26 Sep 95	640	N27:20.65	W111:13.28	3	4	50	On
77		207	27 Sep 95	1354	N24:30.80	W109:29.89	3	4	15	On
77		213	29 Sep 95	724	N26:29.08	W111:05.51	4	7	10	On
77		218	29 Sep 95	1618	N26:56.72	W111:30.78	4	4	5	On
77		219	29 Sep 95	1623	N26:57.45	W111:31.38	4	122	20	On
77		242	1 Oct 95	1717	N26:49.72	W111:26.78	4	122	25	On
77		245	2 Oct 95	1108	N24:39.44	W110:14.32	3	130	35	On
77	21	250	2 Oct 95	1339	N24:24.41	W110:08.05	3	76	425	On
77		251	2 Oct 95	1339	N24:24.41	W110:08.05	3	76	30	On
77		254	3 Oct 95	638	N22:58.35	W107:58.35	4	73	18	On
77		255	3 Oct 95	715	N22:53.62	W107:53.66	4	7	1	On
77		269	10 Oct 95	1014	N22:45.39	W106:31.37	1	76	2	Off
77		271	10 Oct 95	1342	N22:38.60	W106:33.78	4	135	200	On
77		272	10 Oct 95	1357	N22:36.09	W106:35.05	4	4	30	On
77		274	10 Oct 95	1547	N22:17.33	W106:43.00	4	73	200	On
77		275	10 Oct 95	1618	N22:12.27	W106:45.04	4	76	200	On
77		276	10 Oct 95	1709	N22:04.01	W106:48.21	4	76	4	On
77		284	12 Oct 95	715	N20:32.94	W105:26.48	2	4	2	On
77		289	12 Oct 95	1112	N20:37.49	W105:28.83	2	128	2	On
77		294	13 Oct 95	839	N20:31.43	W105:42.00	3	7	3	On
77		304	14 Oct 95	1608	N21:20.98	W106:53.35	4	73	25	On
77		305	14 Oct 95	1620	N21:22.54	W106:54.24	4	73	10	On
77		315	16 Oct 95	935	N23:30.02	W109:19.73	2	4	5	On
77	13	316	16 Oct 95	939	N23:30.69	W109:19.87	2	4	72	On
77		319	16 Oct 95	1501	N23:30.70	W109:21.31	2	73	3	On
77		347	20 Oct 95	1558	N27:39.72	W112:26.47	6	129	250	Off
77		349	21 Oct 95	646	N26:10.12	W111:12.14	2	76	2	On
77		361	21 Oct 95	952	N25:51.45	W111:04.99	2	4	5	On
77	98	363	21 Oct 95	954	N25:51.22	W111:04.64	2	4	43	On
77		381	24 Oct 95	1115	N24:39.09	W110:27.45	5	73	25	On
77		392	26 Oct 95	735	N22:39.06	W109:35.01	3	4	20	On
77		404	26 Oct 95	1644	N23:33.23	W108:48.35	5	73	40	On
77		405	26 Oct 95	1649	N23:33.70	W108:47.67	5	4	100	On
77		406	26 Oct 95	1702	N23:34.94	W108:45.78	5	73	20	On
77		408	27 Oct 95	724	N24:22.66	W108:16.55	4	4	8	Off
77		409	27 Oct 95	727	N24:22.45	W108:16.96	4	76	15	On

Species Name										
Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Ef-fort
77		410	27 Oct 95	812	N24:18.86	W108:23.59	4	4	1	On
77		415	27 Oct 95	1354	N24:03.89	W108:47.60	4	7	4	On
77		425	28 Oct 95	1206	N23:47.23	W109:19.83	1	7	22	On
77		438	30 Oct 95	922	N23:29.90	W109:21.98	2	76	17	On
77		447	31 Oct 95	1031	N24:30.08	W110:31.27	3	7	15	On
77		449	31 Oct 95	1046	N24:32.32	W110:30.38	3	122	12	On
77		452	31 Oct 95	1234	N24:37.96	W110:20.90	3	76	20	On
77		453	31 Oct 95	1331	N24:31.70	W110:13.56	4	76	100	On
77		473	2 Nov 95	716	N23:26.42	W111:18.99	4	76	3	On
77		474	2 Nov 95	731	N23:27.62	W111:21.02	4	4	1	On
77	18	480	2 Nov 95	1646	N23:48.47	W111:51.67	4	4	75	On
77		483	3 Nov 95	1054	N24:58.13	W113:10.70	4	119	1	On
77		489	4 Nov 95	1521	N24:17.91	W112:36.90	2	4	3	On
77		491	5 Nov 95	1228	N26:53.48	W114:35.55	2	73	115	On
77		498	6 Nov 95	1138	N28:08.53	W115:45.55	4	73	40	On
77	36	499	6 Nov 95	1207	N28:12.36	W115:45.74	4	7	33	On
unid. small whale										
78		174	22 Sep 95	1329	N27:02.11	W111:08.09	4	4	1	On
78		258	4 Oct 95	731	N20:37.03	W105:20.89	2	99	1	Off
78		267	10 Oct 95	902	N22:49.96	W106:30.84	2	4	2	On
78		414	27 Oct 95	1255	N24:06.61	W108:37.81	4	7	1	On
unid. large whale										
79		4	7 Sep 95	1052	N28:47.01	W115:51.82	4	86	1	Off
79		65	12 Sep 95	1647	N22:50.05	W109:18.18	1	86	1	On
79		351	21 Oct 95	711	N26:08.72	W111:07.96	2	4	1	On
Kogia simus/breviceps										
80		33	11 Sep 95	624	N23:03.21	W110:59.35	0	73	1	On
80		121	17 Sep 95	954	N27:22.22	W110:59.28	0	7	2	Off
80		169	21 Sep 95	1257	N24:39.48	W110:24.90	4	4	1	On
80	48	268	10 Oct 95	939	N22:45.89	W106:30.95	1	76	6	On
Mesoplodon sp. A										
83		68	12 Sep 95	1714	N22:54.81	W109:17.65	1	76	1	On
83		298	14 Oct 95	757	N21:06.85	W106:21.37	3	7	1	On
83		371	22 Oct 95	746	N24:07.38	W109:32.91	0	73	3	Off
Stenella attenuata (unid. subsp.)										
90	10	160	20 Sep 95	719	N27:20.76	W111:08.51	2	125	250	On
90		263	4 Oct 95	1425	N20:31.33	W105:44.25	5	73	100	On
90		265	4 Oct 95	1620	N20:49.00	W105:46.90	5	7	50	On
90		266	10 Oct 95	840	N22:53.92	W106:29.23	2	4	150	On
90		283	12 Oct 95	705	N20:33.10	W105:24.56	3	4	75	On
90		285	12 Oct 95	734	N20:32.77	W105:29.89	2	76	30	On
90		286	12 Oct 95	832	N20:31.90	W105:39.92	2	73	23	On
90		287	12 Oct 95	931	N20:33.29	W105:39.80	2	73	13	On
90		290	13 Oct 95	621	N20:36.37	W105:17.84	2	4	40	On
90		291	13 Oct 95	624	N20:35.96	W105:18.19	2	4	11	On
90		292	13 Oct 95	802	N20:32.45	W105:35.21	3	134	2	On
90		293	13 Oct 95	809	N20:32.33	W105:36.47	3	7	9	On
90		383	24 Oct 95	1717	N24:12.38	W109:36.53	5	76	20	On
90		422	28 Oct 95	948	N23:53.31	W109:05.70	2	76	250	On
unid. cetacean										
96		252	2 Oct 95	1406	N24:20.11	W110:06.41	3	4	1	On
96		341	20 Oct 95	648	N28:45.06	W113:03.43	5	4	2	On
96		398	26 Oct 95	1513	N23:26.93	W109:00.90	4	131	1	On

Species Name										
Code	Other Codes	Sighting Number	Date	Time	Latitude	Longitude	Bft.	Obs. no.	School size	Effort
96		454	31 Oct 95	1409	N24:26.87	W110:09.38	3	4	1	On
unid. whale										
98		21	9 Sep 95	949	N23:46.85	W113:47.90	5	76	2	Off
98		24	9 Sep 95	1716	N24:05.20	W112:55.54	5	7	1	On
98		234	1 Oct 95	921	N27:15.01	W111:39.31	4	7	1	On
98	77	363	21 Oct 95	954	N25:51.22	W111:04.64	2	4	43	On
98		479	2 Nov 95	1641	N23:48.09	W111:50.87	4	73	1	On
98		497	6 Nov 95	907	N27:48.77	W115:36.28	4	4	2	On
Balaenoptera borealis/edeni										
99		311	16 Oct 95	733	N23:21.35	W109:17.34	3	7	1	On
99		313	16 Oct 95	855	N23:26.01	W109:18.76	2	76	1	On
99		328	18 Oct 95	1040	N26:04.56	W111:13.46	3	135	1	Off
99		330	18 Oct 95	1130	N26:09.58	W111:11.26	3	129	1	Off
99		335	18 Oct 95	1519	N26:34.75	W111:26.26	2	7	1	On
99		348	20 Oct 95	1629	N27:37.26	W112:24.27	6	129	2	Off
99		352	21 Oct 95	720	N26:08.42	W111:06.59	2	73	1	On
99		353	21 Oct 95	739	N26:07.16	W111:03.78	2	135	1	On
99		354	21 Oct 95	803	N26:03.83	W111:01.91	3	7	1	On
99		378	23 Oct 95	1526	N23:33.30	W109:16.55	0	73	2	On
99		384	25 Oct 95	941	N23:09.85	W109:21.75	5	4	1	On
99		401	26 Oct 95	1548	N23:29.58	W108:55.89	4	4	2	On
99		402	26 Oct 95	1555	N23:30.20	W108:54.96	5	76	3	On
99		440	30 Oct 95	1009	N23:36.96	W109:24.78	4	73	1	On

Table 5. Sighting Summary - A list summarizing all species sighted and number of times each species was sighted on the cruise.

Species		No. Schools Sighted			Average
Code	Name	Pure	Mixed	Total	School size
01	*Mesoplodon peruvianus*	1	0	1	2.0
02	*Stenella attenuata* (offshore)	21	13	34	105.8
05	*Delphinus* (unid. spp.)	17	2	19	183.8
10	*Stenella longirostris orientalis*	9	11	20	135.4
13	*Stenella coeruleoalba*	3	1	4	27.2
15	*Steno bredanensis*	5	1	6	10.1
16	*Delphinus capensis*(long-beak)	10	1	11	298.0
17	*Delphinus delphis* (short-beak)	15	0	15	273.2
18	*Tursiops truncatus*	53	17	70	51.8
21	*Grampus griseus*	35	6	41	83.1
22	*Lagenorhynchus obliquidens*	1	1	2	152.3
36	*Globicephala macrorhynchus*	10	6	16	52.7
37	*Orcinus orca*	7	0	7	4.7
46	*Physeter macrocephalus*	25	2	27	12.9
48	*Kogia simus*	20	1	21	2.4
49	*ziphiid* whale	8	0	8	1.6
51	*Mesoplodon* spp.	6	0	6	1.9
61	*Ziphius cavirostris*	21	0	21	2.5
63	*Berardius bairdii*	3	0	3	8.1
70	*Balaenoptera* spp.	25	2	27	1.1
72	*Balaenoptera edeni*	17	2	19	1.4
73	*Balaenoptera borealis*	1	0	1	1.0
74	*Balaenoptera physalus*	10	0	10	1.5
75	*Balaenoptera musculus*	7	2	9	1.8
76	*Megaptera novaeangliae*	1	0	1	3.0
77	unid. dolphin	86	6	92	38.6
78	unid. small whale	4	0	4	1.3
79	unid. large whale	3	0	3	1.0
80	*Kogia simus/breviceps*	3	1	4	1.4
83	*Mesoplodon* sp. A	3	0	3	1.7
90	*Stenella attenuata* (unid. subsp.)	13	1	14	67.7
96	unid. cetacean	4	0	4	1.3
98	unid. whale	5	1	6	7.7
99	*Balaenoptera borealis/edeni*	14	0	14	1.3

Table 6. Mixed Schools - A list of sightings of all schools observed with more than one species of marine mammal in the group.

Schools of Mixed Species Composition Species 1	Species 2	Species 3	Total
02 OFFSH_SPOT	10 EAST_SPINR		10
02 OFFSH_SPOT	16 LONGB_COMM		1
02 OFFSH_SPOT	18 TURSIOPS		2
05 UNID_COMM	18 TURSIOPS		1
10 EAST_SPINR	90 UNID_SPOT		1
13 STRIPED	77 UNID_DOLPH		1
15 STENO	18 TURSIOPS		1
18 TURSIOPS	21 GRAMPUS		5
18 TURSIOPS	77 UNID_DOLPH		1
21 GRAMPUS	77 UNID_DOLPH		1
22 P_WHT_SIDE	05 UNID_COMM	77 UNID_DOLPH	1
36 SHRT_PILOT	18 TURSIOPS		5
36 SHRT_PILOT	77 UNID_DOLPH		1
46 SPERM_WHAL	18 TURSIOPS		2
48 DWARFSPERM	80 KOGIA_SPP		1
72 BRYDES_WHL	70 UNID_RORQL		1
75 BLUE_WHALE	70 UNID_RORQL		1
75 BLUE_WHALE	72 BRYDES_WHL		1
98 UNID_WHALE	77 UNID_DOLPH		1

Table 7. Photo-Identification Studies - Report of the photographs taken for identification purposes, to match with photograph database at UABCS. When individuals match to photo in the database, they are "identified". UABCS did not have previous photographs of sperm whales, but had 78 individuals in the photo record for killer whales, and had 243 individuals in the photo record for pilot whales.

Species Photographed	Animals Photographed	No. Of Matches	Sight No.
Physeter macrocephalus	44	1	216 to 340*
Orcinus orca	12	1	366
Globicephala macrorhynchus	36	0	none

*CADDIS sighting number 216 of two individual sperm whales (29 Sep. 1995) matched with another CADDIS sighting, number 340 (19 Oct. 1995).

Table 8. Dive Interval Data - Chronological record of dive interval data, including date, sighting number (SI #), species identification, group size (GS), the presence of calves (CLF; Y=yes, N=no; NR = not recorded), range of Beaufort sea states (BEAUF), range of swell heights in feet (SWELL), clock times at surface (UP) and for dives (DOWN), and durations of dives (DIVETIME) and surface periods (SURFTIME). Times are in the format HH:MM:SS.

Date	SI #	SPECIES	GS	CLF	Beauf	Swell	UP	DOWN	DIVETIME	SURFTIME
090795	6	*Berardius bairdii*	8	N	4-5	3-3	16:21:14	16:29:38		00:08:24
							16:35:38	16:40:01	00:06:00	00:04:23
							16:46:42	16:55:13	00:06:41	00:08:31
							17:12:26	17:15:52	00:17:13	00:03:26
							17:28:19	17:31:49	00:12:27	00:03:30
							18:10:03	18:19:55	00:38:14	00:09:52
							18:35:23	18:36:47	00:15:28	00:01:24
090795	6b	*Berardius bairdii*	3	Y	4-4	3-3	17:46:44	17:52:17		00:05:33
090795	6c	*Berardius bairdii*	8	N	4-4	3-3	18:31:40	18:34:28		00:02:48
091195	33	*Kogia simus/breviceps*	1	Y	1-4	1-1	06:24:23	06:25:15		00:00:52
							06:33:19	06:36:18	00:08:04	00:02:59
							07:07:08	07:07:50	00:30:50	00:00:42
							07:31:59	07:33:51	00:24:09	00:01:52
							07:42:30	07:43:31	00:08:39	00:01:01
091195	39	*Kogia simus*	1	N	1-1	1-2	11:14:24	11:15:23		00:00:59
							11:34:08	11:35:00	00:18:45	00:00:52
							11:39:27	11:40:28	00:04:27	00:01:01
							11:51:17	11:53:12	00:10:49	00:01:55
							12:13:31	12:14:16	00:20:19	00:00:45
091795	118	*Ziphius cavirostris*	6	Y	1-1	0-2	09:08:00	09:08:24		00:00:24
							09:34:00	09:36:06	00:25:36	00:02:06
							10:03:03	10:08:09	00:26:57	00:05:06
091795	120	*Kogia simus*	2	Y	1-1	0-0	09:50:18	09:50:38		00:00:20
091795	124	*Ziphius cavirostris*	3	N	0-2	0-0		12:51:00		

(continued)

Table 8. (continued)

Date	SI #	SPECIES	GS	CLF	Beauf	Swell	UP	DOWN	DIVETIME	SURFTIME
							13:30:17	13:31:01	00:39:17	00:00:44
							14:04:21	14:06:47	00:33:20	00:02:26
							15:34:53	15:36:40	01:28:06	00:01:47
091795	125	*Kogia simus*	2	N	0-1	0-0	12:52:28	12:56:32		00:04:04
							13:13:16	13:15:35	00:16:44	00:02:19
							13:26:56	13:28:20	00:11:21	00:01:24
092095	164	*Ziphius cavirostris*	1	N	2-3	0-3		10:01:57		
							10:43:57	10:44:30	00:42:00	00:00:33
							11:24:00	11:33:32	00:39:30	00:09:32
092095	166	*Kogia simus*	1	N	2-2	3-3	12:57:31	12:58:18		00:00:47
							13:02:18	13:05:16	00:04:00	00:02:58
092095	165	*Ziphius cavirostris*	3	N	1-2	0-3	13:12:04	13:16:22		00:04:18
							14:36:03	14:38:08	01:19:41	00:02:05
							15:18:36	15:21:12	00:40:28	00:02:36
							15:50:54	15:52:51	00:29:42	00:01:57
092095	165b	*Ziphius cavirostris*	2	N	1-1	1-1	16:14:47	16:17:07		00:02:20
							16:35:19	16:37:25	00:18:12	00:02:06
092295	176	*Ziphius cavirostris*	3	N	4-4	2-2	17:06:31	17:07:31		00:01:00
							17:45:28	17:47:16	00:37:57	00:01:48
092595	186	*Kogia simus*	3	Y	1-4	0-2	08:29:50	08:30:30		00:00:40
							08:51:25	08:52:38	00:20:55	00:01:13
							09:11:27	09:14:13	00:18:49	00:02:46
							09:35:09	09:36:13	00:20:56	00:01:04
							09:48:06	09:48:17	00:11:53	00:00:11
							09:51:38	09:52:17	00:03:21	00:00:39
							09:59:34	10:00:24	00:07:17	00:00:50
							10:07:33	10:08:28	00:07:09	00:00:55
							10:33:20	10:34:50	00:24:52	00:01:30
							10:41:41	10:42:04	00:06:51	00:00:23

(continued)

Table 8. (continued)

Date	SI #	SPECIES	GS	CLF	Beauf	Swell	UP	DOWN	DIVETIME	SURFTIME
							10:45:32	10:46:58	00:03:28	00:01:26
							11:05:24	11:06:43	00:18:26	00:01:19
							11:10:56	11:11:50	00:04:13	00:00:54
							11:18:06	11:18:52	00:06:16	00:00:46
							11:22:53	11:24:03	00:04:01	00:01:10
							11:27:47	11:29:41	00:03:44	00:01:54
092695	195	*Ziphius cavirostris*	3	N	2-3	0-1	08:00:50	08:03:38		00:02:48
							08:36:18	08:37:40	00:32:40	00:01:22
							09:07:51	09:09:11	00:30:11	00:01:20
							09:37:33	09:39:54	00:28:22	00:02:21
							10:08:46	10:11:18	00:28:52	00:02:32
							10:44:17	10:46:23	00:32:59	00:02:06
							11:20:35	11:25:26	00:34:12	00:04:51
092795	209	*Ziphius cavirostris*	2	Y	1-4	1-2		15:47:54		
							16:09:38	16:11:44	00:21:44	00:02:06
							16:33:27	16:36:34	00:21:43	00:03:07
							16:56:21	17:00:02	00:19:47	00:03:41
							17:17:17	17:19:06	00:17:15	00:01:49
100495	259	*Mesoplodon peruvianus*	2	Y	1-3	1-1		08:36:23		
							09:03:57	09:04:37	00:27:34	00:00:40
							09:19:44	09:20:41	00:15:07	00:00:57
							09:36:48	09:39:03	00:16:07	00:02:15
							09:57:53	10:00:59	00:18:50	00:03:06
							10:17:36	10:20:30	00:16:37	00:02:54
							10:46:09	10:48:15	00:25:39	00:02:06
							11:10:16	11:14:18	00:22:01	00:04:02
							11:51:32	11:54:22	00:37:14	00:02:50
101095	268A	*Kogia simus*	6	Y	0-1	0-1	09:52:26	09:53:42		00:01:16
							10:06:57	10:08:29	00:13:15	00:01:32
							10:28:08	10:30:17	00:19:39	00:02:09
							10:33:39	10:34:30	00:03:22	00:00:51
							11:02:48	11:04:43	00:28:18	00:01:55

(continued)

Table 8. (continued)

Date	SI #	SPECIES	GS	CLF	Beauf	Swell	UP	DOWN	DIVETIME	SURFTIME
							11:08:20	11:11:59	00:03:37	00:03:39
							11:22:53	11:26:05	00:10:54	00:03:12
							11:33:10	11:36:03	00:07:05	00:02:53
							11:50:31	11:53:39	00:14:28	00:03:08
101095	268B	*Kogia simus*	2	Y	0-3	0-1	10:38:03	10:38:52		00:00:49
							10:46:47	10:48:37	00:07:55	00:01:50
							11:28:19	11:29:03	00:39:42	00:00:44
							12:00:45	12:00:57	00:31:42	00:00:12
							12:29:45	12:30:37	00:28:48	00:00:52
101395	295	*Ziphius cavirostris*	3	N	2-3	0-3	08:49:25	08:50:25		00:01:00
							09:23:00	09:24:45	00:32:35	00:01:45
							09:48:53	09:52:46	00:24:08	00:03:53
							11:04:16	11:06:02	01:11:30	00:01:46
101695	317A	*Ziphius cavirostris*	5	Y	1-2	2-3		09:56:30		
							10:21:32	10:22:43	00:25:02	00:01:11
							10:52:00	10:53:12	00:29:17	00:01:12
							11:16:59	11:19:06	00:23:47	00:02:07
							11:40:22	11:44:04	00:21:16	00:03:42
101695	317B	*Ziphius cavirostris*	2	N	1-1	2-2	12:46:02	12:47:35		00:01:33
							13:11:33	13:12:55	00:23:58	00:01:22
							13:32:23	13:33:46	00:19:28	00:01:23
102295	370	*Mesoplodon* spp.	2	N	1-1	1-1		06:42:20		
							06:59:17	07:03:26	00:16:57	00:04:09
102295	371	*Mesoplodon sp. A*	3	N	1-4	1-1	07:45:38	07:49:01		00:03:23
							08:01:57	08:05:11	00:12:56	00:03:14
							08:17:22	08:24:09	00:12:11	00:06:47
							09:03:24	09:05:48	00:39:15	00:02:24
							09:18:02	09:20:49	00:12:14	00:02:47
							09:52:20	09:52:47	00:31:31	00:00:27

(continued)

Table 8. (continued)

Date	SI #	SPECIES	GS	CLF	Beauf	Swell	UP	DOWN	DIVETIME	SURFTIME
							10:16:38	10:19:17	00:23:51	00:02:39
							10:39:42	10:41:02	00:20:25	00:01:20
							10:59:40	11:01:09	00:18:38	00:01:29
102395	375	*Kogia simus*	1	N	2-4	0-1		10:23:04		
							10:25:35	10:26:59	00:02:31	00:01:24
							10:37:17	10:38:43	00:10:18	00:01:26
							11:30:55	11:31:22	00:52:12	00:00:27
102395	376	*Ziphius cavirostris*	3	N	1-2	0-0	10:48:52	10:49:20		00:00:28
							11:23:14	11:25:37	00:33:54	00:02:23
							11:58:23	12:00:54	00:32:46	00:02:31
							12:32:20	12:34:53	00:31:26	00:02:33
							(interval excluded due to uncertainties)			
							13:09:19	13:10:57		00:01:38
102395	379	*Ziphius cavirostris*	2	N	0-2	0-.5	15:54:39	15:56:03		00:01:24
							16:19:45	16:21:33	00:23:42	00:01:48
							16:48:58	16:50:19	00:27:25	00:01:21
							17:08:38	17:09:29	00:18:19	00:00:51
							17:32:57	17:36:55	00:23:28	00:03:58
102995	430	*Kogia simus*	1	N	1-2	2-2		06:50:02		
							07:01:22	07:03:34	00:11:20	00:02:12
							07:27:56	07:30:13	00:24:22	00:02:17
							07:33:37	07:35:35	00:03:24	00:01:58
							07:38:14	07:39:14	00:02:39	00:01:00
							08:01:27	08:04:47	00:22:13	00:03:20
							08:05:54	08:06:21	00:01:07	00:00:27
							08:24:27	08:25:54	00:18:06	00:01:27
							08:27:18	08:27:43	00:01:24	00:00:25
							08:29:43	08:30:19	00:02:00	00:00:36
							08:32:35	08:34:23	00:02:16	00:01:48
102995	430b	*Kogia simus*	1	N	1-2	2-2		06:50:46		
							07:03:09	07:04:10	00:12:23	00:01:01

(continued)

Table 8. (continued)

Date	SI #	SPECIES	GS	CLF	Beauf	Swell	UP	DOWN	DIVETIME	SURFTIME
							07:31:10	07:31:53	00:27:00	00:00:43
							07:33:37	07:36:08	00:01:44	00:02:31
							07:57:32	08:00:46	00:21:24	00:03:14
							08:02:53	08:03:47	00:02:07	00:00:54
							08:08:41	08:09:53	00:04:54	00:01:12
							08:28:25	08:29:32	00:18:32	00:01:07
							08:31:10	08:33:09	00:01:38	00:01:59
110295	476	*Balaenoptera musculus*	1	N	5-5	3-3	10:49:42	10:51:11		00:01:29
							10:57:27	11:00:15	00:06:16	00:02:48
110295	476b	*Balaenoptera musculus*	1	N	5-5	3-3	12:01:18	12:04:48		00:03:30
							12:16:34	12:21:05	00:11:46	00:04:31
							12:29:40	12:32:24	00:08:35	00:02:44
							12:43:51	12:46:31	00:11:27	00:02:40
							12:55:55	12:58:32	00:09:24	00:02:37
							13:04:12	13:07:02	00:05:40	00:02:50
							13:24:59	13:27:29	00:17:57	00:02:30
							13:38:51	13:41:17	00:11:22	00:02:26
110295	478	*Balaenoptera musculus*	1	N	4-4	3-3	14:58:20	15:02:58		00:04:38
							15:06:51	15:07:59	00:03:53	00:01:08
							15:15:43	15:18:21	00:07:44	00:02:38
							15:19:58	15:26:44	00:01:37	00:06:46
							15:30:55	15:32:11	00:04:11	00:01:16
							15:42:12	15:45:43	00:10:01	00:03:31
							15:46:46	15:55:08	00:01:03	00:08:22
							15:58:21	15:59:20	00:03:13	00:00:59
110395	482	*Balaenoptera musculus*	1	N	4-4	3-3		07:50:43		
							08:09:43	08:12:33	00:19:00	00:02:50
							08:34:19	08:37:35	00:21:46	00:03:16
							08:54:30	09:00:26	00:16:55	00:05:56
							09:02:31	09:06:54	00:02:05	00:04:23
							09:09:59	09:11:13	00:03:05	00:01:14
							09:17:32	09:19:30	00:06:19	00:01:58

(continued)

Table 8. (continued)

Date	SI #	SPECIES	GS	CLF	Beauf	Swell	UP	DOWN	DIVETIME	SURFTIME
							09:28:30	09:30:44	00:09:00	00:02:14
							09:45:37	09:47:14	00:14:53	00:01:37
							09:55:49	09:58:27	00:08:35	00:02:38
							10:13:30	10:14:18	00:15:03	00:00:48
110395	485	*Globicephala macrorhynchus*	50	NR	3-3	4-4	12:24:08	12:26:13		00:02:05
							12:26:46	12:27:36	00:00:33	00:00:50
							12:27:58	12:31:06	00:00:22	00:03:08
							12:35:28	12:37:16	00:04:22	00:01:48
							12:39:13	12:41:56	00:01:57	00:02:43
							12:42:08	12:47:32	00:00:12	00:05:24
							12:50:22	12:54:23	00:02:50	00:04:01
							12:58:22	13:02:28	00:03:59	00:04:06
							13:02:44	13:03:40	00:00:16	00:00:56
							13:04:42	13:14:02	00:01:02	00:09:20
							13:14:17	13:14:35	00:00:15	00:00:18
110395	486	*Balaenoptera musculus*	1	N	3-3	4-4	14:34:00	14:38:33		00:04:33
							14:39:24	14:40:37	00:00:51	00:01:13
							14:41:48	14:44:10	00:01:11	00:02:22
							14:44:41	14:50:21	00:00:31	00:05:40
							14:51:54	14:54:05	00:01:33	00:02:11
							14:55:16	14:56:04	00:01:11	00:00:48
							14:58:52	15:03:01	00:02:48	00:04:09
							15:04:43	15:05:23	00:01:42	00:00:40
							15:10:23	15:10:41	00:05:00	00:00:18
							15:13:29	15:13:51	00:02:48	00:00:22
							15:17:39	15:18:29	00:03:48	00:00:50
							15:19:35	15:20:38	00:01:06	00:01:03
							15:21:16	15:21:35	00:00:38	00:00:19
							15:26:52	15:28:26	00:05:17	00:01:34
							15:30:58	15:32:09	00:02:32	00:01:11
110795	505	*Berardius bairdii*	5	N	3-5	4-5		14:56:56		
							15:24:07	15:28:34	00:27:11	00:04:27
							15:44:37	15:47:17	00:16:03	00:02:40

(continued)

Table 8. (continued)

Date	SI #	SPECIES	GS	CLF	Beauf	Swell	UP	DOWN	DIVETIME	SURFTIME
							15:58:50	16:02:39	00:11:33	00:03:49
							16:11:08	16:19:41	00:08:29	00:08:33
							16:31:51	16:35:20	00:12:10	00:03:29
							16:54:55	16:59:23	00:19:35	00:04:28

Table 9. Dive Interval Summary - Summary of dive interval data obtained on CADDIS 1995. The % time at the surface was calculated for both mean and median times using the following formulae: Mean % time at surface = Mean surface time / (Mean surface time + Mean dive time), and Median % time at surface = Median surface time / (Median surface time + Median dive time).

Species	**Data summary**		**Dive durations (minutes)**					**Surface durations (minutes)**					**% time at surface**	
	# dives	**# surface periods**	**Mean**	**Median**	**Min.**	**Max.**	**Std Dev**	**Mean**	**Median**	**Min.**	**Max.**	**Std Dev**	**Mean**	**Median**
Baird's beaked whale	12	15	15.9	12.2	6.0	38.2	8.8	5.0	4.4	1.4	9.9	2.5	24.0	26.5
Cuvier's beaked whale	38	48	32.4	25.0	17.3	88.1	15.4	2.3	2.0	0.4	9.5	1.5	6.5	7.2
Mesoplodon spp.	17	18	21.6	18.7	12.2	39.3	8.0	2.6	2.7	0.5	6.8	1.4	10.9	12.7
Kogia spp.	59	67	13.1	7.9	1.1	52.2	10.8	1.5	1.2	0.2	4.1	0.9	10.1	13.2
Blue whale	39	43	6.7	3.9	0.5	21.8	5.7	2.6	2.4	0.3	8.4	1.8	27.9	38.5
Short-finned pilot whale	10	11	1.6	0.6	0.2	4.4	1.5	3.2	2.7	0.3	9.3	2.5	66.6	83.2

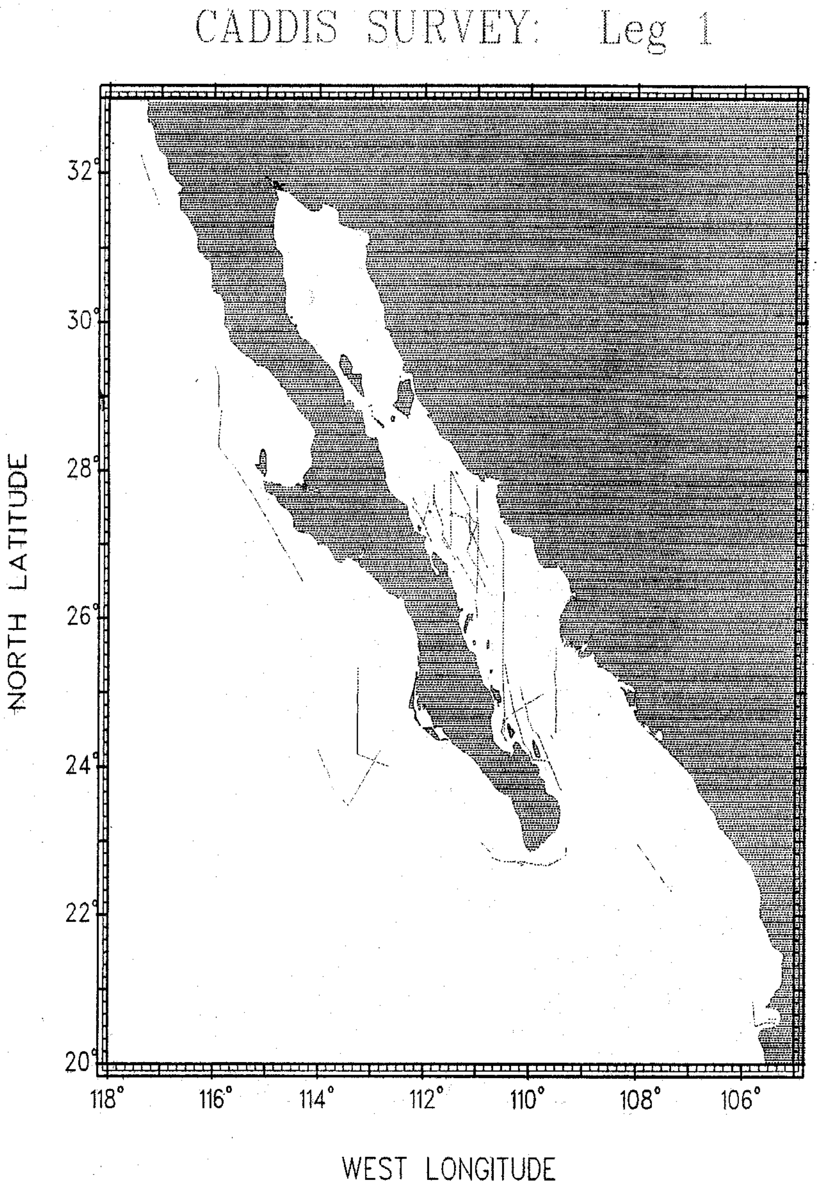

Figure 1. Survey transect lines completed during Leg I.

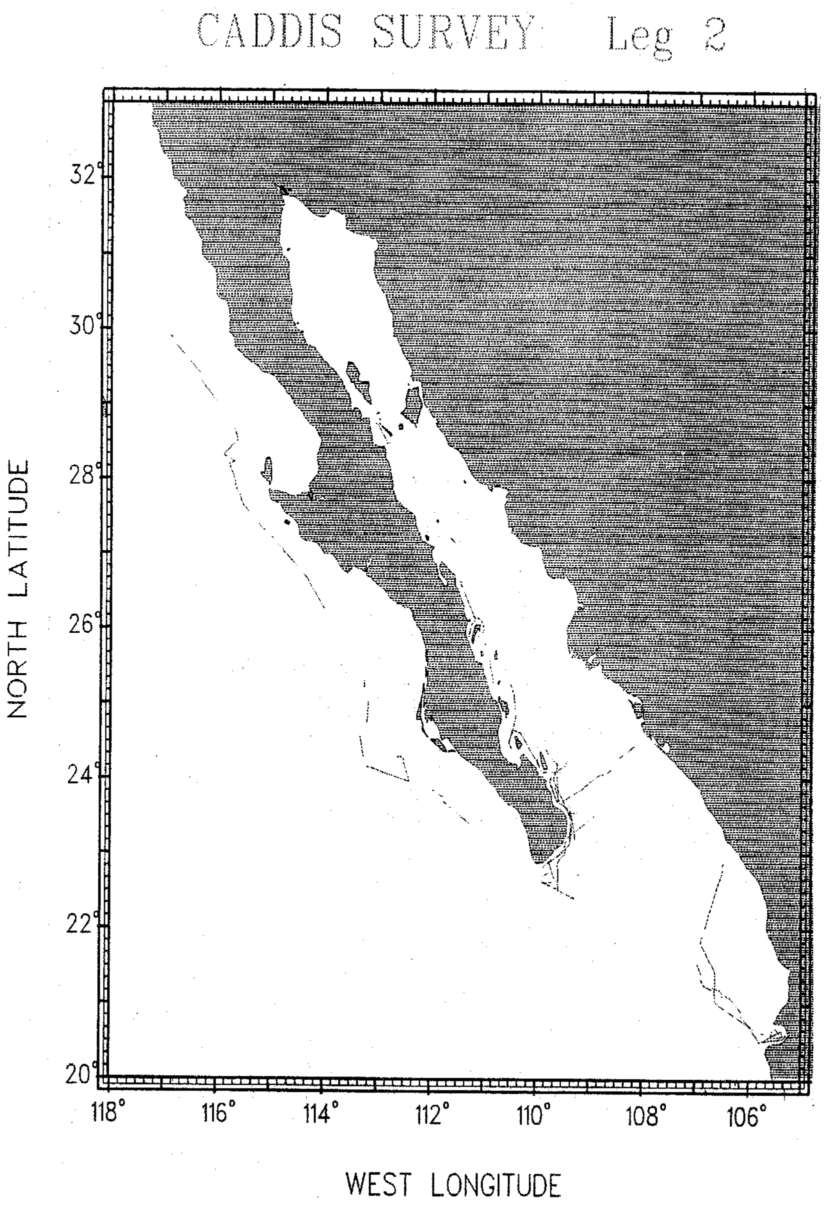

Figure 2. Survey transect lines completed during Leg II.

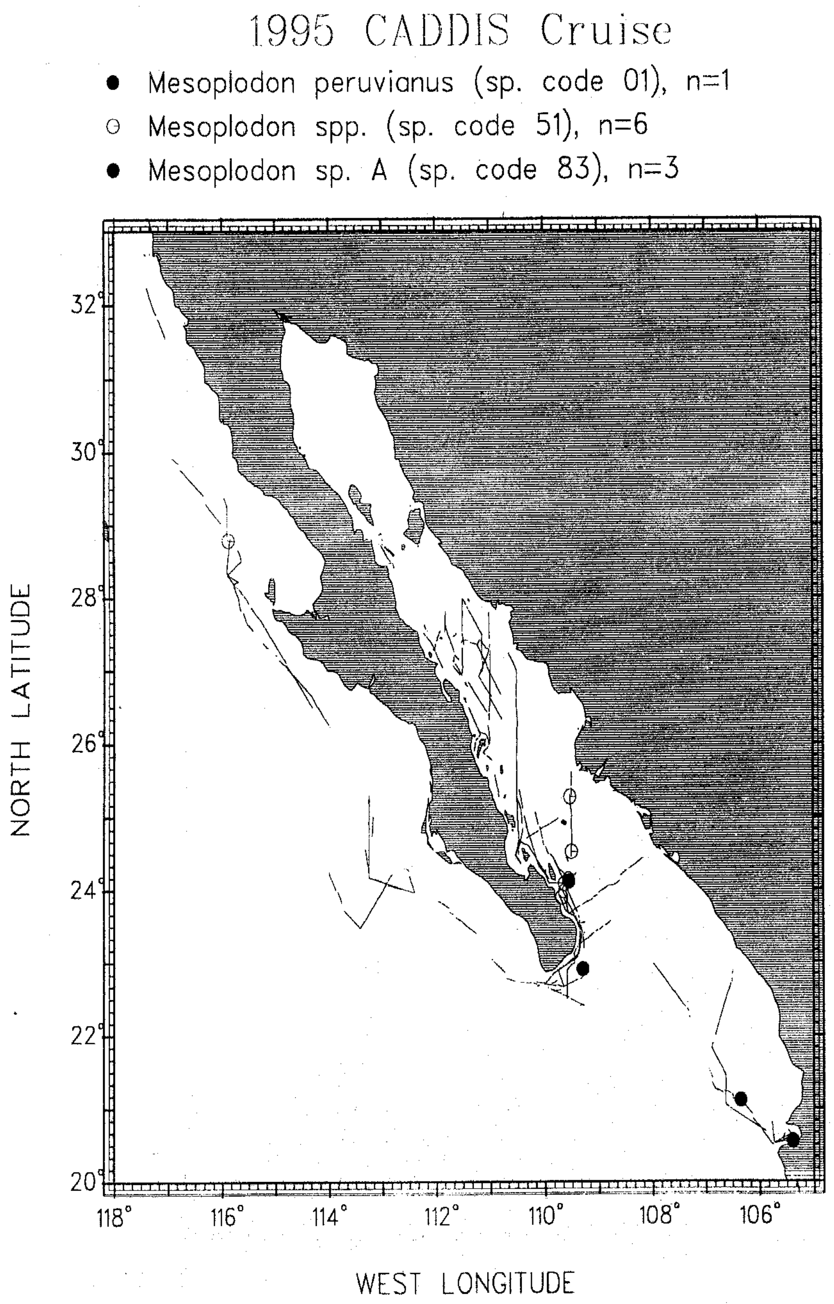

Figure 3. Geographical locations for sightings of different *Mesoplodon* species.

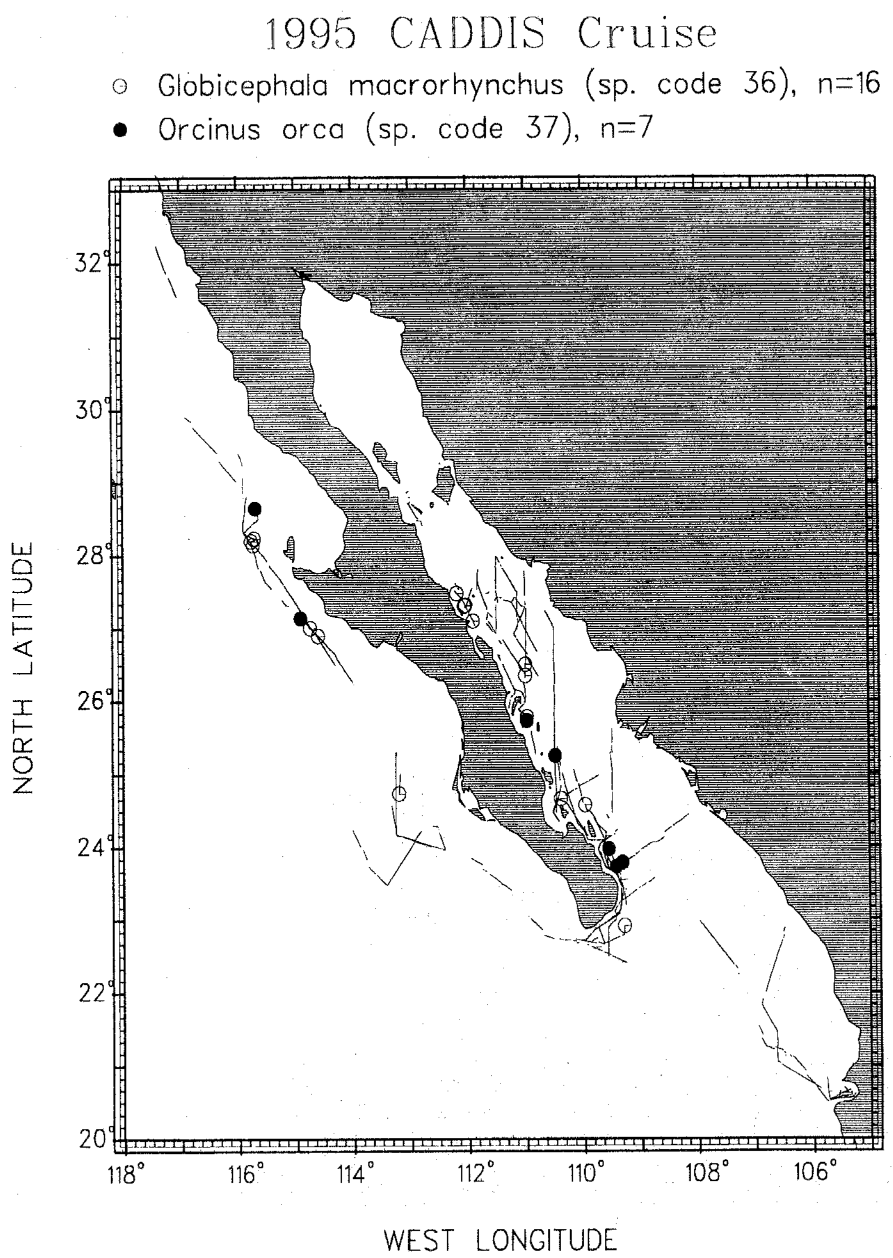

Figure 4. Geographical locations for sightings of Short-finned Pilot Whales and Killer Whales.

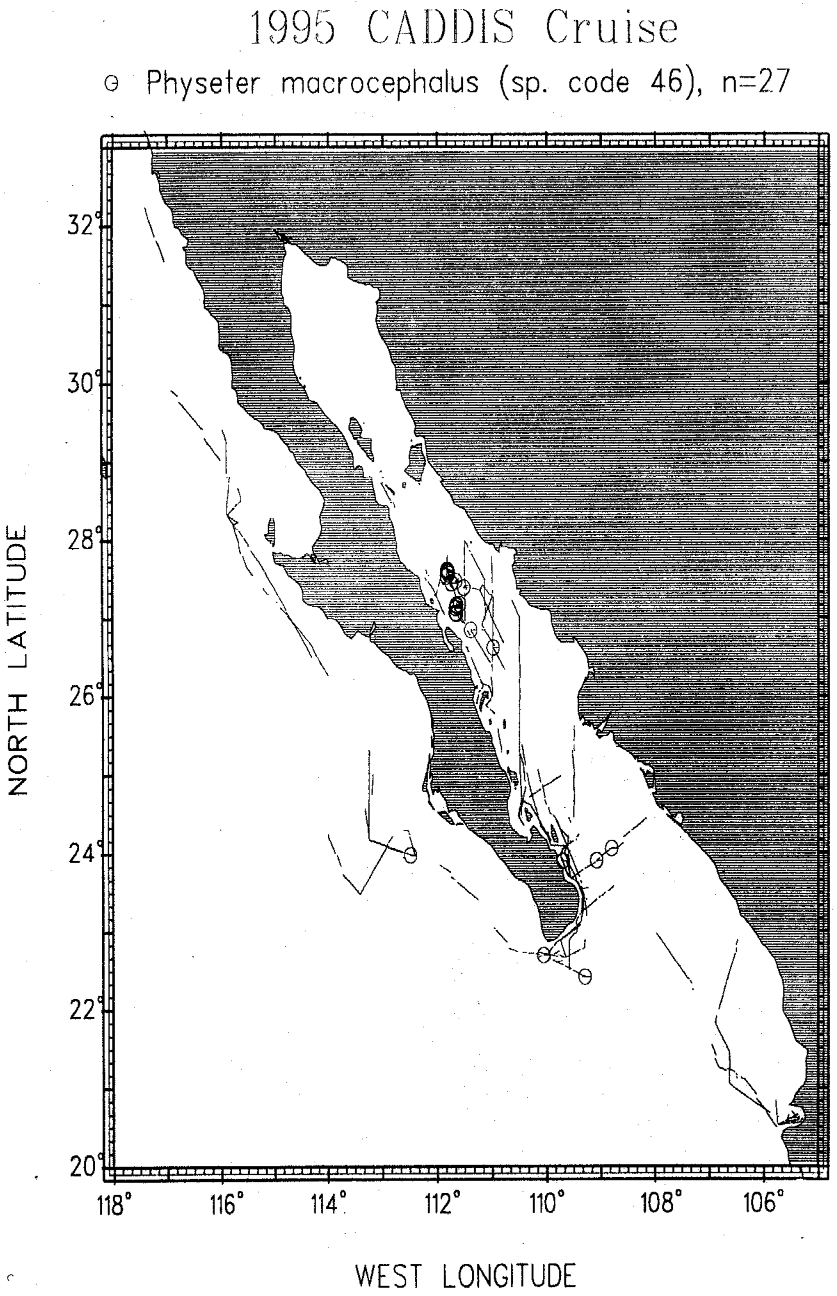

Figure 5. Geographical locations for Sperm Whale sightings.

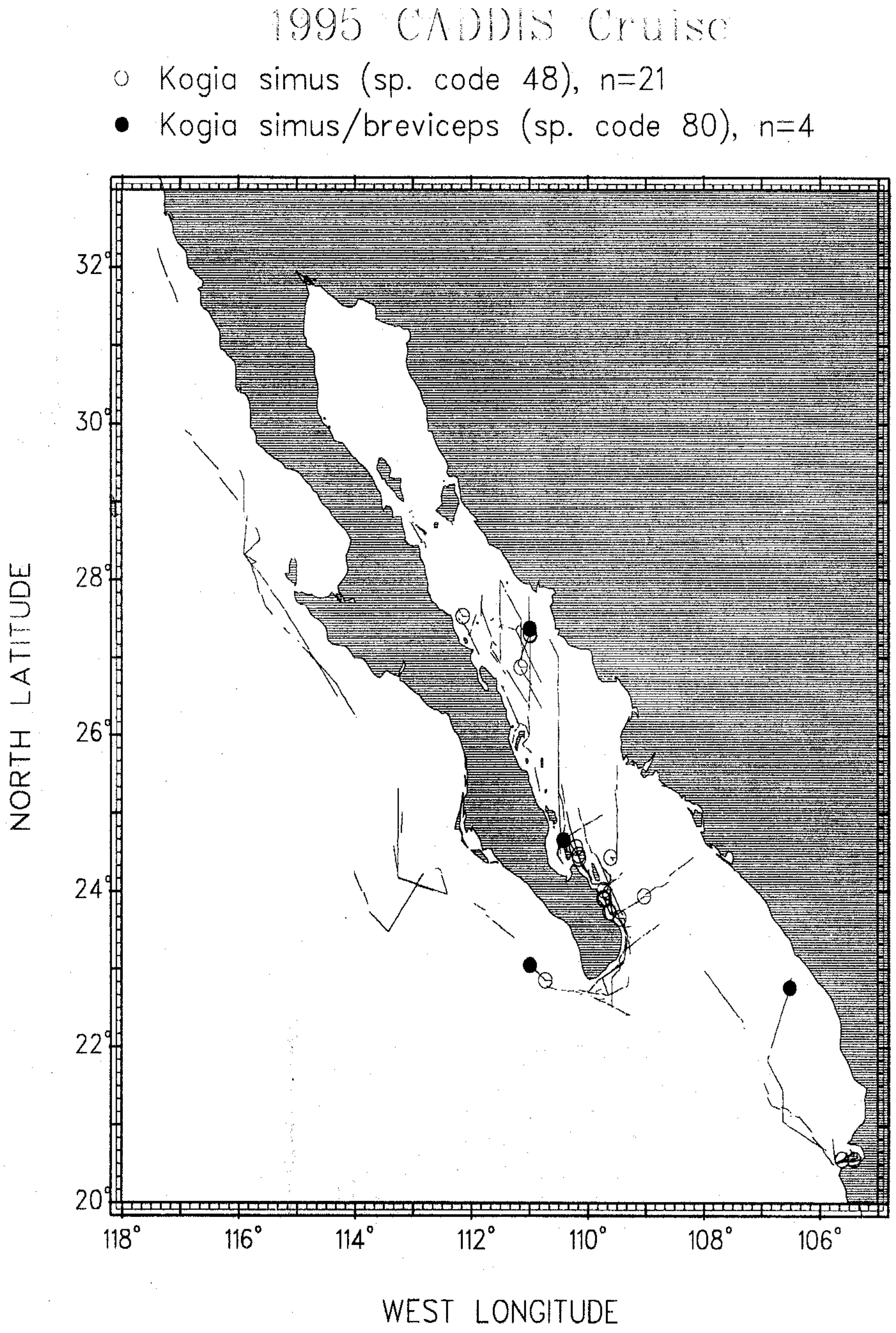

Figure 6. Geographical locations for *Kogia* sightings.

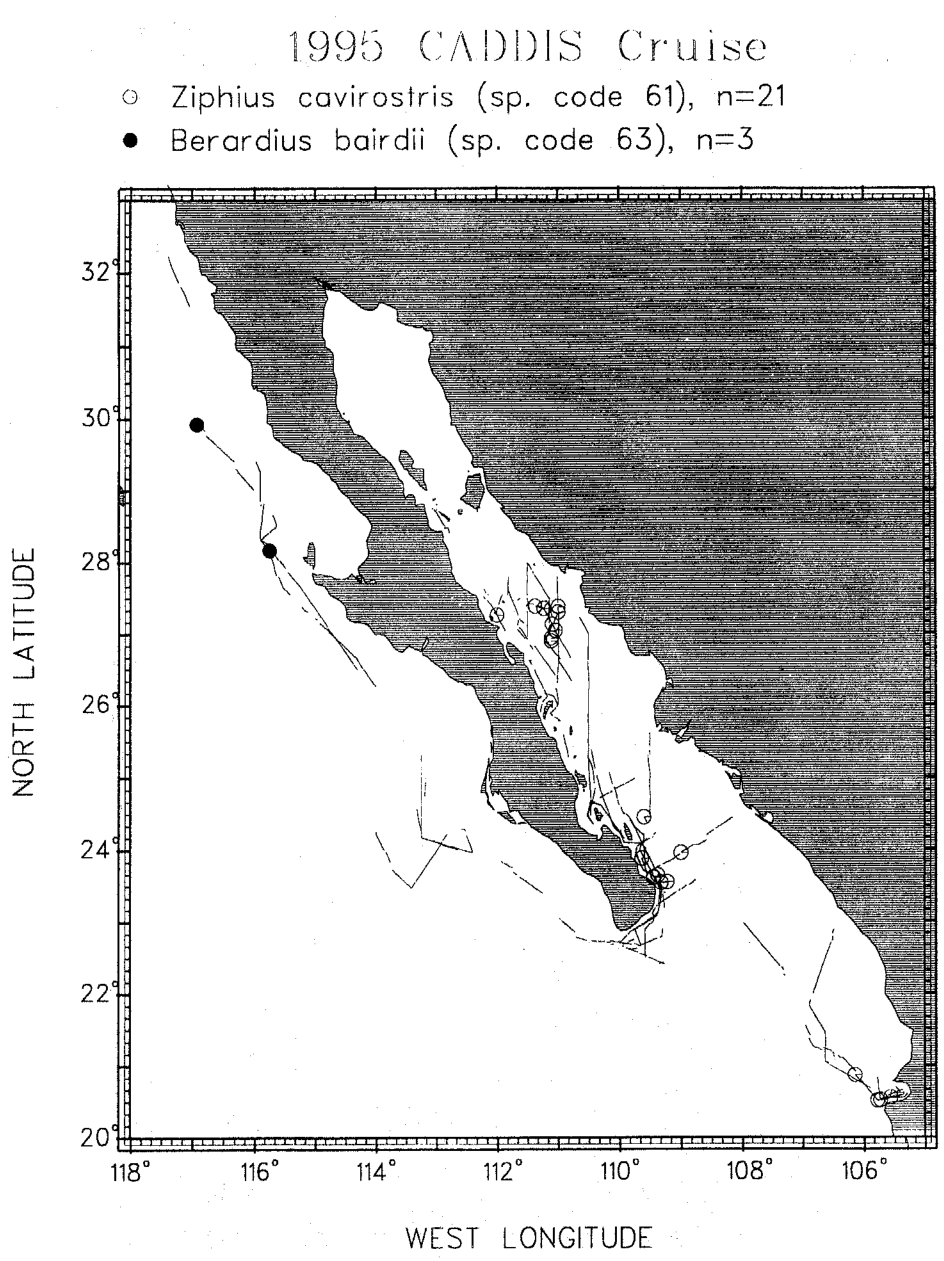

Figure 7. Locations of Cuvier's and Baird's Beaked Whales.

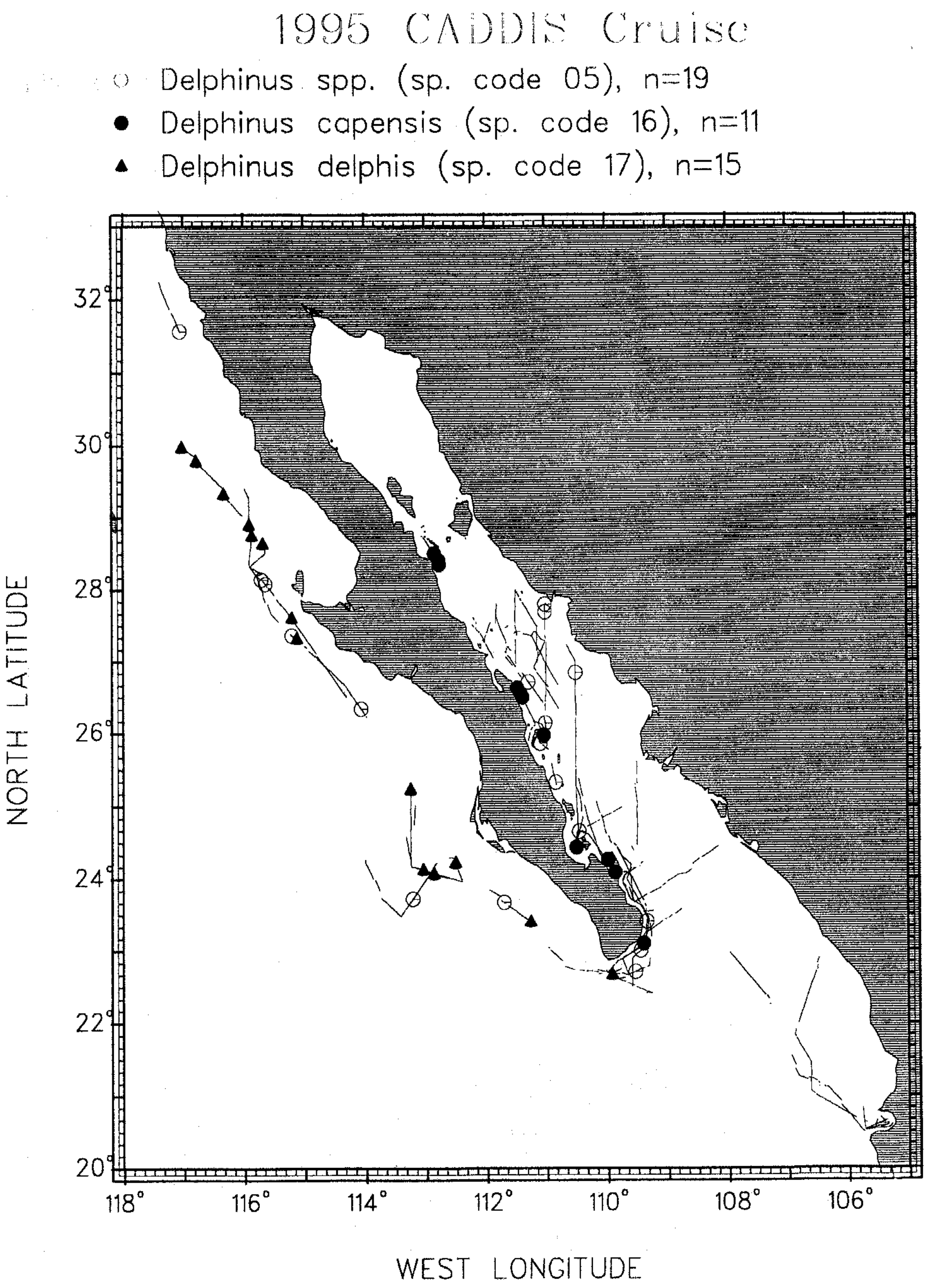

Figure 8. Locations of Common Dolphin species.

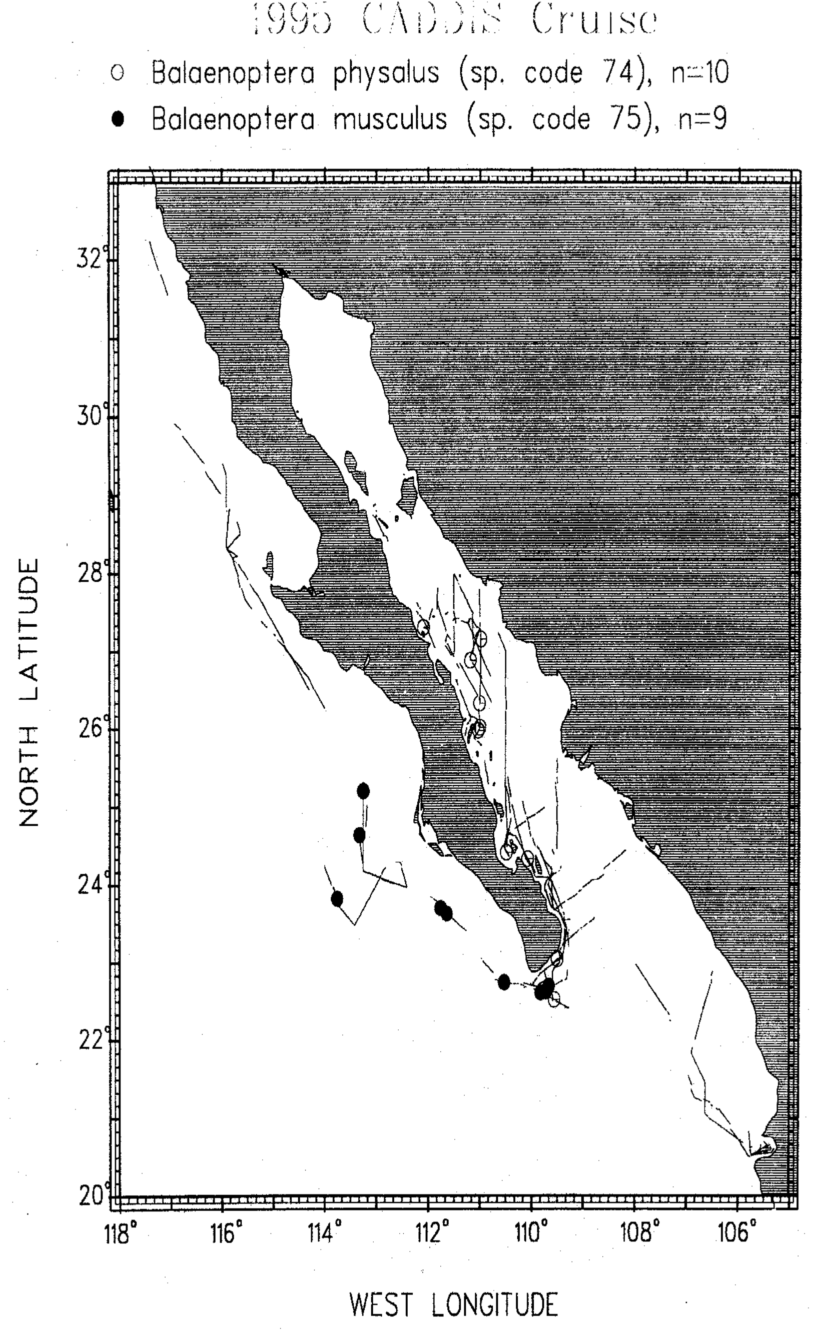

Figure 9. Locations of Fin and Blue Whales.

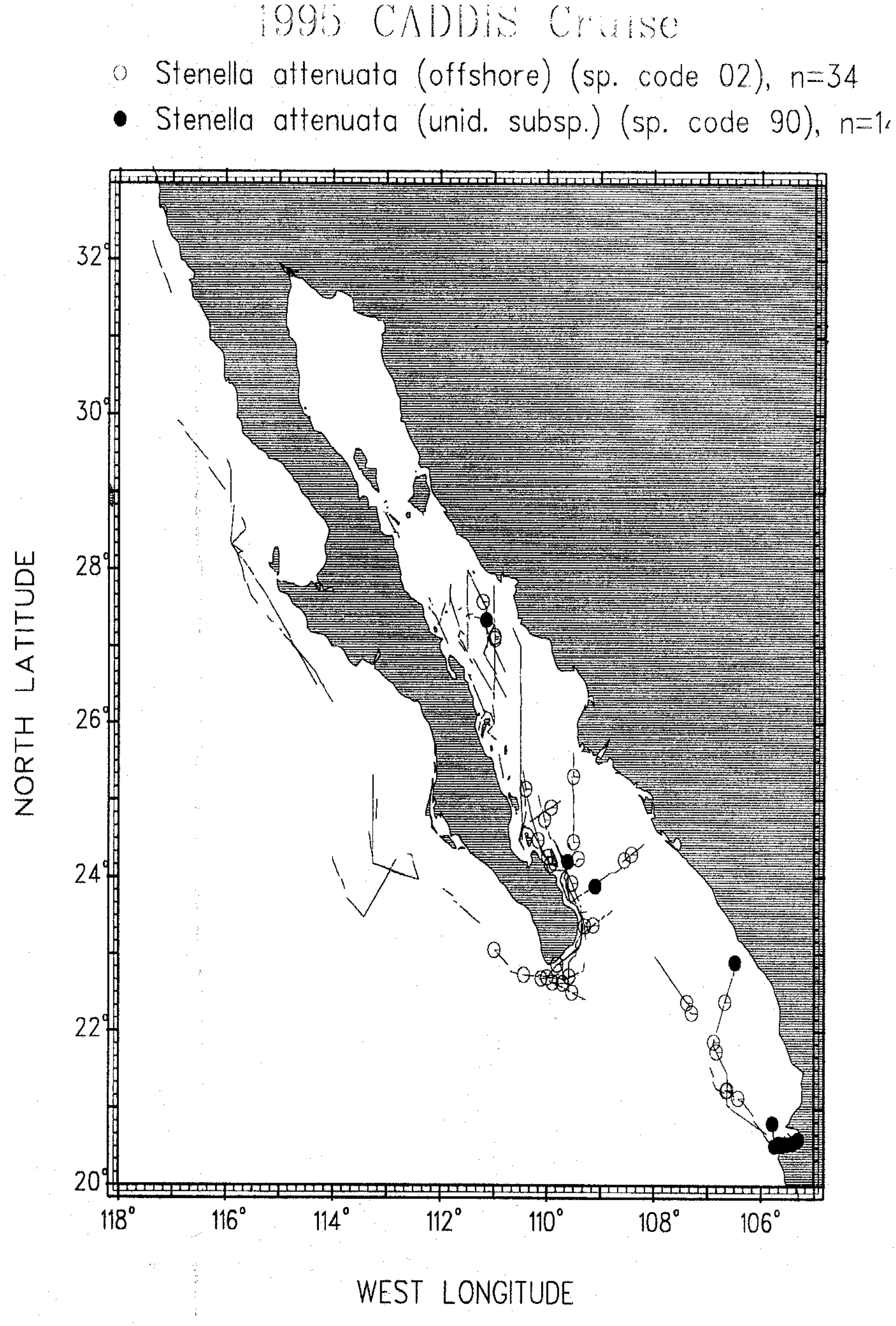

Figure 10. Locations of Spotted Dolphin species.

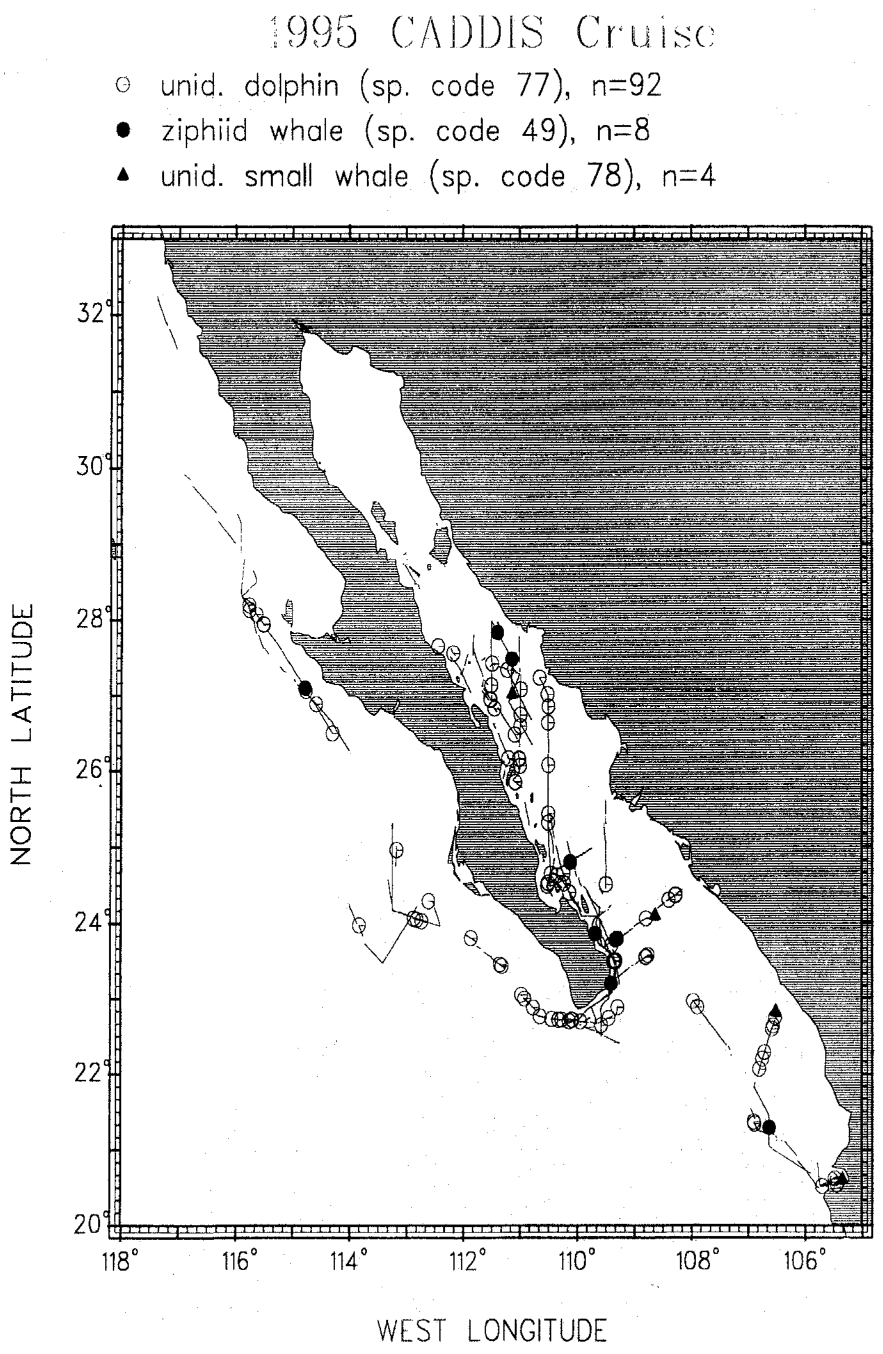

Figure 11. Locations of unidentified dolphin, Ziphiid and unidentified small whale sightings.

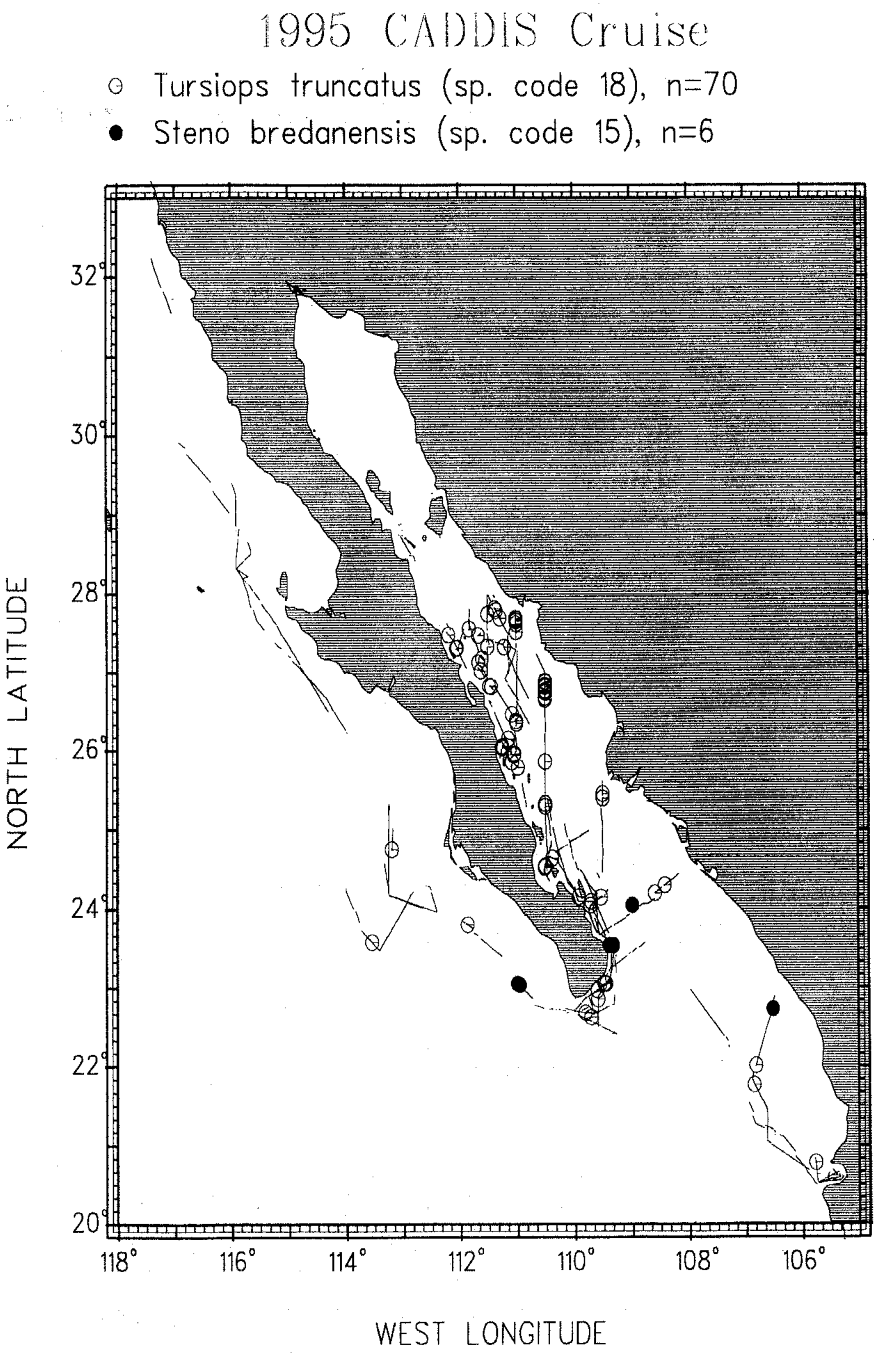

Figure 12. Locations of Rough-Toothed and Bottlenose Dolphin sightings.

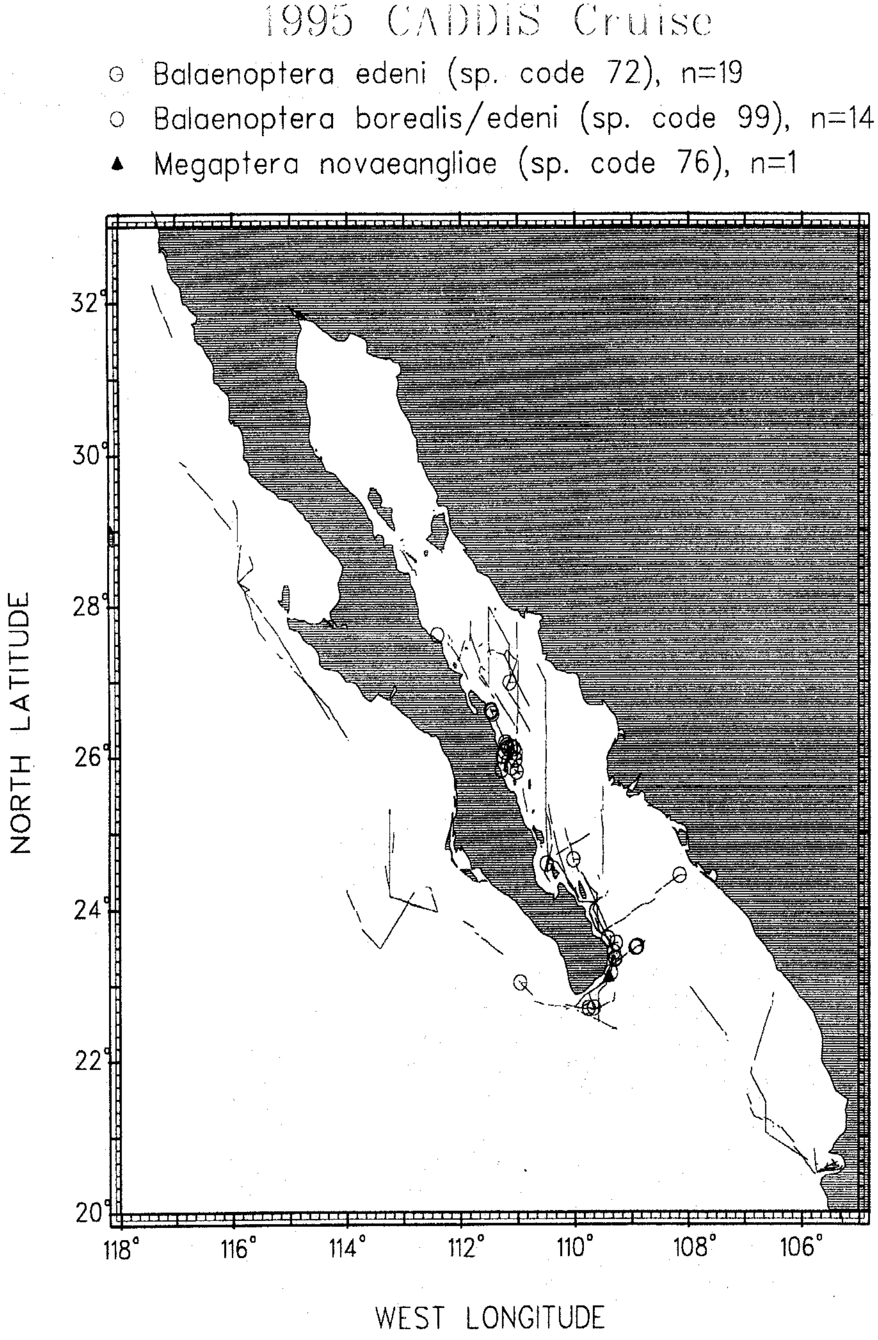

Figure 13. Locations of sightings of Bryde's, Sei, and Humpback whales.

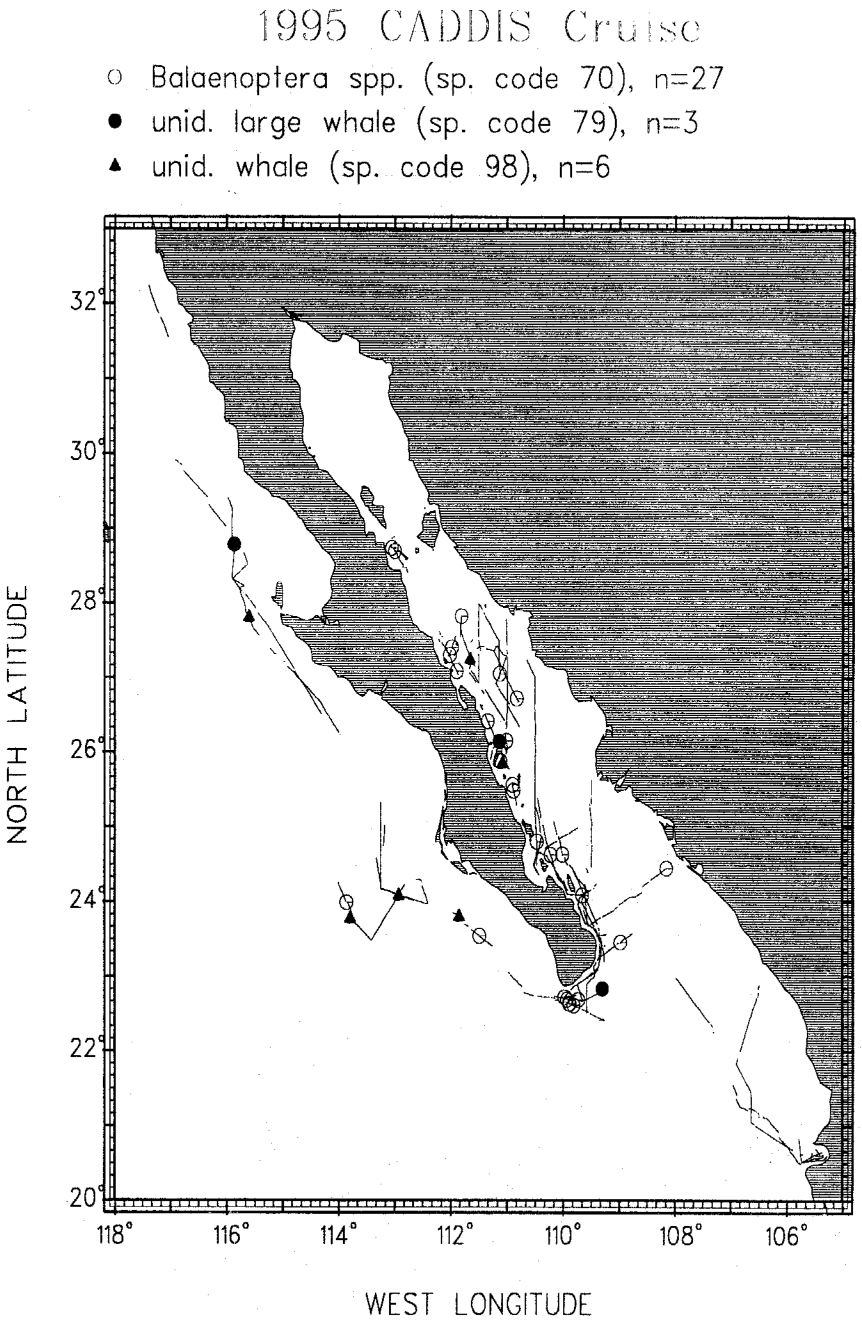

Figure 14. Locations of sightings of some balaenopterid and unidentified large whale species.

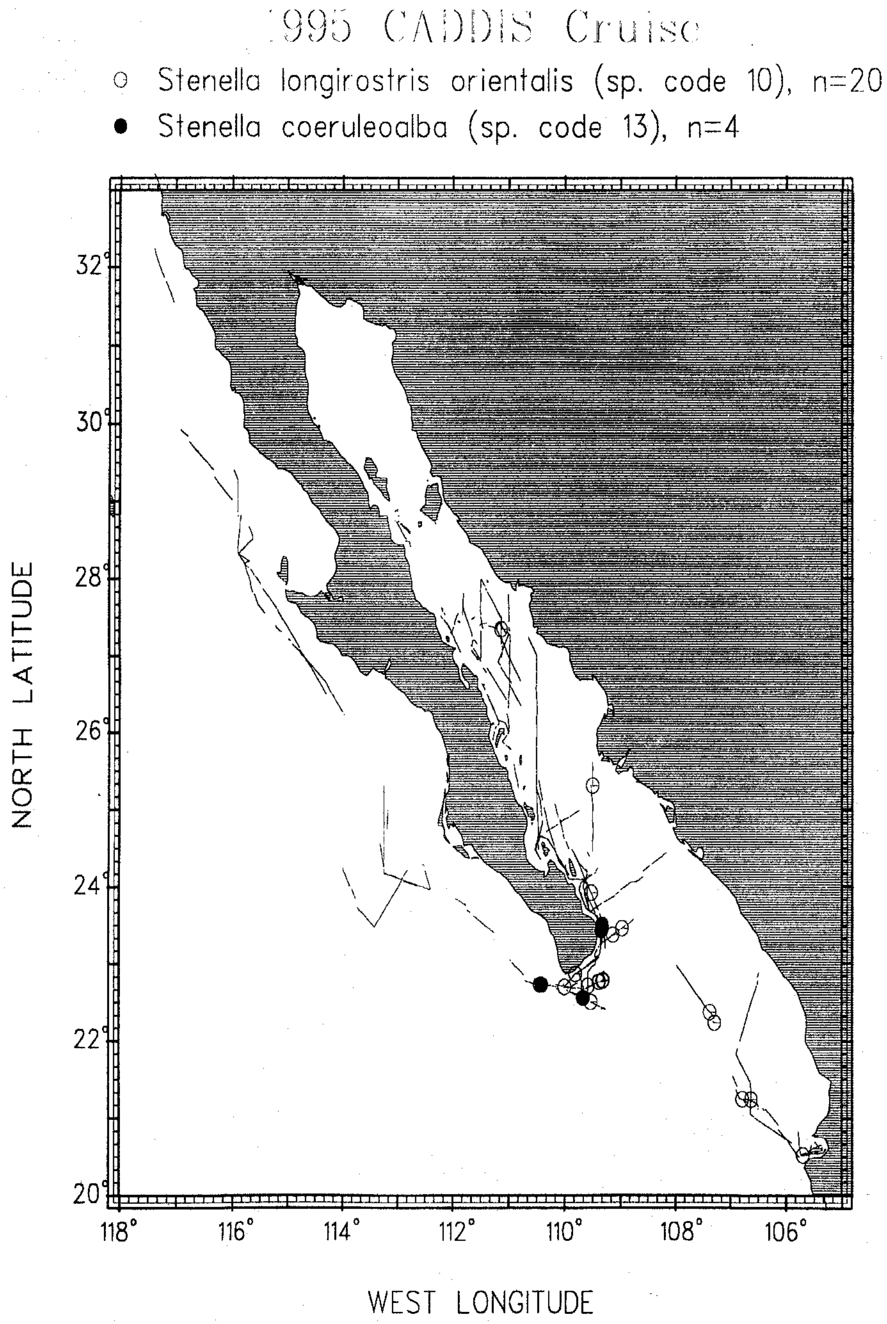

Figure 15. Locations of sightings of Eastern Spinner, and Striped dolphins.

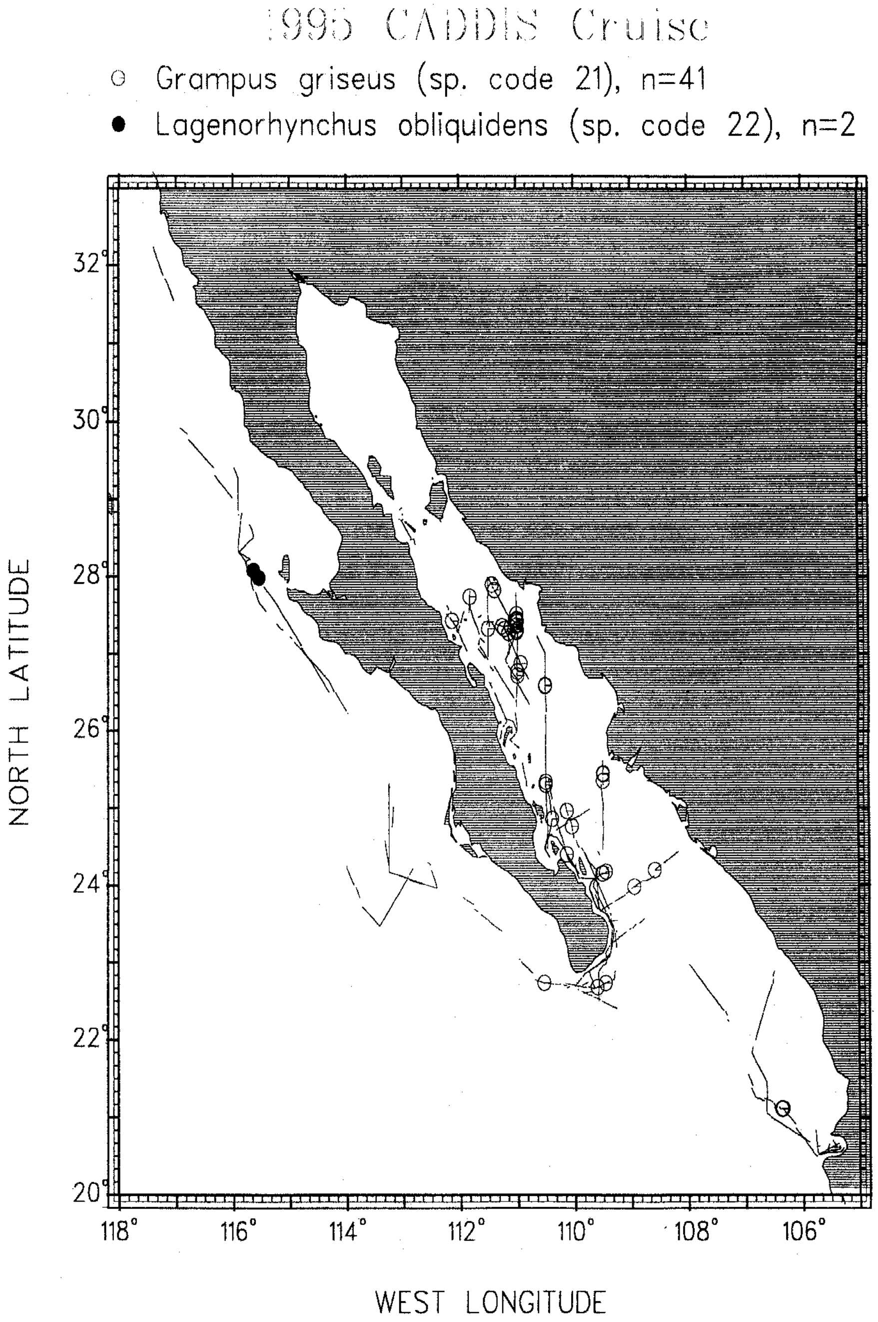

Figure 16. Locations of sightings of Risso's and Pacific White-Sided dolphins.

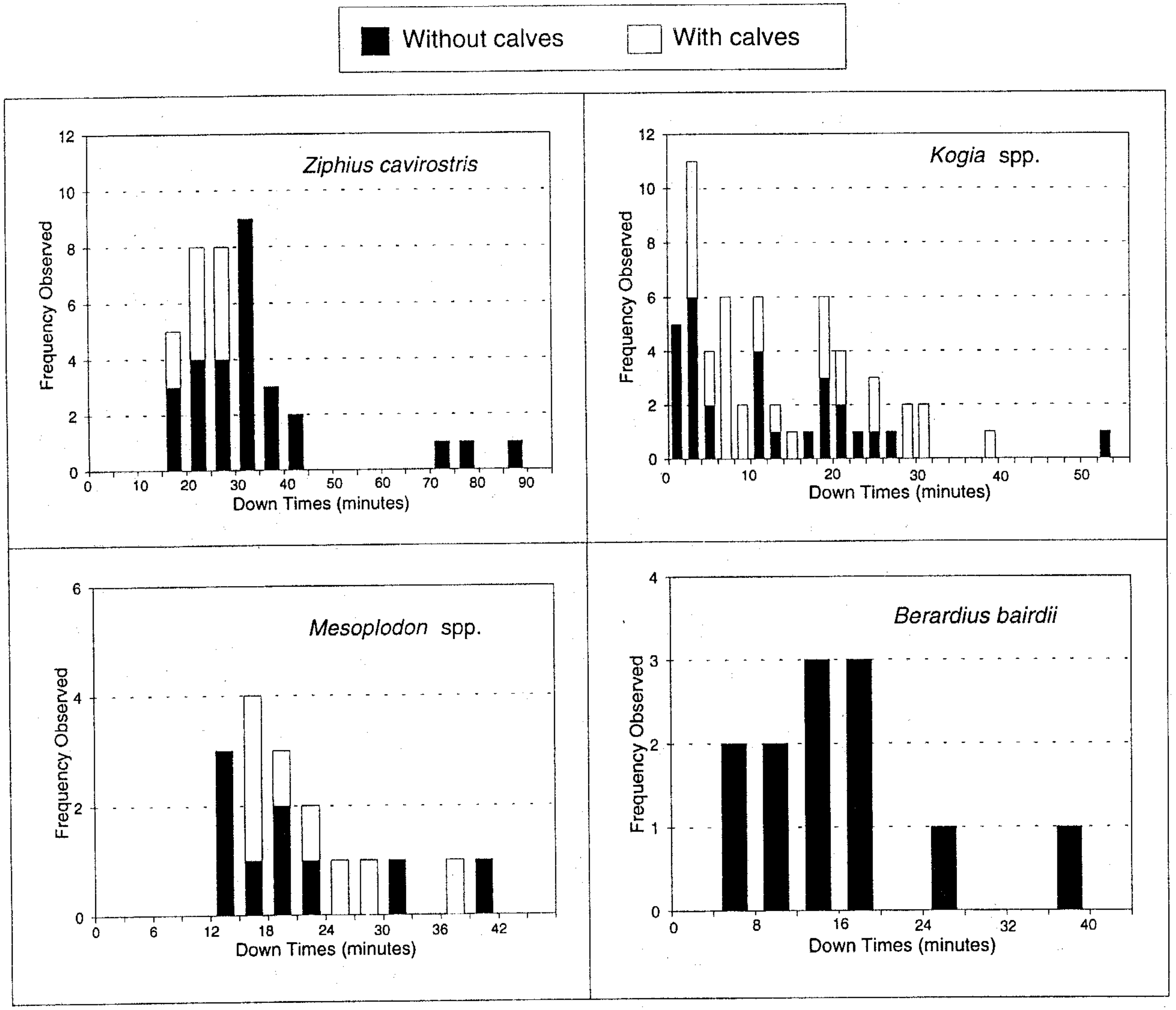

Figure 17. Frequencies of dive durations for beaked whales and pygmy/dwarf sperm whales.

Appendix A. CRUISE3 Data Entry Codes

Event	Field	Field #	Values or Codes
B = begin effort			
	Cruise #	1	4-digit cruise number
E = end effort			
R = resume effort			
S = marine mammal sighting			
	Sight #	1	sighting number
	Obs ID	2	Observer code (see Table 2) for observer who made sighting
	Cue	3	1=bird, 2=splash, 3=mammals, 4=ships, 5=other or unknown, 6=blow and 7=helo
	SCode	4	3=crew, 4=observer 25X, 5=observer not 25X, 6=other or unknown, 7=helo and 8=independent observer
	Bearing	5	relative bearing from ship to animals
	Reticle	6	reticle distance to sighting, in tenths
	Distance	7	nautical miles to sighting, in tenths
A = auxiliary sighting information			
	Sight #	1	sighting number
	W. Temp	2	degrees centigrade, in tenths
	Photo	3	Y/N
	Birds	4	Y/N
	Spp1Code	5	see Appendix E
	Spp2Code	6	see Appendix E
	Spp3Code	7	see Appendix E
# = observer estimates (entered during nightly editing)			
	Obs ID	1	see Table 2
	BestSS	2	observer's best school size estimate
	HighSS	3	observer's high school size estimate
	LowSS	4	observer's low school size estimate
	%Spp1	5	% of animals of species 1
	%Spp2	6	% of animals of species 2
	%Spp3	7	% of animals of species 3
P = observer positions			
	Left	1	Obs ID (see Table 2) at left bino
	Right	2	Obs ID (see Table 2) at right bino
	Recorder	3	Obs ID (see Table 2) at recorder

V = viewing conditions

Beaufort	1	see Appendix B
Swell Ht	2	numeric value, in feet
SwellDir	3	relative to North
W. Temp	4	degrees centigrade

N = navigation

Course	1	ship heading relative to North
Speed	2	ship speed, in knots

W = weather

Rain/Fog	1	1=no rain or fog, 2=fog, 3=rain, 4=rain and fog, 5=haze, but not rain or fog
Horz Sun	2	see Appendix C
Vert Sun	3	see Appendix C
Wind Dir	4	relative to North
Visbilty	5	nautical miles of visibility

t = turtle sighting

Obs ID	1	Observer code see Table 2 for observer who made sighting
Spp	2	LO = olive ridleys, CC = loggerheads CM = green turtle, DC = leatherbacks EI = Hawksbill, UNK = Unknown
Bearing	3	relative bearing from ship to animals
DistNMI	4	nautical miles to sighting, in tenths
#Turtles	5	numeric value
AssocJFR	6	J=jellyfish, F=floating object, R=red tide

C = Comment

Appendix B. SWFSC Marine Mammal Species Code List

Code	Alpha Code	Species or classification	Common name
01	MESOP_PERU	*Mesoplodon peruvianus*	Pygmy beaked whale
02	OFFSH_SPOT	*Stenella attenuata* (offshore)	Offshore pantropical spotted dolphin
03	UNID_SPINR	*Stenella longirostris* (unidentified subspecies)	Unidentified spinner dolphin
04	CLYMENE	*Stenella clymene*	Clymene or short-snouted spinner dolphin
05	UNID_COMM	*Delphinus* sp.	Unidentified common dolphin
06	COAST_SPOT	*Stenella attenuata graffmani*	Coastal spotted dolphin
07	SOTALIA	*Sotalia fluviatilis*	Tucuxi, Guiana dolphin
08	ORCAELLA	*Orcaella brevirostris*	Irrawaddy dolphin
09	SPECTACLED	*Australophocaena dioptrica*	Spectacled porpoise
10	EAST_SPINR	*Stenella longirostris orientalis*	Eastern spinner dolphin
11	WBEL_SPINR	*Stenella longirostris* hybrid	Whitebelly spinner dolphin
12	WHITE-BEAK	*Lagenorhynchus albirostris*	White-beaked dolphin
13	STRIPED	*Stenella coeruleoalba*	Striped dolphin, streaker
14	A_WHT_SIDE	*Lagenorhynchus acutus*	Atlantic white-sided dolphin
15	STENO	*Steno bredanensis*	Rough-toothed dolphin, Steno
16	LONGB_COMM	*Delphinus capensis*	Baja neritic common dolphin, long-beaked common dolphin
17	SHRTB_COMM	*Delphinus delphis*	Offshore common dolphin, short-beaked common dolphin
18	TURSIOPS	*Tursiops truncatus*	Bottlenose dolphin
19	HEAVISIDES	*Cephalorhynchus heavisidii*	Heaviside's dolphin
20	HECTORS	*Cephalorhynchus hectori*	Hector's or pied dolphin
21	GRAMPUS	*Grampus griseus*	Risso's dolphin, grampus
22	P_WHT_SIDE	*Lagenorhynchus obliquidens*	Pacific white-sided dolphin
23	PEALES	*Lagenorhynchus australis*	Peale's dolphin, blackchin
24	HOURGLASS	*Lagenorhynchus cruciger*	Hourglass dolphin
25	DUSKY	*Lagenorhynchus obscurus*	Dusky dolphin
26	FRASERS	*Lagenodelphis hosei*	Fraser's or Sarawak dolphin
27	LISSO_BOR	*Lissodelphis borealis*	Northern right whale dolphin
28	LISSO_PER	*Lissodelphis peronii*	Southern right whale dolphin
29	BLACK_DOL	*Cephalorhynchus eutropia*	Black or Chilean dolphin
30	COMMERSONS	*Cephalorhynchus commersonii*	Commerson or piebald dolphin
31	MELON_HEAD	*Peponocephala electra*	Melon-headed whale, electra dolphin
32	PYGMY_KLLR	*Feresa attenuata*	Pygmy killer whale, slender blackfish
33	FALSE_KLLR	*Pseudorca crassidens*	False killer whale
34	GLOBI_SP	*Globicephala* sp.	Unidentified pilot whale
35	LONG_PILOT	*Globicephala melas*	Long-finned pilot whale, Atlantic pilot whale
36	SHRT_PILOT	*Globicephala macrorhynchus*	Short-finned pilot whale
37	KILLER_WHA	*Orcinus orca*	Killer whale
38	SOUSA_CHIN	*Sousa chinensis*	Indo-Pacific hump-backed or white dolphin
39	SOUSA_TEUS	*Sousa teuszii*	Atlantic hump-backed dolphin
40	HARBR_PORP	*Phocoena phocoena*	Harbor porpoise, herring hog
41	VAQUITA	*Phocoena sinus*	Vaquita, Gulf of California harbor porpoise
42	BURMEISTER	*Phocoena spinipinnis*	Burmeister or black porpoise

43	BL_FINLESS	*Neophocaena phocaenoides*	Black finless porpoise
44	DALLS_PORP	*Phocoenoides dalli*	Dall's porpoise
45	BELUGA	*Delphinapterus leucas*	White whale, beluga
46	SPERM_WHAL	*Physeter macrocephalus*	Sperm whale
47	PYGMYSPERM	*Kogia breviceps*	Pygmy sperm whale
48	DWARFSPERM	*Kogia simus*	Dwarf sperm whale
49	ZIPHIID_WH	ziphiid whale	Unidentified beaked whale
50	HYPERO_PLN	*Hyperoodon planifrons*	Southern bottlenose whale
51	MESOP_SP	*Mesoplodon* sp.	Unidentified *Mesoplodon*
52	MESOP_CARL	*Mesoplodon carlhubbsi*	Hubb's beaked whale, archbeak whale
53	MESOP_HECT	*Mesoplodon hectori*	Hector's beaked whale
54	MESOP_BOWD	*Mesoplodon bowdoini*	Andrew's beaked whale
55	MESOP_EURO	*Mesoplodon europaeus*	Gervais' beaked whale, Antillean beaked whale
56	MESOP_BDNS	*Mesoplodon bidens*	Sowerby's beaked whale
57	MESOP_GNKO	*Mesoplodon ginkgodens*	Ginkgo-toothed beaked whale
58	MESOP_GRAY	*Mesoplodon grayi*	Gray's beaked whale
59	MESOP_DENS	*Mesoplodon densirostris*	Blaineville's beaked whale, tropical beaked whale
60	MESOP_LAYA	*Mesoplodon layardii*	Strap-toothed whale
61	ZIPHI_CAVI	*Ziphius cavirostris*	Cuvier's beaked whale
62	BERARD_ARN	*Berardius arnuxii*	Arnoux's beaked whale, southern giant bottlenose
63	BERARD_BAI	*Berardius bairdii*	Baird's beaked whale, nouthern giant bottlenose
64	TASMA_SHEP	*Tasmacetus shepherdi*	Shepherd's beaked whale
65	MESOP_PACI	*Mesoplodon pacificus*	Longman's beaked whale, Indo-Pacific beaked whale
66	N_RIGHT_WH	*Eubalaena glacialis*	Northern right whale
67	BOWHEAD_WH	*Balaena mysticetus*	Bowhead whale
68	PYGMY_RGHT	*Caperea marginata*	Pygmy right whale
69	GRAY_WHALE	*Eschrichtius robustus*	Gray whale
70	UNID_RORQL	*Balaenoptera* sp.	Unidentified rorqual
71	MINKE_WHAL	*Balaenoptera acutorostrata*	Minke whale
72	BRYDES_WHL	*Balaenoptera edeni*	Bryde's whale
73	SEI_WHALE	*Balaenoptera borealis*	Sei whale
74	FIN_WHALE	*Balaenoptera physalus*	Fin whale
75	BLUE_WHALE	*Balaenoptera musculus*	Blue whale
76	HUMPBACK_W	*Megaptera novaeangliae*	Humpback whale
77	UNID_DOLPH	unid. dolphin	Unid. dolphin or porpoise
78	UNID_SM_WH	unid. small whale	Unidentified small whale
79	UNID_LG_WH	unid. large whale	Unidentified large whale
80	KOGIA_SP	*Kogia simus/breviceps*	Dwarf or pygmy sperm whale
81	MESOP_STEJ	*Mesoplodon stejnegeri*	Stejneger's beaked whale
82	MESOP_MIRU	*Mesoplodon mirus*	True's Beaked Whale
83	MESOP_SP_A	*Mesoplodon* sp. A	Unnamed beaked whale
84	HYPERO_AMP	*Hyperoodon ampullatus*	N. Atlantic bottlenose whale
85	NARWHAL	*Monodon monoceros*	Narwhal, sea unicorn
86	S_RIGHT_WH	*Eubalaena australis*	Southern right whale
87	FRANCISCAN	*Pontoporia blainvillei*	Franciscana, La Plata dolphin
88	C_A_SPINNR	*Stenella longirostris centroamericana*	Central American spinner or Costa Rican spinner
89	UNID_SPOT	*Stenella attenuata/plagidon*	Unidentified spotted dolphin in Atlantic
90	UNID_SPOT	*Stenella attenuata* (unid. subsp.)	Unidentified pantropical

			spotted dolphin
91	AT_SPOTTED	*Stenella frontalis*	Atlantic spotted dolphin
92	GANGES_DOL	*Platanista gangetica*	Ganges susu, Ganges dolphin
93	INDUS_DOL	*Platanista minor*	Indus susu, Indus dolphin
94	INIA	*Inia geoffrensis*	Boto, Amazon river dolphin
95	LIPOTES	*Lipotes vexillifer*	Baiji, Chinese river dolphin
96	UNID_CETAC	unid. cetacean	Unidentified cetacean
97	UNID_OBJCT	unid. object	Unidentified object, possible marine mammal
98	UNID_WHALE	unid. whale	Unidentified whale
99	SEI/BRYDES	*Balaenoptera borealis/edeni*	Rorqual identified as a Sei whale or Bryde's whale
PU	UNID_PINNI	unid. pinniped	Unidentified pinniped
UO	UNID_OTARI	unid. sea lion	Unidentified sea lion
EJ	STELLAR_SL	*Eumetopias jubatus*	Stellar sea lion
ZC	CA_SEALION	*Zalophus californianus*	California sea lion
UA	UNID_FURSL	unid. fur seal	Unidentified fur seal
AT	GUAD_FURSL	*Arctocephalus townsendi*	Guadalupe fur seal
CU	NO_FURSEAL	*Callorhinus ursinus*	Northern fur seal
US	UNID_SEAL	unid. seal	Unidentified seal
MA	N_ELEPHN_S	*Mirounga angustirostris*	Northern elephant seal
PV	HARBR_SEAL	*Phoca vitulina*	Harbor seal

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