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# A Survey of the Marine Mammals of the Upper Gulf of California, Mexico, with an Assessment of the Status of Phocoena Sinus

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# ABSTRACT

The upper Gulf of California supports a variety of marine mammal species, though until recently knowledge of this fauna has been limited to scattered sightings and beach-cast skeletal material. This region is now a subject of concern because of human impacts upon its ecosystems. From 03 March 1979 to 01 April 1979 we conducted a boat survey along 1959 km of daylight transects between the midriff islands and a distributary of the Colorado River in an attempt to describe and assess the marine mammal fauna. Of particular interest was the status of the endemic Gulf of California harbor porpoise (Phocoena sinus).

In addition to Phocoena sinus, nine species of marine mammals were recorded from 204 sightings: bottlenose dolphin (Tursiops sp.), common dolphin (Delphinus delphis), pilot whale (Globicephala melaena), sperm whale (Physeter catodon), fin whale (Balaenoptera physalus), blue whale (Balaenoptera musculus), minke whale (Balaenoptera acutorostrata), the gray whale (Eschrichtius robustus), and California sea lion (Zalophus californianus). Environmental and behavioral data were collected for each sighting.

Groups of small, elusive porpoises, believed to be Phocoena sinus, were encountered in the north part of the upper Gulf on two occasions. Bottlenose dolphins were relatively abundant in the northern part of the upper Gulf, primarily in shallow waters near shore. One offshore sighting involved a group traveling with a pilot whale school. Common dolphins were sighted throughout the upper Gulf, but were often found to the south of the Tursiops sightings, near shore or submarine escarpments. Our sightings of sperm whales were within the previously reported range of the animals, near a submerged break in the slope in Canal de Ballenas. A single group of pilot whales was seen in Canal de Ballenas. Fin whales were seen in the southwest upper Gulf, primarily in waters less than 180 m deep. A year-round population is indicated, based on our sightings and those of other researchers. Two sightings of blue whales north of Isla Ángel de la Guarda may represent the northernmost record for this species in the Gulf. Minke whales were seen in shallow waters in the northern upper Gulf; this may be the northernmost record for this species in the Gulf. One gray whale was observed heading north, south of Puertocitos. Sea lions were seen throughout the Gulf, primarily near shore and in waters less than 125 m deep.

Our impressions of the populations of bottlenose dolphins, common dolphins, fin whales and California sea lions are that they are abundant. Much more research is needed to establish baselines for abundance of animals during other seasons and over several years; this is especially important for the harbor porpoise, whose numbers have been suspected to be decreasing.

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# INTRODUCTION

The upper Gulf of California, from the midriff islands above Lat 28°50'N to Islas Montague and Gore at the mouth of the Rio Hardy (a distributary of the Colorado River) has been an exceptionally productive area for shrimps, fish, birds and marine mammals. It has been the site of a once important fishery for the giant sciaenid fish Cynoscion macdonaldi, the totoaba, and sustains an important shrimp fishery and a more minor fishery for other species such as certain croakers. It is the home of a very diverse marine mammal population including, apparently, the entire world's population of the Gulf of California Harbor Porpoise, Phocoena sinus.

Phocoena sinus was originally described from skulls collected near San Felipe (Figure 1) by Norris and McFarland (1958), and since then has been seen or reported infrequently. Though possible sightings have previously been reported from areas to the south (Norris and McFarland, 1958; Nelson, 1899; Scammon, 1874), all 21 confirmed sightings and all specimens collected through 1974 were obtained in the northern part of the upper Gulf (Brownell, 1976; Fitch and Brownell, 1968; IUCN Red Book, 1978; Noble and Fraser, 1971; Norris and McFarland, 1958; Norris and Prescott, 1961; Orr, 1969). In addition, interviews with local fishermen indicated that the porpoise was most common in the shallow waters of the northern end of the Gulf, especially near San Felipe (Kelly, unpubl. manuscript; Norris and McFarland, 1958; Norris and Prescott, 1961). Villa-R. (1976) reported three sightings of P. sinus, north of Bahía San Francisquito, in Bahía de los Ángeles, and near Isla Raza (one of the Midriff islands, at Lat. 113°00'W., Long. 28°49'N.). He also reported that local fishermen in the Bahía de los Ángeles area were familiar with the porpoise. Fishermen from San Felipe indicated that the porpoises left their area in the summer, and moved to the waters off Bahía de los Ángeles and Isla Ángel de la Guarda (Norris and McFarland, 1958). The small size of the porpoise, the small size of its groups, and its elusive nature have no doubt contributed to the paucity of sightings.

Knowledge of other marine mammals has been based on scattered sightings and beach-cast specimens and skeletal material (eg.: Gilmore, 1957; Norris and Prescott, 1961; and Brownell, 1969) until recent systematic efforts to describe the fauna were made. Van Gelder (1960), on the schooner Puritan, obtained sightings, which included California sea lions (Zalophus californianus) and fin whales (Balaenoptera physalus) as far north as San Felipe (31°N) and through the Midriff Islands, which extend across the Gulf near 28°30'N. In November-December of 1978 the barkentine R/V Regina Maris cruised north through this same area to Bahía de los Ángeles and Islas Encantadas via the west side of Isla Ángel de la Guarda, and returned south through the midriff area along the west coast of Isla Tiburón (Balcomb, Villa and Nichols, 1979). Sightings included sea lions, fin whales, pilot whales (reported as Globicephala macrorhynchus), common dolphins (Delphinus delphis), and bottlenose dolphins (reported as Tursiops gilli).

In July, 1979, the R/V E.W. Scripps cruised north through the midriff area, along the west coast of Isla Ángel de la Guarda crossing to Isla San Jorge on the Sonoran coast and then southwest to Isla Tiburón (Gisiner, et al., unpubl. manuscript). Upper Gulf sightings included large numbers of sea lions, a single juvenile elephant seal (Mirounga angustirostris) on Isla Ángel de la Guarda, fin whales and common dolphins.

Stephen Leatherwood (pers. comm.) reports aerial sightings of Bryde's whale (Balaenoptera edeni), the humpback whale (Megaptera novaeangliae) and the blue whale (Balaenoptera musculus) from the upper Gulf region. Gilmore et al. (1967) and Patten and Samaras (1977) report gray whale records from the Gulf region, Gilmore (1957) describes a stranding of sperm whales off La Paz, and Brownell (1969) reports a pygmy sperm whale (Kogia breviceps) from the upper Gulf.

The exceptionally productive upper Gulf of California is now a subject of concern because of human impact upon its ecosystems. We may expect that such impact will be reflected most clearly at the highest trophic levels: birds and mammals. A number of impacts on Gulf ecosystems exist, including fisheries and interference with the flow of enriching sediments into the Gulf (Villa-R., 1976).

Fishery influence has been great. Shrimp trawlers in great numbers scour its bottom with drag nets, taking large quantities of invertebrates, including shrimps, and small fish. Gill net fisheries, such as that for totoaba (Berdegue-A., 1955, Flanagan and Hendrickson, 1976) or sharks (pers. obs.) may also adversely affect the marine mammal populations through incidental mortalities, or reduction of available prey. Phocoena sinus might be especially vulnerable to the effects of gill nets. Before the closing of the totoaba fishery in 1975, the annual incidental kill of porpoises was probably in the range of 10-100+ (Brownell, 1976; Norris and Prescott, 1961). At that time, the fishery was concentrated in the portion of the Gulf from which most of the confirmed porpoise sightings have been recorded. Brownell described a relatively small, localized population of porpoises at that time. It is not known how the incidental take from this population affected the status of the porpoises, or what effect the continued gill net fishing for other fishes will have. Fitch and Brownell (1968) found remains of squid, grunts (Orthopristis reddingi), and croakers (Bairdiella icistius) in the stomach of a single porpoise. Both species of fish were apparently abundant throughout the Gulf at the time, but few recent data are available.

Most of the resident cetacean biomass of the Gulf of California is present in the form of large schools of bottlenose dolphins (Tursiops sp.) and common dolphins (Delphinus delphis). Two features suggest that monitoring the populations of these species is important. First, the damming of the Colorado River in the United States, and to a much lesser extent in Mexico, has all but eliminated the sediment load that once entered the Gulf (Flanagan and Hendrickson, 1976). This sediment is largely responsible for the extensive flat-bottomed shallow sea that occupies the northernmost Gulf, and must have been very important in the enrichment of its waters. The Gulf undergoes only modest exchange with the Pacific through its mouth because a seiche operates in the Gulf to produce an internal tidal exchange that moves back and forth with a node near Guaymas, just to the south of our study area, where only slight tides occur. High tides exceeding 8 meters occur in the upper Gulf, and a somewhat lower maximum high is recorded at La Paz near the mouth of the Gulf. Even though Gulf waters have been notably productive, much water is in effect locked in the Gulf for long residencies. Thus, we wonder how dependent the entire food chain is upon nutrients from the Colorado River, and if we may expect reductions in the population sizes of resident marine mammals. Only by repeated counts can anything substantive be said about this potential circumstance.

Future change can be expected to accelerate because of increasing boat traffic from a burgeoning tourist industry. It may, for example, threaten sea lion haul-out grounds. These pinnipeds are also used for bait, especially for shark fishing (personal observation), are apparently taken incidentally in nets (Arizona-Sonora Desert Museum, 1975) but at unknown levels.

From 03 March to 01 April 1979 we conducted a boat survey along approximately 1960 km of daylight transects in the upper Gulf of California, north of latitude 28°25'N, to the mouth of the Rio Hardy, using the 7.6m vessel Nai'a, operated by the authors. The objectives of the survey were to:

1. determine whether there is an extant population of Phocoena sinus in the Gulf of California, and, if so, the abundance of the population;

2. determine, as possible, present threats to the population; and

3. collect data on the presence, distribution and abundance of other marine mammal species in the upper Gulf of California.

Plans originally called for two surveys--one through the northern part of the upper Gulf, and a later survey through the midriff region. Logistical considerations resulted in the two surveys being conducted back-to-back, thus covering the entire upper Gulf in a single series of transects.

## DESCRIPTION OF THE STUDY AREA

The northernmost Gulf of California (30°25'N-31°40'N) is predominantly a shallow, mud or sand-bottomed sea, bordered by alluvial bluffs or extensive tidal flats. A broad trench occupies the center of the Gulf, deepening to the south. Tides exceeding 8 m in height flood for many kilometers over tidal flats. Only two small island groups exist: Rocas Consag, 33 km east of San Felipe, and Isla San Jorge, 42 km SE of Puerto Peñasco (Figure 1). Both island groups consist of one major island less than 3 km long and less than 100 m high, with a number of associated exposed rocks. Both islands serve as roosts for large numbers of sea birds, particularly cormorants (Phalacrocorax auritus), brown pelicans (Pelecanus occidentalis) and brown boobies (Sula leucogaster), as well as providing haul-out grounds for considerable populations of sea lions. Most human activity and development in this region is concentrated around the towns of San Felipe and Puerto Peñasco, established as a direct result of the totoaba fishery (Berdegue-A., 1955).

South of Puertocitos (30°22'N) on the Baja California coast, offshore depths increase rapidly to several hundred meters, with the 200 m contour occasionally coming within a few kilometers of the rugged, cliff-lined shore south of Punta Final (29°25'N) in the Canal de Ballenas. From Punta Remedios (29°15'N) south to the southernmost latitude of our study area at Bahía San Franisquito (28°25'N) the coast is indented by several reasonably large bays enclosed by cliffed headlands and backed by sand beaches, and the 200 m contour generally penetrates these bays. Between Punta Santa Isabel (30°09'N) and Bahía San Francisquito are two major groups of offshore islands. To the north are the six Islas Encantadas, all within 10 km of the Baja California coast. They occupy a shelf generally less than 75 m deep. Farther south, extending across the Gulf are the Midriff Islands, ranging in size from the 72 km long Isla Ángel de la Guarda, to several islands less than 2 km in length. Offshore of shelves surrounding most of these islands the sea deepens abruptly to more than 1450 m in intervening channels. Currents in these channels are often in excess of 11 km/hr.

Sea lions haul out on several of the islands, and many islands, particularly the smaller ones, serve as roosts and breeding areas for a variety of sea birds. The primary human settlements are at Puertocitos and Bahía Los Ángeles on the Baja California coast, and Bahía Kino on the Sonoran coast. All three provide facilities for both sport and fishing vessels.

## METHODS

The survey was conducted from a 7.6 m twin engine fiberglass vessel, with a crew of two to four researchers. The boat generally operated on one engine at a time, averaging 11 km/hr depending upon winds and currents. Usually two observers were on duty at any given time, scanning from port and starboard with binoculars, at an eye height of approximately 2 m above sea level. Survey transects were initiated when swells were less than 0.5 m high and winds less than 28 km/hr with whitecaps extending over less than 15-20% of the surface. Transect routes were selected to: (1) sample representative marine mammal habitats, (2) visit previous locations where Phocoena sinus had been sighted, (3) allow refueling, and (4) provide protected anchorages each night. Even so, local conditions of weather and topography required some changes in initial plans. The actual survey routes are presented in Figure 1. Numbers appearing along the transects correspond to the dates when the routes were traversed. Details of the transects are presented in Table 1. In general, it may be assumed that sighting effort was relatively uniform throughout the daylight hours when the boat was underway, though before 15 March there were occasionally as many as three to four observers at a time.

All sightings of marine mammals were recorded. Sightings usually occurred within 5 km of the vessel. Sighting cues included: fins and backs, blows, leaping animals, the presence of shrimp trawlers, and flocks of birds circling an area. Once a sighting was made, the ship's course was altered to allow identification and estimation of numbers (see Eberhardt, et al., 1979). Once a sighting was confirmed, a suite of environmental data was collected including: (1) time of sighting and duration of observations, (2) water depth to the nearest fathom (1.82 m), using a Furuno FE-500 recording depth sounder, (3) position to the nearest minute of latitude and longitude, using triangulation from landmarks and water depth, or from dead reckoning, (4) surface water temperature (°C), (5) relative water clarity to the nearest

0.5 m, as indicated by the disappearance of a 5x10 cm white plastic rectangle suspended on a measured monofilament line, (6) tidal state, from published tables, (7) estimated sea height and direction, (8) estimated wind speed and direction, (9) viewing conditions, (10) animal activity, and (11) associated species. Mean values for these data are accompanied by standard deviations throughout the text.

When sea lion haul-out areas were encountered, estimates of the number of animals were made by slowly passing the animals generally at a less than 50 m distance and counting. Observers made independent counts. In most cases the distance was sufficient to avoid disturbing the animals. Estimates of this kind were made at Rocas Consag, Isla San Jorge, Isla Lobos, and along the south coast of Isla San Esteban.

Many fishermen and local residents were queried about various marine mammals in the upper Gulf, especially with reference to P. sinus. As this animal appears to be known by various common names such as "vaquita," "duende," and "cochito," we attempted to avoid using such names ourselves, and allowed the observer to use his own. "Cochito" is often used to indicate Delphinus delphis, adding another complication to use of this name.

## RESULTS

In addition to two probable sightings of Phocoena sinus, nine other species of marine mammals were recorded from 204 sightings, including: (1) Odontocete species (toothed whales)--bottlenose dolphin (Tursiops sp.), common dolphin (Delphinus delphis), sperm whale (Physeter catodon), and pilot whale (Globicephala melaena); (2) Mysticete species (baleen whales)--fin whale (Balaenoptera physalus), blue whale (Balaenoptera musculus), minke whale (Balaenoptera acutorostrata), and the gray whale (Eschrichtius robustus); Pinniped species (sea lions)--California sea lion (Zalophus californianus). Sighting and environmental data are summarized in Table 2 for each species, while detailed accounts of the species follow:

### Odontoceti

### Gulf of California Harbor Porpoise (Phocoena sinus)

Two pairs or trios of extremely elusive and very small (approximately 1.5 m) porpoises were encountered from N of Rocas Consag, to within 20 km of Bahía San Felipe (Table 3, Figure 2). The day of the sightings was dead calm and the water was glassy or the animals would surely have evaded us altogether. The closest we were able to approach was an estimated 90 m. When these animals dove they did not swim in a straight line but changed course underwater and reappeared moving in unexpected directions. On two occasions a blunt snout was seen and twice the peculiar "hitching" motion was noticed as an animal surfaced, a feature typical of Phocoena. It occurs as the animal rolls to the surface and an abrupt thrust forward occurs as if propelled by a strong tail beat. Dorsal fins appeared both slightly falcate and triangular, and one photograph shows a falcate profile. This feature has been noted before on sightings of what were presumed to be P. sinus (Norris and McFarland, 1958). Norris and Prescott (1961) described animals seen in San Felipe Bay as follows: "The animals were very wary. Usually two were seen together. When the boat pursued them they took a short breath, arched their tail stocks, and dived without showing their flukes above the surface. They then disappeared for rather long periods of time, coming unobtrusively to the surface in unexpected locations. They never seemed to pursue a straight path under water, but circled and swam long distances to avoid being sighted again. Their dorsal fins seemed to be much more acute than is normal for Phocoena phocoena. In one instance an animal was seen whose dorsal was quite high and had a somewhat curved posterior contour." The correspondence to these earlier observations, including the locality of sighting is strong, but we still reserve judgment on their secure identity.

Bottlenose Dolphins (Tursiops sp.)

The specific identity of Gulf of California bottlenose dolphins remains in question and hence we reserve judgment. Approximately 477 individuals were seen in 58 sightings along both coasts of the upper Gulf (Figure 3, Table 4). They were found further south on the Sonoran coast than on the Baja California coast (28°45'N compared to 29°45'N). Carcasses were found at both Desemboque and Bahía Kino, on the Sonoran coast. Limited observations do not represent range limits but may indicate abundance for the species, since Tursiops is well represented in bays to the south on the Mexican mainland (Bahía Reforma, Bahía Topolobampo, for instance), and Baja California (Bahía de Los Angeles).

Our sightings were generally in shallow water, mostly over mud or sand bottom. This is a common habitat for this genus throughout the world (Nishiwaki, 1972). Sighting frequency relative to depth showed a clear correlation with shallow water (Figure 4). All but one of the sightings were in less than 75 m depth, and most were in less than 20 m. One sighting was in 1170 m depth, in the company of a pilot whale school.

Neither water clarity nor temperature seemed related to range limits, though this species penetrates muddy water whereas others seem to avoid it (e.g.: *Globicephala*).

Groups ranged from 2-75 individuals (Figure 5) and all were within 17 km of shore (Figure 6). Distribution from shore was non-random. Most sightings were less than 5 km from shore, and many records were within a few hundred meters of beach or tidal flats. The species was also common in the vicinity of harbors such as Puerto Peñasco, Puertocitos, and Bahía Kino.

Though there was a possible trend towards increasing group size with increasing depth (Figure 7) we cannot be sure of the influence of small sample size (our data are not significant at the 95% confidence level). Group size did not vary in a regular manner with distance from shore (Figure 8). Significantly smaller groups were found 4.0 to 6.0 km from shore as compared to groups found 2.0 km or less from shore. Nonetheless, the effect may be related to sample size. No group size relations seem associated with tidal state. There may be an increase in group size during mid-to-late afternoon, though our data are not statistically significant (Figure 9). The presence or absence of shrimp trawlers did not seem to affect group size.

Bottlenose dolphins were seen in association with both sea lions (*Zalophus*) and pilot whales (*Globicephala*). The dolphins were frequently seen diving behind shrimp trawlers with nets down (see also Norris and Prescott, 1961, and Leatherwood, 1975). These trawlers create a muddy trail approximately 30 m in width. Sea lions were often seen swimming and diving in and near these trails, often close to the net. Nineteen percent of bottlenose dolphin sightings were associated with such trawlers, and 37.5% of these sightings included sea lions. Most trawling occurs in relatively shallow water along the margins of the Gulf north of Puertocitos on the Baja California coast, and Isla San Jorge on the Sonoran coast.

Six bottlenose dolphins, including a calf, were sighted near the center of a group of 20-25 pilot whales. The whales swam in rank formation in a zig-zag path in Canal de Ballenas. Though the dolphins surfaced more frequently than the whales, they maintained position with these larger animals. The dorsal fins of these dolphins were much more falcate than those of any other group we saw during the survey. Bottlenose dolphins commonly associated with offshore whales may represent populations distinct from the more shore-frequenting groups. A parallel observation of bottlenose dolphins and pilot whale schools off southern California has been recorded (Norris and Prescott, 1961). These latter animals were noted to be much less scarred than animals sighted along the coast. The association of dolphins and pilot whales may have its function in a commensal relationship, with the dolphins utilizing the larger range of pilot whale echolocation, and the efficiency of a spread school in prey location (Norris and Prescott, 1961).

Bottlenose dolphins may be subject to incidental mortality in shark gill nets. We examined three carcasses of bottlenose dolphins on shore in the midst of shark gill netting areas near Desemboque and Bahía Kino, Sonora, but decomposition prevented determination of the cause of death. Such nets are often set perpendicular close to shore and extend several hundred meters offshore.

The different dorsal fin shapes shown by on- and offshore bottlenose dolphins is impressive and may warrant description of these groups as different populations based on the technique of Würsig, et al. (1979). The distinction must remain tentative since insufficient photographs were obtained of the offshore animals to apply statistical analysis.

Mean group size found in this study was (8.68 ± 12.97) between that found for Tursiops truncatus in the waters of the west coast of Florida (4.84 ± 4.31) (Wells, et al., 1980), and that observed for T. truncatus off Argentina (14.90 ± 3.28) (Würsig and Würsig, 1979). Within one portion of the range of T. truncatus off the west coast of Florida, group size varied significantly with the depth and "openness" of the habitat, in a manner similar to the trend noted here (Wells, et al., 1980). Wells, et al. also found no difference in group size as a function of tidal state, though they did note a trend toward increased group size in mid- and late afternoon, just as we noted here.

The incidence of ectoparasites on the tip of the dorsal fins of Gulf of California Tursiops was very high, some fins having several in a cluster. Viewed from a distance these appeared to be barnacles, probably Xenobalanus.

Common Dolphin (Delphinus delphis)

Approximately 3043 common dolphins were counted in 70 groups (Figure 10, Table 5). They were seen throughout the study area, though sightings were most frequent south of 30° 40'N. It was surprising to see a large school (est. 100 animals) at latitude 30°14'N, not far from the small port of El Golfo (or Santa Clara). This school was swimming in rather turbid water as shallow as 16 m, in an area of mudflats and great tidal change.

Three stranded specimens were found on the beach near Desemboque, Sonora. They may have been killed in the shark gill net fishery that operates in this area.

Common dolphins were sighted in water ranging from 16 m to 1100 m in depth. Typically they were found relatively near shorelines and close to abrupt changes in the submarine slope, such as where a shallow shelf ended and descent to deep water began. This parallels the observations of Evans (1975, 1976) and Hui (1979). Hui noted that depth apparently did not influence distribution; rather, animals occurred in areas of high relief, probably in response to the distribution of prey species.

Common dolphins were not associated with human activities. They did not orient to trawlers, and they did not seem to associate with harbor areas, as *Tursiops* did.

Most often they were seen either in fairly tight, synchronously swimming groups, which may be termed traveling schools, or as numerous scattered subgroups milling in an area, apparently feeding. Such schools sometimes spread over several km of sea. Individual common dolphins were never seen far from others of their species. Group size estimates ranged from 2-500+ dolphins (Figure 5); the mean estimated group size being 51 animals.

No significant differences (comparison of 95% confidence intervals) in group size relative to water depth or distance from shore were found (Figures 11 and 12). A bimodal curve of group size vs. time of day (Figure 13) shows peaks of school size early in the morning and in the afternoon. This could relate to the tightening of feeding schools into traveling groups at those times, which could increase our estimates of numbers.

The common dolphin associated with birds and sea lions in what we called "feeding swarms." In these we estimated from 5-300 common dolphins in association with 1-30 sea lions, as well as thousands of sea birds. Typically at least one species of diving bird was present; brown pelicans (*Pelecanus occidentalis*), or brown boobies (*Sula leucogaster*), and one or more surface feeding species such as western gulls (*Larus occidentalis*), California gulls (*Larus californicus*), and Heerman's gulls (*Larus heermanni*). Cormorants (*Phalacrocorax* sp.) were occasionally seen. Following dives that lasted a few minutes, the dolphins and sea lions surfaced nearly simultaneously amidst diving pelicans and boobies. The diving birds were subjected to harassment by wheeling and diving gulls. Activity at the surface continued for several minutes before subsiding into a rest period in which dolphins were less active, birds rested at the surface, and sea lions rested, often with flippers extended above the surface. These quiescent periods sometimes alternated with additional active periods. Feeding bouts tended to occur 50-100 m from the feeding location. Nine major swarms were observed during the study. Swarms sometimes broke into several smaller ones scattered within an area several-hundred meters along the greatest dimension. Although fish were never seen in the swarms, clouds of material resembling scales and fish fragments were observed near the surface, and recorded on the depth sounder to a depth of about 6 meters. A "fishy" odor was noted several times in the vicinity of such swarms. These swarms have parallels with the behavior of the dusky dolphin (Lagenorhynchus obscurus) and the southern sea lion (Otaria byronia) feeding in anchovy schools (Würsig and Würsig, 1980), in which sea lions followed and did not cooperate with the dolphins but were suspected of taking advantage of dolphin fish herding capacities.

Evans (1975, 1976) suggests that Gulf of California common dolphins are distinct from other populations of the species, based on pigmentation and rostrum length. This possibility will be tested by Dr. Evans by looking at our numerous photographs of these animals.

The relatively large numbers of common dolphins of all age classes found by us in March-April, 1979, and by Gisiner, et al. (unpubl. manuscript) in June-July, 1979 in the same areas suggest a healthy population. Fewer animals, in relatively smaller groups were recorded by Balcomb, Villa, and Nichols (1979) even though these observers, like the Gisiner party, passed through what we found to be the areas of greatest concentration for the species. This might indicate a seasonal shift in the population, a pattern much like that found by Hui (1979) for the Delphinus of the Southern California borderland, in which generally smaller groups were found in the fall than at other seasons.

Sperm Whale (Physeter catodon)

Sperm whales were sighted on two occasions, within 22 km of each-other in Canal de Ballenas (Figure 2, Table 3). The first school of at least 10 individuals was swimming eastward at approximately 9 km/hr, in a rough rank. They were visible at the surface about 50% of the time, blowing 5-10 times before submerging for 1-3 minutes. The school was subdivided into subgroups of 2-4 animals. No calves were noted. The speed and direction of swimming did not change during 69 minutes of observation. The second sighting was of a single animal which we did not approach for further observation. Both sightings were 1.9-5.6 km from the Baja California shore, and 1.5-3.5 km from a submerged break of slope 100 m - 1000 m or more below the surface.

Our records were within the previously defined range of the species. Gilmore (1957) described two strandings of sperm whales, one in April, 1953, near San Fèlipe, Baja California, and another in December, 1954, near Cabo Tepoca, Sonora. Balcomb, Villa, and Nichols (1979) report a sighting

240 km south of our record, near the Baja California coast, while a major stranding occurred near Santa Rosalia, Baja California during January 1979. All these records and that of Gilmore (1957) from La Paz, Baja California are from the colder months, and when one considers that the Gisiner party (unpubl. manuscript) failed to sight the species in the summer, the possibility exists of a seasonal movement of the species within and/or into and out of the Gulf of California.

Pilot Whale (*Globicephala melaena*)

It seems probable that two species of pilot whales occupy the Gulf of California; *G. melaena* and *G. macrorhynchus*, the long and short-finned pilot whales respectively. Our sighting, from mid-channel in the Canal de Ballenas, was of animals with distinct, light-colored saddlemarks behind their dorsal fins, a feature present in *G. melaena*, but absent in *G. macrorhynchus*, while one of us (Norris) has identified *G. macrorhynchus* from observations and a specimen obtained further to the south (Figure 2, Table 3). A school of *G. macrorhynchus* was sighted on 9 January 1979 while on board the R/V *Regina Maris* midway between Isla Santa Cruz and the Baja California shore, and a skull of *G. macrorhynchus* was taken from the shoreside bluff of Bahía Amortajada, Isla San José, on 9 January 1979.

It would not be surprising to confirm a cold water pilot whale from the upper Gulf in the Canal de Ballenas area since many other cold water animals, including several species of fish and invertebrates, are isolated there probably by a temporary southward incursion of cool water in the fairly recent geologic past (Hubbs, 1948).

Twenty to twenty-five individuals, including two calves and several juveniles, swimming in rank formation in 5-8 animal subgroups moved in a slow zig-zag path to the NNW. They spent much time at the surface. As mentioned earlier, a group of six *Tursiops* accompanied the pilot whales. Several breaches by the whales were observed.

Though pilot whales are probably abundant in the Gulf, neither Van Gelder (1960) in a March-May cruise, nor Gisiner, et al. (unpubl. manuscript) in mid-summer reported them, suggesting seasonal changes in abundance.

Mysticeti

Fin Whale (*Balaenoptera physalus*)

Sixteen fin whale sightings were recorded (Figure 14, Table 6). These consisted of as many as 21 whales seen in a single field of vision. All sightings were in the western Gulf, south of 30°18'N. Distribution with depth was not random

(Figure 15). Most sightings were close to the 180 m contour, or shallower, but ranged from 26 m to over 550 m. All but one sighting were less than 11 km from shore (Figure 16). The single exception occurred in 180 m depth where the contour was relatively far from shore. Fin whales were found in water varying in temperature from 14-19.5°C, with water clarity of 3-13 m.

Although sometimes many whales were in sight at one time, usually only 2-4 swam together. As many as 12 animals were seen within 2 km of our traverse. One small whale, perhaps 10 m in length, was seen. Contact seemed to occur frequently within the small groups, including repeated surfacing by one pair with their ventral surfaces touching.

What was probably feeding behavior was seen several times. Several individuals were seen at the surface with baleen exposed, or were seen rising out of the water to approximately the level of the pectoral flippers, then rolling onto one side with water streaming from their mouths through exposed baleen plates.

Fin whale reports from the Gulf are frequent and support the idea that there may be a permanent population there (Gilmore, 1957). Van Gelder (1960) reported 70 or more in or near Bahía San Luis Gonzaga during May, 1957. Gisiner et al. (unpubl. manuscript) found fin whales in the midriff area during July, 1979. Balcomb, et al. (1979) observed fin whales in the same area during December, 1978. This situation merits further study since the fin whale is usually migratory. Interesting questions about feeding, mating, and calving, and the physiological changes normally associated with migration come to mind.

Blue Whale (*Balaenoptera musculus*)

Blue whales were seen three times during the survey (Figure 2, Table 3). All sightings were in the western half of the Gulf, south of 30°00'N, near the 180 m contour. Two pairs and a single whale were seen. One pair was composed of a large whale and one only 3/4 its length, though we were not close enough to make a reliable estimate of length, except in a case in which the animal was estimated to be 25 m in length. Both pairs were traveling steadily on a straight course, while the single individual milled and surfaced repeatedly in a single area.

Leatherwood, et al. (1972) reported blue whales near the mouth of the Gulf of California, and Norris, et al. (in press) reported blue whales in January, 1979, feeding over a 65 m bank off Bahía Reforma, northernmost Sinaloa, Mexico. One whale was approximately 24 m in length while the other was considerably smaller.

Thus our records are the northernmost for this species for the Gulf of California.

Minke Whale (Balaenoptera acutorostrata)

Two individuals were seen in the upper Gulf, northeast of San Felipe, near a current rip (Figure 2, Table 3). In one case a whale approached within 5 m of our vessel. Leatherwood et al. (1972) reported the species near the mouth of the Gulf, and Balcomb, et al. (1979) observed a minke whale near Isla San Pedro Martir, south of our survey area. Thus our record is the northernmost for this species for the Gulf of California.

Gray Whale (Eschrichtius robustus)

A single gray whale, apparently a yearling, was seen 1.6 km off Punta San Isabel, Baja California, headed north (Figure 2, Table 3). The animal avoided the vessel.

This gray whale had apparently strayed from the normal migratory route on the western or ocean coast of Baja California. Brownell (1971) reported a stranded specimen from about 16 km southeast of El Golfo de Santa Clara. Patten and Samaras (1977) summarized aberrant sightings of gray whales. They reported a sighting in May, 1972, of a "large number" of gray whales in Canal de Ballenas, between Isla Angel de la Guarda and Isla San Lorenzo. They suggested that some individuals or groups of gray whales do not participate in the established pattern of migration and that populations appear to reside throughout the year in the Gulf of California. Whether our sighting was a year-around resident, or a confused migrator remains unknown, but it appears to be one of the northernmost records of a gray whale for the Gulf of California.

In January, 1979, Norris, et al. (in press) revisited Bahía Reforma on the Sonora-Sinaloa coast, where Gilmore et al. (1967) had seen gray whales, and did not see any. Norris and party also documented a gathering presumed to be composed of males, juveniles and non-parturient females at Cabo San Lucas, Baja California. This locality at the tip of Baja California could possibly lead to navigational mistakes by migrating gray whales, especially inexperienced juveniles. A traverse of only a few kilometers to the east of this tip of Baja California would route any northward moving whale into the Gulf rather than up the outer coast toward Alaska. Our suspicion is that such errors may be relatively common and that Gulf populations are transients rather than established groups. This view may be strengthened by the fact that numbers of gray whales in the Gulf seem to fluctuate greatly.

## Pinnipedia

California Sea Lion (Zalophus californianus)

Sea lions were the most ubiquitous marine mammal observed throughout the upper gulf of California (Figure 17, Table 7). Most sightings were near shore, especially near haul-out areas on islands, and included all age classes, (Table 8). Distribution was not random with regard to depth. Most were seen in water less than 125 m deep and within 10 km of shore (Figure 16). Sightings were in water varying in temperature from 14-21°C, with 1-13 m visibility, including animals within the murky harbor at Puerto Peñasco, Sonora.

Sea lions were frequently seen traveling individually or in small groups of 2-3 animals, or resting on the surface with appendages in the air. Large groups were seen only in the feeding swarms described for Delphinus or near haul-out areas.

One stranded carcass bore the bite marks of a large shark.

Gisiner, et al. (unpubl. manuscript) report that the majority of the northern Gulf population is concentrated in the midriff region. This is consistent with our observations, though many animals were observed near the islands farther north. Gisiner, et al. (unpubl. manuscript) estimate 15,800-19,200 sea lions in the Gulf of California, including areas to the south of our study area. This is much higher than earlier estimates of Mate (1977) and Lluch (1966).

Sea lions seem to tolerate man's presence well in the Gulf of California, although they are taken for bait (personal communication) and incidentally killed in trawlers and gill nets; this is demonstrated by their scattered remains on beaches.

## DISCUSSION AND CONCLUSIONS

The Gulf of California has a diverse marine mammal fauna. Attemps to define and differentiate the ecological niches of Tursiops and Delphinus, and Balaenoptera musculus and B. physalus could not be made on the basis of physical factors such as water temperature, depth, water clarity and distance from shore; no significant differences at the 0.05 level of significance were found (Mann-Whitney U Test). There is a distinction between concentrations of Tursiops and Delphinus at the northern end of the Gulf, but sightings overlap further south. Differences in feeding habits seem to be present; Tursiops habitually follows trawlers, while

*Delphinus* never does. We saw fin whales apparently feeding, but have no evidence that the blue whales seen were feeding.

The Gulf of California Harbor Porpoise, *Phocoena sinus*, seems rare, though its shy nature and difficulties in observing it in all but the calmest seas makes such a conclusion uncertain. It was unknown to many fishermen, who one might expect should have been familiar with it.

This report is a beginning on typification and quantification of the Gulf of California marine mammal fauna. Similar information is needed from other seasons and years and from further south in the Gulf before the dynamics of the populations will begin to be known.

## RECOMMENDATIONS

1. There remains a need to obtain baseline abundance, distribution, and natural history information for the marine mammals of the Gulf of California through all seasons before assessments of changes in their status can be made. Capture for marking and use of the harmless lavage technique (Hall, 1977) would allow determination of movements and an understanding of the part played by some of these animals in the food web.

2. Periodic surveys of the Gulf of California are recommended to monitor the status of the fauna over the next 5-10 years. Perturbations of the waters of the Gulf should be monitored in conjunction with the surveys.

3. The status of *Phocoena sinus* warrants particular attention, as a small and possibly decreasing population is suggested. A coordinated study using a small aircraft to locate potential porpoise schools, in communication with a small boat that could confirm identifications and to observe the animals might be useful. In addition, an intensive effort to determine the range of the species from beach-cast skeletal materials and reports from fishermen should be undertaken. The fishermen might also be able to provide fresh specimens from incidental net kills that could provide much natural history information.

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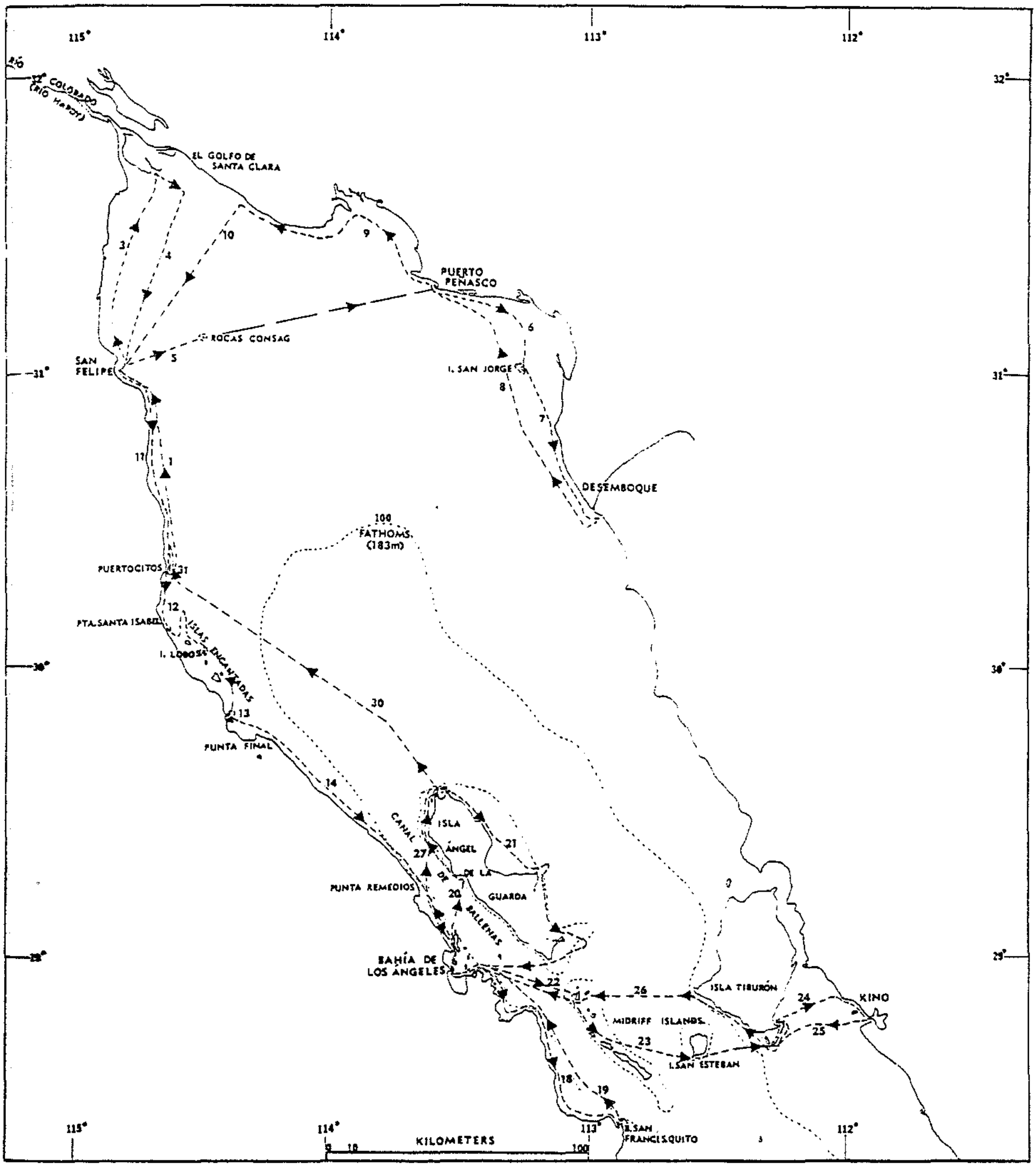



Figure 1

Survey route through the Gulf of California. Short-dash lines represent daylight transects. Long-dash lines represent night traverses (when no sightings were made). Numbers designate day of the month route was traversed.

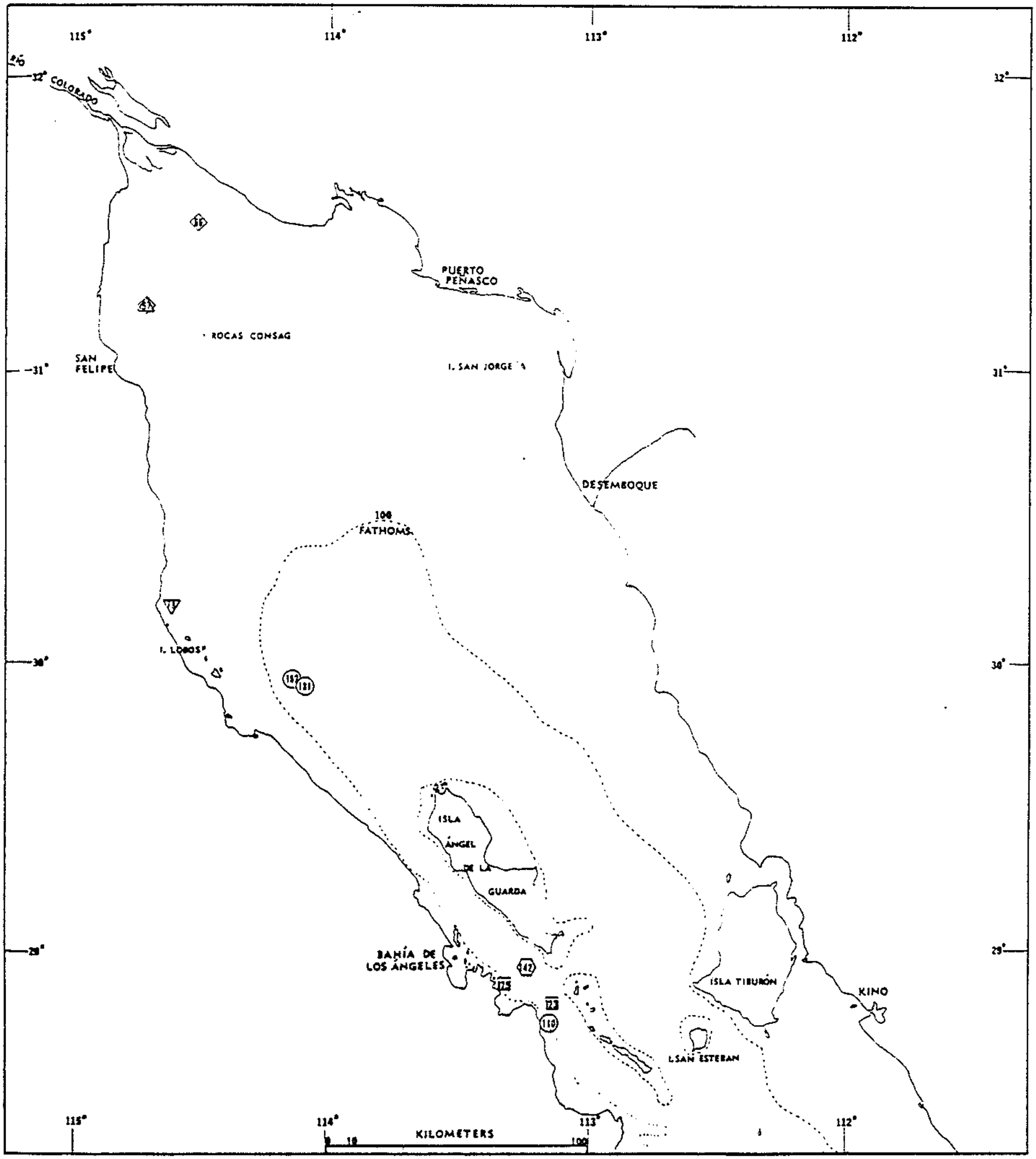



Figure 2
Sightings of Phocoena sinus, ◇ , Physeter catodon, □ Globicephala melaena, ⬡ , Balaenoptera musculus, ○, Balaenoptera acutorostrata, △, and Eschrichtius robustus, ▽ , in the Gulf of California. Numbers within symbols are the sighting numbers from Table 3.

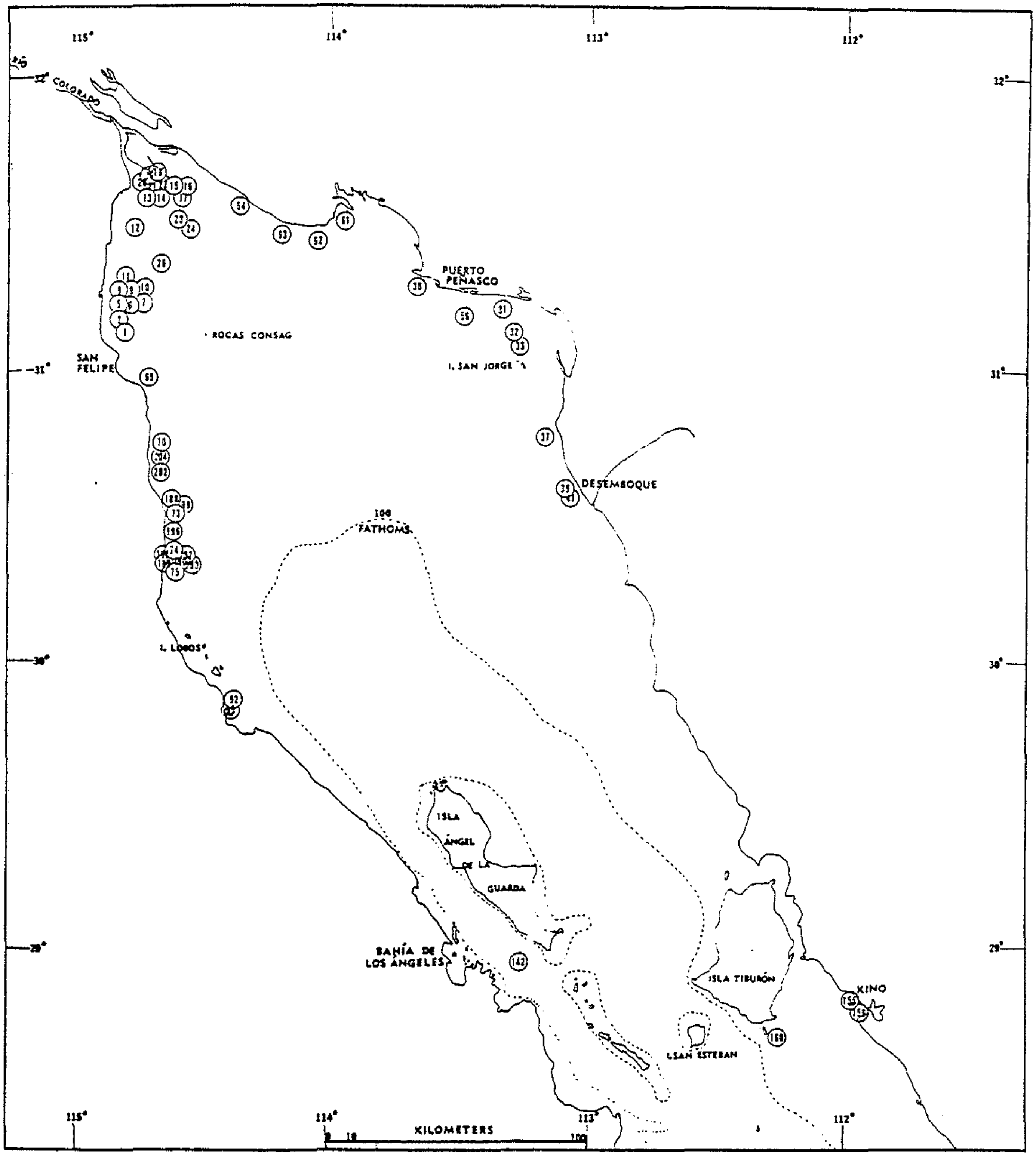



Figure 3

Sightings of *Tursiops* sp. in the Gulf of California. Numbers within circles are the sighting numbers from Table 4.

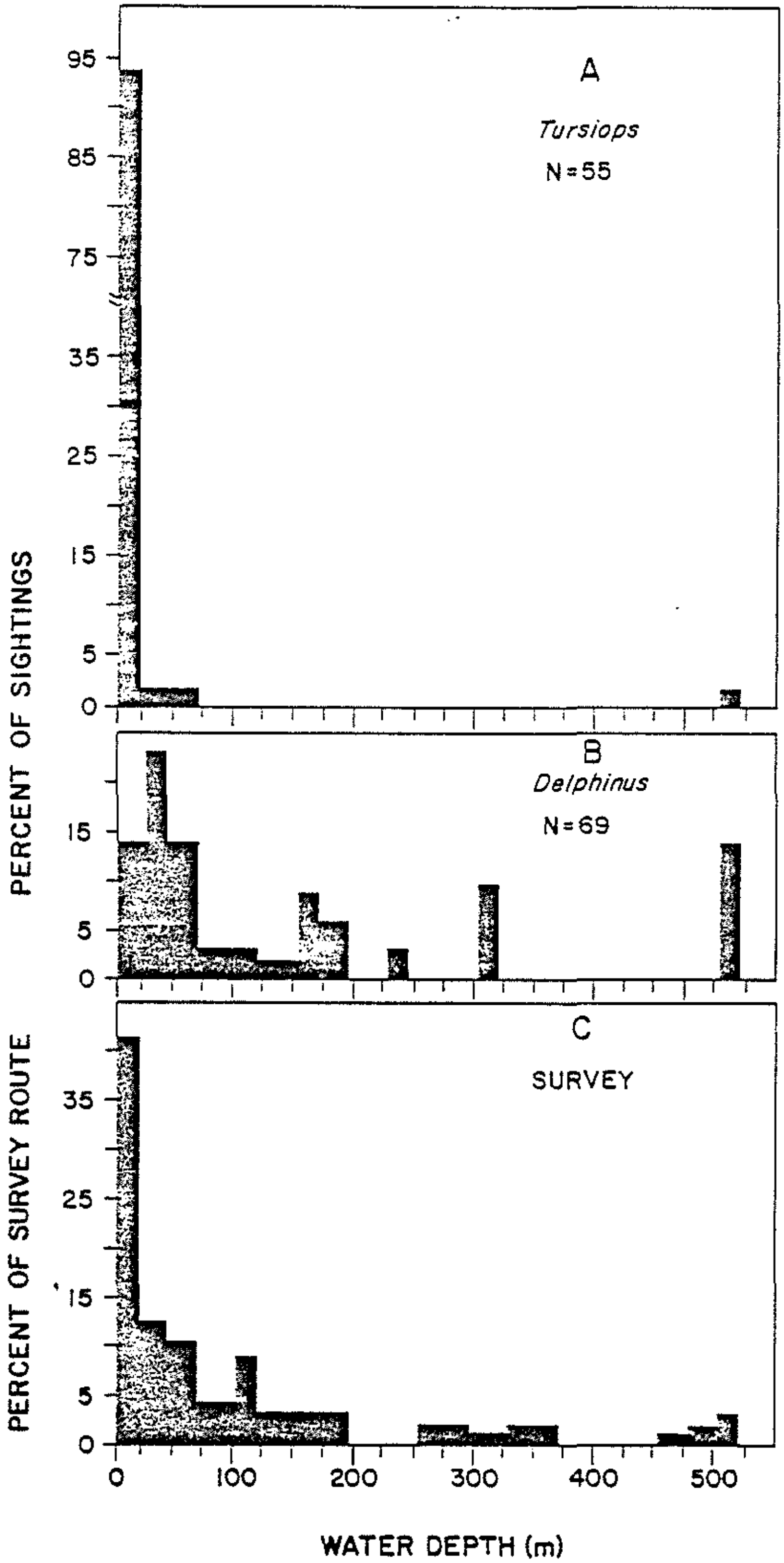



Figure 4

Percent of sightings of groups of Tursiops sp. (A) and Delphinus delphis (B) vs. 25 m divisions of water depth. Percentages of the total number of kilometers of the survey that were through waters of given depth are presented in C for comparison.

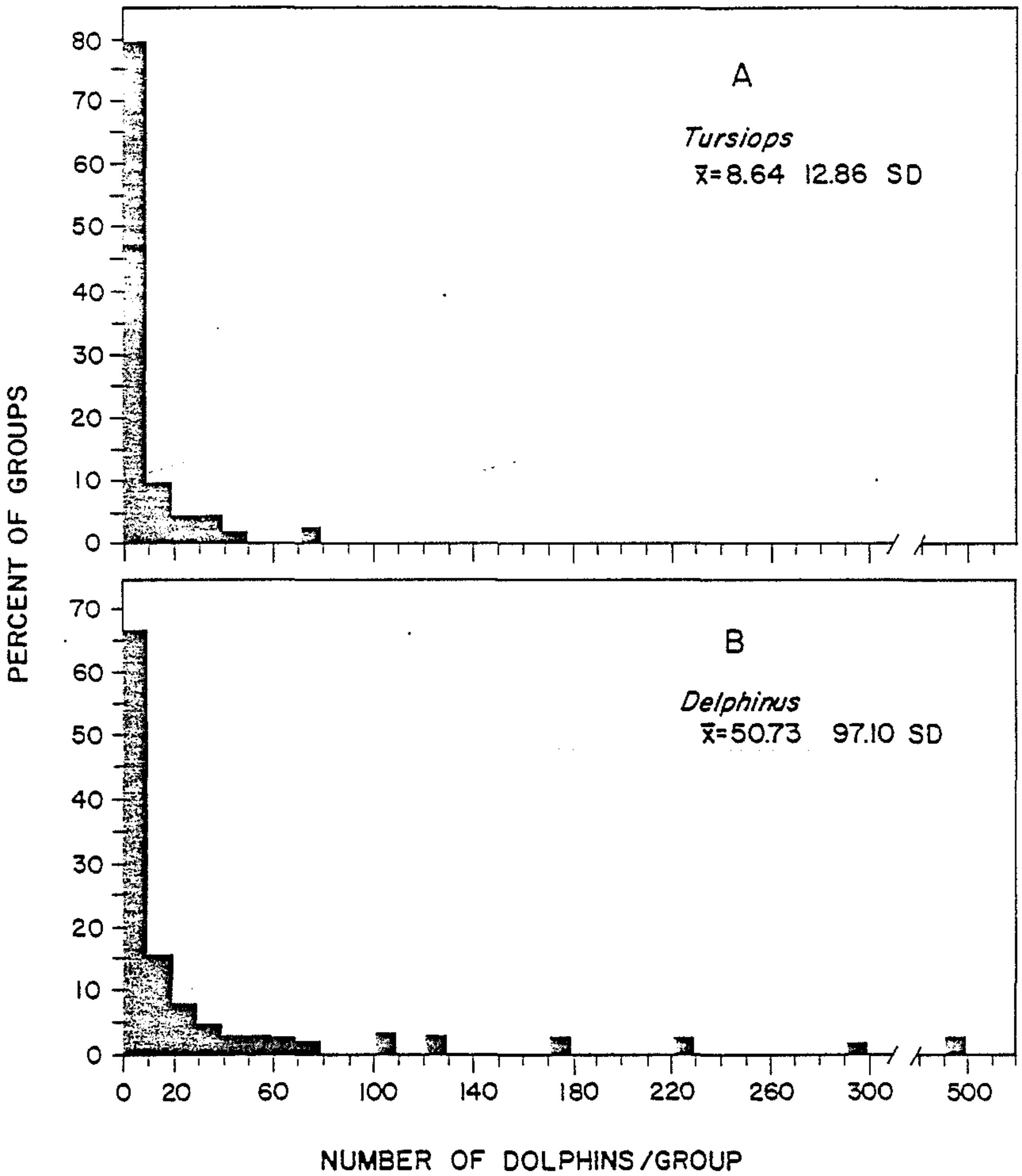



Figure 5

Frequency of occurrence of groups of given numbers of individuals of *Tursiops* sp. (A) and *Delphinus delphis* (B).

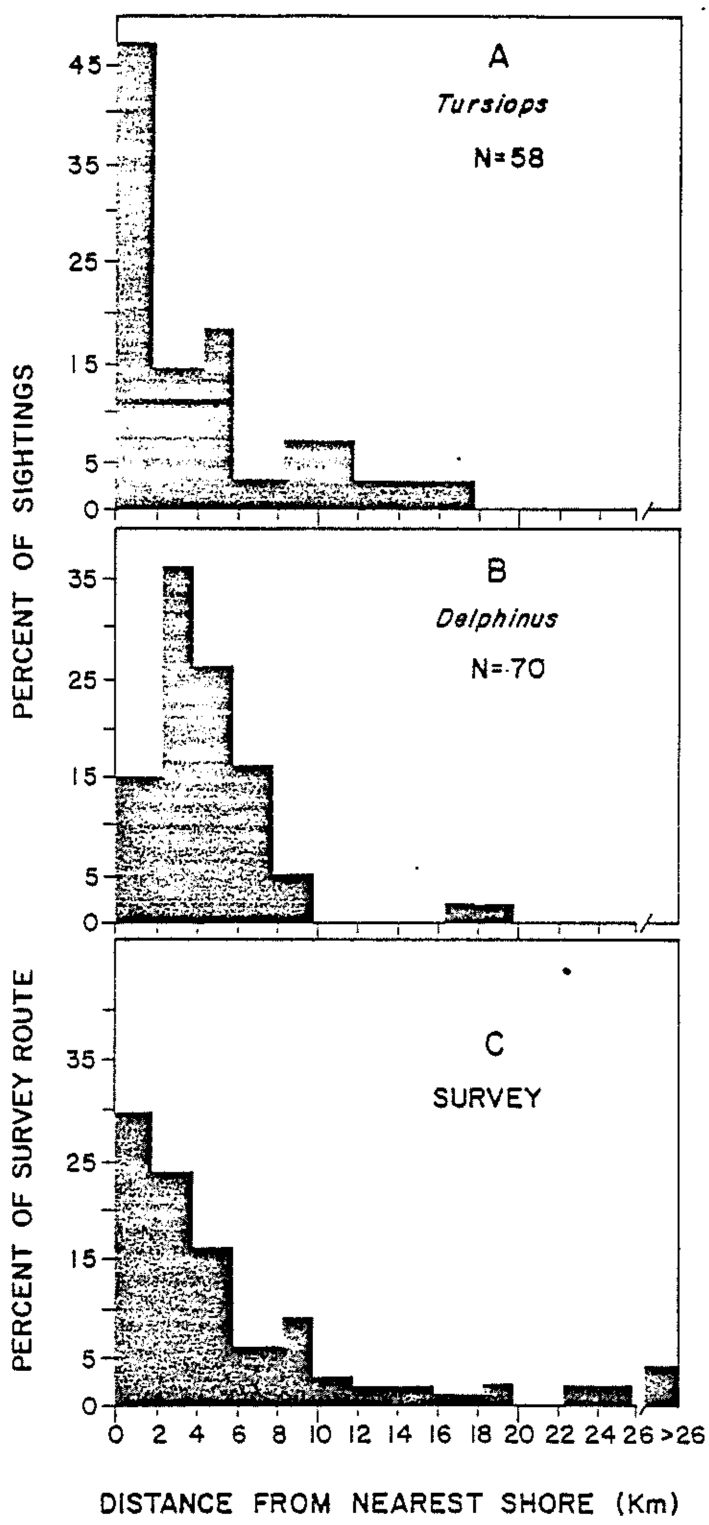



Figure 6

Percent of sightings of groups of *Tursiops* sp. (A) and *Delphinus delphis* (B) vs. distance from nearest shore. Percentages of the total number of kilometers of the survey that were within the given distance categories are presented in C for comparison.

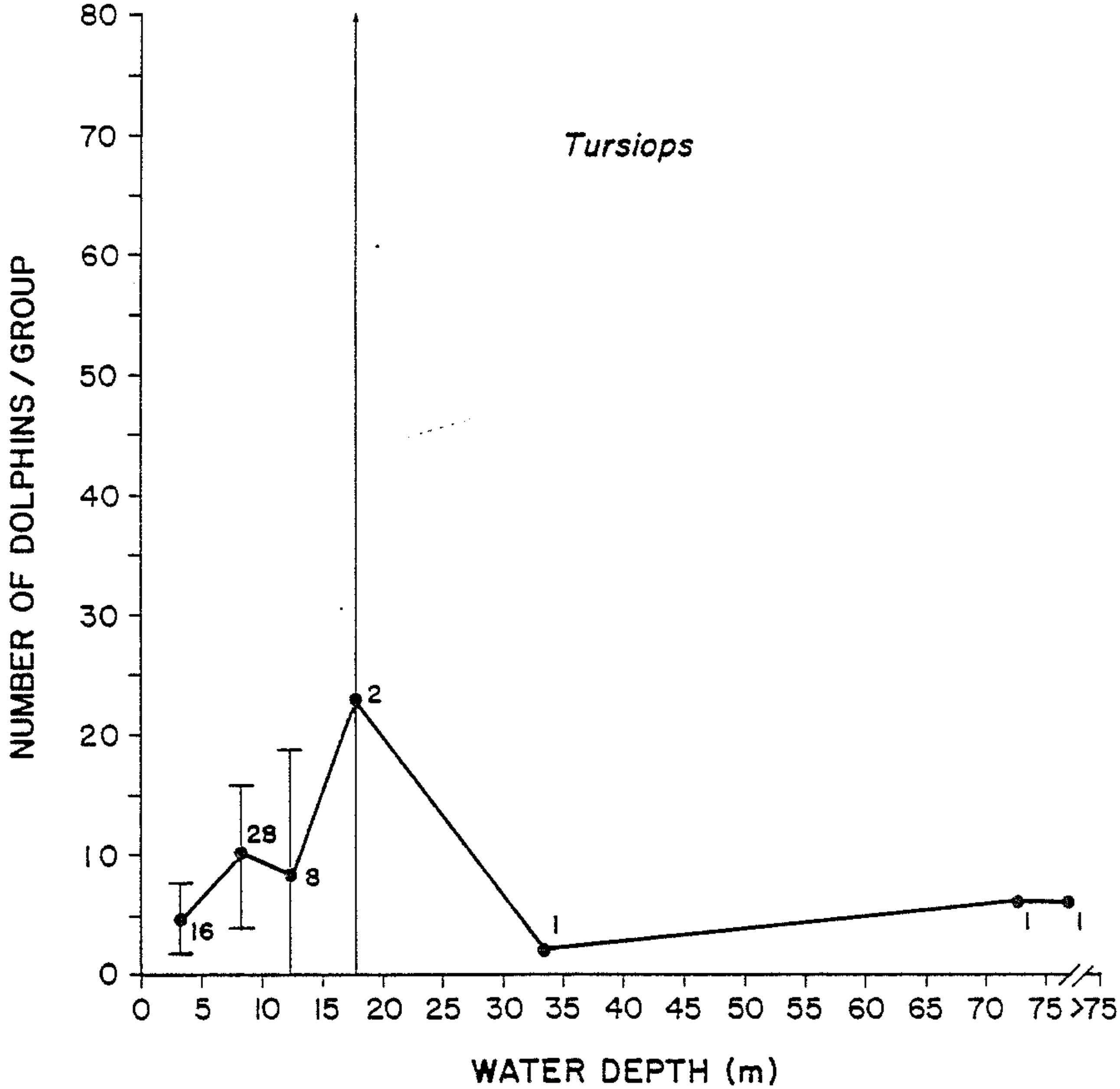



Figure 7

Group size vs. water depth for Tursiops sp.; mean group size and 95% confidence limits are presented graphically. Sample sizes appear by means.

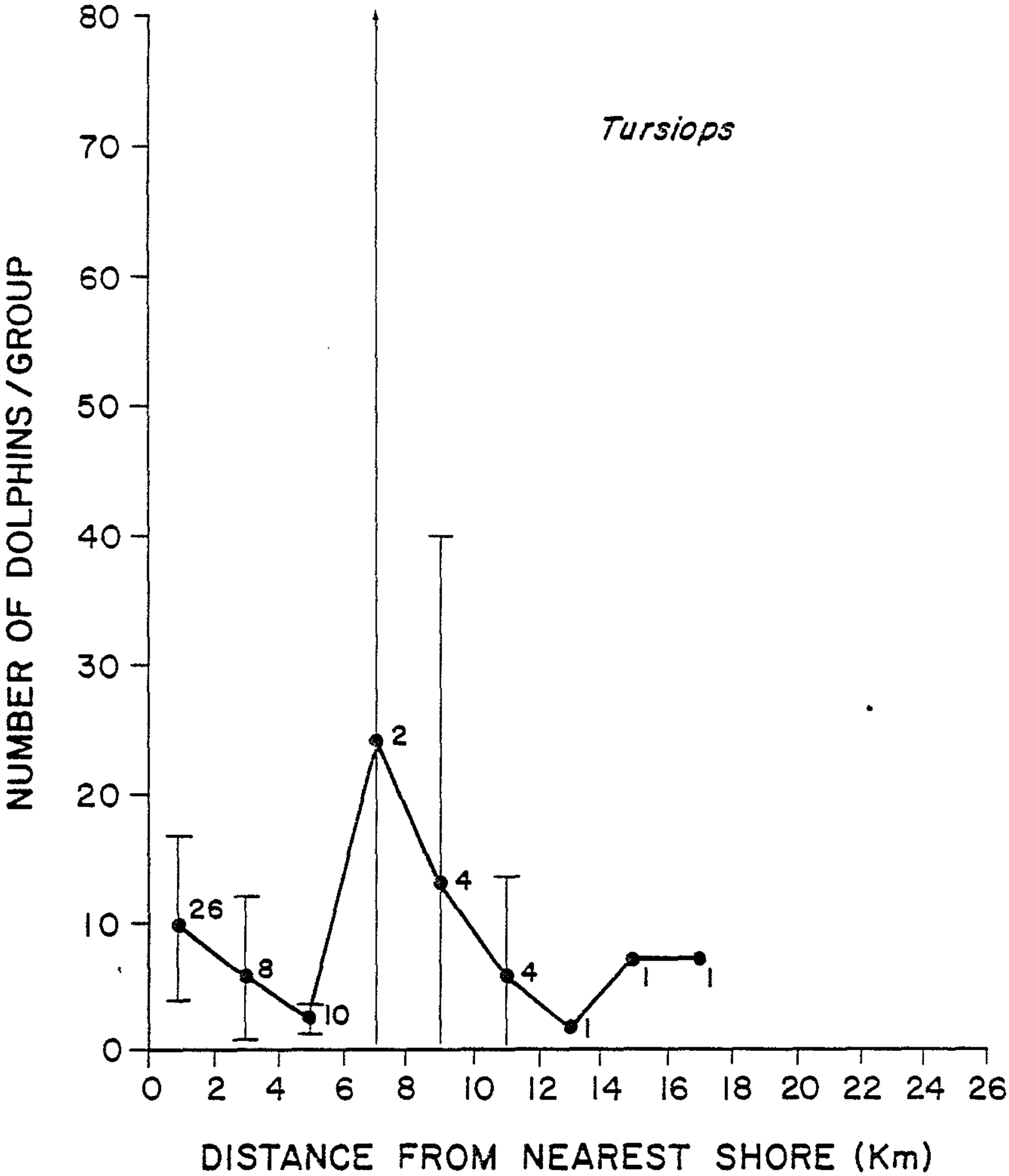



Figure 8

Group size vs. distance from nearest shore for Tursiops sp.; mean group size and 95% confidence limits are presented graphically. Sample sizes appear by means.

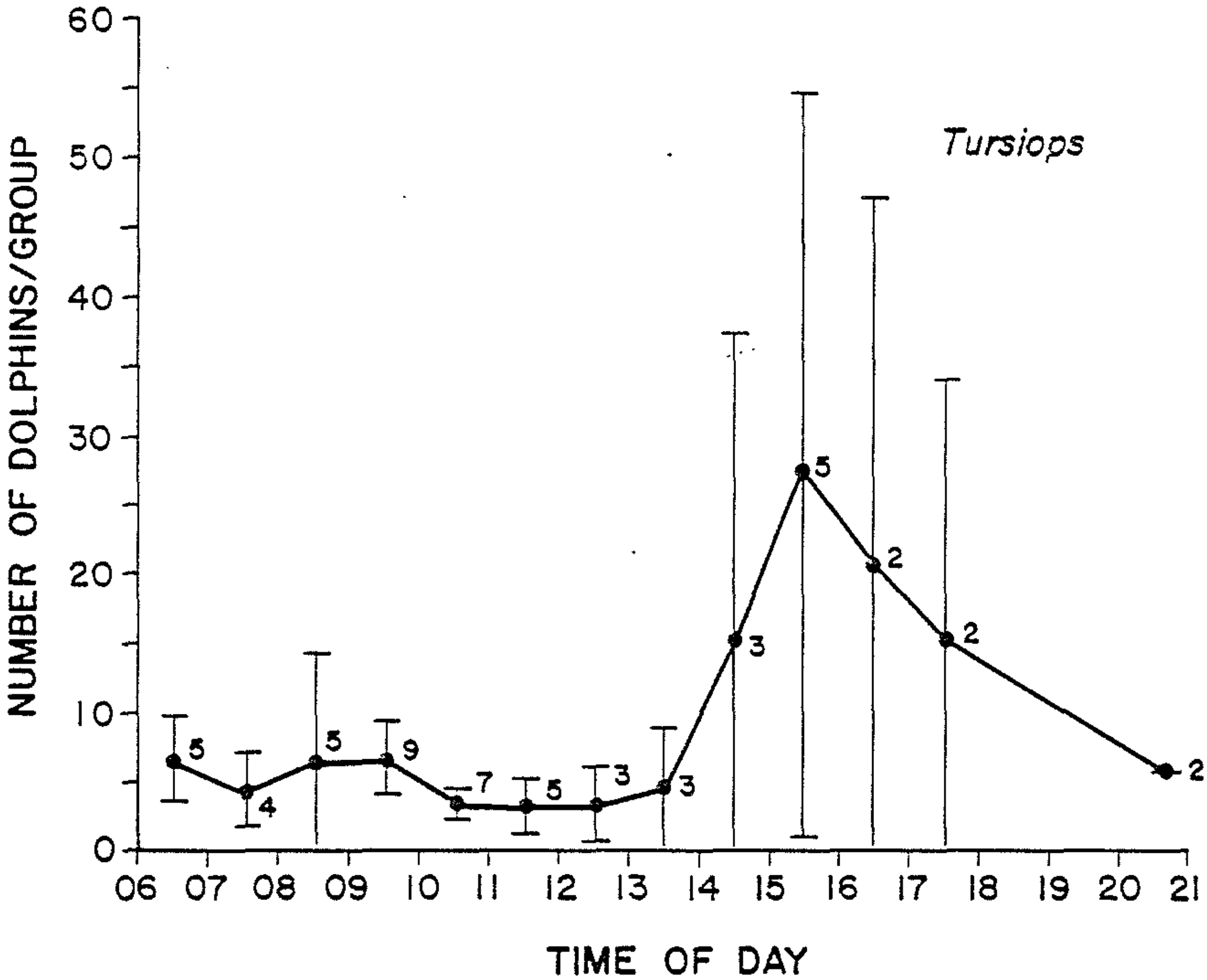



Figure 9

Group size vs. time of day for Tursiops sp.; mean group size and 95% confidence limits are presented graphically. Sample sizes appear by means.

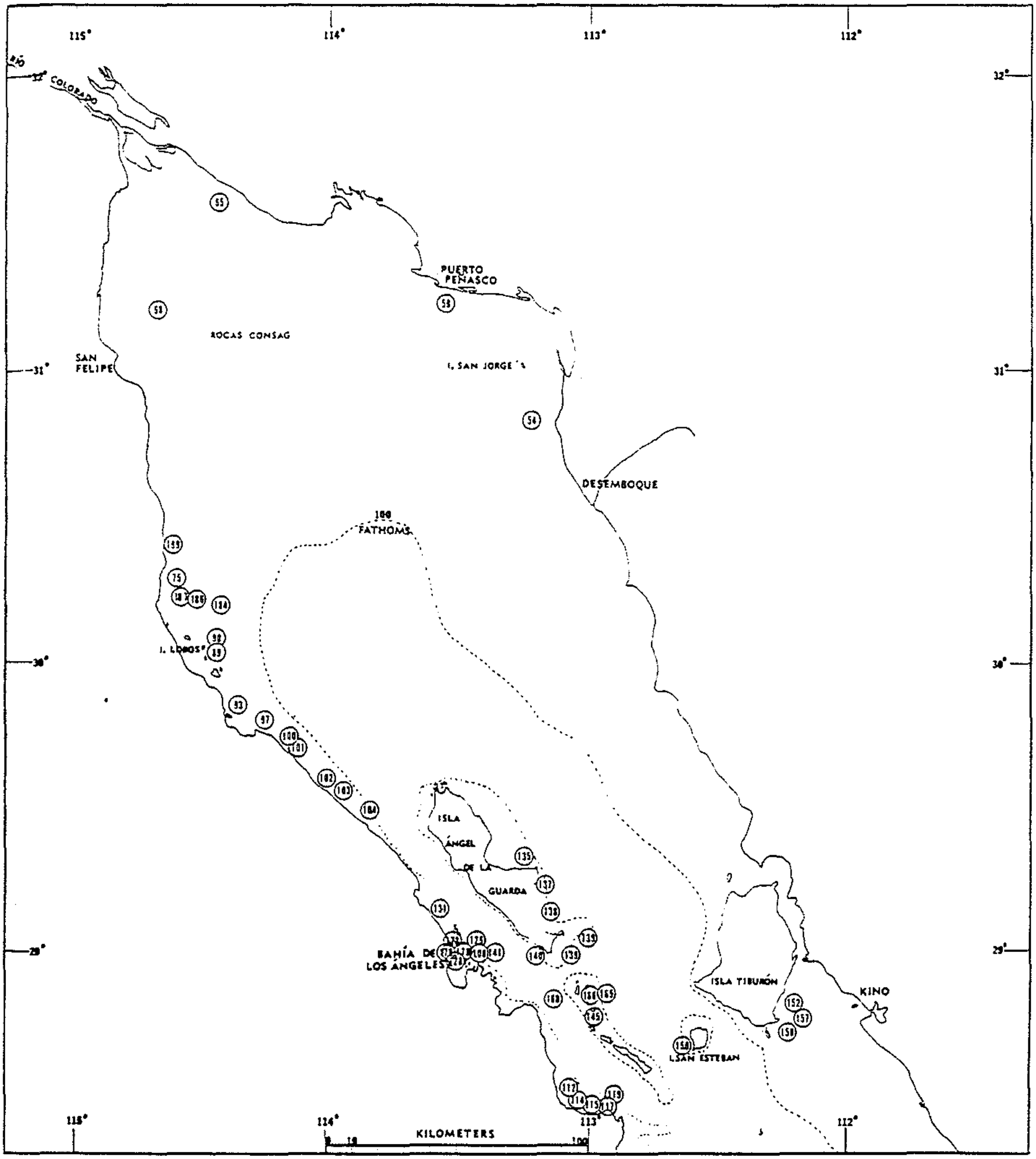



Figure 10

Sightings of Delphinus delphis in the Gulf of California. Numbers within circles are the sighting numbers from Table 5.

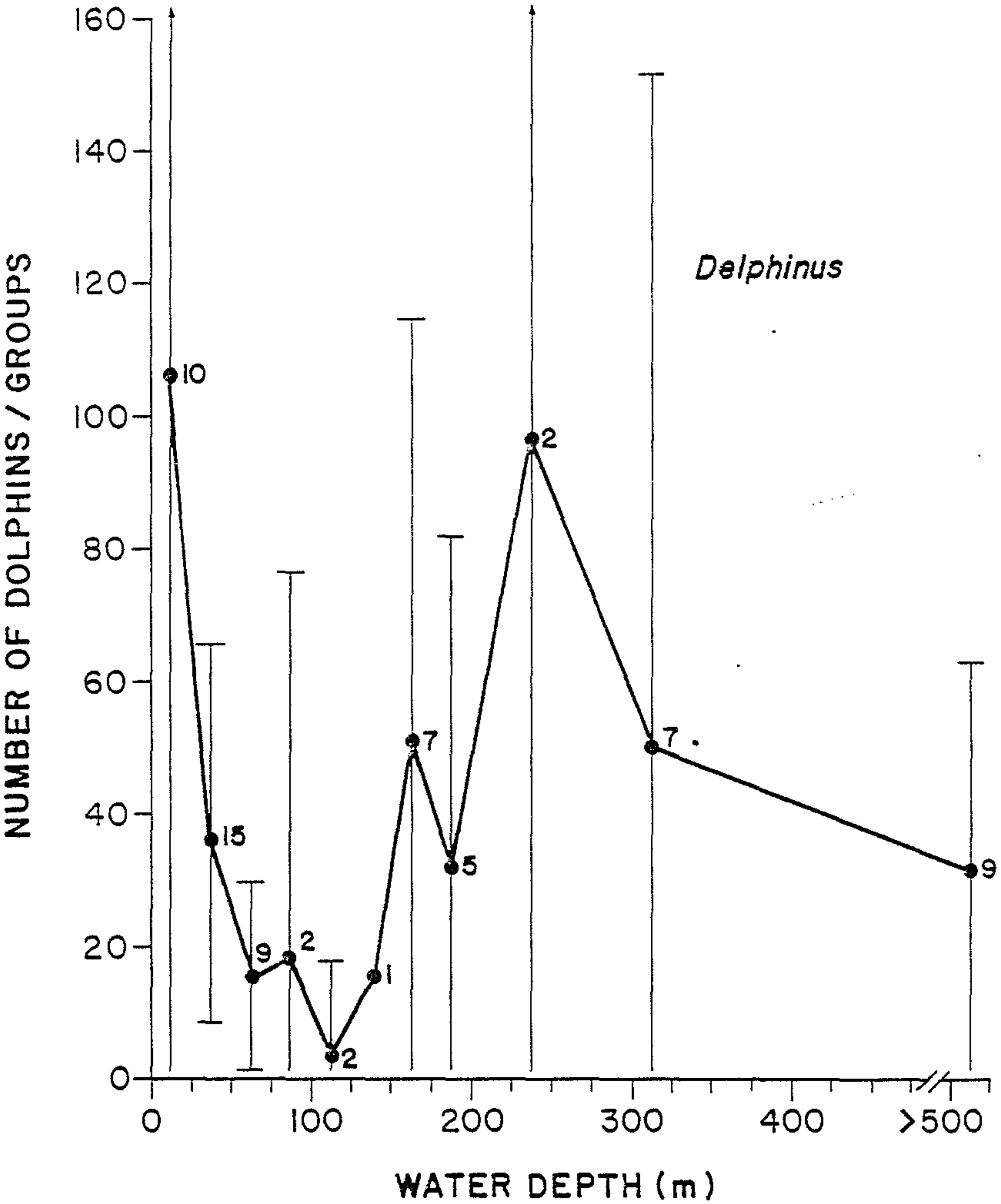



Figure 11
Group size vs. water depth for Delphinus delphis; mean group size and 95% confidence limits are presented graphically. Sample sizes appear by means.

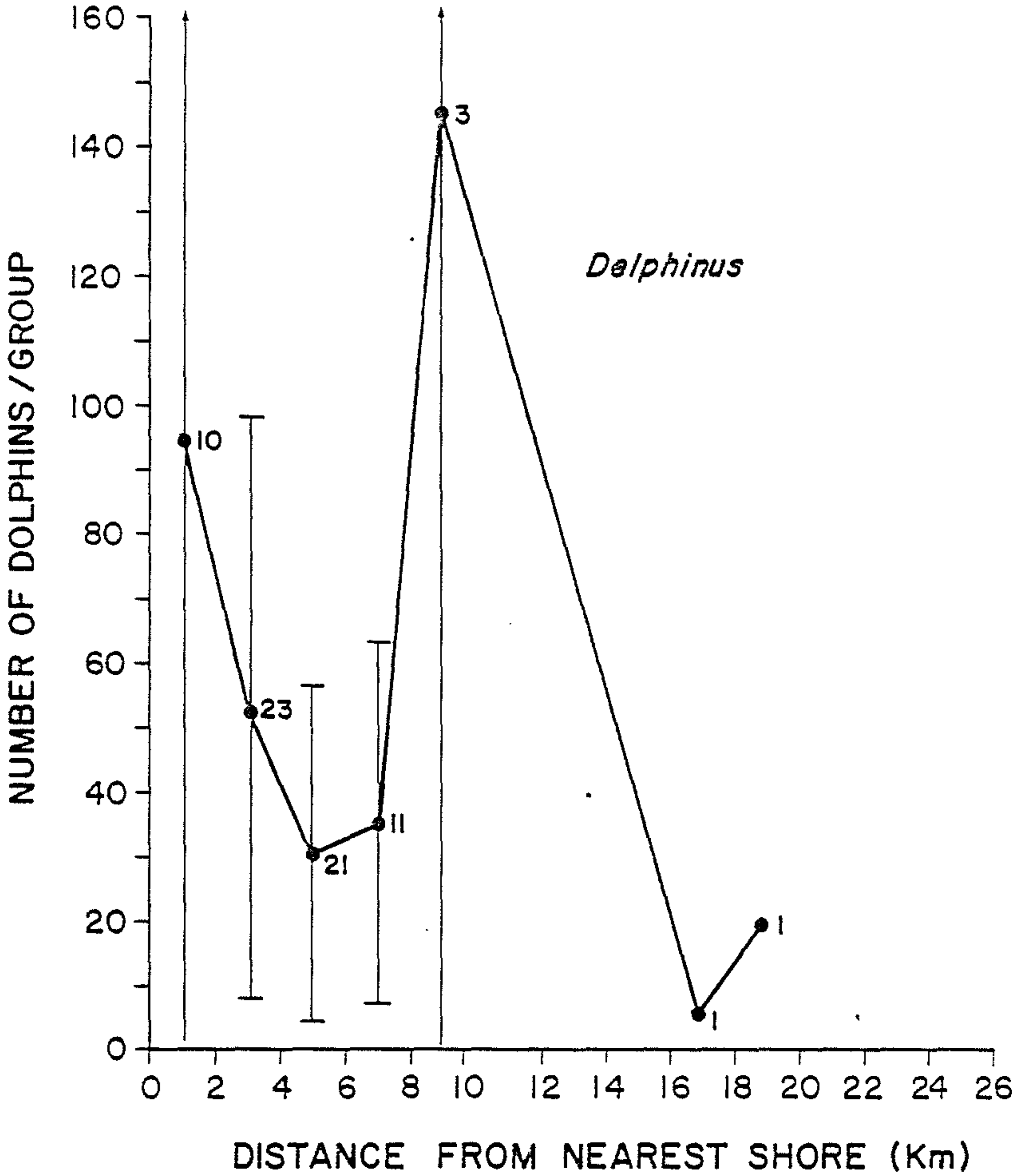



Figure 12

Group size vs. distance from nearest shore for Delphinus delphis; mean group size and 95% confidence limits are presented graphically. Sample sizes appear by means.

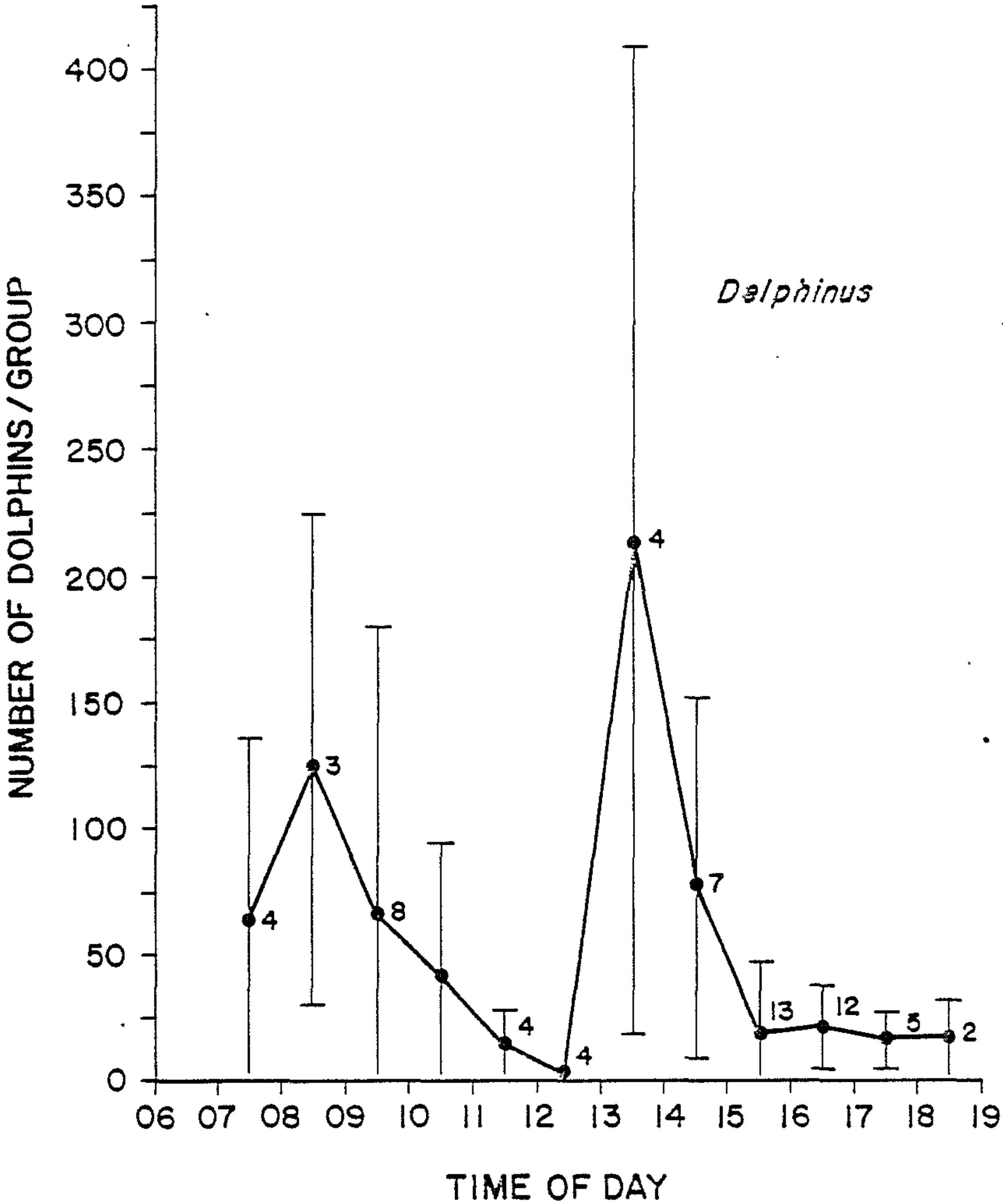
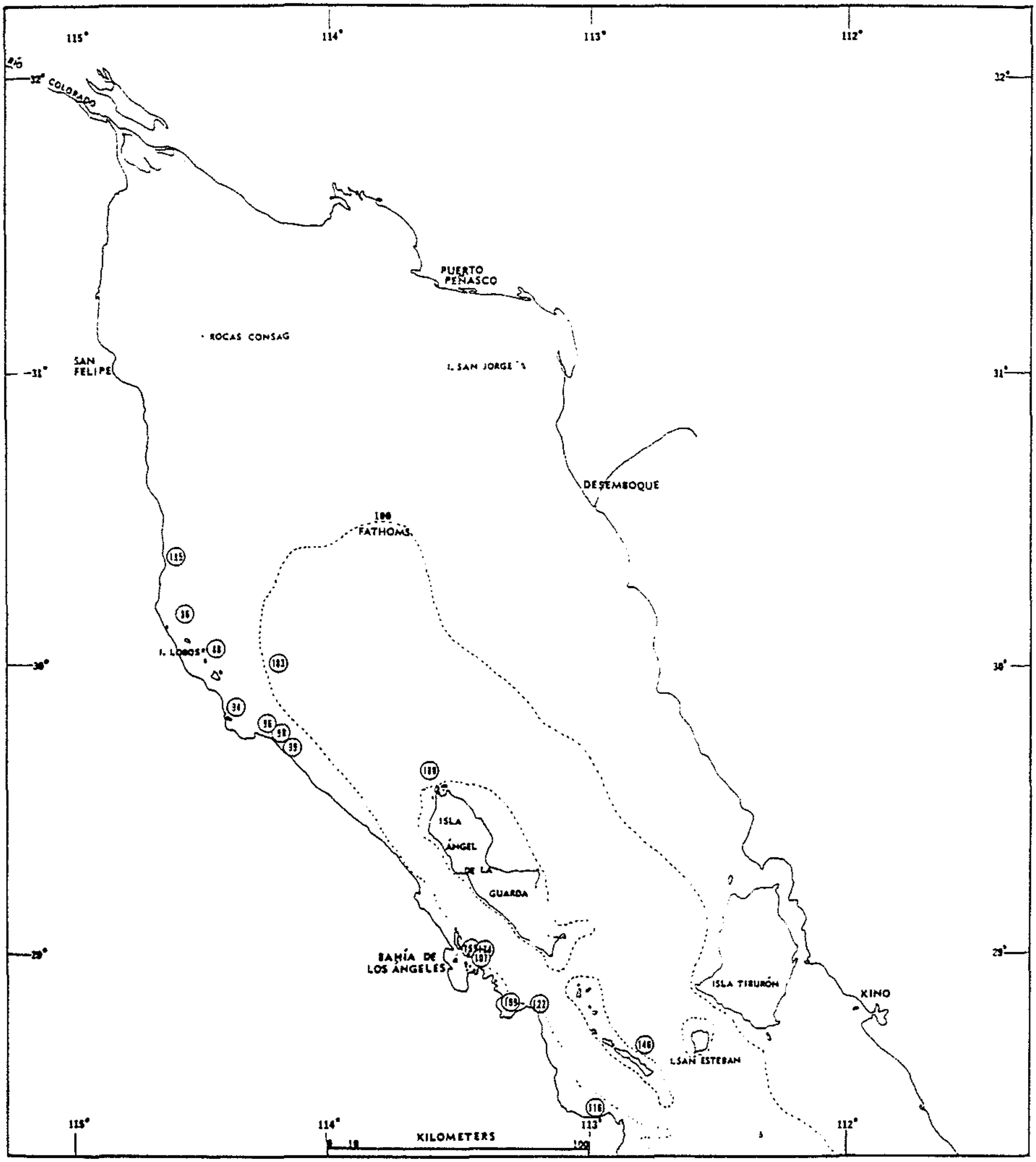



Figure 13

Group size vs. time of day for Delphinus delphis; mean group size and 95% confidence limits are presented graphically. Sample sizes appear by means.




<u>Figure 14</u>

Sightings of <u>Balaenoptera</u> <u>physalus</u> in the Gulf of California. Numbers within circles are the sighting numbers from Table 6.

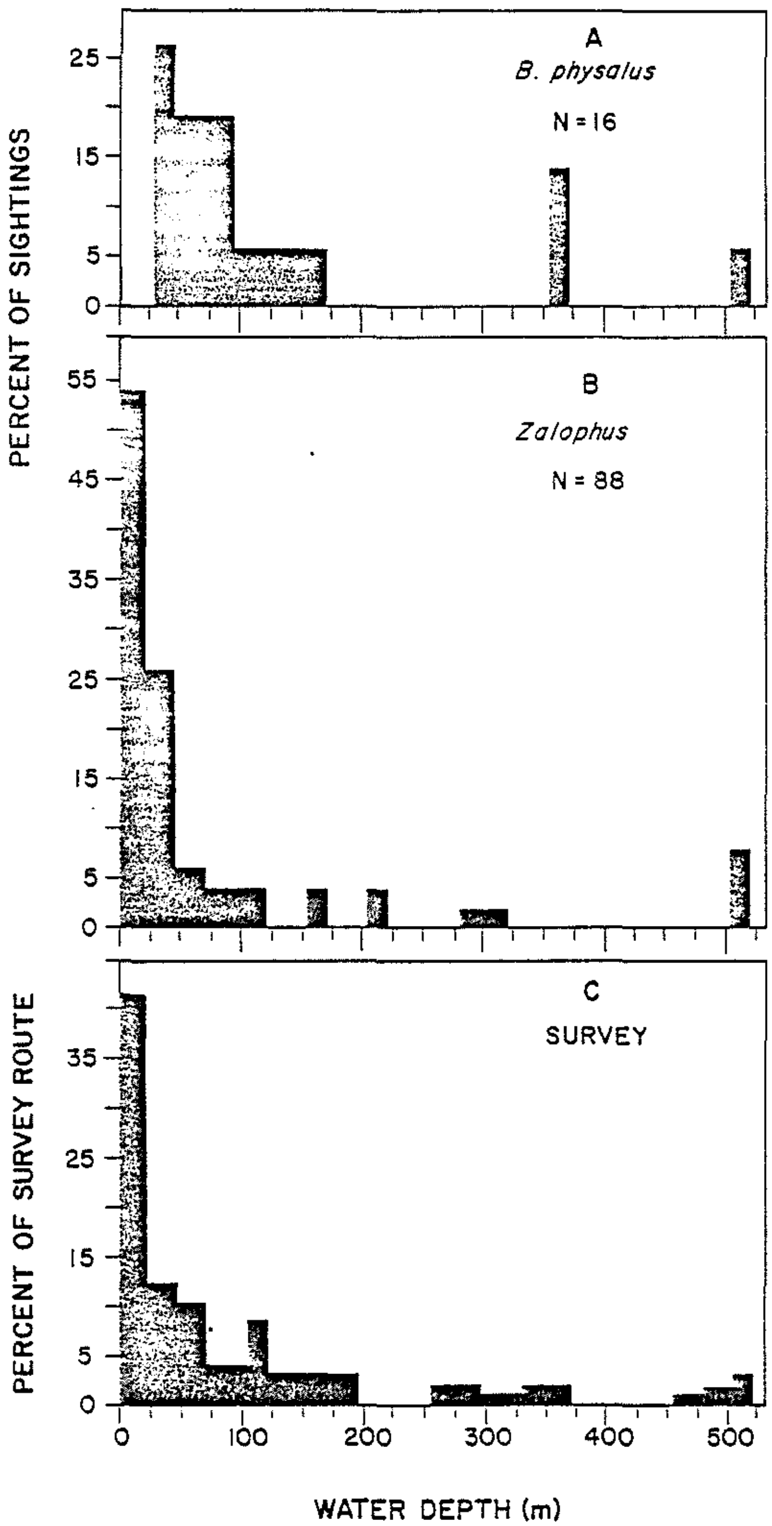



Figure 15

Percent of sightings of Balaenoptera physalus (A) and Zalophus californianus (B) vs. water depth. Percentages of the total number of kilometers of the survey that were through waters of given depth are presented for comparison in C.

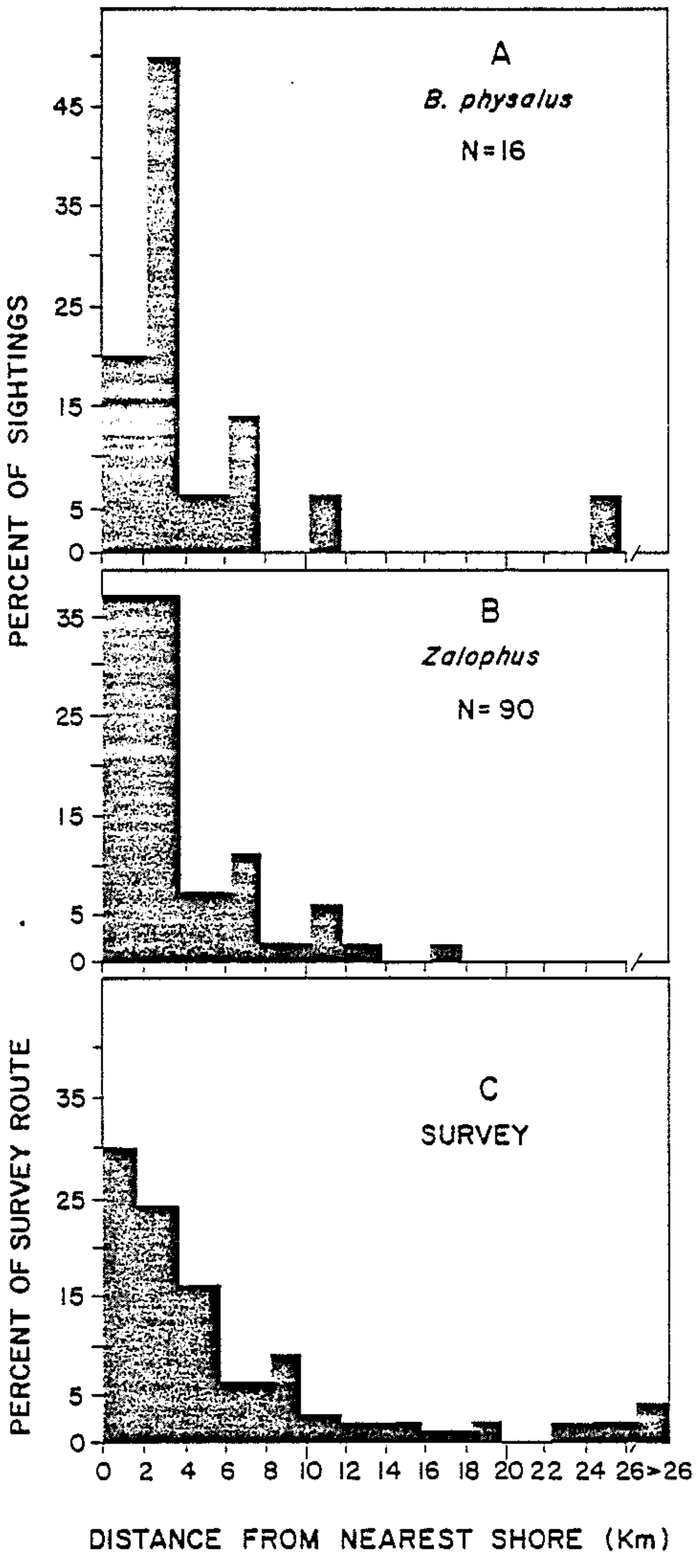



Figure 16

Percent of sightings of Balaenoptera physalus (A) and Zalophus californianus (B) vs. distance from nearest shore. Percentages of the total number of kilometers of the survey that were within given distance categories are presented for comparison in C.

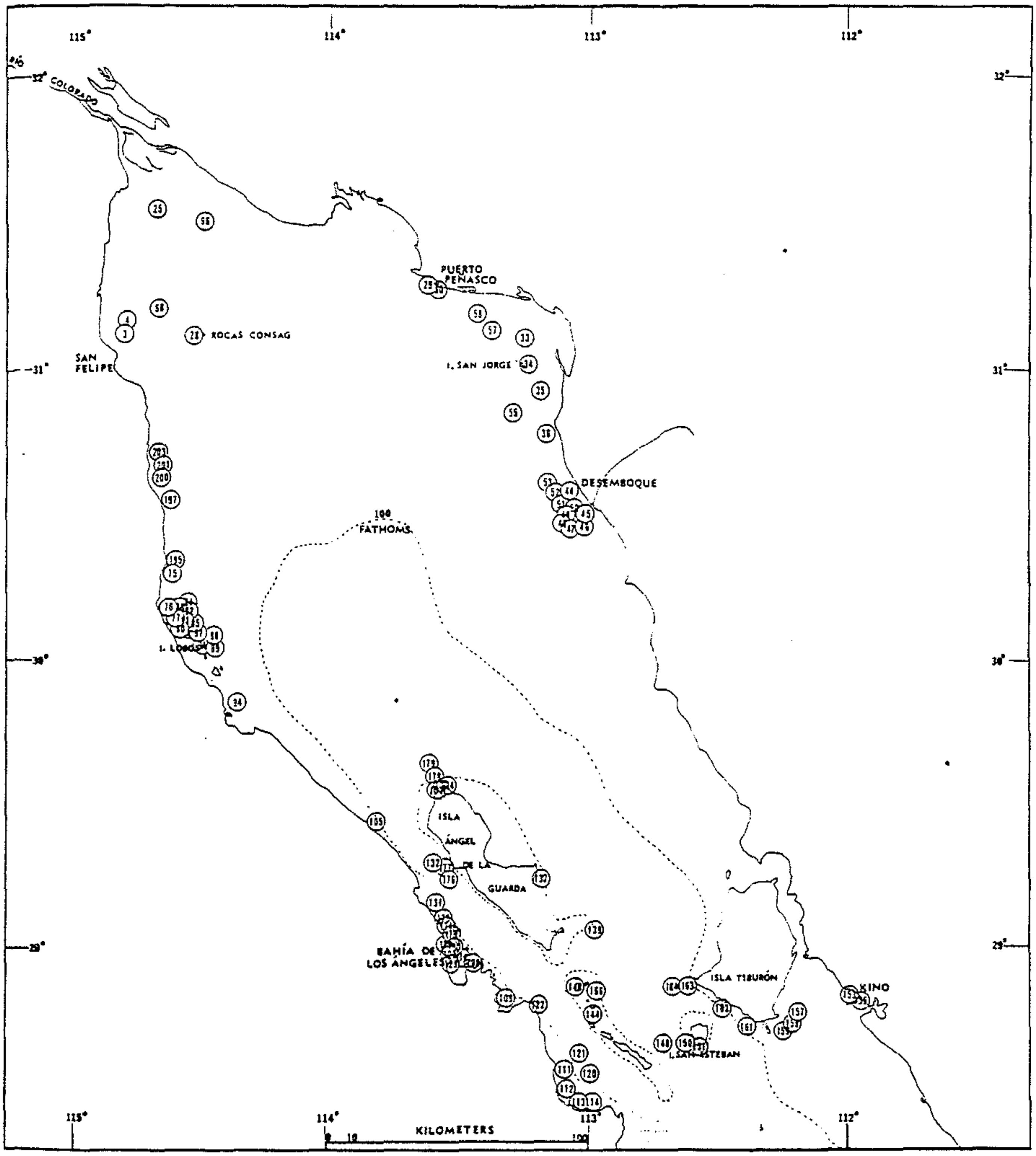



Figure 17

Sightings of *Zalophus californianus* in the Gulf of California. Numbers within circles are the sighting numbers from Table 7.

Table 1: Description of survey routes.

| Date | Time Start | Time End | From | To | Km | Conditions* |
|---|---|---|---|---|---|---|
| March 3 | 0800 | 1610 | San Felipe | Mouth of Río Colorado | 80 | Good to Excellent |
| 4 | 0745 | 1515 | Mouth of Río Colorado | San Felipe | 85 | Good to Excellent |
| 5 | 1315 | 1715 | San Felipe | Rocas Consag | 40 | Good |
| 6 | 1200 | 1800 | Puerto Peñasco | Isla San Jorge | 50 | Good to Excellent |
| 7 | 1835 | 1710 | Isla San Jorge | Desemboque | 60 | Good to Excellent |
| 8 | 0915 | 1900 | Desemboque | Puerto Peñasco | 90 | Good to Excellent |
| 9 | 1355 | 1810 | Puerto Peñasco | Bahía de Adair | 50 | Good to Excellent |
| 10 | 0550 | 1745 | Bahía de Adair | San Felipe | 120 | Good to Excellent |
| 11 | 0910 | 1750 | San Felipe | Puertocitos | 97 | Excellent |
| 12 | 0900 | 1730 | Puertocitos | Isla Lobos | 60 | Good to Excellent |
| 13 | 1515 | 1800 | Off Bahía Willard | | | Excellent |
| 14 | 0820 | 1800 | Bahía Willard | Punta Remedios | 110 | Good |
| 18 | 0630 | 1910 | Bahía de Los Ángeles | Bahía San Francisquito | 110 | Good to Excellent |
| 19 | 0630 | 1715 | Bahía San Francisquito | Bahía de Los Ángeles | 100 | Good to Excellent |
| 20 | 0925 | 1600 | Bahía de Los Ángeles | Puerto Refugio | 100 | Fair to Poor |
| 21 | 0630 | 1930 | Puerto Refugio | Bahía de Los Ángeles | 150 | Good to Excellent |

Table 1 (page 2)

| Date | Time Start | Time End | From | To | Km | Conditions* |
|---|---|---|---|---|---|---|
| March 22 | 1110 | 1700 | Bahía de Los Ángeles | Isla Partida | 57 | Good to Excellent |
| 23 | 0600 | 1700 | Isla Partida | Isla San Esteban | 70 | Good |
| 24 | 0645 | 1130 | Isla Tiburón | Kino | 35 | Fair to Good |
| 25 | 0625 | 1135 | Kino | Isla Tiburón | 60 | Fair to Good |
| 26 | 0550 | 1810 | Isla Tiburón | Bahía de Los Ángeles | 140 | Excellent |
| 27 | 0945 | 1615 | Bahía de Los Ángeles | Puerto Refugio | 75 | Good to Bahía Humbug, Fair thereafter |
| 30 | 0550 | 1810 | Puerto Refugio | Puertocitos | 140 | Good to Excellent |
| 31 | 0550 | 0740 | Vicinity of Puertocitos | | | Good |
| April 1 | 0545 | 1130 | Puertocitos | San Felipe | 80 | Excellent |

* Excellent: Winds less than 18.5 km/hr., seas less than 0.3 meters, no whitecaps.
Good: Winds between 9.3 and 27.8 km/hr., seas between 0.3 and 0.8 meters, little whitecapping.
Fair: Winds between 18.5 and 37.0 km/hr., seas between 0.5 and 1.0 meters, little whitecapping.
Poor: Winds greater than 37.0 km/hr., seas greater than 1.0 meters, extensive whitecapping.
Conditions, as reported above, are averaged over the entire day, and varied greatly from location to location.

Table 2: Summary of sighting data for all species.

| | No. of Groups Sighted | Animals/Group $\bar{X} \pm SD$ | Depth (m) $\bar{X} \pm SD$ | Distance[a] (km) $\bar{X} \pm SD$ | Temp (°C) $\bar{X} \pm SD$ | Clarity (m) $\bar{X} \pm SD$ |
|---|---|---|---|---|---|---|
| Odontoceti: | | | | | | |
| <u>Phocoena sinus</u>[b] | 2 | 2.5± 0.71 | 19.2±2.55 | 17.6± 1.27 | 17.3±1.06 | 2.3±0.35 |
| <u>Tursiops</u> sp.[c] | 58 | 8.6±12.86 | 29.4±155.49 | 4.1± 4.05 | 17.2±1.03 | 1.8±1.36 |
| <u>Tursiops</u> sp.[d] | 57 | 8.7±12.97 | 8.7± 9.86 | 4.0± 4.02 | 17.2±1.03 | 1.7±1.26 |
| <u>Delphinus delphis</u> | 70 | 50.7±97.10 | 174.3±223.38 | 4.7± 3.19 | 17.0±0.95 | 5.4±2.74 |
| <u>Physeter catodon</u> | 2 | 5.5± 6.36 | 691.0±873.77 | 3.8± 2.62 | 15.5±0.71 | 7.0±1.41 |
| <u>Globicephala melaena</u> | 1 | 22-25 | 1169.9 | 9.3 | 16.0 | 5.5 |
| Mysticeti: | | | | | | |
| <u>Balaenoptera physalus</u> | 16 | 5.4± 7.4 | 140.5±150.88 | 5.3± 5.88 | 16.8±1.57 | 6.2±3.58 |
| <u>Balaenoptera musculus</u> | 3 | 1.7± 0.58 | 359.5±184.69 | 22.5±17.87 | 17.3±1.15 | 6.3±0.58 |
| <u>Balaenoptera acutorostrata</u> | 1 | 2.0 | 21.0 | 18.5 | 18.0 | 2.5 |
| <u>Eschrichtius robustus</u> | 1 | 1.0 | 21.9 | 1.5 | 21.0 | 4.0 |
| Pinnipedia: | | | | | | |
| <u>Zalophus californianus</u>[e] | 86 | 2.3±4.33 | 86.8±162.09 | 4.4± 3.47 | 17.3±1.59 | 4.2±3.11 |

[a]Straightline distance from nearest shore in Kilometers.

[b]Identification of species not confirmed

[c]Includes all <u>Tursiops</u> sightings

[d]Excludes the single, offshore, deepwater sighting of <u>Tursiops</u> with <u>Globicephala</u>

[e]Does not include hauled-out sealions

Table 3: Sightings of *Phocoena sinus*, *Physeter catodon*, *Globicephala melaena*, *Balaenoptera musculus*, *Balaenoptera acutorostrata*, and *Eschrichtius robustus*.

| Sighting # | Date | Time | Latitude | Longitude | Group Size | Depth (m) | Distance from Shore (km) | Surface Water Temp (°C) | Clarity (m) | Tide |
|---|---|---|---|---|---|---|---|---|---|---|
| *Phocoena sinus*: | | | | | | | | | | |
| 66 | 10 March | 0958 | 31°30'N | 114°26'W | 3 | 17.4 | 16.7 | 16.5 | 2.0 | Fall |
| 67 | 10 March | 1315 | 31°15'N | 114°22'W | 2+ | 21.0 | 18.5 | 18 | 2.5 | Fall |
| *Physeter catodon*: | | | | | | | | | | |
| 123 | 19 March | 1246 | 28°51'N | 113°09'W | 10+ | 1308.8 | 5.6 | 16 | 8.0 | Fall |
| 125 | 19 March | 1525 | 28°56'N | 113°20'W | 1 | 73.1 | 1.9 | 15 | 6.0 | Fall |
| *Globicephala melaena*: | | | | | | | | | | |
| 142 | 22 March | 1419 | 28°27'N | 113°17'W | 20-25 | 1169.9 | 9.3 | 16 | 5.5 | Low |
| *Balaenoptera musculus*: | | | | | | | | | | |
| 110 | 18 March | 1112 | 28°40'N | 113°10'W | 2 | 146.2 | 1.9 | 16 | 7.0 | Rise |
| 181 | 30 March | 1123 | 29°58'N | 113°59'N | 1 | 466.1 | 33.3 | 18 | 6.0 | Rise |
| 182 | 30 March | 1215 | 29°59'N | 114°01'W | 2 | 466.1 | 32.4 | 18 | 6.0 | Rise |
| *Balaenoptera acutorostrata*: | | | | | | | | | | |
| 67 | 10 March | 1222 | 31°13'N | 114°40'W | 2 | 21.0 | 18.5 | 18 | 2.5 | Fall |
| *Eschrichtius robustus*: | | | | | | | | | | |
| 78 | 12 March | 1154 | 30°07'N | 114°40'W | 1 | 21.9 | 1.5 | 21 | 4.0 | High |

Table 4: Sightings of *Tursiops* sp.

| Sighting # | Date | Time | Latitude | Longitude | Group Size | Depth (m) | Distance from Shore (km) | Surface Water Temp (°C) | Clarity (m) | Tide |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 03 March | 0907 | 31°04'N | 114°49'W | 4 | 9 | 3 | 16 | 1 | Fall |
| 2 | 03 March | 0934 | 31°07'N | 114°50'W | 7 | 7 | 6 | 16 | 1 | Fall |
| 5 | 03 March | 1041 | 31°14'N | 114°49'W | 3 | 4 | 6 | 16 | 1.2 | Low |
| 5 | 03 March | 1041 | 31°14'N | 114°49'W | 3 | 4 | 6 | 16 | 1.2 | Low |
| 6 | 03 March | 1053 | 31°14'N | 114°49'W | 3 | 4 | 6 | 16 | 1.2 | Low |
| 7 | 03 March | 1054 | 31°14'N | 114°49'W | 5 | 4 | 6 | 16 | 1.2 | Low |
| 8 | 03 March | 1059 | 31°14'N | 114°49'W | 1 | 4 | 6 | 16 | 1.2 | Low |
| 9 | 03 March | 1101 | 31°14'N | 114°49'W | 2 | 4 | 6 | 16 | 1.2 | Low |
| 10 | 03 March | 1104 | 31°14'N | 114°49'W | 3 | 4 | 6 | 16 | 1.2 | Low |
| 11 | 03 March | 1105 | 31°14'N | 114°49'W | 1 | 4 | 6 | 16 | 1.2 | Low |
| 12 | 03 March | 1258 | 31°30'N | 114°46'W | 2 | 5 | 11 | 17 | 1.2 | Rise |
| 13 | 03 March | 1330 | 31°33'N | 114°44'W | 9 | 6 | 11 | 17 | 1 | Rise |
| 14 | 03 March | 1350 | 31°33'N | 114°44'W | 2 | 6 | 11 | 17 | 1 | Rise |
| 15 | 03 March | 1530 | 31°35'N | 114°37'W | 2 | 7 | 8 | 17.5 | 0.6 | Rise |
| 16 | 03 March | 1535 | 31°35'N | 114°37'W | 5 | 7 | 9 | 17.5 | 0.6 | Rise |
| 17 | 03 March | 1543 | 31°35'N | 114°37'W | 11 | 7 | 10 | 17.5 | 0.6 | Rise |
| 18 | 03 March | 2025 | 31°40'N | 114°42'W | 6 | 5 | 1 | 17.5 | night | Fall |
| 19 | 04 March | 0640 | 31°40'N | 114°40'W | 7 | 7 | 1 | 16 | 0.6 | Fall |
| 20 | 04 March | 0754 | 31°40'N | 114°42'W | 2 | 7 | 1 | 16 | 1 | Fall |
| 21 | 04 March | 0822 | 31°39'N | 114°42'W | 2 | 7 | 3 | 16 | 1 | Fall |
| 22 | 04 March | 0829 | 31°39'N | 114°44'W | 22 | 5 | 3 | 16 | 0.6 | Fall |
| 23 | 04 March | 0940 | 31°39'N | 114°44'W | 1 | 5 | 3 | 16 | 1 | Fall |
| 24 | 04 March | 1000 | 31°32'N | 114°38'W | 7 | 8 | 15 | 16 | 1 | Fall |
| 26 | 04 March | 1146 | 31°19'N | 114°41'W | 7 | 15 | 17 | 16.5 | 2 | Rise |
| 30 | 06 March | 1130 | 31°17'N | 113°35'W | 2 | 5 | <1 | - | 1.5 | Fall |
| 31 | 06 March | 1345 | 31°12'N | 113°22'W | 1 | 11 | 5 | 17 | 3 | Rise |
| 32 | 06 March | 1425 | 31°10'N | 113°17'W | ~38 | 12 | 8 | 18 | 2 | Rise |
| 33 | 06 March | 1615 | 31°04'N | 113°15'W | ~40 | 15 | 6 | 17 | 2 | Rise |
| 37 | 07 March | 1038 | 30°46'N | 113°08'W | 2 | 7 | 5 | 18 | 2 | Rise |
| 39 | 07 March | 1237 | 30°45'N | 113°05'W | 6 | 3 | 1 | 18 | 1.5 | Fall |
| 41 | 07 March | 1401 | 30°45'N | 113°05'W | 1 | 5 | 1 | 18 | 1.2 | Fall |
| 56 | 08 March | 1610 | 31°08'N | 113°24'W | 2 | 32 | 12 | 17 | 4 | Fall |
| 61 | 09 March | 2020 | 31°31'N | 113°57'W | ~6 | 7 | 3 | ~17 | night | Rise |
| 62 | 10 March | 0618 | 31°26'N | 114°02'W | 2 | 5 | 4 | 17.5 | 2 | Rise |
| 62 | 10 March | 0618 | 31°26'N | 114°02'W | 7 | 5 | 4 | 17.5 | 2 | Rise |
| 63 | 10 March | 0725 | 31°30'N | 114°10'W | 8 | 5 | 1 | 17 | 0.4 | Rise |

Table 4 (*Tursiops* sp. cont.)

| Sighting # | Date | Time | Latitude | Longitude | Group Size | Depth (m) | Distance from Shore (km) | Surface Water Temp. (°C) | Clarity (m) | Tide |
|---|---|---|---|---|---|---|---|---|---|---|
| 64 | 10 March | 0830 | 31°30'N | 114°20'W | 2 | 4 | 1 | 17 | 0.4 | Rise |
| 69 | 11 March | 0954 | 30°58'N | 114°42'W | 11 | 9 | 1 | 18 | 1.5 | Rise |
| 70 | 11 March | 1245 | 30°45'N | 114°38'W | 1 | 12 | 1 | 17.5 | 1.25 | Fall |
| 73 | 11 March | 1541 | 30°29'N | 114°33'W | ~75 | 5 | <1 | 19 | 3.5 | Fall |
| 74 | 12 March | 0110 | 30°22'N | 114°41'W | 15-20 | 2 | <1 | 16 | night | Fall |
| 74 | 12 March | 0450 | 30°22'N | 114°41'W | 15-20 | 2 | <1 | - | night | Fall |
| 75 | 12 March | 0918 | 30°21'N | 114°40'W | 6 | 18 | 2 | 20 | 4.5 | Rise |
| 92 | 13 March | 0914 | 29°52'N | 114°26'W | 7 | — | 2 | seen from shore | | Rise |
| 95 | 13 March | 1735 | 29°50'N | 114°22'W | 6 | 8 | <1 | 17 | 2 | Fall |
| 142 | 22 March | 1419 | 28°57'N | 113°17'W | 6 | 1170 | 9 | 16 | 5.5 | Fall |
| 155 | 24 March | 0950 | 28°48'N | 111°58'W | 12-17 | 5 | 1 | - | - | Rise |
| 156 | 25 March | 0632 | 28°48'N | 112°57'W | 4-5 | 2 | 2 | - | - | Rise |
| 160 | 25 March | 1008 | 28°42'N | 112°17'W | 6 | 71 | 2 | 17 | 8 | Rise |
| 188 | 31 March | 0530 | 31°43'N | 114°40'W | 6-8 | 5 | 1 | 18 | 1.5 | Fall |
| 189 | 31 March | 0736 | 31°38'N | 114°37'W | 4-6 | 5 | <1 | 18 | 1.5 | Fall |
| 190 | 31 March | 0925 | 31°38'N | 114°37'W | 3 | 5 | 1 | 18 | 1.5 | Rise |
| 191 | 31 March | 1530 | 31°38'N | 114°37'W | 40-50 | 7 | <1 | 19 | 2.5 | Rise |
| 192 | 31 March | 1702 | 31°38'N | 114°37'W | 20-30 | 7 | <1 | 19 | 2.5 | Fall |
| 193 | 31 March | 1920 | 31°38'N | 114°37'W | 5 | 7 | <1 | 19 | 2.5 | Fall |
| 196 | 01 April | 0640 | 30°25'N | 114°36'W | 12 | 10 | 1 | 18 | 2 | Fall |
| 198 | 01 April | 0753 | 30°33'N | 114°39'W | 2 | 13 | 1 | 18 | 2 | Fall |
| 202 | 01 April | 0845 | 30°38'N | 114°39'W | 5-6 | 14 | 4 | 18 | 2 | Fall |
| 204 | 01 April | 0859 | 30°41'N | 114°41'W | 1 | 13 | 2 | 18 | 2 | Fall |

Table 5: Sightings of *Delphinus delphis*

| Sighting # | Date | Time | Latitude | Longitude | Group Size | Depth (m) | Distance from Shore (km) | Surface Water Temp (°C) | Clarity (m) | Tide |
|---|---|---|---|---|---|---|---|---|---|---|
| 54 | 08 March | 1327 | 30° 49 'N | 113° 14 'W | 35 | 24 | 9 | 18 | 2.5-3 | Fall |
| 54 | 08 March | 1410 | 30° 49 'N | 113° 14 'W | 100 | 24 | 9 | 18 | 2.5-3 | Fall |
| 59 | 08 March | 1818 | 31° 14 'N | 113° 30 'W | >10 | 18 | 5 | 17 | - | Rise |
| 65 | 10 March | 0845 | 31° 33 'N | 114° 24 'W | 100 | 21 | 6 | 17 | 3 | Rise |
| 68 | 10 March | 1529 | 31° 13 'N | 114° 40 'W | 6 | 16 | 18 | 18 | 2.5 | Fall |
| 75 | 12 March | 0918 | 30° 21 'N | 114° 40 'W | 500 | 18 | 2 | 20 | 4.5 | Rise |
| 89 | 12 March | 1656 | 30° 04 'N | 114° 30 'W | 20 | 37 | 4 | 18 | 4 | Fall |
| 90 | 12 March | 1707 | 30° 04 'N | 114° 30 'W | 30 | 37 | 4 | 18 | 4 | Fall |
| 93 | 13 March | 1400 | 29° 52 'N | 114° 26 'W | 500 | — | 4 | - | - | Fall |
| 97 | 14 March | 1020 | 29° 46 'N | 114° 14 'W | 50-70 | 61 | 2 | 18 | 4 | Rise |
| 100 | 14 March | 1137 | 29° 42 'N | 114° 13 'W | 4 | 62 | 3 | 17 | - | Rise |
| 101 | 14 March | 1150 | 29° 41 'N | 114° 13 'W | 14 | 57 | 3 | 17 | - | Rise |
| 102 | 14 March | 1407 | 29° 36 'N | 114° 01 'W | 30-40 | 177 | 3 | 17 | 6.5 | Fall |
| 103 | 14 March | 1438 | 29° 35 'N | 113° 57 'W | 15-30 | 154 | 3 | 17 | 6.5 | Fall |
| 103 | 14 March | 1438 | 29° 35 'N | 113° 57 'W | 50-75 | 154 | 3 | 17 | 6.5 | Fall |
| 103 | 14 March | 1438 | 29° 35 'N | 113° 57 'W | 15-30 | 154 | 3 | 17 | 6.5 | Fall |
| 103 | 14 March | 1507 | 29° 35 'N | 113° 57 'W | 2 | 154 | 3 | 17 | 6.5 | Fall |
| 104 | 14 March | 1519 | 29° 30 'N | 113° 52 'W | 14 | 183 | 5 | 17 | - | Fall |
| 104 | 14 March | 1519 | 29° 30 'N | 113° 52 'W | 6 | 183 | 5 | 17 | - | Fall |
| 104 | 14 March | 1519 | 28° 30 'N | 113° 52 'W | 6-8 | 183 | 5 | 17 | - | Fall |
| 104 | 14 March | 1519 | 28° 30 'N | 113° 52 'W | 6-8 | 183 | 5 | 17 | - | Fall |
| 108 | 18 March | 0851 | 28° 59 'N | 113° 25 'W | 8-12 | 186 | 2 | 14 | - | Fall |
| 112 | 18 March | 1415 | 28° 33 'N | 113° 08 'W | 13 | 27 | 4 | 16.5 | 5.5 | Rise |
| 114 | 18 March | 1502 | 28° 27 'N | 113° 02 'W | 150-200 | 29 | 4 | 17 | - | Fall |
| 115 | 18 March | 1602 | 28° 28 'N | 113° 00 'W | 50 | 39 | 4 | 17 | - | Fall |
| 115 | 18 March | 1602 | 28° 28 'N | 113° 00 'W | 75 | 39 | 4 | 17 | - | Fall |
| 117 | 18 March | 1725 | 28° 28 'N | 112° 56 'W | ~5 | 119 | 2 | 17 | - | Fall |
| 119 | 19 March | 0733 | 28° 28 'N | 112° 52 'W | 15-20 | 227 | 5 | 15 | 7 | Fall |
| 119 | 19 March | 0800 | 28° 28 'N | 112° 52 'W | 150-200 | 227 | 5 | 15 | 7 | Fall |
| 126 | 19 March | 1535 | 28° 58 'N | 113° 25 'W | 15 | 146 | 2 | 15 | 6 | Fall |
| 128 | 20 March | 0938 | 28° 58 'N | 113° 32 'W | 4-6 | 46 | 1 | 16 | 2 | Fall |
| 131 | 20 March | 1142 | 29° 08 'N | 113° 35 'W | 3 | 119 | 3 | 16 | - | Rise |
| 135 | 21 March | 0950 | 29° 19 'N | 113° 17 'W | 4 | 99 | 3 | 15 | - | Fall |
| 137 | 21 March | 1145 | 29° 17 'N | 113° 11 'W | 25-40 | 80 | 4 | 16 | 8 | Fall |

Table 5: (*Delphinus delphis* cont.)

| Sighting # | Date | Time | Latitude | Longitude | Group Size | Depth (m) | Distance from Shore (km) | Surface Water Temp (°C) | Clarity (m) | Tide |
|---|---|---|---|---|---|---|---|---|---|---|
| 138 | 21 March | 1315 | 29°09'N | 113°10'W | 200 | 157 | 5 | 16 | 7 | Rise |
| 139 | 21 March | 1420 | 29°03'N | 113°01'W | 300 | 302 | 9 | 17 | 5.5 | Rise |
| 139 | 21 March | 1545 | 29°03'N | 113°01'W | 10 | 302 | 7 | 17 | 5.5 | Rise |
| 139 | 21 March | 1548 | 29°03'N | 113°01'W | 10 | 302 | 7 | 17 | 5.5 | Rise |
| 139 | 21 March | 1552 | 29°03'N | 113°01'W | 10 | 302 | 7 | 17 | 5.5 | Rise |
| 139 | 21 March | 1557 | 29°03'N | 113°01'W | 5 | 302 | 7 | 17 | 5.5 | Rise |
| 139 | 21 March | 1559 | 29°03'N | 113°01'W | 5 | 302 | 7 | 17 | 5.5 | Rise |
| 139 | 21 March | 1601 | 29°03'N | 113°01'W | 10 | 302 | 7 | 17 | 5.5 | Rise |
| 139 | 21 March | 1611 | 29°03'N | 113°01'W | 3 | 73 | 6 | 17 | 5.5 | Rise |
| 139 | 21 March | 1615 | 29°03'N | 113°01'W | 2 | 73 | 6 | 17 | 5.5 | Rise |
| 139 | 21 March | 1617 | 29°03'N | 113°01'W | 5-10 | 73 | 6 | 17 | 5.5 | Rise |
| 139 | 21 March | 1620 | 29°03'N | 113°01'W | 3 | 73 | 6 | 17 | 5.5 | Rise |
| 139 | 21 March | 1641 | 29°03'N | 113°01'W | 20 | 64 | 3 | 17 | 5.5 | Rise |
| 140 | 21 March | 1655 | 28°59'N | 113°11'W | 50-75 | 1097 | 4 | - | - | Rise |
| 140 | 21 March | 1701 | 28°59'N | 113°11'W | 15-20 | 1097 | 4 | - | - | Rise |
| 141 | 21 March | 1753 | 28°58'N | 113°19'W | 4-6 | 695 | 6 | - | - | Rise |
| 145 | 23 March | 0745 | 28°46'N | 112°58'W | 40-50 | >548 | 3 | 16 | 5.5 | Rise |
| 150 | 23 March | 1100 | 28°38'N | 112°37'W | 30-50 | 155 | 4 | 15 | 5.5 | Fall |
| 152 | 24 March | 0712 | 28°49'N | 112°13'W | 15 | 16 | 5 | 17 | - | Rise |
| 157 | 25 March | 0837 | 28°47'N | 112°14'W | 40-80 | 24 | 7 | 18 | 2.5 | Rise |
| 158 | 25 March | 0943 | 28°44'N | 112°15'W | 3 | 29 | 5 | 18 | 2.5 | Rise |
| 158 | 25 March | 0947 | 28°44'N | 112°15'W | 2 | 29 | 5 | 18 | 2.5 | Rise |
| 158 | 25 March | 0952 | 28°44'N | 112°15'W | 1 | 29 | 5 | 18 | 2.5 | Rise |
| 158 | 25 March | 0955 | 28°44'N | 112°15'W | 4-6 | 29 | 5 | 18 | 2.5 | Rise |
| 165 | 26 March | 1205 | 28°53'N | 112°57'W | 6-8 | 521 | 5 | 17 | 12 | Fall |
| 166 | 26 March | 1229 | 28°51'N | 112°59'W | 5-6 | 521 | 3 | 17 | 12 | Fall |
| 166 | 26 March | 1232 | 28°51'N | 112°59'W | 4-6 | 521 | 3 | 17 | 12 | Fall |
| 166 | 26 March | 1232 | 28°51'N | 112°59'W | 2-3 | 521 | 3 | 17 | 12 | Fall |
| 168 | 26 March | 1353 | 28°51'N | 113°07'W | 100-150 | 914 | 7 | 17 | 11.5 | Fall |
| 170 | 27 March | 1001 | 28°58'N | 113°32'W | 2 | 26 | 1 | 17 | 2.5 | Rise |
| 172 | 27 March | 1022 | 29°01'N | 113°32'W | 2 | 46 | 1 | 17 | 2.5 | Rise |
| 173 | 27 March | 1026 | 29°01'N | 113°31'W | 100-150 | 49 | <1 | 17 | 2.5 | Rise |
| 184 | 30 March | 1645 | 30°14'N | 114°23'W | 15-25 | 68 | 19 | 18 | 4 | Fall |
| 186 | 30 March | 1755 | 30°19'N | 114°33'W | 20-30 | 37 | 7 | 18 | - | Fall |
| 187 | 30 March | 1807 | 30°21'N | 114°33'W | 20-30 | 33 | 6 | 18 | - | Fall |
| 199 | 01 April | 0806 | 30°34'N | 114°39'W | 220-250 | 18 | 1 | - | 2 | Fall |

Table 6: Sightings of Balaenoptera physalus

| Sighting # | Date | Time | Latitude | Longitude | Group Size | Depth (m) | Distance from Shore (km) | Surface Water Temp (°C) | Clarity (m) | Tide |
|---|---|---|---|---|---|---|---|---|---|---|
| 86 | 12 March | 1339 | 30°10'N | 114°38'W | 21 | 27 | 7 | 19.5 | 3.5 | Fall |
| 88 | 12 March | 1625 | 30°04'N | 114°30'W | 4 | 44 | 4 | 18 | 4 | Fall |
| 94 | 13 March | 1520 | 29°52'N | 114°26'W | 8 | 27 | 4 | — | 2.5 | Fall |
| 96 | 14 March | 0915 | 29°48'N | 114°17'W | 19 | 54 | 3 | 18.5 | 3.5 | Rise |
| 98 | 14 March | 1055 | 29°48'N | 114°11'W | 2 | 90 | 4 | 17 | 5 | Rise |
| 99 | 14 March | 1125 | 29°43'N | 114°13'W | 1 | 90 | 4 | 17 | 5 | Rise |
| 107 | 18 March | 0635 | 28°59'N | 113°25'W | 1 | 79 | 4 | 14 | [illegible] | Fall |
| 109 | 18 March | 0820 | 28°51'N | 113°20'W | 1 | 55 | 4 | 16 | 3 | Fall |
| 116 | 18 March | 1635 | 28°28'N | 112°58'W | 1 | 139 | 3 | 17 | [illegible] | Fall |
| 122 | 19 March | 1150 | 28°51'N | 113°10'W | 1 | 155 | 2 | 16 | 7.3 | Fall |
| 124 | 19 March | 1520 | 28°59'N | 113°26'W | 2 | 113 | 3 | 15 | 6 | Fall |
| 146 | 23 March | 0915 | 28°46'N | 112°58'W | 2 | 548 | 6 | 16 | 5.5 | Rise |
| 169 | 26 March | 1641 | 28°59'N | 113°27'W | 4 | 59 | 1 | 15 | 4.5 | Fall |
| 180 | 30 March | 0710 | 29°40'N | 113°36'W | 1 | 358 | 6 | 16.5 | 11 | Rise |
| 183 | 30 March | 1435 | 30°07'N | 114°13'W | 1 | 366 | 25 | 19 | 13 | Fall |
| 185 | 30 March | 1710 | 30°18'N | 114°32'W | 17 | 46 | 11 | 18 | 13 | Fall |

Table 7: Sightings of *Zalophus californianus*

| Sighting # | Date | Time | Latitude | Longitude | Group Size | Depth (m) | Distance from Shore (km) | Surface Water Temp (°C) | Clarity (m) | Tide |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 03 March | 0953 | 31°08'N | 114°49'W | 2 | 7 | 7 | 16 | 1 | Fall |
| 4 | 03 March | 1008 | 31°09'N | 114°50'W | 1 | — | 7 | 16 | 1 | Slack |
| 25 | 04 March | 1010 | 31°30'N | 114°38'W | 1 | 8 | 17 | 16 | 1 | Fall |
| 28 | 05 March | 1630 | 31°07'N | 114°30'W | 326 | < 18 | — | 17 | - | Rise |
| 29 | 06 March | 0900 | 31°17'N | 113°25'W | 1 | 4 | < 1 | - | 1 | Fall |
| 33 | 06 March | 1615 | 31°04'N | 113°15'W | 3 | 15 | 7 | 17 | 2 | Rise |
| 34 | 07 March | 0725 | 31°01'N | 113°16'W | 1806-2274 | < 9 | — | 16 | 4 | Rise |
| 35 | 07 March | 0915 | 31°00'N | 113°16'W | 1 | 18 | 10 | 16 | 4 | Rise |
| 36 | 07 March | 1020 | 30°47'N | 113°23'W | 2 | 5 | 4 | 16 | 4 | Rise |
| 44 | 07 March | 1519 | 30°34'N | 113°03'W | 1 | 6 | 4 | 18.5 | 1 | Fall |
| 45 | 07 March | 1640 | 30°30'N | 113°00'W | 1 | 4 | 2 | 18.5 | 1 | Fall |
| 46 | 08 March | 0932 | 30°29'N | 113°01'W | 1 | 15 | 6 | 18 | 2 | Rise |
| 47 | 08 March | 0946 | 30°29'N | 113°07'W | 1 | 16 | 7 | 18 | 2 | Rise |
| 48 | 08 March | 0954 | 30°30'N | 113°02'W | 1 | 16 | 7 | 18 | 2.5 | Rise |
| 49 | 08 March | 0958 | 30°33'N | 113°02'W | 2 | 16 | 5 | 18 | 2.5 | Rise |
| 50 | 08 March | 1005 | 30°33'N | 113°04'W | 1 | 15 | 5 | 18 | 2.5 | Rise |
| 51 | 08 March | 1018 | 30°34'N | 113°04'W | 1 | 13 | 6 | 18 | 2.5 | Rise |
| 52 | 08 March | 1023 | 30°34'N | 113°04'W | 1 | 13 | 6 | 18 | 2.5 | Rise |
| 53 | 08 March | 1032 | 30°35'N | 113°05'W | 2 | 14 | 13 | 18 | 2.5 | Rise |
| 55 | 08 March | 1430 | 30°53'N | 113°15'W | 1 | 25 | 13 | 18 | 2.5-3 | Fall |
| 57 | 08 March | 1655 | 31°10'N | 113°25'W | 1 | 29 | 10 | 17 | 4 | Fall |
| 58 | 08 March | 1732 | 31°12'N | 113°25'W | 1 | 26 | 7 | 17 | 4 | Fall |
| 60 | 09 March | 1355 | 31°19'N | 113°34'W | 1 | 5 | < 1 | 17 | - | Fall |
| 68 | 10 March | 1529 | 31°13'N | 114°40'W | 1 | 16 | 18 | 18 | 2.5 | Fall |
| 75 | 12 March | 0918 | 30°21'N | 114°40'W | 4 | 18 | 2 | 20 | 4.5 | Rise |
| 76 | 12 March | 1130 | 30°10'N | 114°40'W | 1 | 11 | 3 | 20 | 4.5 | Rise |
| 77 | 12 March | 1147 | 30°08'N | 114°40'W | 1 | 20 | 3 | 20 | 4.5 | Rise |
| 80 | 12 March | 1248 | 30°07'N | 114°34'W | 2 | 24 | 4 | 21 | 4 | High |
| 81 | 12 March | 1305 | 30°07'N | 114°34'W | 1 | 24 | 4 | 21 | 4 | Fall |
| 82 | 12 March | 1330 | 30°07'N | 114°34'W | 1 | 24 | 4 | 21 | 4 | Fall |
| 83 | 12 March | 1331 | 30°07'N | 114°34'W | 1 | 24 | 4 | 21 | 4 | Fall |
| 84 | 12 March | 1334 | 30°07'N | 114°34'W | 1 | 24 | 4 | 21 | 4 | Fall |
| 85 | 12 March | 1339 | 30°07'N | 114°34'W | 1 | 24 | 4 | 21 | 4 | Fall |
| 87 | 12 March | 1530 | 30°06'N | 114°31'W | 1 | 35 | 4 | 19.5 | 3.5 | Fall |
| 88 | 12 March | 1625 | 30°04'N | 114°30'W | 3 | 44 | 4 | 18 | 4 | Fall |
| 89 | 12 March | 1656 | 30°04'N | 114°30'W | 3 | 37 | 4 | 18 | 4 | Fall |
| 91 | 12 March | 1700 | 30°04'N | 114°31'W | 1670-2231 | < 9 | — | 18 | 4 | Fall |

Table 7: (*Zalophus californianus* cont.)

| Sighting # | Date | Time | Latitude | Longitude | Group Size | Depth (m) | Distance from Shore (km) | Surface Water Temp (°C) | Clarity (m) | Tide |
|---|---|---|---|---|---|---|---|---|---|---|
| 94 | 13 March | 1520 | 29°52'N | 114°26'W | 1 | 27 | 4 | - | 2.5 | Fall |
| 94 | 13 March | 1531 | 29°56'N | 114°26'W | 1 | 27 | 4 | - | 2.5 | Fall |
| 105 | 14 March | 1546 | 29°28'N | 114°51'W | 2 | 44 | 4 | 17 | - | Fall |
| 106 | 18 March | 0615 | 28°57'N | 113°27'W | 1 | 4 | <1 | 14 | - | Fall |
| 109 | 18 March | 0802 | 28°21'N | 113°20'W | 1 | 55 | 4 | 16 | 3 | Fall |
| 111 | 18 March | 1348 | 28°35'N | 113°08'W | 1 | 32 | 2 | 16 | - | Rise |
| 112 | 18 March | 1415 | 28°33'N | 113°05'W | 3 | 27 | 4 | 16.5 | 5.5 | Rise |
| 113 | 18 March | 1500 | 28°29'N | 113°05'W | 1 | 34 | 4 | 16.5 | 5.5 | Rise |
| 114 | 18 March | 1502 | 28°28'N | 113°02'W | 6-12 | 29 | 3 | 17 | - | Fall |
| 120 | 19 March | 0922 | 28°34'N | 113°00'W | 1 | 292 | 10 | 17 | 6.5 | Fall |
| 121 | 19 March | 1004 | 28°38'N | 113°03'W | 1 | > 548 | 8 | 17 | 6.5 | Fall |
| 122 | 19 March | 1150 | 28°51'N | 113°10'W | 1 | 155 | 2 | 16 | 7.3 | Fall |
| 128 | 20 March | 0937 | 28°58'N | 113°32'W | 1 | 46 | 2 | 16 | 2 | Fall |
| 129 | 20 March | 1015 | 29°00'N | 113°32'W | 1 | 37 | 2 | 16 | 2 | Low |
| 130 | 20 March | 1025 | 29°01'N | 113°32'W | 1 | 44 | 1 | 16 | 2 | Rise |
| 131 | 20 March | 1103 | 29°05'N | 113°32'W | 1 | 73 | 3 | 16 | 2 | Rise |
| 132 | 20 March | 1305 | 29°19'N | 113°38'W | 1 | 612 | 6 | 16 | - | Rise |
| 133 | 20 March | 2000 | 29°35'N | 113°32'W | 1 | 9 | 1 | 16 | - | Fall |
| 134 | 21 March | 0645 | 29°35'N | 113°32'W | 1 | 55 | 1 | - | - | Fall |
| 137 | 21 March | 1145 | 29°17'N | 113°11'W | 10 | 80 | 3 | 16 | 8 | Rise |
| 139 | 21 March | 1420 | 29°03'N | 113°01'W | 12 | 302 | 10 | 17 | 5.5 | Rise |
| 143 | 22 March | 2145 | 28°52'N | 113°04'W | 1 | 5 | 2 | 15 | - | Rise |
| 144 | 23 March | 0735 | 28°46'N | 112°58'W | 1 | — | 4 | - | - | Fall |
| 148 | 23 March | 1036 | 28°39'N | 112°42'W | 1 | > 548 | 10 | 16 | 5.5 | Fall |
| 149 | 23 March | 1055 | 28°39'N | 112°39'W | 1 | 219 | 6 | 16 | 5.5 | Fall |
| 150 | 23 March | 1100 | 28°38'N | 112°37'W | 30 | 155 | 4 | 15 | 5.5 | Fall |
| 151 | 23 March | 1500 | 28°40'N | 112°33'W | 750 | < 9 | — | - | - | Low |
| 153 | 24 March | 0915 | 28°49'N | 111°59'W | 1 | 5 | 2 | - | - | Rise |
| 155 | 24 March | 0950 | 28°48'N | 111°58'W | 2 | 5 | 2 | - | - | Rise |
| 155 | 24 March | 0950 | 28°48'N | 111°58'W | 1 | 5 | 2 | - | - | Rise |
| 155 | 24 March | 0950 | 28°48'N | 111°58'W | 2 | 5 | 2 | - | - | Rise |
| 157 | 25 March | 0837 | 28°47'N | 112°14'W | 1 | 24 | 7 | 18 | 2.5 | Rise |
| 158 | 25 March | 0955 | 28°44'N | 112°15'W | 2 | 29 | 6 | 18 | 2.5 | Rise |
| 159 | 25 March | 0959 | 28°43'N | 112°16'W | 1 | 29 | 6 | 18 | 2.5 | Rise |
| 161 | 26 March | 0730 | 28°33'N | 112°24'W | 3 | 110 | 4 | 16 | 13 | Rise |
| 162 | 26 March | 0814 | 28°45'N | 112°28'W | 2 | 110 | 4 | 16 | 13 | Rise |

Table 7: (*Zalophus californianus* cont.)

| Sighting # | Date | Time | Latitude | Longitude | Group Size | Depth (m) | Distance from Shore (km) | Surface Water Temp (°C) | Clarity (m) | Tide |
|---|---|---|---|---|---|---|---|---|---|---|
| 163 | 26 March | 0855 | 28°48'N | 112°46'W | 1 | 44 | 2 | 16 | 13 | Rise |
| 164 | 26 March | 0923 | 28°58'N | 112°39'W | 1 | 749 | 4 | 16 | 13 | Rise |
| 166 | 26 March | 1232 | 28°51'N | 112°59'W | 20-30 | 54 | 4 | 17 | 12 | Fall |
| 171 | 27 March | 1019 | 29°00'N | 113°32'W | 1 | 29 | 2 | 17 | 2.5 | Rise |
| 172 | 27 March | 1022 | 29°01'N | 113°32'W | 1 | 46 | 2 | 17 | 2.5 | Rise |
| 173 | 27 March | 1026 | 29°01'N | 113°31'W | 3 | 49 | 2 | 17 | 2.5 | Rise |
| 174 | 27 March | 1056 | 29°03'N | 113°31'W | 1 | 22 | <1 | 17 | 2.5 | Rise |
| 175 | 27 March | 1100 | 29°04'N | 113°31'W | 1 | 7 | 1 | 17 | 2.5 | Rise |
| 176 | 27 March | 1335 | 29°17'N | 113°34'W | 2 | >548 | 4 | 15 | 11 | Fall |
| 177 | 27 March | 1435 | 29°20'N | 113°31'W | 2 | >548 | 2 | 15 | 11 | Fall |
| 178 | 30 March | 0610 | 29°33'N | 113°34'W | 1 | 42 | 2 | - | - | Fall |
| 179 | 30 March | 0630 | 29°34'N | 113°35'W | 1 | 219 | 4 | - | - | Fall |
| 195 | 01 April | 0615 | 30°25'N | 114°36'W | 1 | 17 | 2 | 18 | 2 | Fall |
| 197 | 01 April | 0738 | 30°32'N | 114°36'W | 2 | 18 | 1 | 18 | 2 | Fall |
| 200 | 01 April | 0830 | 30°36'N | 114°39'W | 1 | 20 | 3 | 18 | 2 | Fall |
| 201 | 01 April | 0837 | 30°36'N | 114°39'W | 1 | 18 | 3 | 18 | 2 | Fall |
| 203 | 01 April | 0856 | 30°41'N | 114°41'W | 1 | 18 | 2 | 18 | 2 | Fall |

Table 8: Estimates of numbers of *Zalophus californianus* at haul-out areas.

| Location | Date | Time | Number of Animals |
|---|---|---|---|
| Rocas Consag | 05 March | 1630-1715 | 326 |
| Isla San Jorge | 07 March | 0725-0835 | 1806-2274 |
| Isla Lobos | 12 March | 1700-1730 | 1670-2231 |
| Isla San Esteban (South Shore) | 23 March | 1500-1700 | 750 |
| | | Total | 3552-5581 |