Cetacean strandings in San Diego County, California, USA: 1851–2008

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ABSTRACT

There were 717 cetacean strandings recorded in San Diego County, California, USA between 1851 and 2008. These strandings comprised 18 odontocete and 6 mysticete species. Common dolphins (both the short-beaked (*Delphinus delphis*) and long-beaked common dolphin (*D. capensis*)) were the most commonly stranded cetacean species (43.2%), followed by bottlenose dolphins (*Tursiops truncatus*) (16.5%), gray whales (*Eschrictius robustus*) (11.0%), and Pacific white-sided dolphins (*Lagenorhyncus obliquidens*) (7.0%). A higher number of strandings was observed in the La Jolla and Coronado/Imperial Beach areas, which likely reflects the influence of coastal protrusions in those regions. Strandings of bottlenose dolphin neonates suggests their calving season extends from May to September. Strandings of common dolphin species peaked in the early- to mid-1970s and in the late-1990s to 2008, coincident with cool oceanographic regimes. In addition, extralimital strandings of harbour porpoises and temporal changes in stranding rates of Dall's porpoises (*Phocoenoides dalli*) and short-finned pilot whales (*Globicephala macrorhynchus*) may have been associated with changes in oceanographic conditions. Evidence of human interaction in strandings included entanglements, boat strikes, shootings and harpooning. Overall, the stranding record largely reflected the species composition of the Southern California Bight and provided confirmation for presence of cryptic species not previously recorded by aerial and ship surveys.

KEY WORDS: STRANDINGS; NORTHERN HEMISPHERE; PACIFIC OCEAN; CLIMATE CHANGE; DISTRIBUTION; SEASONALITY; COMMON DOLPHIN; LONG-BEAKED COMMON DOLPHIN; BOTTLENOSE DOLPHIN; DALL'S PORPOISE; SHORT-FINNED PILOT WHALE; GRAY WHALE; PACIFIC WHITE-SIDED DOLPHIN

INTRODUCTION

Stranded marine mammals allow researchers to gather valuable data which is otherwise unobtainable. They offer a unique opportunity to learn about a species' life history (Greig *et al.*, 2005; Murphy, 2004; Toperoff, 2002; Westgate and Read, 2007), population structure (McFee *et al.*, 2006; McLellan *et al.*, 2002), occurrence (Woodhouse, 1991), disease prevalence (Greig *et al.*, 2005), anthropogenic causes of mortality (Balcomb and Claridge, 2001; Cox *et al.*, 1998) and to understand fossil assemblages (Pyenson, 2010). Additionally, stranding patterns may reflect changes in environmental conditions, health status or species distribution.

The Marine Mammal Protection Act (MMPA) of 1972 specified that a national stranding network should be established. This became part of the broader Marine Mammal Health and Stranding Response Program (MMHSRP) established under the 1992 amendment to the MMPA. This program is overseen by the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS). The MMHSRP coordinates the national stranding network, responses and investigations of mortality events, biomonitoring, tissue and serum banking, and analytical quality assurance.

The California Marine Mammal Stranding Network (CMMSN) is part of the national stranding program. San Diego County is one of six sub regions in the CMMSN and the most southern region in California. Most of the approximately 80 miles (125km) of beaches in San Diego County are public beaches that are routinely patrolled by lifeguards or beach clean-up crews throughout the year. Public use is limited along 17 miles (27.4km) of coastline at Camp Pendleton Marine Corp Base (27.4km), 1 mile (1.6km) at Naval Air Station North Island and 2 miles (3.2km) at Naval Amphibious Base. However, these sections of coastline are routinely monitored by game wardens and biologists on base. Consequently, in San Diego County, it is thought that few strandings go unnoticed.

In this paper both live and dead cetacean strandings documented in San Diego County between 1851 and 2008 are summarised. When possible, spatial, temporal, and sex-specific trends in strandings were analysed.

METHODS

Stranding events were primarily recorded by local scientists actively seeking information about stranded marine mammals. However, strandings were also documented in newspapers (n = 17), museum records (n = 4), historical photos (n = 2) and in the files of William E. Ritter (n = 1) of Scripps Institution of Oceanography (SIO). Newspaper documentation was obtained from the *San Diego Herald* (1851–60) and the *San Diego Union Tribune* (1868–2008). In addition, all records were compared to those collected by NOAA's Southwest Region to ensure the dataset was complete.

Prior to 1945 there was no systematic effort to record marine mammal strandings. After 1944, strandings were more routinely recorded, primarily by Carl L. Hubbs of SIO and Raymond M. Gilmore of the US Fish and Wildlife Service and later of the San Diego Natural History Museum.

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By 1946, local scientists started to publish on cetacean strandings from San Diego County (Hubbs, 1946; Hubbs, 1951; 1953; Kenyon, 1952; Moore, 1963; Moore and Gilmore, 1965; Mitchell, 1968; Brownell, 1971). Sea World began cetacean rehabilitation efforts in 1963, although the park did not open until 1964. The US Navy Marine Mammal Program (MMP) responded to live stranded cetaceans in San Diego County from 1972–79. In 1966, the Southwest Fisheries Science Center (SWFSC) began responding to and documenting dead stranded cetaceans. However, the number of strandings investigated was limited because no formal effort was made to notify beach personnel of the SWFSC's interest in cetacean strandings.

In 1972, following the passage of the MMPA, the National Marine Fisheries Service (NMFS) and the California Department of Fish and Game (CDFG) began to collect state wide information on strandings and the first marine mammal report form was drafted. During this time there was a general increase in knowledge on the part of beach personnel as to SWFSC's desire to collect stranded cetaceans. In 1979, the Cooperative Marine Mammal Salvage Program was formed in San Diego County. Under this agreement, the SWFSC and Hubbs-Sea World Research Institute responded to dead marine mammals while Sea World and the MMP responded to live animals (Henderson and Hansen, 1983). Currently, Sea World and SWFSC are the only organisations that respond to marine mammal strandings in San Diego County.

For each stranding event that occurred after 1971, at minimum the following information (Geraci and Lounsbury, 2005) was recorded: species; number of animals; location and date of stranding; total body length (Norris, 1961); decomposition state; and sex. Skulls, skeletons, life history and health assessment data were collected when possible. However, results from these collections are not discussed here. San Diego County was divided into 11 regions in order to track the geographic occurrence of strandings (Fig. 1). San Diego County lies within the Southern California Bight (SCB), which is the body of water from Point Conception to a point just south of the United States/Mexico border, with a

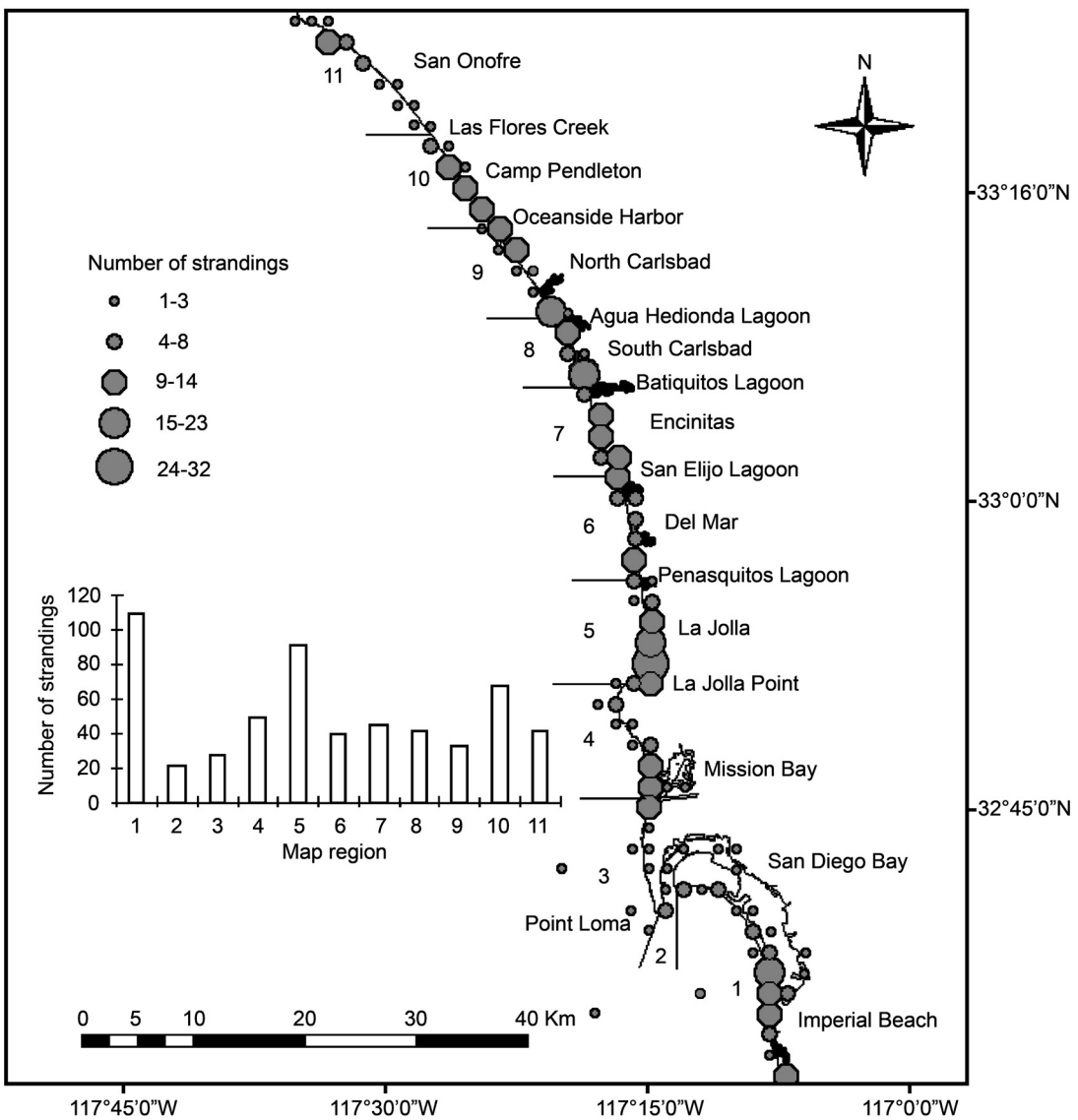

Fig. 1. Cetacean strandings recorded along the San Diego County coastline from 1972 to 2008. Map region two includes San Diego Bay coastline. Regions bordering San Diego County (Orange County to the north and Mexico to the south) are not depicted on map. Cetacean strandings were most common in regions 1, 5 and 10.

maximum width of 300km from shore at the Patton Escarpment (Dailey *et al.*, 1993). Statistical analyses were restricted to data that were collected after 1971, when formal reporting of marine mammal strandings began.

All data collected were verified whenever possible, paying particular attention to the accuracy of species identifications. Whenever photographs, morphological data, or tissue for genetic analysis were available, species identifications were confirmed. This was especially important in the case of short-beaked common dolphins (*Delphinus delphi*s) and long-beaked common dolphins (*Delphinus capensis*). Heyning and Perrin (1994) revised the taxonomy of *Delphinus* to include two species, the short-beaked common dolphin and long-beaked common dolphin, based on cranial characteristics, genetic data and colour pattern variation. For specimens collected prior to the revision, common dolphin records have been updated to accord with the current taxonomy whenever possible. Since a number of unidentified common dolphin remain in the data set prior to the 1994 revision, only specimens collected after 1993 were used in statistical analyses of the two species.

Both coastal and offshore stocks of bottlenose dolphin (*Tursiops truncatus*) occur off California (Carretta *et al.*, 2009) and they are genetically distinct (Lowther, 2006). When tissue or bone was available, coastal and offshore stock designations were determined using genetic analyses of mitochondrial (mt) DNA, as outlined by Lowther (2006).

Stillbirths were defined as specimens without inflated lungs. Inflation of the lungs was determined either by histopathology or flotation of lungs (from freshly dead specimens) in water. Neonates were defined as specimens with both fetal folds and inflated lungs. Although neonates by definition are four weeks or less in age, this definition has been extended to approximately 6–8 weeks, since fetal folds are visible for this length of time in bottlenose dolphins (Cockcroft and Ross, 1990; Kastelein *et al.*, 1990). The above information was not available for all bottlenose dolphins and none of the gray whale (*Eschrictius robustus*) specimens. In lieu of the above criteria, bottlenose dolphin neonates were defined as specimens with a total standard body length between 111cm (smallest animal in data set with fetal folds and inflated lungs) and 137cm (largest animal with fetal folds). Using Sanchez Pacheco (1998) and Rice and Wolman (1971) as guidelines, gray whale length classes were defined as follows: calf (340–639cm); yearling (640–950cm); juvenile (female: 951–1,169cm; males: 951–1,109cm); and adult (females: 1,170+cm; males: 1,110+cm).

For common dolphins, sex ratios and standard total body length were compared between stranded specimens and those incidentally killed in the California drift and small-mesh gillnet (California gillnet – CAGN) fisheries between 1994 and 2008. Observers placed onboard CAGN fishing vessels recorded at a minimum the location and date of each net set and the species and sex of incidentally killed cetaceans. When possible biological data and samples such as standard total body length, gonads, skin and teeth were collected (Carretta *et al.*, 2005a)

Stranding records were examined for evidence of human interaction. However, the human interaction data should be interpreted cautiously as its collection has varied over time, which is why statistical analyses were not performed on the available data. The occurrence of human interaction does not necessarily equate with cause of death and the absence of human interaction does not mean it did not occur. An animal was considered to be shot if a bullet was recovered from the carcass. Entangled animals were considered to be those with net impressions, appendages removed or had gear attached to their bodies. Ship strikes were either reported by mariners or determined by the presence of propeller marks across an animal's body.

Kuiper's test (Batschelet, 1981) was used to determine whether the distribution of strandings was uniform. This is a nonparametric goodness-of-fit test for cumulative distributions that is used for comparisons of circular distributions. Pearson's chi-square test was used to determine whether stranding frequencies varied by season, geographic location, sex or size class. The non-parametric Mann-Whitney test was used to compare standard total length between stranded and CAGN short-beaked common dolphin specimens because the data were not normally distributed.

RESULTS

For the period 1851 to 2008 a total of 717 cetacean strandings (150 live and 567 dead), representing 18 odontocete and 6 mysticete species were recorded in San Diego County (Appendix I). Between 1972 and 2008, strandings of the two common dolphin species occurred the most frequently (43.2%), followed by bottlenose dolphins (16.5%), gray whales (11.1%), and Pacific white-sided dolphins (*Lagenorhyncus obliquidens*) (7.0%). The remaining 22.2% of strandings comprised nineteen other cetacean species (Table 1). All strandings were of individuals, with the exception of three group events: (1) a juvenile and pregnant female pygmy sperm whale (*Kogia breviceps*) stranded together alive in 1955; (2) two adult female bottlenose dolphin stranded together alive in 1963; and (3) two live adult Cuvier's beaked whales (*Ziphius cavirostris*) became entangled in a fishing net in 1963. It is possible that there have been other group events because other cetaceans have been found dead on the same day and location but it is not known whether they washed in on the same day or were simply found on the same day. Of particular note was the observation of five dead adult long-beaked common dolphin on Silver Strand State Beach between 9–10 July 2007. All specimens tested positive for the biotoxin domoic acid.

In general, a bimodal trend in strandings is apparent, with additional peaks scattered throughout the record (Fig. 2). From 1972 to 2008, the average stranding rate was 15.5 (SE = 1.01) individuals per year (2.9 live, 12.6 dead). In general, strandings were most common from March through August ($p<0.01$, $K = 3.7311$). A significantly higher number of strandings were recorded in map regions one (Coronado/Imperial Beach), five (La Jolla), and ten (Camp Pendleton) ($\chi^2 = 146.668$, df = 10, $p<0.0001$) (Fig. 1).

Common dolphins

Two modes in common dolphin strandings occurred, one in the early- to mid-1970s and the other beginning in the late-1990s to 2008 (Fig. 3). Significant seasonality in strandings was found for both short-beaked common dolphin ($K = 2.2481$, $p<0.01$) and long-beaked common dolphin

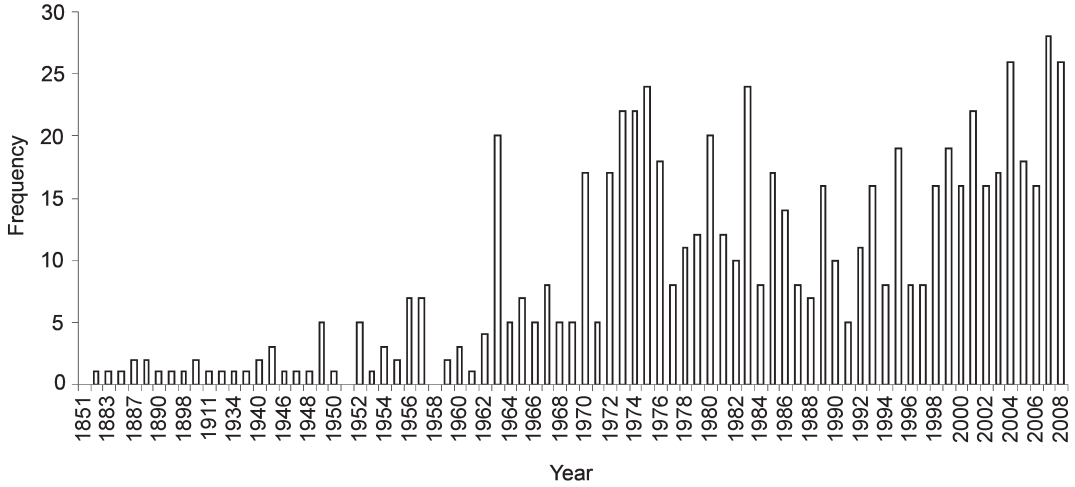

Fig. 2. Frequency distribution of recorded cetacean strandings in San Diego County, California.

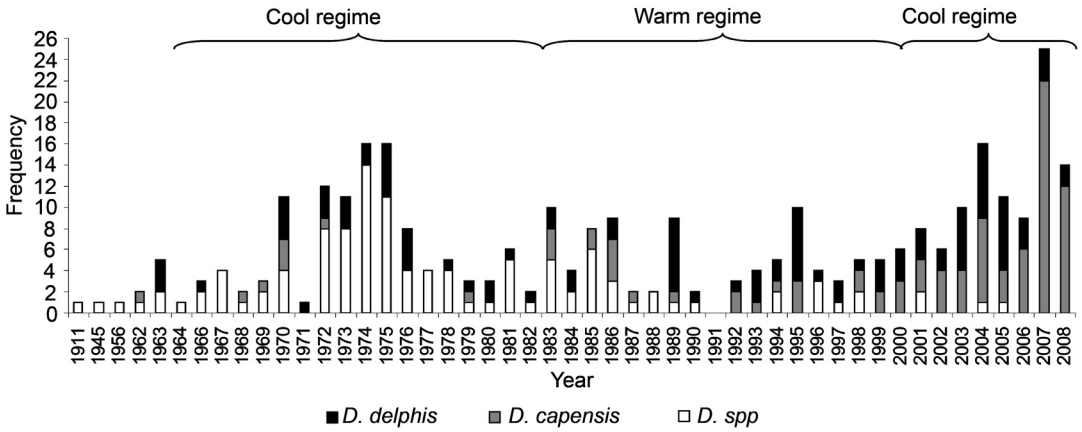

Fig. 3. Frequency distribution of recorded San Diego County common dolphin strandings. Cool and warm water oceanographic regime designations are approximate.

(K = 3.0166, p<0.01). Both short-beaked and long-beaked common dolphin strandings peaked from March through to July (Fig. 4). One neonate stranding was recorded for each common dolphin species: (1) an approximately 100cm long-beaked common dolphin stranded freshly dead in July 2004; and (2) an 85.8cm freshly dead short-beaked common dolphin stranded in June 2007.

An average of 3.5 (SE = 0.60) and 4.9 (SE = 1.46) short-beaked common dolphins and long-beaked common dolphins stranded per year, respectively. Peaks in short-beaked common dolphin strandings occurred in 1989, 1995 and 2003–05. Long-beaked common dolphin strandings peaked in 2007 and 2008 (Fig. 3). A notable increase in the proportion of long-beaked common dolphins compared to short-beaked common dolphins began in 2006. The stranded short-beaked common dolphin male-to-female ratio of 1.04:1 (n = 47) was not significantly different (χ^2 = 0.021, df = 1, p = 0.884), whereas the 1.68:1 ratio (n = 252) observed in the CAGN fishery was significantly male biased (χ^2 = 16.254, df = 1, p = 0.0001). The male-to-female ratios of stranded (1.2:1, n = 70) and CAGN (1.5:1, n = 20) long-beaked common dolphin were not significantly different from parity (χ^2 = 0.514, df = 1, p = 0.473 and χ^2 = 0.800, df = 1, p = 0.371, respectively)

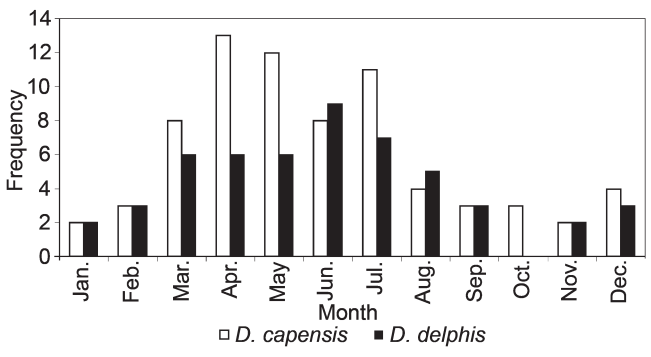

Fig. 4. Frequency distribution of common dolphin strandings by month.

For short-beaked common dolphins there are sufficient data to compare the standard total body lengths of strandings to those observed in the CAGN fisheries (Fig. 5). The average standard total body length for stranded and CAGN male short-beaked common dolphins was not significantly different (Mann-Whitney: p = 0.464) at 166.2cm (n = 21) and 166.6 cm (n = 136), respectively. However, standard total body length of stranded females (168.1cm, n = 22) was significantly different (Mann-Whitney: p = 0.016) from those in the gillnet fisheries (158.5cm, n = 74).

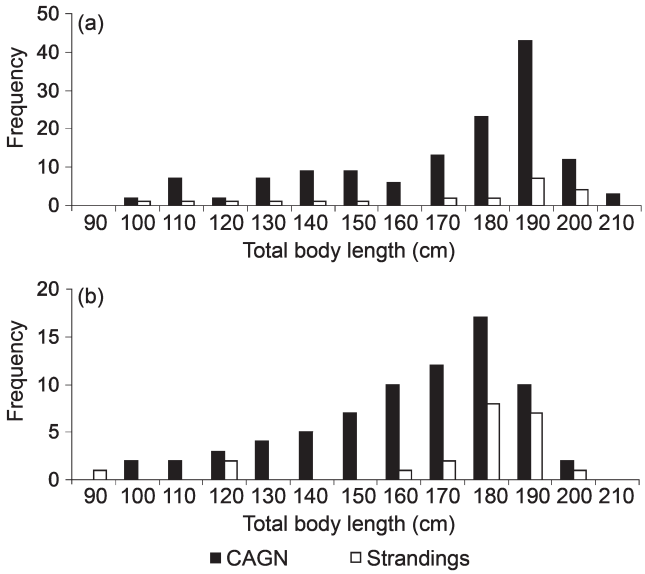

Fig. 5. Total body length frequency distributions of (a) male and (b) female stranded and CAGN short-beaked common dolphins. The *x*-axis labels represent the upper bound of the length interval.

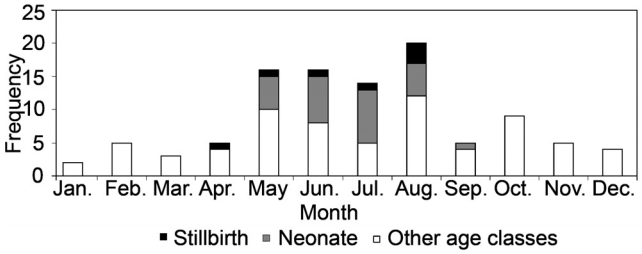

Fig. 7. Frequency distribution of bottlenose dolphin strandings by month.

Bottlenose dolphin

Preliminary stock designation analyses were run on 83 of the 118 bottlenose dolphin specimens that have stranded in San Diego County (Appendix II). None of these were assigned by genetic analysis to the offshore stock, while 61 were assigned to the coastal stock, and 22 of these are currently considered to be undetermined because they share a mitochondrial haplotype with the offshore stock (n = 18) or are a new haplotype (n = 4) that has not yet been matched with a known coastal or offshore animal. Further research is needed to resolve stock designations for these individuals.

An average of 2.9 (SE = 0.32) bottlenose dolphins stranded per year in San Diego County. Bottlenose dolphin strandings peaked in 1980, with a notably low stranding rate from 1996–99 (Fig. 6). Bottlenose dolphin strandings varied seasonally (K = 3.3227, p<0.01), with peaks from May through August (Fig. 7). Neonates only occurred from May to September. If neonates and stillbirths are removed from the dataset, seasonality in bottlenose dolphin strandings is no longer significant (K = 1.7467, 0.05<p<0.10). The 0.85:1 ratio of stranded males to females (n = 98) was not significantly different (χ^2 = 0.653, df = 1, p = 0.419).

Gray whale

The gray whale is the only large whale to regularly strand in San Diego County (Table 1). On average, 1.81 (SE = 0.279) gray whales stranded in San Diego County per year, with a high of five individuals in 1999 (Fig. 8). Although this species has stranded in every month, these strandings were not uniformly distributed throughout the year (K = 2.7906, p<0.01). Two peaks, corresponding with the migratory period, occurred in January and April (Fig. 9). Neonates and yearlings were most common (χ^2 = 18.279, df = 3, p<0.0001). The significantly different (χ^2 = 4.091, df = 1, p = 0.043) male-to-female ratio for stranded individuals was 1.8:1 (n = 55).

Pacific white-sided dolphin

Pacific white-sided dolphins stranded sporadically throughout the study period, with a notable peak in 1980 (Fig. 10). The number of Pacific white-sided dolphin strandings did not vary significantly by season (K = 0.9532, p>0.15; Fig. 9). The ratio of stranded males to females was 0.77:1 (n = 20), which was not significantly different (χ^2 = 0.533, df = 1, p = 0.465).

Other species

Dall's porpoise (*Phocoenoides dalli*) occurred regularly in the stranding record from 1960 to 1979 at a rate of 0.7 per year, was absent 1980–1997 and stranded at a rate of 0.2 per year from 1998–2008 (Fig. 11). There has been a

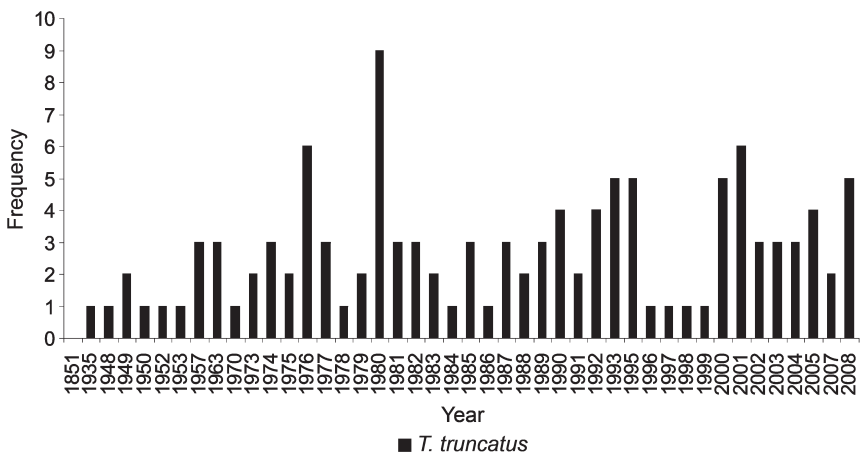

Fig. 6. Frequency distribution of recorded San Diego County bottlenose dolphin strandings.

Table 1

Number of cetaceans stranded along San Diego County coastline between 1851 and 2008.

	Alive	Dead	Total
Balaenoptera spp.	0	4	4
Balaenoptera acutorostrata	0	3	3
Balaenoptera musculus	0	4	4
Balaenoptera physalus	0	6	6
Delphinus capensis	7	88	95
Delphinus delphis	21	81	102
Delphinus sp.	52	61	113
Eschrictius robustus	3	77	80
Eubalaena japonica	0	1	1
Globicephala macrorhynchus	3	17	20
Grampus griseus	3	5	8
Kogia breviceps	10	5	15
Lagenorhyncus obliquidens	9	41	50
Lissodelphis borealis	4	9	13
Megaptera novaeangliae	1	3	4
Mesoplodon carlhubbsi	2	1	3
Mesoplodon ginkodens	0	1	1
Mesoplodon perrini	0	4	4
Mesoplodon stejnegeri	1	0	1
Phocoena phocoena	0	2	2
Phocoenoides dalli	6	13	19
Physeter macrocephalus	0	2	2
Stenella coeruleoalba	1	4	5
Tursiops truncatus	12	106	118
Unidentified cetacean	0	2	2
Unidentified dolphin or porpoise	6	15	21
Unidentified large whale	1	3	4
Unidentified whale	3	0	3
Ziphius cavirostris	5	9	14
Total	150	567	717

steady decline in short-finned pilot whale (*Globicephala macrorhynchus*) strandings since the 1960s (Fig. 11). Pygmy sperm whale strandings have fluctuated over time, peaking in the 1990s and absent 2000–2008 (Fig. 11). Extralimital strandings of harbour porpoises (*Phocoena phocoena*) occurred in 2005 and 2006. A North Pacific right whale (*Eubalaena japonica*) stranded in Oceanside (map region 9, Fig. 1) in February 1856.

Beaked whales rarely stranded with only 23 strandings observed between 1946 and 2008. However, these records represent five species (Table 1). Fourteen Cuvier's beaked whales were recorded between 1945 and 2007, five of which were alive at the time of stranding. On 12 June 1963, two Cuvier's beaked whales were caught in fishing net off La Jolla Cove (region 5, Fig. 1). One was freed alive, the other died after disentangling itself. On this same day, another Cuvier's beaked whale stranded alive in Del Mar (region 6, Fig. 1) and died on the beach. Nine individuals of the genus *Mesoplodon,* representing four species, stranded between 1946 and 1986. All of these stranded as single individuals and three stranded alive. Four of the beaked whale specimens were first identified as Hector's beaked whale (*M. hectori*) (Mead, 1981) but they were later described as a new species, Perrin's beaked whale (*M. perrini*) (Dalebout *et al.*, 2002).

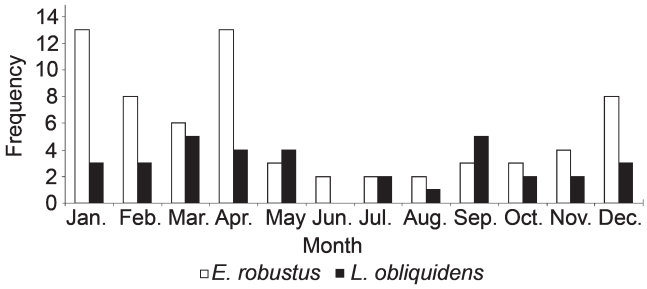

Fig. 9. Frequency distribution of gray whale and Pacific white-sided dolphin strandings by month.

Human interaction

The most common forms (in descending order) of human interaction observed in San Diego County cetaceans were entanglement, boat strikes, and gunshots (Table 2). Entanglement was noted in eight different cetacean species and was most commonly observed for long-beaked common dolphins and gray whales. Ship strikes were observed for five different cetacean species and were most commonly observed in gray whales. Three cetacean species were impacted by gunshots. The long-beaked common dolphin shootings (n = 4) occurred during one event in 2007. One dead gray whale was observed with a harpoon tip embedded in its back on 12 December 1999. The harpoon is believed to have originated from an aboriginal Russian hunt (R. Brownell, pers. comm.).

DISCUSSION

Stranding records do not reflect all cetaceans that have stranded. The general increase in strandings after 1972,

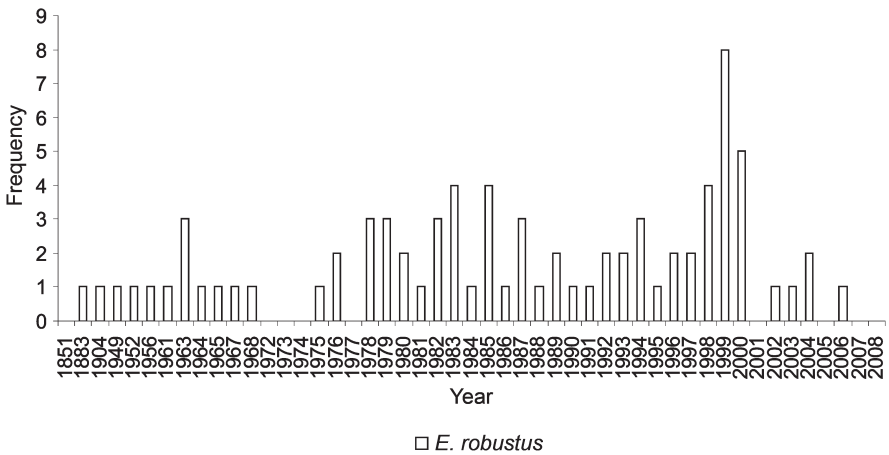

Fig. 8. Frequency distribution of recorded San Diego County gray whale strandings.

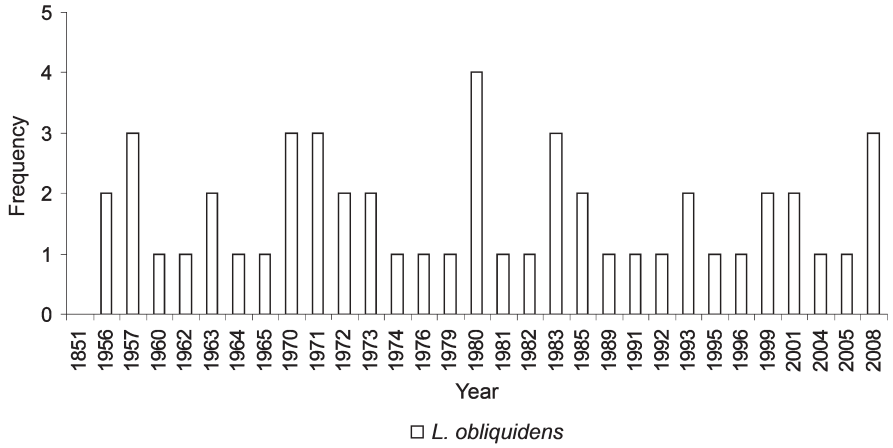

Fig. 10. Frequency distribution of recorded San Diego County Pacific white-sided dolphin strandings.

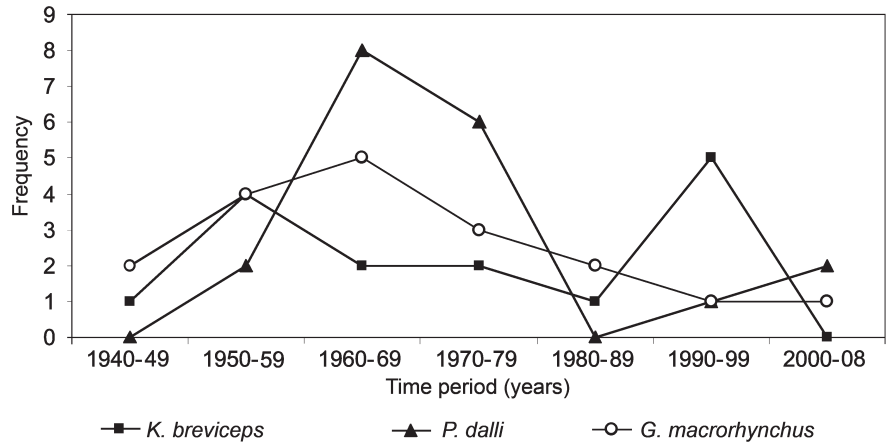

Fig. 11. Temporal changes in stranding frequency for pygmy sperm whales, Dall's porpoise, and short-finned pilot whales in San Diego County.

shown in Fig. 2, probably does not reflect an increase in actual strandings but an increase in reporting of strandings. Prior to 1972, beach personnel may not have known of SWFSC's interest in strandings, and animals may have been disposed of without being reported. There is also inherent variability in strandings reported due to beach personnel turnover and differences in their interest and knowledge of stranded marine mammals and the CMMSN.

Although there may be variability in reporting of strandings, the stranding record largely reflected the species composition of live animals observed in the Southern California Bight (SCB) during boat and aerial surveys (Barlow and Forney, 2007; Forney and Barlow, 1998; Forney *et al.*, 1995; Shane, 1994), with a few exceptions. Killer whales (*Orcinus orca*) were observed in the SCB during one survey (Forney and Barlow, 1998) but not in the stranding record. Killer whales may not appear in the stranding record because they are not very common in the SCB, as indicated by only one survey sighting on the outer edge of the SCB (Forney and Barlow, 1998) and their abundance off the west coast (n = 810) is relatively low (Barlow and Forney, 2007). Conversely, harbour porpoise and pygmy sperm whales were recorded in the stranding record and not observed during live animal surveys in the SCB. Pygmy sperm whales could have been missed in the SCB during live surveys because it is a cryptic species with a relatively low abundance off the west coast (n = 1,237) (Barlow and Forney, 2007). Harbour porpoise is also a cryptic species and was only observed stranded in 2006 and 2007, during which period there were no surveys. Overall the stranding record reflected a greater species richness than live animal surveys, which is what Pyenson (2010) also found in his survey of California cetacean strandings. This highlights the importance of stranding records because they are essentially an uninterrupted record, whereas surveys generally

Table 2

Number of documented San Diego County cetaceans with signs of human interaction.

Species	Entanglement	Boat strike	Gunshot	Harpoon
Balaenoptera acutorostrata	1	1	–	–
Balaenoptera physalus	–	1	–	–
Delphinus capensis	9	–	4	–
Delphinus delphis	1	–	–	–
Delphinus sp.	–	1	–	–
Eschrictius robustus	8	5	–	1
Grampus griseus	2	–	1	–
Lagenoryhncus obliquidens	1	–	–	–
Tursiops truncatus	3	1	1	–
Ziphius cavirostris	2	–	–	–
Unidentified whale	1	1	–	–
Total	28	10	6	1

document species distributions during relatively brief time periods.

Coastal geography is likely the main factor influencing the deposition rates of carcasses in map regions one and five. Brabyn and McLean (1992) observed a similar trend in New Zealand, where mass strandings were associated with protrusions from the coastline. La Jolla Point and Point Loma likely 'capture' drifting carcasses into map regions five and one (Fig. 1). In addition, the presence of small coastal eddies just North of map regions one and five (DiGiacomo and Holt, 2001) may contribute to the 'capture' of carcasses offshore of these regions. It is also possible that increased effort, either by those reporting or responding to strandings, could have been a factor in map regions one, five, and ten at some point in time.

Common dolphins

The general bimodal trend of cetacean strandings over time (Fig. 2) was mostly driven by the large number of common dolphins in the stranding record, which has a distinct bimodal trend in strandings over time (Fig. 3). Peaks in common dolphin strandings occurred during cool oceanographic regimes in the Northeast Pacific (Chavez *et al.*, 2003; Peterson and Schwing, 2003) (Fig. 3). This suggests that either common dolphin distribution shifted or their population health declined in response to the regime shifts. Off California, the distribution of common dolphins has been shown to vary seasonally in response to changing oceanographic conditions (Forney and Barlow, 1998). Therefore, it is possible that temporal trends in common dolphin strandings may reflect a shift of this species closer to the San Diego County shoreline, allowing more carcasses to drift to shore. The increased proportion of long-beaked common dolphin strandings beginning in 2006 (Fig. 3) may reflect increased numbers of this species off California. This is supported by increased abundance estimates for this species from 11,714 in 2005 to 62,447 in 2008 (Barlow, 2010; Forney, 2007). Alternatively, the health of common dolphin populations could have been affected by a change in biotoxin presence or prey type associated with changing oceanographic conditions.

The biotoxin, domoic acid, which is produced by the diatom *Pseudonitzchia spp*., was first implicated in marine mammal deaths off California in 1998 (Scholin *et al.*, 2000) and was first detected in common dolphins in 2002 (Berman and Fahy, 2003). Half of all stranded San Diego County common dolphin samples that tested positive for domoic acid were as high as those reported in California sea lions (*Zalophus californianus*) exhibiting acute effects of domoic acid toxicosis (Goldstein *et al.*, 2008). Anchovies have been implicated as the primary vector for domoic acid toxicity in long-beaked common dolphins (Berman and Fahy, 2003) and they are known to be more prevalent in cool water regimes (Chavez *et al.*, 2003). The peak in long-beaked common dolphins in 2007 (Fig. 3) was likely due to a combination of human interaction (four were shot) and domoic acid toxicosis (9 out of 14 tested positive for domoic acid).

The seasonality in both species of common dolphin strandings (Fig. 4) suggests that these species shift their distribution offshore of San Diego County or experience increased mortality from March to July. As mentioned above, a change in biotoxin or prey could play a role in mortality. Domoic acid concentrations typically increase during the spring and summer off California (Langlois, 2007; Schnetzer *et al.*, 2007). Previous stranding events of long-beaked common dolphins due to domoic acid toxicosis have occurred during these seasons (Berman and Fahy, 2003).

The observation that the sex ratio for both common dolphin species was not significantly different in the stranded sample likely reflects a 1:1 ratio that would be expected in the population as a whole and suggests that both sexes have similar mortality rates. The significantly male dominated short-beaked common dolphin sex ratio observed in the CAGN sample suggests that the fishery incidentally captured more males due to behavioural differences between the sexes, such as schooling in different areas or interacting with fishing gear differently. A male-dominated sex ratio has also been reported for central North Pacific and North Atlantic short-beaked common dolphins (Ferrero and Walker, 1995; Murphy, 2004; Westgate and Read, 2007) that were incidentally killed in fisheries.

The greater female average standard total body length for stranded specimens compared to CAGN specimens can be explained by examining the length frequency distributions for each group. Smaller (younger) females are lacking in the stranded sample (Fig. 5). This may indicate that young females have a lower mortality rate than young males or that they school farther offshore, making it less likely that their carcasses would drift to shore.

Bottlenose dolphin

The high percentage (73.5%) of bottlenose dolphin specimens definitively assigned to the coastal stock suggests that the majority of stranded bottlenose dolphins in San Diego County belong to the coastal stock, a population of approximately 450 individuals (Carretta *et al.*, 2009). This population estimate was a modification of the mark recapture population estimate by Dudzik *et al*. (2006) and accounts for animals that lacked distinguishing marks in their study. It is plausible that almost all coastal bottlenose dolphins that die strand along the coastline given that their range is within one nautical mile of shore. Based on this assumption, between 0.47% and 0.64% of the coastal population dies and strands along the San Diego County coastline every year. This range was calculated by assigning the 26.5% of bottlenose dolphins whose stock designation is currently undetermined to either offshore or coastal for the minimum and maximum estimates, respectively.

The reason for the bottlenose dolphin stranding peaks in 1980 is unknown. However, possibilities include disease outbreak, a southerly distributional shift of the coastal stock or the movement of the offshore stock closer to shore. Since seven of the nine dolphins that stranded in 1980 were determined to be from the coastal stock, movement of the offshore stock is an unlikely reason for the peak in strandings. The decrease in bottlenose dolphin strandings from 1996–99 cannot be attributed to a distribution shift out of the area as there were no significant changes in sighting rates or abundance for bottlenose dolphins off San Diego County during that time period (D. Weller, pers. comm.).

The seasonality in bottlenose dolphin strandings that was detected actually reflects a calving season from May to

September, rather than seasonality of occurrence (Fig. 7). When neonates were removed from the dataset, this seasonality was no longer significant. Defran and Weller (1999) also found that there was no seasonality in bottlenose dolphin occurrence off San Diego County during their boat-based surveys of this population, which were conducted year-round from 1982–89.

The bottlenose dolphin sex ratio (0.84:1) found in this study was not significantly different from a 1:1 ratio. However, Lowther (2006) found a significantly male-biased ratio (1.9:1) of biopsied bottlenose dolphins off San Diego County. The difference between data sets supports the possibility presented by Lowther (2006) that a sampling bias existed in biopsied bottlenose dolphins, rather than representing a skewed sex ratio for the population.

Gray whale

The peak in gray whale strandings occurred during the 1999/2000 die-off, which may have been related to overall food availability (LeBoeuf *et al.*, 2000; Moore *et al.*, 2001; Perryman *et al.*, 2002). The low number and sometimes absence of gray whale strandings following the 1999/2000 die-off is curious (Fig. 8). It is possible that the die-off reduced the population to the extent that there were simply fewer whales to strand. Or, alternatively, the die-off could have reduced the number of compromised individuals such that the population is now comprised of healthier individuals that are less likely to strand. The January and April peaks in strandings likely correspond with southbound and northbound migrating whales, respectively. The higher proportion of males and yearlings in the San Diego County stranding record may indicate that young males are more likely to migrate than females.

Pacific white-sided dolphin

The lack of seasonality in strandings for Pacific white-sided dolphins was surprising considering that their distribution shifts seasonally from California waters in the winter to Oregon and Washington waters in the summer (Forney and Barlow, 1998). Thus, a winter peak in strandings was expected. Pacific white-sided dolphin strandings peaked in 1980, which is the same year bottlenose dolphin strandings peaked. This may suggest that an environmental change occurred that significantly affected their health or shifted their distribution such that they were more likely to strand along the San Diego County coastline. These species are not known to interact, thus disease transmission between the two populations is not likely.

Other species

Dall's porpoise is endemic to the cool temperate North Pacific and San Diego is at approximately the southern limit of its range (Reeves *et al.*, 2002; Rice, 1998). Thus, a shift in its distribution may be more easily detected here. The cool to warm oceanographic regime shift of the late 1970s in the North Pacific may have prompted a northward movement of Dall's porpoise which resulted in its absence off San Diego County from 1980–1997. Its appearance in the San Diego County stranding record again from 1998 to 2006 may be due to the shift into a cooler oceanographic regime, allowing it to expand its range south again.

The decrease in short-finned pilot whale strandings reflects a decline in density of this species in the SCB. Pilot whales moved from the area following the strong El Niño event of 1982–83 (Shane, 1995). Sighting surveys (Barlow, 1995; 1997; Carretta *et al.*, 1995; 2009; Forney *et al.*, 1995; Von Saunder and Barlow, 1999) and incidental takes in the CAGN fishery (Carretta *et al.*, 2005b) indicate short-finned pilot whales returned to California waters nine years after the El Niño event, but not to the SCB.

Risso's dolphins are thought to have replaced short-finned pilot whales in the SCB in the mid to late 1980s (Shane, 1995). The temporal trend of Risso's dolphins in the San Diego County stranding record supports this hypothesis. Although there were only eight recorded Risso's dolphins, 75% of these occurred between 1990 and 2008.

Little is known about pygmy sperm whales off California and thus it is difficult to make any comparisons. Four sightings of *Kogia spp*. have been recorded off central and northern California during ship surveys (Barlow and Forney, 2007). The stranding records presented here represent the only published information available for this species in southern California.

The appearance of harbour porpoises in 2005 and 2006 was surprising since it is a cool-temperate species that normally only ranges as far south as Point Conception (Carretta *et al.*, 2009), although Norris and McFarland (1958) reported bycatch of this species within Los Angeles County. Harbour porpoises are thought to shift their distribution in response to changing oceanographic conditions (Forney, 1999) and thus their appearance in San Diego County may either reflect anomalous oceanographic conditions during 2005 and 2006 or an expansion of their range to the south, perhaps in response to the current cool oceanographic regime. However, harbour porpoises were not reported during the previous cool oceanographic regime (the harbour porpoise reported by Norris and McFarland (1958) in the SCB was captured in 1934 when oceanographic temperatures in this region were reported as being highly variable (Rebstock, 2003)). Interestingly, an extralimital stranding of a southern sea otter in San Diego County occurred on the same day as the stranding of a harbour porpoise in 2006.

The North Pacific right whale observation is the only stranding record for this species in the literature for the mainland United States (one was reported in 1916 on Santa Cruz Island, CA (Woodhouse and Strickley, 1982)). There have been 14 sightings of this species off California in the 20th century, all of which occurred between February and May (Brownell *et al.*, 2001). This stranding occurred in February, which follows the apparent migratory season for this species off the coast of California.

Based on the cetaceans recorded and collected during the study period, two new species were discovered and described from specimens collected in San Diego County: Hubb's beaked whale (*Mesoplodon carlhubbsi*) and Perrin's beaked whale (Dalebout *et al.*, 2002; Moore and Gilmore, 1965).

Human interaction

The most common type of human interaction observed in San Diego County cetaceans was entanglement and this was most frequently observed in long-beaked common dolphins

and gray whales. The origin of gray whale entanglements observed off San Diego could have occurred anywhere along their migratory path whereas long-beaked common dolphin entanglements likely occurred within the SCB or northern Mexico. There are two Category I fisheries (i.e. those with frequent mortality or serious injury of marine mammals) that operate off southern California: (1) the shark/swordfish drift gillnet fishery, of which short-beaked common dolphins are the most commonly entangled cetacean (Carretta *et al.*, 2005b); and (2) the halibut set gillnet fishery of which harbour porpoise are the most commonly entangled cetacean (Julian and Beeson, 1998). Thus, it seems likely that an unobserved or minimally observed fishery is responsible for long-beaked common dolphin entanglements off San Diego County; either a Category II (occasional marine mammal mortality/injury) or Category III US fishery (unknown marine mammal mortality/injury), or a fishery off northern Mexico.

Conclusion

In summary, San Diego County cetacean stranding records reflected the species composition of the SCB and over the long-term were better at detecting the presence of cryptic species likely missed during aerial and ship surveys. The results of this study demonstrate the value of stranding networks in monitoring cetacean species and highlight the importance of stranding records for documenting extralimital sightings, cryptic species and revealing changes in mortality or distribution due to oceanographic conditions.

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REFERENCES

Balcomb, K.C., III and Claridge, D.E. 2001. A mass stranding of cetaceans caused by naval sonar in the Bahamas. *Bahamas Journal of Science* 2: 2–12.

Barlow, J. 1995. The abundance of cetaceans in California coastal waters: I. Ship surveys in the summer/fall 1991. *Fish. Bull.* 93: 1–14.

Barlow, J. 1997. Preliminary estimates of cetacean abundance off California, Oregon and Washington based on a 1996 ship survey, and comparisons of passing and closing modes. *SWFSC Admin. Rep. No.* LJ-97-11: 25pp.

Barlow, J. 2010. Cetacean abundance in the California Current estimated from a 2008 ship-based line-transect survey. *NOAA Tech. Mem. NOAA-TM-NMFS-SWFSC* 456: 19pp.

Barlow, J. and Forney, K. 2007. Abundance and population density of cetaceans in the California Current ecosystem. *Fish. Bull.* 105: 509–26.

Batschelet, E. 1981. *Circular Statistics in Biology*. Academic Press, London. 371pp.

Berman, M.S. and Fahy, K. 2003. Domoic acid and dolphins; a deadly combination. Presented to the 15th Biennial Conference on the Biology of Marine Mammals, 14–19 December 2003, Greensboro, NC.

Brabyn, M.W. and McLean, I.G. 1992. Oceanography and coastal topography of herd-stranding sites for whales in New Zealand. *J. Mammal.* 73(3): 469–76.

Brownell, R.L. 1971. Whales, dolphins and oil pollution. pp.255–76. *In*: Straughan, D. (eds). *Biology and Bacteriology*. Allan Hancock Foundation, University of Southern California, Los Angeles, USA. 426pp.

Brownell, R.L., Clapham, P.J., Miyashita, T. and Kasuya, T. 2001. Conservation status of North Pacific right whales. *J. Cetacean Res. Manage. (special issue)* 2: 269–86.

Carretta, J.V., Chivers, S.J. and Danil, K. 2005a. Preliminary estimated of marine mammal bycatch, mortality and biological sampling of cetaceans in California gillnet fisheries for 2004. *NOAA Admin. Rep.* LJ-05-10: 17pp.

Carretta, J.V., Forney, K.A. and Barlow, J. 1995. Report of 1993–1994 marine mammal aerial surveys conducted within the US Navy outer sea test range off southern California. *NOAA Tech. Mem.* NOAA-TM-NMFS-SWFSC-217: 90pp.

Carretta, J.V., Forney, K.A., Lowry, M.S., Barlow, J., Baker, J., Hanson, B. and Muto, M.M. 2009. U.S. Pacific Marine Mammal Stock Assessments: 2008. *NOAA Tech. Memo. NMFS-SWFSC-414*: 334pp.

Carretta, J.V., Price, T., Petersen, D. and Read, R. 2005b. Estimates of marine mammal, sea turtle, and seabird mortality in the California drift gillnet fishery for swordfish and thresher shark, 1996–2002. *Mar. Fish. Rev.* 66(2): 21–30.

Chavez, F.P., Ryan, J., Lluch-Cota, S.E. and Niquen, C.M. 2003. From anchovies to sardines and back: multidecadal change in the Pacific Ocean. *Science* 299(5604): 217–21.

Cockcroft, V.G. and Ross, G.J.B. 1990. Observations on the early development of a captive bottlenose dolphin calf. pp.461–78. *In*: Leatherwood, S. and Reeves, R. (eds). *The Bottlenose Dolphin*. Academic Press, New York. 653pp.

Cox, T.M., Read, A.J., Barco, S.G., Evans, J., Gannon, D.P., Koopman, H.N., McLellan, W.A., Murray, K., Nicolas, J., Pabst, D.A., Potter, C.W., Swingle, W.M., Thayer, V.G., Touhey, K.M. and Westgate, A.J. 1998. Documenting the bycatch of harbor porpoises, *Phocoena phocoena,* in coastal gillnet fisheries from stranded carcasses. *Fish. Bull.* 96(4): 727–34.

Dailey, M.D., Reish, D.J. and Anderson, J.W. 1993. *Ecology of the Southern California Bight: a synthesis and interpretation*. University of California, Berkeley. 926pp.

Dalebout, M.L., Mead, J.G., Baker, C.S., Baker, A.N. and Van Helden, A.L. 2002. A new species of beaked whale *Mesoplodon perrini* sp. N. (Cetacea: Ziphiidae) discovered through phylogenetic analyses of mitochondrial DNA sequences. *Mar. Mammal Sci.* 18(3): 577–608.

Defran, R.H. and Weller, D.W. 1999. Occurrence, distribution, site fidelity, and school size of bottlenose dolphins (*Tursiops truncatus*) off San Diego, California. *Mar. Mammal Sci.* 15(2): 366–80.

DiGiacomo, P.M. and Holt, B. 2001. Satellite observations of small coastal ocean eddies in the Southern California Bight. *J. Geophys Res.* 106(C10): 22521–44.

Dudzik, K.J., Baker, K.M. and Weller, D.W. 2006. Mark-recapture abundance estimate of California coastal stock bottlenose dolphins: Fedbruary 2004 to April 2005. *NOAA Admin. Rep.* LJ-06-02C: 15pp.

Ferrero, R.C. and Walker, W.A. 1995. Growth and reproduction of the common dolphin, *Delphinus delphis* Linnaeus, in the offshore waters of the north Pacific Ocean. *Fish. Bull.* 93(3): 483–94.

Forney, K.A. 1999. Trends in harbour porpoise abundance off central California, 1986–95: evidence for interannual changes in distribution. *J. Cetacean Res. Manage.* 1(1): 73–80.

Forney, K.A. 2007. Preliminary estimates of cetacean abundance along the US west coast and within four National Marine Sanctuaries during 2005. *NOAA Tech. Memo. NMFS* SWFSC-406: 27pp.

Forney, K.A. and Barlow, J. 1998. Seasonal patterns in the abundance and distribution of California cetaceans, 1991–1992. *Mar. Mammal Sci.* 14(3): 460–89.

Forney, K.A., Barlow, J. and Carretta, J.A. 1995. The abundance of cetaceans in California waters. Part II: Aerial surveys in winter and spring of 1991 and 1992. *Fish. Bull.* 93: 15–26.

Geraci, J.R. and Lounsbury, V.J. 2005. *Marine Mammals Ashore: a Field Guide for Strandings*. 2nd ed. National Aquarium in Baltimore, Baltimore, MD. 371pp.

Goldstein, T., Mazet, J.A.K., Zabka, T.S., Langlois, G., Colegrove, K.M., Silver, M., Bargu, S., van Dolah, F., Leighfield, T. and Conrad, P.A. 2008. Novel symptomatology and changing epidemiology of domoic acid

toxicosis in California sea lions (*Zalophus californianus*): an increasing risk to marine mammal health. *Proc. R. Soc. Lond. Ser. B.* 275(1632): 267–76.
Greig, D., Gulland, F.M.D. and Kreuder, C. 2005. A decade of live California sea lion *(Zalophus californianus)* strandings along the central California coast: causes and trends, 1991–2000. *Aquat. Mamm.* 31(1): 11–22.
Henderson, J.R. and Hansen, L.J. 1983. Stranded marine mammals recovered by the Southwest Fisheries Center, 1966–1980. *NOAA Admin. Rep.* LJ-83-07: 31pp.
Heyning, J.E. and Perrin, W.F. 1994. Evidence for two species of common dolphins (Genus *Delphinus*) from the eastern North Pacific. *Contrib. Sci. [Los Angeles]* 442: 1–35.
Hubbs, C.L. 1946. First records of two beaked whales, *Mesoplodon bowdoini* and *Ziphius cavirostris*, from the Pacific coast of the United States. *J. Mammal.* 27: 242–55.
Hubbs, C.L. 1951. Eastern Pacific records and general distribution of the pygmy sperm whale. *J. Mammal* 32(4): 403–10.
Hubbs, C.L. 1953. Dolphin protecting dead young. *J. Mammal* 34(4): 498.
Julian, F. and Beeson, M. 1998. Estimates of marine mammal, turtle, and seabird mortality for two California gillnet fisheries: 1990–1995. *Fish. Bull.* 96: 271–84.
Kastelein, R.A., Dokter, T. and Zwart, P. 1990. The suckling of a bottlenose dolphin calf (*Tursiops truncatus*) by a foster mother, and information on transverse birth bands. *Aquat. Mamm.* 16(3): 134–38.
Kenyon, K.W. 1952. A bottlenose dolphin from the California coast. *J. Mammal* 33(3): 385–87.
anglois, G.W. 2007. Yearly Marine Biotoxin Monitoring Reports, since 2001. [Available from: http://ww2.cdph.ca.gov/HealthInfo/environhealth/water/Pages/Shellfishreports.aspx].
LeBoeuf, B.J., Pérez-Cortés M, H., Urbán R, J., Mate, B.R. and Ollervides U, F. 2000. High gray whale mortality and low recruitment in 1999: potential causes and implications. *J. Cetacean Res. Manage.* 2(2): 85–99.
Lowther, J.L. 2006. Genetic variation of coastal and offshore bottlenose dolphins, *Tursiops truncatus*, in the eastern North Pacific Ocean. MSc thesis, University of San Diego, CA. 126pp.
McFee, W.E., Hopkins-Murphy, S.R. and Schwacke, L.H. 2006. Trends in bottlenose dolphin (*Tursiops truncatus*) strandings in South Carolina, USA, 1997–2003: implications for the Southern North Carolina and South Carolina Management Units. *J. Cetacean Res. Manage.* 8(2): 195–201.
McLellan, W.A., Friedlander, A.S., Mead, J.G., Potter, C.W. and Pabst, D.A. 2002. Analysing 25 years of bottlenose dolphin (*Tursiops truncatus*) strandings along the Atlantic coast of the USA: do historic records support the coastal migratory stock hypothesis? *J. Cetacean Res. Manage.* 4(3): 297–304.
Mead, J.G. 1981. First records of *Mesoplodon hectori* (Ziphiidae) from the Northern Hemisphere and a description of the adult male. *J. Mammal.* 62(2): 430–32.
Mitchell, E. 1968. Northeast Pacific stranding distribution and seasonality of Cuvier's beaked whale, *Ziphius cavirostris*. *Can. J. Zool.* 46: 265–79.
Moore, J.C. 1963. Recognizing certain species of beaked whales of the Pacific ocean. *Amer. Midland Nat.* 70(2): 396–428.
Moore, J.C. and Gilmore, R.M. 1965. A beaked whale new to the western hemisphere. *Nature* 205: 1239–40.
Moore, S., Urbán R, J., Perryman, W., Gulland, F., Perez-Cortes, H., Rojas-Bracho, L. and Rowles, T. 2001. Are gray whales hitting 'K' hard? *Mar. Mammal Sci.* 17(4): 954–58.
Murphy, S. 2004. The biology and ecology of the common dolphin *Delphinus delphis* in the northeast Atlantic. PhD thesis, University College Cork, Ireland. 281pp.
Norris, K. 1961. Standardized methods for measuring and recording data on the smaller cetaceans. *J. Mammal.* 42(4): 471–76.
Norris, K.S. and McFarland, W.N. 1958. A new porpoise of the genus *Phocoena* from the Gulf of California. *J. Mammal.* 39(1): 22–39.
Perryman, W.L., Donahue, M.A., Perkins, P.C. and Reilly, S.B. 2002. Gray whale calf production 1994–2000: Are observed fluctuations related to changes in seasonal ice cover? *Mar. Mammal Sci.* 18(1): 121–44.
Peterson, W.T. and Schwing, F.B. 2003. A new climate regime in northeast Pacific ecosystems. *Geophys. Res. Lett.* 30(17): 1–4.
Pyenson, N.D. 2010. Carcasses on the coastline: measuring the ecological fidelity of the cetacean stranding record in the eastern North Pacific Ocean. *Paleobiology* 36(3): 453–80.
Rebstock, G.A. 2003. Long-term change and stability in the California Current System: lessons from CalCOFI and other long-term data sets. *Deep-Sea Res. II* 50(14-16): 2583–94.
Reeves, R.R., Srewart, B.S., Clapham, P.J. and Powell, J.A. 2002. *National Audubon Society Guide to Marine Mammals of the World*. Alfred A. Knopf Inc., New York.
Rice, D.W. 1998. *Marine Mammals of the World: Systematics and Distribution*, *Special Publication Number 4, The Society for Marine Mammalogy*. Allen Press, USA. ix+231pp.
Rice, D.W. and Wolman, A.A. 1971. *The Life History and Ecology of the Gray Whale*. (*Eschrichtius robustus*). American Society of Mammalogists, Special Publication No. 3, Stillwater, Oklahoma. viii+142pp.
Sanchez P, J.A. 1998. Gray whale mortality at Ojo de Liebre and Guerrero Negro Lagoons, Baja California Sur, Mexico: 1984–1995. *Mar. Mammal Sci.* 14(1): 149–55.
Schnetzer, A., Miller, P.E., Schaffner, R.A., Stauffer, B.A., Jones, B.H., Weisberg, S.B., Digiacomo, P.M., Berelson, W.M. and Caron, D.A. 2007. Blooms of Pseudo-Nitzschia and domoic acid in the San Pedro Channel and Los Angeles Harbor areas of the Southern California Bight, 2003–2004. *Harmful Algae* 6(3): 372–87.
Scholin, C.A., Gulland, F., Doucette, G., Benson, S., Busman, M., Chavez, F.P., Cordaro, J., DeLong, R., De Vogelaere, A., Harvey, J., Haulena, M., Lefebvre, K., Lipscomb, T., Loscutoff, S., Lowenstine, L., Marin Iii, R., Miller, P.E., McLellan, W., Moeller, P.D.R., Powell, C.L., Rowles, T., Silvagni, P., Silver, M., Spraker, T., Trainer, V. and Van Dolah, F. 2000. Mortality of sea lions along the central California coast linked to a toxic diatom bloom. *Nature* 403: 80–84.
Shane, S.H. 1994. Occurrence and habitat use of marine mammals at Santa Catalina Island, California, from 1983–1991. *Bull. Southern California Acad. Sci.* 93(1): 13–29.
Shane, S.H. 1995. Relationship between pilot whales and Risso's dolphins at Santa Catalina Island, California, USA. *Marine Ecology. Progress Series* 123: 5–11.
Toperoff, M. 2002. Diet and life history of harbor porpoise (*Phocoena phocoena*) from central California 1970 to 2000. MSc thesis, San Jose State University, CA. 103pp.
Von Saunder, A. and Barlow, J. 1999. A report of the Oregon, California and Washington line-transect experiment (ORCAWALE) conducted in west coast waters during summer/fall 1996. *NOAA Tech. Memo. NOAA-NMFS-SWFSC* 264: 49pp.
Westgate, A.J. and Read, A.J. 2007. Reproduction in short-beaked common dolphins *(Delphinus delphis)* from the western North Atlantic. *Mar. Biol.* 150(5): 1011–24.
Woodhouse, C.D. 1991. Marine mammal beachings as indicators of population events. *NOAA Tech. Mem.* NMFS 98: pp.111–115
Woodhouse, C.D. and Strickley, J. 1982. Sighting of northern right whale (*Eubalaena glacialis*) in the Santa Barbara channel. *J. Mammal.* 63(4): 701–02.

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Appendix I

List of San Diego County cetacean strandings recorded between 1851 and 2008

If geographic coordinates were not available but general area was known, map regions consistent with Fig. 1 were listed instead.

Specimen	Year	Month	Day	Species	Sex	Latitude	Longitude
XXX0075	1856	2	13	*Eubalaena japonica*	U	33º12'N	117º23'W
XXX0076	1883	1	29	*Eschrichtius robustus*	U	-	-
XXX0077	1884	7	12	Unidentified whale	U	-	-
XXX0078	1887	4	1	Unidentified whale	U	32º41'N	117º11'W
XXX0079	1887	8	16	*Megaptera novaeangliae*	U	32º45'N	117º15'W
XXX0081	1888	1	6	Unidentified dolphin or porpoise	U	-	-
XXX0080	1888	10	6	*Balaenoptera*	U	32º32'N	117º07'W
XXX0082	1890	6	14	Unidentified large whale	U	33º04'N	117º18'W
XXX0083	1897	2	14	*Balaenoptera physalus*	U	33º13'N	117º27'W
XXX0084	1898	4	24	Unidentified large whale	U	32º59'N	117º16'W
CLH0055	1904	1	-	*Eschrichtius robustus*	U	32º51'N	117º16'W
CLH0037	1904	1	-	*Globicephala macrorhynchus*	U	32º46'N	117º15'W
CLH0002	1911	11	9	*Delphinus* sp.	U	32º51'N	117º15'W
XXX0008	1927	7	2	*Balaenoptera musculus*	U	32º51'N	117º16'W
XXX0085	1934	10	18	*Balaenoptera*	U	32º41'N	117º11'W
XXX0007	1935	1	7	*Tursiops truncatus*	M	32º48'N	117º15'W
XXX0005	1940	2	14	*Stenella coeruleoalba*	M	32º46'N	117º15'W
XXX0006	1940	10	16	*Globicephala macrorhynchus*	F	32º48'N	117º15'W
CLH0001	1945	-	0	*Delphinus* sp.	F	32º51'N	117º15'W
CLH0077	1945	7	25	*Mesoplodon carlhubbsi*	M	32º51'N	117º16'W
CLH0066	1945	9	24	*Ziphius cavirostris*	F	32º58'N	117º16'W
CLH0021	1946	1	7	*Physeter macrocephalus*	U	32º52'N	117º15'W
CLH0084	1947	6	30	Unidentified dolphin or porpoise	U	32º56'N	117º15'W
CLH0046	1948	5	10	*Tursiops truncatus*	M	32º43'N	117º13'W
CLH0056	1949	4	8	*Eschrichtius robustus*	U	32º42'N	117º14'W
CLH0047	1949	11	27	*Tursiops truncatus*	F	32º43'N	117º13'W
CLH0078	1949	12	10	*Kogia breviceps*	M	32º33'N	117º08'W
CLH0048	1949	12	11	*Tursiops truncatus*	U	32º52'N	117º15'W
CLH0045	1949	-	-	*Globicephala macrorhynchus*	U	32º51'N	117º16'W
CLH0049	1950	12	24	*Tursiops truncatus*	M	32º56'N	117º16'W
WFP0241	1952	3	22	*Phocoenoides dalli*	F	32º52'N	117º15'W
CLH0057	1952	3	30	*Eschrichtius robustus*	F	32º45'N	117º15'W
CLH0082	1952	7	12	*Tursiops truncatus*	U	32º35'N	117º08'W
WFP0237	1952	7	26	*Globicephala macrorhynchus*	M	32º35'N	117º08'W
WFP0238	1952	8	20	*Globicephala macrorhynchus*	F	33º02'N	117º18'W
RMG4551	1953	10	9	*Tursiops truncatus*	F	32º48'N	117º15'W
RMG4556	1954	1	23	*Globicephala macrorhynchus*	F	32º58'N	117º16'W
RMG4558	1954	5	21	*Phocoenoides dalli*	M	32º46'N	117º15'W
RMG4559	1954	6	10	*Mesoplodon ginkgodens*	F	32º58'N	117º16'W
CLH0071	1955	2	6	*Kogia breviceps*	F	33º02'N	117º17'W
CLH0072	1955	2	6	*Kogia breviceps*	F	33º02'N	117º18'W
RMG4605	1956	1	8	*Lagenorhynchus obliquidens*	M	32º51'N	117º15'W
CLH0081	1956	2	9	*Globicephala macrorhynchus*	F	32º36'N	117º17'W
CLH0058	1956	3	15	*Eschrichtius robustus*	M	32º36'N	117º08'W
RMG4636	1956	6	23	*Delphinus* sp.	M	32º51'N	117º15'W
WFP0291	1956	7	3	*Lissodelphis borealis*	U	32º53'N	117º15'W
CLH0022	1956	10	3	*Lagenorhynchus obliquidens*	M	32º48'N	117º15'W
CLH0079	1956	11	30	*Kogia breviceps*	U	32º58'N	117º16'W
RMG4659	1957	1	7	*Lagenorhynchus obliquidens*	M	32º58'N	117º16'W
WFP0240	1957	1	25	*Lagenorhynchus obliquidens*	F	32º59'N	117º16'W
RMG4660	1957	1	27	*Ziphius cavirostris*	F	32º41'N	117º12'W
CLH0083	1957	6	29	*Tursiops truncatus*	U	32º40'N	117º07'W
RMG4700	1957	8	20	*Lagenorhynchus obliquidens*	M	32º54'N	117º15'W
RMG4701	1957	10	15	*Tursiops truncatus*	M	32º51'N	117º15'W
SDNHM21213	1957	12	2	*Tursiops truncatus*	F	Region 2	-
CLH0067	1959	6	13	*Ziphius cavirostris*	M	32º51'N	117º16'W
CLH0073	1959	10	11	*Kogia breviceps*	M	32º46'N	117º15'W
CLH0044	1960	1	28	*Globicephala macrorhynchus*	F	32º33'N	117º08'W
CLH0075	1960	2	16	*Kogia breviceps*	F	32º57'N	117º16'W
WFP0239	1960	4	25	*Lagenorhynchus obliquidens*	M	32º52'N	117º15'W
CLH0059	1961	3	31	*Eschrichtius robustus*	U	32º38'N	117º09'W
CLH0003	1962	2	13	*Delphinus capensis*	M	32º50'N	117º17'W
CLH0031	1962	2	27	*Phocoenoides dalli*	M	32º53'N	117º15'W
CLH0004	1962	2	28	*Delphinus* sp.	M	32º54'N	117º15'W
CLH0025	1962	7	12	*Lagenorhynchus obliquidens*	F	32º51'N	117º15'W
CLH0060	1963	1	28	*Eschrichtius robustus*	U	32º35'N	117º08'W
CLH0062	1963	3	14	*Eschrichtius robustus*	M	32º41'N	117º15'W
CLH0027	1963	3	15	*Lagenorhynchus obliquidens*	U	33º09'N	117º21'W
CLH0042	1963	3	15	*Globicephala macrorhynchus*	M	32º56'N	117º16'W
CLH0085	1963	3	17	Unidentified dolphin or porpoise	U	32º56'N	117º16'W

Cont.

Specimen	Year	Month	Day	Species	Sex	Latitude	Longitude
CLH0026	1963	3	27	*Lagenorhynchus obliquidens*	M	32°57'N	117°16'W
CLH0005	1963	4	15	Unidentified dolphin or porpoise	U	33°00'N	117°16'W
CLH0006	1963	4	16	*Delphinus delphis*	M	32°51'N	117°16'W
CLH0007	1963	4	17	*Delphinus delphis*	F	33°03'N	117°18'W
CLH0008	1963	4	18	*Delphinus delphis*	F	33°04'N	117°18'W
CLH0069	1963	6	12	*Ziphius cavirostris*	M	32°58'N	117°16'W
XXX0090	1963	6	12	*Ziphius cavirostris*	U	32°51'N	117°16'W
CLH0070	1963	6	13	*Ziphius cavirostris*	F	32°51'N	117°16'W
CLH0063	1963	6	14	*Eschrichtius robustus*	M	32°49'N	117°17'W
CLH0050	1963	8	7	*Tursiops truncatus*	F	32°53'N	117°15'W
CLH0051	1963	8	7	*Tursiops truncatus*	F	32°53'N	117°15'W
CLH0009	1963	9	1	*Delphinus* sp.	M	32°53'N	117°15'W
CLH0052	1963	9	23	*Tursiops truncatus*	F	32°44'N	117°15'W
CLH0074	1963	10	2	*Kogia breviceps*	F	32°35'N	117°08'W
CLH0010	1963	11	18	*Delphinus* sp.	M	33°00'N	117°16'W
XXX0086	1964	2	25	*Eschrichtius robustus*	U	Region 3	-
CLH0011	1964	4	4	*Delphinus* sp.	M	32°56'N	117°16'W
CLH0032	1964	4	23	*Phocoenoides dalli*	U	32°35'N	117°08'W
CLH0033	1964	5	17	*Phocoenoides dalli*	F	32°51'N	117°16'W
CLH0028	1964	6	21	*Lagenorhynchus obliquidens*	M	32°53'N	117°15'W
CLH0043	1965	3	15	*Globicephala macrorhynchus*	F	33°06'N	117°19'W
CLH0034	1965	3	28	*Phocoenoides dalli*	F	32°51'N	117°16'W
RMG4752	1965	7	2	*Balaenoptera musculus*	M	32°48'N	117°15'W
RMG4751	1965	7	10	*Phocoenoides dalli*	M	32°37'N	117°08'W
XXX0009	1965	9	14	*Eschrichtius robustus*	U	33°21'N	117°31'W
CLH0029	1965	9	28	*Lagenorhynchus obliquidens*	U	32°52'N	117°15'W
CLH0068	1965	11	23	*Ziphius cavirostris*	F	32°48'N	117°15'W
SWC0060	1966	5	7	*Delphinus* sp.	M	33°12'N	117°23'W
CLH0012	1966	8	6	*Delphinus* sp.	M	32°51'N	117°16'W
CLH0035	1966	8	13	*Phocoenoides dalli*	M	32°51'N	117°16'W
WFP0236	1966	9	8	*Delphinus delphis*	M	32°52'N	117°15'W
RMG4753	1966	9	12	*Ziphius cavirostris*	U	32°35'N	117°08'W
CLH0064	1967	1	23	*Eschrichtius robustus*	F	32°54'N	117°15'W
CLH0014	1967	4	5	*Delphinus* sp.	U	32°56'N	117°16'W
CLH0036	1967	6	1	*Phocoenoides dalli*	U	32°58'N	117°16'W
CLH0080	1967	7	21	*Delphinus* sp.	U	32°53'N	117°15'W
CLH0015	1967	8	21	*Delphinus* sp.	U	33°01'N	117°17'W
CLH0041	1967	8	23	*Globicephala macrorhynchus*	U	33°00'N	117°16'W
SWC0001	1967	8	27	*Delphinus* sp.	M	32°35'N	117°08'W
CLH0019	1967	11	7	*Lissodelphis borealis*	M	32°34'N	117°08'W
SWC0002	1968	2	3	*Delphinus* sp.	F	32°45'N	117°15'W
CLH0016	1968	4	20	*Delphinus capensis*	M	32°56'N	117°16'W
CLH0065	1968	6	18	*Eschrichtius robustus*	U	32°51'N	117°15'W
SWC0067	1968	8	10	*Mesoplodon stejnegeri*	F	33°01'N	117°17'W
SWC0051	1968	10	19	*Phocoenoides dalli*	M	32°51'N	117°16'W
RMG4755	1969	1	22	*Grampus griseus*	M	32°34'N	117°08'W
SWC0061	1969	3	10	*Delphinus* sp.	F	32°51'N	117°15'W
WFP0616	1969	4	7	*Delphinus* sp.	M	33°05'N	117°19'W
WFP0612	1969	11	29	*Delphinus capensis*	F	32°51'N	117°15'W
CLH0040	1969	12	26	*Globicephala macrorhynchus*	U	32°46'N	117°15'W
SWC0003	1970	3	23	*Delphinus* sp.	U	32°47'N	117°15'W
WFP0033	1970	4	6	*Delphinus delphis*	M	32°56'N	117°16'W
WFP0036	1970	4	27	*Tursiops truncatus*	M	32°56'N	117°16'W
WFP0038	1970	5	8	*Delphinus delphis*	F	32°54'N	117°15'W
WFP0037	1970	5	8	*Lagenorhynchus obliquidens*	F	32°50'N	117°17'W
WFP0039	1970	5	9	*Delphinus* sp.	M	32°58'N	117°16'W
WFP0040	1970	5	19	*Delphinus delphis*	M	32°54'N	117°15'W
XXX0013	1970	5	28	*Delphinus* sp.	U	32°53'N	117°15'W
SWC0043	1970	6	3	*Lagenorhynchus obliquidens*	U	32°35'N	117°08'W
XXX0015	1970	6	8	Unidentified dolphin or porpoise	M	32°48'N	117°15'W
XXX0014	1970	6	8	Unidentified dolphin or porpoise	U	32°44'N	117°15'W
WFP0043	1970	6	17	*Lagenorhynchus obliquidens*	F	32°53'N	117°15'W
WFP0044	1970	8	17	*Delphinus capensis*	M	32°56'N	117°16'W
WFP0045	1970	8	17	*Delphinus capensis*	M	32°52'N	117°15'W
WFP0046	1970	8	28	*Delphinus capensis*	M	32°56'N	117°16'W
WFP0060	1970	10	22	*Delphinus delphis*	M	32°52'N	117°15'W
WFP0061	1970	11	8	*Delphinus* sp.	M	33°04'N	117°18'W
CLH0076	1971	3	25	*Kogia breviceps*	M	32°56'N	117°16'W
SWC0044	1971	4	15	*Lagenorhynchus obliquidens*	U	32°48'N	117°15'W
WFP0082	1971	5	16	*Lagenorhynchus obliquidens*	M	32°52'N	117°15'W
NUC8020	1971	7	20	*Delphinus delphis*	U	32°35'N	117°08'W
WFP0185	1971	12	3	*Lagenorhynchus obliquidens*	F	32°58'N	117°16'W
XXX0057	1972	1	22	*Delphinus capensis*	M	Region 3	-
NUC0204	1972	3	30	*Delphinus* sp.	M	32°58'N	117°16'W
NUC0215	1972	4	10	*Delphinus* sp.	F	33°09'N	117°21'W
WFP0217	1972	4	11	*Delphinus delphis*	M	32°51'N	117°16'W

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Specimen	Year	Month	Day	Species	Sex	Latitude	Longitude
WFP0218	1972	6	3	*Delphinus* sp.	M	32º53'N	117º15'W
WFP0221	1972	6	27	*Delphinus delphis*	M	32º53'N	117º15'W
WFP0220	1972	6	27	*Delphinus* sp.	U	32º53'N	117º15'W
WFP0225	1972	7	5	*Delphinus delphis*	M	33º19'N	117º30'W
XXX0003	1972	7	5	*Delphinus* sp.	U	33º16'N	117º27'W
WFP0227	1972	7	5	*Delphinus* sp.	M	33º15'N	117º26'W
WFP0226	1972	7	5	*Phocoenoides dalli*	U	33º15'N	117º26'W
WFP0224	1972	7	5	*Delphinus* sp.	M	33º14'N	117º25'W
WFP0223	1972	7	5	*Delphinus* sp.	M	33º14'N	117º25'W
WFP0222	1972	7	5	*Lagenorhynchus obliquidens*	M	33º14'N	117º25'W
WFP0230	1972	11	7	*Phocoenoides dalli*	F	33º16'N	117º27'W
WFP0231	1972	11	14	*Lagenorhynchus obliquidens*	F	33º02'N	117º17'W
WFP0232	1972	12	20	*Physeter macrocephalus*	M	33º16'N	117º27'W
WFP0233	1973	1	2	*Delphinus* sp.	F	32º45'N	117º15'W
WFP0234	1973	1	15	*Delphinus delphis*	U	33º01'N	117º17'W
XXX0058	1973	2	12	*Lagenorhynchus obliquidens*	F	32º51'N	117º17'W
WFP0246	1973	3	9	*Delphinus delphis*	M	33º13'N	117º24'W
WFP0247	1973	3	12	*Globicephala macrorhynchus*	F	33º00'N	117º17'W
WFP0248	1973	3	14	*Phocoenoides dalli*	F	32º52'N	117º15'W
XXX0067	1973	3	15	*Globicephala macrorhynchus*	U	Region 10	-
WFP0249	1973	3	15	*Globicephala macrorhynchus*	F	32º53'N	117º15'W
NUC0253	1973	3	28	*Delphinus* sp.	M	32º37'N	117º08'W
WFP0264	1973	3	29	*Delphinus delphis*	M	33º03'N	117º18'W
XXX0066	1973	3	-	*Lagenorhynchus obliquidens*	U	-	-
WFP0265	1973	4	2	*Globicephala macrorhynchus*	F	33º17'N	117º28'W
XXX0059	1973	4	15	*Delphinus* sp.	U	Region 1	-
WFP0266	1973	4	25	*Delphinus* sp.	F	32º53'N	117º15'W
XXX0068	1973	4	-	*Delphinus* sp.	U	Region 1	-
WFP0272	1973	6	8	*Lissodelphis borealis*	M	32º48'N	117º15'W
SWC0055	1973	7	13	*Tursiops truncatus*	U	32º35'N	117º08'W
XXX0069	1973	8	5	*Delphinus* sp.	U	-	-
NUC0381	1973	8	6	*Delphinus* sp.	M	33º22'N	117º34'W
WFP0278	1973	8	22	*Tursiops truncatus*	M	32º32'N	117º07'W
WFP0279	1973	9	11	*Lissodelphis borealis*	F	32º52'N	117º15'W
SWC0007	1973	10	12	*Delphinus* sp.	U	32º42'N	117º14'W
SWC0008	1974	3	3	*Delphinus* sp.	M	32º46'N	117º15'W
WFP0309	1974	3	4	*Delphinus* sp.	F	32º51'N	117º16'W
SWC0009	1974	3	11	*Delphinus* sp.	F	32º51'N	117º15'W
SWC0010	1974	4	2	*Delphinus* sp.	M	32º51'N	117º15'W
WFP0465	1974	4	16	*Delphinus* sp.	M	32º53'N	117º15'W
NUC0385	1974	4	27	*Delphinus* sp.	F	32º41'N	117º13'W
SWC0012	1974	5	5	*Delphinus* sp.	M	32º32'N	117º07'W
SWC0013	1974	6	29	*Delphinus* sp.	U	32º35'N	117º08'W
RMG4795	1974	7	6	*Delphinus* sp.	M	32º53'N	117º15'W
RMG4794	1974	7	10	*Delphinus* sp.	M	32º46'N	117º15'W
WFP0472	1974	7	15	*Lagenorhynchus obliquidens*	F	32º51'N	117º15'W
SWC0016	1974	7	22	*Delphinus* sp.	M	32º45'N	117º15'W
WFP0473	1974	7	27	*Delphinus delphis*	F	33º04'N	117º18'W
WFP0474	1974	8	2	*Tursiops truncatus*	F	33º09'N	117º21'W
RMG4797	1974	10	3	*Tursiops truncatus*	M	32º51'N	117º16'W
WFP0482	1974	10	3	*Mesoplodon carlhubbsi*	F	32º45'N	117º15'W
NUC0390	1974	10	18	*Delphinus* sp.	M	32º52'N	117º15'W
WFP0475	1974	10	31	*Tursiops truncatus*	F	32º51'N	117º15'W
WFP0477	1974	11	3	*Lissodelphis borealis*	F	32º41'N	117º11'W
WFP0479	1974	12	2	*Delphinus* sp.	M	32º56'N	117º16'W
WFP0480	1974	12	7	*Delphinus* sp.	M	32º52'N	117º15'W
WFP0481	1974	12	27	*Delphinus delphis*	F	32º51'N	117º15'W
CLH0086	1975	1	21	Unidentified whale	U	32º36'N	117º12'W
WFP0485	1975	3	11	*Delphinus delphis*	M	33º04'N	117º18'W
WFP0487	1975	3	15	*Delphinus* sp.	M	33º02'N	117º17'W
WFP0490	1975	3	31	*Delphinus delphis*	F	33º06'N	117º19'W
WFP0488	1975	3	31	*Delphinus delphis*	M	32º47'N	117º15'W
WFP0492	1975	4	23	*Eschrichtius robustus*	F	33º19'N	117º29'W
WFP0493	1975	4	25	*Phocoenoides dalli*	F	33º04'N	117º18'W
WFP0495	1975	5	21	*Delphinus* sp.	F	32º49'N	117º17'W
WFP0496	1975	5	22	*Mesoplodon perrini*	M	33º15'N	117º26'W
WFP0497	1975	5	28	*Mesoplodon perrini*	F	33º15'N	117º26'W
WFP0498	1975	6	10	*Delphinus* sp.	M	33º05'N	117º19'W
WFP0505	1975	7	6	*Delphinus delphis*	F	33º07'N	117º20'W
SWC0017	1975	7	13	*Delphinus* sp.	M	32º41'N	117º13'W
NUC0397	1975	8	5	*Delphinus* sp.	F	32º46'N	117º15'W
WFP0514	1975	8	14	*Phocoenoides dalli*	M	32º32'N	117º07'W
WFP0515	1975	9	-	*Tursiops truncatus*	F	32º42'N	117º15'W
NUC0417	1975	9	13	*Delphinus* sp.	M	33º06'N	117º19'W
WFP0508	1975	9	17	*Delphinus delphis*	M	32º53'N	117º15'W
XXX0070	1975	9	-	*Delphinus* sp.	F	-	-

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Specimen	Year	Month	Day	Species	Sex	Latitude	Longitude
XXX0060	1975	9	-	*Delphinus* sp.	F	-	-
SWC0018	1975	10	12	*Delphinus* sp.	F	32°51'N	117°15'W
WFP0509	1975	10	22	*Tursiops truncatus*	F	-	-
SWC0020	1975	11	29	*Delphinus* sp.	M	33°00'N	117°16'W
WFP0510	1975	12	15	*Delphinus* sp.	M	32°56'N	117°16'W
WFP0511	1976	1	8	*Tursiops truncatus*	M	33°09'N	117°21'W
WFP0512	1976	1	15	*Delphinus delphis*	M	32°54'N	117°15'W
SWC0021	1976	3	3	*Delphinus* sp.	F	32°41'N	117°13'W
SWC0022	1976	3	28	*Delphinus* sp.	F	32°57'N	117°16'W
WFP0517	1976	4	19	*Delphinus delphis*	M	32°41'N	117°13'W
WFP0518	1976	5	20	*Lagenorhynchus obliquidens*	M	33°13'N	117°24'W
WFP0519	1976	6	21	*Delphinus delphis*	M	33°09'N	117°21'W
WFP0520	1976	6	28	*Tursiops truncatus*	M	33°02'N	117°17'W
SWC0023	1976	6	30	*Delphinus* sp.	F	32°46'N	117°15'W
NUC0409	1976	7	11	*Delphinus* sp.	M	33°22'N	117°34'W
WFP0522	1976	7	27	*Tursiops truncatus*	F	32°56'N	117°16'W
WFP0523	1976	8	2	*Tursiops truncatus*	F	32°33'N	117°08'W
WFP0535	1976	8	8	*Tursiops truncatus*	M	32°54'N	117°15'W
WFP0537	1976	8	31	*Tursiops truncatus*	F	33°03'N	117°18'W
WFP0552	1976	10	3	*Delphinus delphis*	M	33°02'N	117°17'W
WFP0553	1976	10	14	*Eschrichtius robustus*	M	32°47'N	117°15'W
SWC0040	1976	10	18	*Kogia breviceps*	F	32°35'N	117°08'W
RMG5000	1976	12	17	*Eschrichtius robustus*	M	32°40'N	117°16'W
WFP0559	1977	2	5	*Tursiops truncatus*	M	32°53'N	117°15'W
SWC0025	1977	3	24	*Delphinus* sp.	M	32°46'N	117°15'W
WFP0560	1977	3	27	*Delphinus* sp.	M	33°06'N	117°19'W
WFP0561	1977	5	4	*Delphinus* sp.	M	32°59'N	117°16'W
WFP0562	1977	5	7	*Delphinus* sp.	M	33°05'N	117°19'W
WFP0563	1977	5	16	*Tursiops truncatus*	F	32°52'N	117°15'W
WFP0564	1977	6	14	*Ziphius cavirostris*	F	32°53'N	117°15'W
WFP0565	1977	6	27	*Tursiops truncatus*	M	32°57'N	117°16'W
WFP0570	1978	1	25	*Eschrichtius robustus*	F	33°15'N	117°26'W
NUC0420	1978	2	13	*Delphinus* sp.	M	33°02'N	117°17'W
WFP0573	1978	3	2	*Eschrichtius robustus*	M	32°57'N	117°16'W
WFP0575	1978	3	14	*Grampus griseus*	F	32°43'N	117°15'W
SWC0026	1978	4	23	*Delphinus* sp.	F	32°37'N	117°08'W
WFP0577	1978	5	5	*Eschrichtius robustus*	F	33°04'N	117°18'W
SWC0027	1978	5	6	*Delphinus* sp.	F	32°51'N	117°15'W
SWC0056	1978	7	16	*Tursiops truncatus*	F	33°16'N	117°27'W
WFP0583	1978	9	8	*Delphinus delphis*	M	33°05'N	117°19'W
JGM0391	1978	9	9	*Mesoplodon perrini*	M	33°08'N	117°20'W
SWC0028	1978	9	15	*Delphinus* sp.	M	32°46'N	117°15'W
WFP0585	1979	2	1	*Eschrichtius robustus*	U	32°36'N	117°08'W
WFP0586	1979	3	3	*Phocoenoides dalli*	F	32°45'N	117°15'W
WFP0591	1979	4	16	*Lagenorhynchus obliquidens*	F	32°52'N	117°15'W
WFP0593	1979	5	1	*Tursiops truncatus*	F	32°54'N	117°15'W
WFP0595	1979	5	11	*Delphinus delphis*	F	33°03'N	117°18'W
JRH0046	1979	5	21	*Eschrichtius robustus*	M	32°45'N	117°15'W
JRH0047	1979	6	26	*Stenella coeruleoalba*	M	32°35'N	117°08'W
XXX0063	1979	7	15	*Delphinus* sp.	F	32°40'N	117°10'W
JRH0049	1979	7	26	*Delphinus capensis*	M	32°57'N	117°16'W
JRH0050	1979	8	21	*Tursiops truncatus*	F	33°05'N	117°19'W
RMG5001	1979	12	12	*Eschrichtius robustus*	F	32°43'N	117°16'W
JRH0052	1979	12	26	*Mesoplodon perrini*	M	32°54'N	117°15'W
JRH0053	1980	1	11	*Eschrichtius robustus*	F	33°02'N	117°18'W
JRH0054	1980	3	6	*Lagenorhynchus obliquidens*	F	33°05'N	117°19'W
JRH0055	1980	3	30	*Eschrichtius robustus*	M	32°46'N	117°15'W
SWC0047	1980	4	2	*Lagenorhynchus obliquidens*	M	32°58'N	117°16'W
JRH0057	1980	5	13	*Tursiops truncatus*	F	32°52'N	117°15'W
JRH0058	1980	5	31	*Tursiops truncatus*	M	32°55'N	117°15'W
JRH0065	1980	6	16	*Delphinus* sp.	F	33°02'N	117°18'W
JRH0067	1980	7	7	*Tursiops truncatus*	M	32°37'N	117°08'W
JRH0070	1980	7	24	*Tursiops truncatus*	F	32°48'N	117°16'W
JRH0071	1980	7	28	*Delphinus delphis*	M	33°08'N	117°20'W
JRH0073	1980	8	3	*Tursiops truncatus*	F	33°22'N	117°34'W
JRH0074	1980	8	13	*Delphinus delphis*	M	32°42'N	117°14'W
JRH0077	1980	9	10	*Tursiops truncatus*	M	32°53'N	117°15'W
JRH0078	1980	9	16	*Lagenorhynchus obliquidens*	U	33°15'N	117°26'W
JRH0084	1980	10	21	*Tursiops truncatus*	F	32°59'N	117°16'W
JRH0086	1980	11	2	*Globicephala macrorhynchus*	M	33°22'N	117°34'W
JRH0087	1980	11	20	*Ziphius cavirostris*	M	32°53'N	117°15'W
JRH0094	1980	12	21	*Lagenorhynchus obliquidens*	F	32°47'N	117°15'W
JRH0095	1980	12	31	*Tursiops truncatus*	M	33°15'N	117°26'W
JRH0098	1980	12	31	*Tursiops truncatus*	M	32°54'N	117°15'W
JRH0096	1981	1	2	*Eschrichtius robustus*	M	32°39'N	117°09'W
SWC0029	1981	3	23	*Delphinus* sp.	F	32°50'N	117°17'W

Cont.

Specimen	Year	Month	Day	Species	Sex	Latitude	Longitude
SWC0030	1981	4	7	*Delphinus* sp.	M	33º03'N	117º18'W
JRH0120	1981	4	18	*Lagenorhynchus obliquidens*	M	32º47'N	117º15'W
JRH0128	1981	5	5	*Tursiops truncatus*	M	32º55'N	117º15'W
JRH0141	1981	5	25	*Delphinus delphis*	F	32º48'N	117º16'W
SWC0069	1981	5	28	*Delphinus* sp.	M	32º53'N	117º15'W
JRH0160	1981	6	13	*Lissodelphis borealis*	F	33º14'N	117º25'W
SWC0031	1981	6	29	*Delphinus* sp.	F	33º09'N	117º21'W
JRH0192	1981	9	3	*Tursiops truncatus*	U	33º22'N	117º33'W
SWC0032	1981	10	2	*Delphinus* sp.	M	32º32'N	117º07'W
LJH0006	1981	11	14	*Tursiops truncatus*	F	32º52'N	117º15'W
LJH0012	1982	2	3	*Lagenorhynchus obliquidens*	M	33º07'N	117º20'W
LJH0015	1982	4	3	*Delphinus* sp.	U	32º48'N	117º15'W
LJH0053	1982	5	30	*Balaenoptera acutorostrata*	M	32º43'N	117º11'W
LJH0054	1982	6	2	*Delphinus delphis*	F	33º23'N	117º36'W
LJH0066	1982	7	29	*Tursiops truncatus*	F	32º53'N	117º15'W
LJH0124	1982	8	10	*Eschrichtius robustus*	F	32º50'N	117º17'W
LJH0123	1982	8	24	*Eschrichtius robustus*	M	32º42'N	117º14'W
MSL0267	1982	10	5	*Tursiops truncatus*	M	33º06'N	117º19'W
MSL0269	1982	10	15	*Tursiops truncatus*	M	33º06'N	117º19'W
MSL0279	1982	12	13	*Eschrichtius robustus*	F	32º36'N	117º07'W
LJH0077	1983	1	12	*Lagenorhynchus obliquidens*	F	32º55'N	117º15'W
LJH0078	1983	1	19	*Delphinus delphis*	F	33º17'N	117º28'W
LJH0079	1983	1	24	Unidentified large whale	U	32º52'N	117º15'W
LJH0080	1983	1	31	*Eschrichtius robustus*	M	32º43'N	117º13'W
XXX0087	1983	3	14	*Eschrichtius robustus*	U	Region 9	-
LJH0082	1983	3	15	*Stenella coeruleoalba*	M	33º16'N	117º26'W
LJH0085	1983	4	11	*Eschrichtius robustus*	F	32º36'N	117º08'W
MSL0290	1983	4	15	*Delphinus* sp.	U	33º04'N	117º18'W
MSL0292	1983	4	19	*Megaptera novaeangliae*	F	32º41'N	117º11'W
LJH0086	1983	5	3	*Stenella coeruleoalba*	F	33º03'N	117º18'W
LJH0094	1983	5	19	*Delphinus capensis*	M	33º02'N	117º17'W
SWC0033	1983	5	22	*Delphinus* sp.	M	32º52'N	117º15'W
LJH0096	1983	5	25	*Tursiops truncatus*	F	33º13'N	117º25'W
LJH0099	1983	6	27	*Delphinus capensis*	M	32º38'N	117º08'W
LJH0105	1983	8	10	*Tursiops truncatus*	F	33º22'N	117º33'W
SWC0048	1983	8	11	*Lagenorhynchus obliquidens*	F	33º12'N	117º23'W
MSL0295	1983	8	17	*Balaenoptera physalus*	F	32º36'N	117º08'W
LJH0106	1983	8	22	*Delphinus delphis*	M	33º09'N	117º21'W
LJH0107	1983	8	24	*Delphinus* sp.	U	32º49'N	117º16'W
LJH0125	1983	9	3	*Delphinus* sp.	M	32º51'N	117º16'W
LJH0119	1983	9	23	*Lagenorhynchus obliquidens*	F	32º58'N	117º16'W
LJH0121	1983	10	16	*Delphinus capensis*	F	32º39'N	117º09'W
LJH0127	1983	11	22	*Delphinus* sp.	M	33º13'N	117º24'W
LJH0128	1983	12	26	*Eschrichtius robustus*	M	32º46'N	117º15'W
LJH0129	1984	4	4	*Eschrichtius robustus*	U	32º40'N	117º14'W
SWC0034	1984	4	19	*Delphinus* sp.	M	32º41'N	117º13'W
LJH0130	1984	5	5	*Tursiops truncatus*	F	32º35'N	117º08'W
HJB0001	1984	7	19	*Delphinus* sp.	M	33º06'N	117º19'W
HJB0002	1984	8	20	*Balaenoptera musculus*	F	33º02'N	117º17'W
HJB0003	1984	11	6	*Delphinus delphis*	M	33º22'N	117º33'W
HJB0004	1984	11	15	*Delphinus delphis*	M	32º43'N	117º10'W
HJB0005	1984	12	17	*Kogia breviceps*	F	32º34'N	117º08'W
HJB0009	1985	1	28	*Eschrichtius robustus*	M	33º13'N	117º24'W
HJB0011	1985	3	6	*Delphinus capensis*	M	33º22'N	117º33'W
HJB0010	1985	3	20	*Delphinus* sp.	F	33º22'N	117º34'W
HJB0013	1985	3	25	*Delphinus capensis*	M	32º57'N	117º16'W
HJB0012	1985	4	4	*Eschrichtius robustus*	M	32º44'N	117º15'W
HJB0014	1985	4	9	*Eschrichtius robustus*	F	32º35'N	117º08'W
AAH0001	1985	4	13	*Tursiops truncatus*	F	32º38'N	117º08'W
HJB0017	1985	5	3	*Delphinus* sp.	U	32º32'N	117º07'W
HJB0018	1985	6	11	*Tursiops truncatus*	M	32º37'N	117º08'W
HJB0019	1985	6	14	*Tursiops truncatus*	F	32º55'N	117º15'W
WFP0699	1985	7	0	*Globicephala macrorhynchus*	U	33º12'N	117º23'W
HJB0021	1985	7	17	*Delphinus* sp.	F	33º09'N	117º21'W
DK-85-18	1985	9	16	*Delphinus* sp.	M	33º09'N	117º21'W
HJB0022	1985	9	25	*Lagenorhynchus obliquidens*	F	32º32'N	117º07'W
HJB0023	1985	9	27	*Eschrichtius robustus*	M	32º38'N	117º06'W
HJB0025	1985	10	22	*Lagenorhynchus obliquidens*	M	32º47'N	117º15'W
SWC0038	1985	10	24	*Delphinus* sp.	M	32º51'N	117º16'W
DK-86-01	1986	1	4	*Delphinus capensis*	M	33º21'N	117º32'W
HJB0026	1986	2	11	*Delphinus* sp.	F	33º01'N	117º17'W
HJB0027	1986	3	31	*Delphinus delphis*	M	32º37'N	117º08'W
HJB0030	1986	4	14	*Delphinus* sp.	M	33º07'N	117º20'W
HJB0029	1986	4	14	*Delphinus capensis*	F	33º03'N	117º18'W
HJB0031	1986	4	24	*Delphinus capensis*	M	33º00'N	117º17'W
HJB0032	1986	5	2	*Delphinus delphis*	M	33º08'N	117º20'W

Cont.

Specimen	Year	Month	Day	Species	Sex	Latitude	Longitude
HJB0033	1986	5	30	*Balaenoptera*	U	33º04'N	117º18'W
JEH0335	1986	6	3	*Mesoplodon carlhubbsi*	F	33º23'N	117º34'W
DK-86-10	1986	6	3	*Delphinus capensis*	F	33º21'N	117º32'W
HJB0035	1986	7	7	*Eschrichtius robustus*	M	33º06'N	117º19'W
HJB0036	1986	8	29	*Tursiops truncatus*	M	33º00'N	117º16'W
HJB0037	1986	10	16	*Delphinus* sp.	M	32º43'N	117º13'W
HJB0038	1986	11	21	Unidentified dolphin or porpoise	U	32º53'N	117º15'W
HJB0040	1987	2	24	*Tursiops truncatus*	F	33º22'N	117º33'W
HJB0044	1987	3	30	*Delphinus* sp.	F	32º56'N	117º15'W
HJB0045	1987	4	17	*Eschrichtius robustus*	M	33º08'N	117º20'W
HJB0046	1987	5	14	*Tursiops truncatus*	F	32º43'N	117º15'W
HJB0048	1987	6	24	*Tursiops truncatus*	M	33º06'N	117º19'W
HJB0049	1987	8	21	*Delphinus capensis*	F	33º01'N	117º17'W
HJB0050	1987	9	14	*Eschrichtius robustus*	F	33º01'N	117º17'W
XXX0073	1987	11	19	*Eschrichtius robustus*	U	-	-
JEH0381	1988	5	31	*Tursiops truncatus*	M	33º16'N	117º27'W
JEH0382	1988	5	31	*Tursiops truncatus*	F	33º16'N	117º27'W
SWC0068	1988	6	17	*Delphinus* sp.	F	32º44'N	117º15'W
XXX0089	1988	7	2	Unidentified dolphin or porpoise	U	Region 7	-
JWG0105	1988	8	1	*Balaenoptera acutorostrata*	M	33º02'N	117º18'W
SWC0062	1988	8	15	*Delphinus* sp.	M	32º46'N	117º15'W
JWG0106	1988	12	19	*Eschrichtius robustus*	M	32º50'N	117º17'W
JEH0412	1989	0	0	*Delphinus delphis*	U	33º12'N	117º23'W
KZP0001	1989	1	8	*Delphinus delphis*	M	33º13'N	117º24'W
SWC0063	1989	1	11	*Delphinus delphis*	M	32º52'N	117º15'W
KZP0002	1989	2	9	*Delphinus delphis*	M	33º12'N	117º23'W
KZP0003	1989	4	15	*Eschrichtius robustus*	F	33º16'N	117º27'W
KZP0004	1989	5	7	*Delphinus* sp.	F	32º45'N	117º15'W
KZP0005	1989	5	10	*Lagenorhynchus obliquidens*	F	33º00'N	117º16'W
KZP0007	1989	5	27	*Delphinus capensis*	F	32º51'N	117º17'W
KZP0008	1989	6	22	*Tursiops truncatus*	M	33º22'N	117º34'W
KZP0009	1989	8	1	*Balaenoptera acutorostrata*	M	32º50'N	117º18'W
KZP0010	1989	9	11	*Tursiops truncatus*	M	33º22'N	117º33'W
KZP0011	1989	9	18	*Delphinus delphis*	M	32º51'N	117º15'W
KZP0012	1989	10	30	*Tursiops truncatus*	F	32º57'N	117º16'W
SWC0064	1989	11	26	*Delphinus delphis*	M	32º46'N	117º15'W
KZP0013	1989	11	27	*Eschrichtius robustus*	M	32º50'N	117º18'W
SWC0065	1989	12	28	*Delphinus delphis*	F	32º58'N	117º16'W
SWC0066	1990	2	18	*Delphinus* sp.	F	32º47'N	117º15'W
KZP0014	1990	2	21	*Delphinus delphis*	F	32º52'N	117º15'W
KZP0016	1990	4	16	*Grampus griseus*	F	32º56'N	117º16'W
KZP0015	1990	4	16	*Eschrichtius robustus*	F	32º42'N	117º10'W
KZP0017	1990	5	10	*Tursiops truncatus*	F	33º12'N	117º23'W
TDL0128	1990	5	21	Unidentified dolphin or porpoise	U	33º16'N	117º27'W
KZP0018	1990	8	3	*Tursiops truncatus*	F	32º54'N	117º15'W
KZP0019	1990	8	4	*Tursiops truncatus*	M	32º39'N	117º09'W
KZP0020	1990	8	13	*Tursiops truncatus*	F	32º50'N	117º17'W
JVK0044	1990	9	16	*Globicephala macrorhynchus*	F	32º37'N	117º08'W
JVK0045	1991	1	5	*Lagenorhynchus obliquidens*	F	33º03'N	117º18'W
JEH0429	1991	1	8	*Grampus griseus*	M	32º51'N	117º17'W
JEH0431	1991	3	10	*Eschrichtius robustus*	M	33º16'N	117º27'W
JVK0046	1991	5	17	*Tursiops truncatus*	F	33º08'N	117º20'W
JVK0047	1991	6	5	*Tursiops truncatus*	F	32º50'N	117º17'W
JVK0049	1992	1	6	*Delphinus delphis*	F	32º52'N	117º15'W
TDL0149	1992	1	28	*Eschrichtius robustus*	M	33º16'N	117º27'W
JVK0050	1992	2	25	*Tursiops truncatus*	M	32º49'N	117º16'W
JVK0051	1992	4	29	*Eschrichtius robustus*	M	32º43'N	117º13'W
JVK0052	1992	5	31	*Lagenorhynchus obliquidens*	M	33º02'N	117º17'W
XXX0011	1992	6	26	Unidentified dolphin or porpoise	U	32º59'N	117º16'W
JVK0053	1992	7	16	*Tursiops truncatus*	F	33º22'N	117º34'W
WTN0003	1992	8	13	*Tursiops truncatus*	F	32º34'N	117º08'W
WTN0004	1992	10	9	*Tursiops truncatus*	M	32º35'N	117º08'W
WTN0005	1992	10	15	*Delphinus capensis*	M	32º52'N	117º15'W
WTN0006	1992	11	4	*Delphinus capensis*	F	32º46'N	117º15'W
WTN0009	1993	1	9	*Delphinus capensis*	F	32º54'N	117º15'W
WTN0011	1993	1	16	*Eschrichtius robustus*	M	32º57'N	117º16'W
KZP0032	1993	1	26	*Eschrichtius robustus*	M	32º38'N	117º08'W
WTN0013	1993	3	28	*Delphinus delphis*	F	33º13'N	117º24'W
XXX0027	1993	4	2	Unidentified dolphin or porpoise	U	33º17'N	117º26'W
JEH0445	1993	5	21	*Kogia breviceps*	M	Region 6	-
WTN0019	1993	5	28	*Delphinus delphis*	M	33º09'N	117º21'W
WTN0020	1993	6	25	*Tursiops truncatus*	M	32º37'N	117º08'W
KZP0023	1993	8	8	*Tursiops truncatus*	F	32º37'N	117º08'W
KZP0024	1993	8	9	*Tursiops truncatus*	M	32º36'N	117º08'W
KZP0025	1993	8	11	*Tursiops truncatus*	M	32º35'N	117º08'W
KZP0026	1993	8	31	*Tursiops truncatus*	M	32º37'N	117º08'W

Cont.

Specimen	Year	Month	Day	Species	Sex	Latitude	Longitude
KZP0027	1993	9	5	*Lagenorhynchus obliquidens*	U	32º37'N	117º08'W
KZP0028	1993	9	21	*Delphinus delphis*	M	32º35'N	117º08'W
KZP0029	1993	9	28	*Lagenorhynchus obliquidens*	F	32º52'N	117º15'W
KZP0030	1993	11	15	*Balaenoptera physalus*	M	32º50'N	117º17'W
KZP0031	1994	1	25	*Eschrichtius robustus*	F	32º58'N	117º16'W
JEH0449	1994	1	26	*Eschrichtius robustus*	M	Region 1	-
XXX0017	1994	3	7	*Eschrichtius robustus*	U	Region 4	-
SWC-Dc-9426B	1994	4	7	*Delphinus capensis*	M	33º06'N	117º19'W
KZP0034	1994	7	7	*Delphinus delphis*	F	33º06'N	117º19'W
SW94076	1994	7	31	*Delphinus* sp.	M	32º51'N	117º15'W
SWC-Dd-9493B	1994	8	22	*Delphinus* sp.	F	32º41'N	117º11'W
MZH0007	1994	9	5	*Delphinus delphis*	F	33º22'N	117º34'W
MZH0011	1995	2	16	*Delphinus delphis*	M	32º33'N	117º08'W
MZH0012	1995	3	3	*Delphinus delphis*	F	33º08'N	117º20'W
MZH0013	1995	3	6	*Eschrichtius robustus*	U	32º43'N	117º15'W
KZP0035	1995	3	9	*Tursiops truncatus*	F	32º53'N	117º15'W
TDL0190	1995	3	13	*Delphinus capensis*	F	Region 11	-
MZH0014	1995	3	20	*Stenella coeruleoalba*	M	32º35'N	117º08'W
MZH0016	1995	4	10	*Delphinus delphis*	U	33º07'N	117º19'W
MZH0017	1995	4	20	*Lagenorhynchus obliquidens*	F	32º33'N	117º08'W
MZH0018	1995	5	4	*Delphinus delphis*	F	32º53'N	117º15'W
MZH0019	1995	5	15	*Delphinus delphis*	F	32º35'N	117º08'W
MZH0022	1995	5	16	*Delphinus capensis*	F	32º45'N	117º15'W
SW9543	1995	6	5	*Tursiops truncatus*	F	32º51'N	117º15'W
SW95034	1995	7	11	*Delphinus capensis*	M	33º09'N	117º21'W
MZH0024	1995	7	27	*Tursiops truncatus*	F	33º00'N	117º17'W
MZH0023	1995	7	28	*Delphinus delphis*	U	32º47'N	117º15'W
KZP0036	1995	8	10	*Delphinus delphis*	U	32º55'N	117º15'W
MZH0026	1995	8	16	*Tursiops truncatus*	M	32º52'N	117º15'W
MZH0027	1995	9	5	*Tursiops truncatus*	M	33º00'N	117º16'W
KZP0039	1995	10	9	*Kogia breviceps*	F	32º54'N	117º15'W
KZP0042	1996	2	1	*Eschrichtius robustus*	F	33º01'N	117º17'W
MZH0033	1996	2	2	*Delphinus* sp.	M	32º46'N	117º14'W
MZH0035	1996	3	15	*Lagenorhynchus obliquidens*	M	32º32'N	117º07'W
MZH0034	1996	5	7	*Delphinus delphis*	F	33º08'N	117º20'W
MZH0037	1996	5	14	*Delphinus* sp.	M	32º57'N	117º16'W
KZP0043	1996	6	4	*Delphinus* sp.	F	33º09'N	117º21'W
MZH0036	1996	6	12	*Eschrichtius robustus*	M	32º36'N	117º08'W
KZP0044	1996	7	2	*Tursiops truncatus*	M	32º58'N	117º16'W
KZP0050	1997	1	20	*Eschrichtius robustus*	M	32º43'N	117º16'W
KZP0046	1997	1	27	*Delphinus delphis*	M	32º48'N	117º15'W
KZP0047	1997	4	17	*Eschrichtius robustus*	F	32º39'N	117º08'W
XXX0029	1997	5	6	Unidentified dolphin or porpoise	U	32º41'N	117º11'W
SW97042	1997	6	22	*Delphinus* sp.	M	32º39'N	117º09'W
MZH0041	1997	7	7	*Tursiops truncatus*	F	32º38'N	117º08'W
MZH0042	1997	7	15	*Delphinus delphis*	M	32º38'N	117º08'W
KZP0049	1997	10	2	*Ziphius cavirostris*	M	32º37'N	117º08'W
MZH0045	1998	2	3	*Eschrichtius robustus*	F	32º45'N	117º15'W
SW98033	1998	3	20	*Delphinus* sp.	M	32º47'N	117º15'W
KZP0051	1998	3	27	*Kogia breviceps*	F	32º40'N	117º14'W
SW98083	1998	4	19	*Phocoenoides dalli*	M	32º41'N	117º11'W
KZP0052	1998	5	7	*Delphinus capensis*	M	33º14'N	117º25'W
MZH0047	1998	5	12	*Tursiops truncatus*	M	32º39'N	117º08'W
XXX0032	1998	5	17	*Delphinus* sp.	F	Region 1	-
MZH0050	1998	8	3	*Kogia breviceps*	M	33º22'N	117º34'W
MZH0051	1998	9	8	*Balaenoptera physalus*	F	32º36'N	117º07'W
MZH0053	1998	9	18	*Delphinus delphis*	M	32º51'N	117º16'W
MZH0046	1998	9	29	*Lissodelphis borealis*	M	33º14'N	117º25'W
KZP0055	1998	11	9	*Eschrichtius robustus*	M	33º01'N	117º17'W
KZP0056	1998	12	2	*Eschrichtius robustus*	M	33º12'N	117º23'W
KZP0057	1998	12	6	*Delphinus capensis*	M	32º51'N	117º15'W
XXX0033	1998	12	22	Unidentified cetacean	U	Region 10	-
XXX0034	1998	12	27	*Eschrichtius robustus*	U	33º23'N	117º35'W
KZP0058	1999	1	13	*Eschrichtius robustus*	F	32º49'N	117º17'W
XXX0036	1999	1	14	*Eschrichtius robustus*	U	32º41'N	117º15'W
KZP0059	1999	1	28	*Lagenorhynchus obliquidens*	F	32º50'N	117º17'W
KZP0060	1999	2	10	*Eschrichtius robustus*	F	32º55'N	117º15'W
XXX0037	1999	2	19	*Eschrichtius robustus*	U	Region 3	-
KZP0061	1999	2	25	*Delphinus delphis*	F	32º57'N	117º16'W
XXX0038	1999	4	8	Unidentified dolphin or porpoise	U	32º59'N	117º16'W
KZP0062	1999	4	9	*Delphinus delphis*	F	33º09'N	117º20'W
KZP0063	1999	4	28	*Delphinus capensis*	M	32º35'N	117º08'W
XXX0039	1999	5	3	Unidentified dolphin or porpoise	U	Region 10	-
XXX0040	1999	6	1	*Eschrichtius robustus*	U	33º23'N	117º35'W
SW99031	1999	6	2	*Kogia breviceps*	F	32º48'N	117º15'W
XXX0041	1999	6	13	Unidentified dolphin or porpoise	U	Region 8	-

Cont.

Specimen	Year	Month	Day	Species	Sex	Latitude	Longitude
KZP0064	1999	6	21	*Delphinus capensis*	F	33º04'N	117º18'W
KZP0065	1999	7	25	*Tursiops truncatus*	M	33º22'N	117º33'W
SJC0001	1999	7	31	*Eschrichtius robustus*	M	33º15'N	117º26'W
SJC0002	1999	8	3	*Delphinus delphis*	M	33º01'N	117º17'W
KZP0067	1999	9	13	*Eschrichtius robustus*	M	33º09'N	117º21'W
KZP0068	1999	12	12	*Eschrichtius robustus*	F	32º40'N	117º14'W
XXX0064	2000	1	-	*Tursiops truncatus*	U	Region 1	-
XXX0072	2000	2	1	*Eschrichtius robustus*	U	-	-
KZP0069	2000	2	3	*Tursiops truncatus*	F	33º03'N	117º18'W
KXD0001	2000	2	11	*Eschrichtius robustus*	M	32º40'N	117º09'W
KXD0002	2000	2	16	*Delphinus capensis*	F	33º22'N	117º33'W
KXD0003	2000	3	24	*Tursiops truncatus*	M	32º35'N	117º08'W
KZP0070	2000	4	2	*Eschrichtius robustus*	M	33º17'N	117º28'W
KXD0004	2000	4	12	*Delphinus delphis*	M	33º22'N	117º34'W
KZP0072	2000	4	12	*Delphinus delphis*	F	33º12'N	117º23'W
KZP0073	2000	4	17	*Tursiops truncatus*	M	32º44'N	117º15'W
KZP0074	2000	4	26	*Eschrichtius robustus*	F	32º40'N	117º14'W
DSJ1877	2000	6	9	*Delphinus capensis*	F	33º21'N	117º32'W
KZP0075	2000	8	16	*Tursiops truncatus*	F	32º56'N	117º15'W
KZP0076	2000	10	6	*Eschrichtius robustus*	M	33º1'N	117º17'W
SW00162	2000	12	12	*Delphinus delphis*	M	33º01'N	117º17'W
KZP0077	2000	12	31	*Delphinus capensis*	M	33º1'N	117º17'W
KZP0078	2001	2	8	*Tursiops truncatus*	F	33º18'N	117º28'W
KXD0007	2001	2	26	*Lagenorhynchus obliquidens*	M	32º53'N	117º15'W
SWC-Dd-0116B	2001	3	7	*Delphinus delphis*	F	32º53'N	117º15'W
SW01072	2001	3	10	*Delphinus delphis*	F	33º02'N	117º18'W
KXD0010	2001	3	20	*Lagenorhynchus obliquidens*	M	32º36'N	117º08'W
KXD0012	2001	3	27	*Phocoenoides dalli*	M	33º07'N	117º20'W
KXD0014	2001	5	17	*Tursiops truncatus*	F	33º04'N	117º18'W
KZP0080	2001	5	23	*Lissodelphis borealis*	F	32º47'N	117º15'W
KZP0081	2001	6	14	*Grampus griseus*	F	33º05'N	117º19'W
KZP0082	2001	6	25	*Delphinus capensis*	M	32º53'N	117º15'W
KZP0083	2001	6	27	*Delphinus delphis*	U	33º04'N	117º18'W
KZP0084	2001	7	16	*Tursiops truncatus*	F	33º02'N	117º17'W
KZP0086	2001	7	25	*Tursiops truncatus*	M	32º34'N	117º08'W
XXX0044	2001	8	5	*Delphinus* sp.	M	32º33'N	117º08'W
KZP0087	2001	8	18	*Delphinus capensis*	M	32º51'N	117º15'W
KZP0088	2001	8	29	*Balaenoptera physalus*	F	33º22'N	117º34'W
SW01245	2001	9	4	*Delphinus* sp.	M	32º52'N	117º15'W
KXD0015	2001	11	26	*Delphinus capensis*	F	33º21'N	117º32'W
XXX0065	2001	11	-	*Tursiops truncatus*	U	Region 3	-
KXD0016	2001	12	4	*Tursiops truncatus*	F	32º41'N	117º11'W
KXD0017	2001	12	7	*Lissodelphis borealis*	F	32º37'N	117º08'W
KZP0089	2001	12	11	*Megaptera novaeangliae*	F	32º50'N	117º17'W
KXD0019	2002	1	17	*Ziphius cavirostris*	F	33º15'N	117º26'W
KXD0020	2002	2	7	*Grampus griseus*	M	33º22'N	117º34'W
KXD0025	2002	4	23	*Tursiops truncatus*	F	32º37'N	117º08'W
KXD0029	2002	5	22	*Delphinus capensis*	F	33º13'N	117º24'W
KXD0028	2002	5	22	*Delphinus capensis*	F	33º13'N	117º24'W
SWC-Dsp-DOA-5-26-02	2002	5	26	*Delphinus delphis*	M	32º54'N	117º15'W
XXX0045	2002	5	27	Unidentified dolphin or porpoise	U	32º59'N	117º16'W
KZP0090	2002	6	2	*Delphinus capensis*	F	33º04'N	117º18'W
DSJ1990	2002	6	19	*Ziphius cavirostris*	F	33º20'N	117º31'W
KXD0037	2002	7	-	*Delphinus delphis*	F	33º14'N	117º25'W
KXD0032	2002	8	23	*Tursiops truncatus*	F	32º53'N	117º15'W
KXD0033	2002	10	10	*Balaenoptera musculus*	M	33º15'N	117º26'W
KXD0034	2002	10	22	*Delphinus capensis*	M	32º34'N	117º08'W
KXD0035	2002	10	23	*Eschrichtius robustus*	M	33º02'N	117º18'W
KXD0036	2002	11	2	*Lissodelphis borealis*	F	32º52'N	117º15'W
SWC-Tt-02221B	2002	11	6	*Tursiops truncatus*	M	32º46'N	117º13'W
KXD0039	2003	2	19	*Eschrichtius robustus*	M	32º52'N	117º15'W
KXD0040	2003	2	24	*Delphinus capensis*	F	33º11'N	117º23'W
KXD0041	2003	3	7	*Delphinus delphis*	M	32º37'N	117º08'W
KXD0042	2003	3	13	*Tursiops truncatus*	M	33º18'N	117º29'W
KXD0044	2003	4	23	*Delphinus capensis*	M	33º18'N	117º28'W
KXD0045	2003	5	29	*Delphinus capensis*	F	32º45'N	117º15'W
XXX0046	2003	5	31	Unidentified dolphin or porpoise	U	33º23'N	117º35'W
XXX0047	2003	6	6	Unidentified dolphin or porpoise	U	33º09'N	117º21'W
KXD0046	2003	6	11	*Delphinus delphis*	F	33º14'N	117º25'W
KXD0047	2003	6	22	*Tursiops truncatus*	F	32º41'N	117º11'W
SW03585	2003	6	23	*Delphinus delphis*	M	32º46'N	117º15'W
KXD0048	2003	6	23	*Tursiops truncatus*	F	32º41'N	117º12'W
KXD0051	2003	10	1	*Balaenoptera physalus*	M	32º39'N	117º15'W
KXD0052	2003	10	15	*Delphinus capensis*	F	32º40'N	117º10'W
SW03921	2003	11	1	*Delphinus delphis*	M	33º23'N	117º35'W
KXD0053	2003	11	3	*Delphinus delphis*	M	32º45'N	117º15'W

Cont.

Specimen	Year	Month	Day	Species	Sex	Latitude	Longitude
KXD0054	2003	11	4	*Delphinus delphis*	F	32º59'N	117º16'W
SW04002	2004	1	5	*Delphinus delphis*	F	33º23'N	117º35'W
KXD0055	2004	1	6	*Delphinus capensis*	M	33º07'N	117º20'W
KXD0057	2004	3	5	*Lagenorhynchus obliquidens*	F	33º07'N	117º20'W
KXD0058	2004	3	5	*Delphinus capensis*	M	32º41'N	117º14'W
KXD0059	2004	3	13	*Delphinus delphis*	M	33º00'N	117º16'W
SW04240	2004	3	26	*Delphinus capensis*	F	32º52'N	117º15'W
KXD0061	2004	4	7	*Tursiops truncatus*	M	33º23'N	117º36'W
KXD0060	2004	4	7	*Eschrichtius robustus*	M	33º02'N	117º17'W
KXD0062	2004	4	13	*Delphinus capensis*	U	33º01'N	117º17'W
SW04392	2004	4	29	*Delphinus delphis*	M	32º41'N	117º11'W
KXD0066	2004	5	19	*Delphinus capensis*	M	33º13'N	117º24'W
KXD0067	2004	6	18	*Delphinus delphis*	F	33º01'N	117º17'W
KXD0068	2004	6	23	*Delphinus delphis*	M	33º13'N	117º24'W
KXD0069	2004	7	9	*Delphinus capensis*	F	32º52'N	117º15'W
KXD0073	2004	8	5	*Delphinus delphis*	F	33º15'N	117º26'W
XXX0074	2004	8	13	Unidentified large whale	U	-	-
KXD0074	2004	8	19	*Phocoenoides dalli*	F	32º52'N	117º15'W
KXD0075	2004	8	26	*Delphinus capensis*	F	32º52'N	117º15'W
XXX0049	2004	8	28	*Balaenoptera*	U	Region 4	-
XXX0048	2004	8	28	Unidentified dolphin or porpoise	U	-	-
KXD0077	2004	8	30	*Delphinus capensis*	F	33º14'N	117º25'W
SW041118	2004	9	29	*Delphinus delphis*	M	33º09'N	117º21'W
SW041182	2004	10	27	*Delphinus* sp.	M	32º32'N	117º07'W
KXD0080	2004	11	17	*Tursiops truncatus*	M	32º41'N	117º13'W
KXD0081	2004	11	26	*Eschrichtius robustus*	M	32º47'N	117º15'W
KXD0082	2004	12	26	*Tursiops truncatus*	U	32º36'N	117º08'W
XXX0050	2005	1	1	*Delphinus* sp.	U	Region 5	-
XXX0051	2005	1	7	Unidentified cetacean	U	32º32'N	117º07'W
KXD0083	2005	2	13	*Delphinus capensis*	M	33º05'N	117º19'W
KXD0084	2005	3	1	*Delphinus capensis*	F	33º10'N	117º22'W
KXD0086	2005	3	23	*Delphinus delphis*	M	33º09'N	117º21'W
SJC0012	2005	4	7	*Delphinus capensis*	M	32º53'N	117º15'W
KXD0087	2005	4	22	*Delphinus delphis*	F	32º56'N	117º15'W
KXD0088	2005	4	24	*Phocoena phocoena*	F	32º41'N	117º11'W
KXD0090	2005	5	6	*Delphinus delphis*	M	33º04'N	117º18'W
KXD0091	2005	5	9	*Delphinus delphis*	M	32º53'N	117º15'W
KXD0093	2005	5	30	*Tursiops truncatus*	M	33º19'N	117º30'W
KXD0094	2005	6	15	*Tursiops truncatus*	M	32º32'N	117º07'W
KXD0095	2005	7	4	*Delphinus delphis*	M	33º06'N	117º19'W
SW050587	2005	7	10	*Delphinus delphis*	F	33º14'N	117º25'W
KXD0096	2005	7	14	*Delphinus delphis*	M	33º00'N	117º17'W
KXD0098	2005	10	16	*Tursiops truncatus*	F	33º06'N	117º19'W
KXD0099	2005	11	22	*Lagenorhynchus obliquidens*	M	32º37'N	117º08'W
KXD0100	2005	11	30	*Tursiops truncatus*	F	32º34'N	117º08'W
SW060088	2006	2	15	*Lissodelphis borealis*	F	33º13'N	117º24'W
PMMC-L-06-02-18-001	2006	2	18	*Lissodelphis borealis*	M	33º24'N	117º36'W
KXD0101	2006	2	22	*Delphinus delphis*	F	33º20'N	117º30'W
KXD0102	2006	4	1	*Delphinus capensis*	M	33º14'N	117º25'W
KXD0103	2006	4	16	*Delphinus capensis*	M	33º18'N	117º28'W
SW060261	2006	4	16	*Delphinus capensis*	M	32º47'N	117º15'W
KXD0110	2006	4	21	*Delphinus capensis*	U	32º39'N	117º09'W
KXD0106	2006	5	13	*Eschrichtius robustus*	U	33º00'N	117º17'W
KXD0109	2006	6	1	*Phocoena phocoena*	F	32º36'N	117º08'W
XXX0054	2006	6	23	Unidentified dolphin or porpoise	U	Region 1	-
XXX0055	2006	7	24	Unidentified dolphin or porpoise	U	Region 10	-
NXH0001	2006	8	14	*Delphinus delphis*	U	32º56'N	117º16'W
SJC0015	2006	9	5	*Delphinus capensis*	F	32º55'N	117º15'W
KXD0112	2006	11	15	*Megaptera novaeangliae*	M	33º07'N	117º20'W
SW070013	2006	12	27	*Delphinus delphis*	F	32º46'N	117º15'W
KXD0113	2006	12	28	*Delphinus capensis*	F	33º14'N	117º25'W
NXH0003	2007	1	3	*Ziphius cavirostris*	M	32º38'N	117º08'W
KXD0117	2007	4	25	*Delphinus capensis*	M	32º51'N	117º16'W
KXD0118	2007	4	26	*Delphinus capensis*	M	33º03'N	117º18'W
KXD0119	2007	4	29	*Delphinus capensis*	F	33º13'N	117º25'W
KXD0120	2007	5	28	*Delphinus capensis*	M	33º12'N	117º24'W
KXD0122	2007	5	30	*Delphinus capensis*	M	33º06'N	117º19'W
SJC0016	2007	5	31	*Delphinus capensis*	M	33º12'N	117º24'W
KXD0123	2007	6	2	*Delphinus capensis*	M	33º11'N	117º22'W
KXD0124	2007	6	5	*Delphinus capensis*	M	33º12'N	117º23'W
SJC0017	2007	6	5	*Delphinus delphis*	M	32º38'N	117º09'W
KXD0125	2007	6	9	*Tursiops truncatus*	F	33º12'N	117º23'W
KXD0126	2007	6	14	*Tursiops truncatus*	F	33º17'N	117º28'W
SWC-Dd-07151B	2007	6	19	*Delphinus delphis*	M	32º55'N	117º16'W
KXD0129	2007	6	28	*Delphinus delphis*	F	33º06'N	117º19'W
KXD0128	2007	6	30	*Delphinus capensis*	M	32º37'N	117º08'W

Cont.

Specimen	Year	Month	Day	Species	Sex	Latitude	Longitude
KXD0130	2007	7	5	*Delphinus capensis*	F	33º09'N	117º21'W
KXD0136	2007	7	5	*Delphinus capensis*	U	32º37'N	117º06'W
KXD0131	2007	7	5	*Delphinus capensis*	F	32º36'N	117º07'W
KXD0132	2007	7	5	*Delphinus capensis*	F	32º36'N	117º07'W
KXD0133	2007	7	9	*Delphinus capensis*	F	32º38'N	117º09'W
KXD0135	2007	7	9	*Delphinus capensis*	M	32º38'N	117º08'W
KXD0134	2007	7	9	*Delphinus capensis*	M	32º37'N	117º08'W
KXD0137	2007	7	10	*Delphinus capensis*	M	32º36'N	117º08'W
KXD0138	2007	7	10	*Delphinus capensis*	M	32º36'N	117º08'W
KXD0139	2007	9	4	*Delphinus capensis*	M	32º35'N	117º08'W
KXD0140	2007	9	30	*Delphinus capensis*	F	32º14'N	117º25'W
SJC0019	2007	11	24	*Delphinus capensis*	M	33º09'N	117º21'W
KXD0141	2007	12	21	*Delphinus capensis*	F	33º08'N	117º20'W
KXD0143	2008	1	28	*Delphinus capensis*	M	33º05'N	117º19'W
KXD0144	2008	3	2	*Delphinus capensis*	M	32º34'N	117º08'W
KXD0145	2008	3	9	*Delphinus capensis*	F	33º10'N	117º22'W
KXD0146	2008	3	19	*Delphinus capensis*	F	32º37'N	117º08'W
KXD0147	2008	3	31	*Delphinus capensis*	M	33º08'N	117º20'W
NXH0004	2008	4	5	*Delphinus capensis*	M	33º10'N	117º22'W
KXD0148	2008	4	7	*Tursiops truncatus*	M	32º56'N	117º16'W
JLL0002	2008	5	13	*Lissodelphis borealis*	M	33º17'N	117º27'W
SJC0020	2008	5	14	*Delphinus capensis*	M	33º17'N	117º28'W
JLL0004	2008	5	20	*Tursiops truncatus*	M	32º37'N	117º08'W
JLL0005	2008	5	21	*Delphinus capensis*	F	32º52'N	117º15'W
JLL0007	2008	5	25	*Globicephala macrorhynchus*	M	32º35'N	117º18'W
JLL0006	2008	5	26	*Delphinus capensis*	F	32º38'N	117º08'W
KXD0150	2008	5	28	*Lagenorhynchus obliquidens*	M	33º06'N	117º19'W
JLL0009	2008	6	7	*Delphinus capensis*	M	32º54'N	117º15'W
KXD0152	2008	6	28	*Delphinus delphis*	F	33º13'N	117º24'W
KXD0153	2008	6	29	*Tursiops truncatus*	F	33º17'N	117º28'W
JLL0010	2008	6	30	*Tursiops truncatus*	M	32º34'N	117º08'W
KXD0156	2008	7	26	*Tursiops truncatus*	U	32º47'N	117º15'W
KXD0154	2008	8	1	*Delphinus delphis*	M	32º59'N	117º16'W
KXD0157	2008	8	7	*Grampus griseus*	F	33º04'N	117º18'W
KXD0158	2008	8	22	*Delphinus capensis*	F	33º11'N	117º23'W
SWC-Gg-08122B	2008	10	18	*Grampus griseus*	M	32º50'N	117º18'W
JHY0001	2008	10	21	*Lagenorhynchus obliquidens*	M	32º48'N	117º16'W
GSV0001	2008	10	26	*Delphinus capensis*	F	32º41'N	117º12'W
SW080913	2008	12	30	*Lagenorhynchus obliquidens*	F	32º51'N	117º16'W

Appendix II

List of stranded San Diego bottlenose dolphin specimens with preliminary stock designations

Specimen	SWFSC Lab ID	Stock
AAH0001	67829	Undetermined
CLH0050	67548	Coastal
CLH0051	67551	Coastal
CLH0052	67546	Coastal
HJB0019	67968	Coastal
HJB0036	61558	Coastal
HJB0040	17434	Undetermined
JEH0381	4371	Coastal
JLL0004	74330	Undetermined
JLL0010	74634	Undetermined
JRH0057	67963	Coastal
JRH0058	23310	Coastal
JRH0067	67833	Coastal
JRH0070	67834	Coastal
JRH0073	67962	Coastal
JRH0077	67835	Coastal
JRH0095	67837	Undetermined
JRH0098	67964	Coastal
JRH0192	67965	Coastal
JVK0046	60359	Coastal
JVK0047	221	Coastal
JVK0050	402	Coastal
JVK0053	743	Undetermined
KXD0014	23623	Undetermined
KXD0016	26136	Coastal
KXD0025	26708	Coastal
KXD0032	28448	Coastal
KXD0042	32003	Undetermined
KXD0047	34075	Coastal
KXD0048	34076	Undetermined
KXD0061	39626	Undetermined
KXD0080	43380	Coastal
KXD0082	44518	Coastal
KXD0093	47193	Coastal
KXD0094	47816	Undetermined
KXD0100	51613	Coastal
KXD0148	74224	Coastal
KXD0153	74636	Coastal
KXD0156	74702	Undetermined
KZP0008	4367	Coastal
KZP0010	60355	Coastal
KZP0012	60354	Coastal
KZP0017	300	Coastal
KZP0018	298	Coastal
KZP0019	60358	Undetermined
KZP0020	60357	Coastal
KZP0023	60363	Coastal
KZP0024	1693	Coastal
KZP0025	1694	Coastal
KZP0026	62360	Coastal
KZP0035	3886	Coastal
KZP0044	62361	Coastal
KZP0065	13354	Undetermined
KZP0069	17363	Coastal

Cont.

Specimen	SWFSC Lab ID	Stock
KZP0073	15493	Coastal
KZP0075	17108	Coastal
KZP0078	18934	Undetermined
KZP0084	24217	Coastal
KZP0086	24218	Coastal
LJH0006	67840	Coastal
MSL0267	67842	Undetermined
MSL0269	67843	Undetermined
MZH0024	4507	Undetermined
MZH0026	11198	Coastal
MZH0027	4533	Coastal
MZH0041	62363	Coastal
MZH0047	9804	Undetermined
RMG4551	67955	Coastal
RMG4797	67549	Coastal
SDNHM21213	67547	Coastal
SW9543	4199	Undetermined
SWC-Tt-02221B	29881	Coastal
WFP0036	67956	Coastal
WFP0278	67957	Coastal
WFP0474	60352	Coastal
WFP0475	60351	Coastal
WFP0509	67958	Coastal
WFP0559	61559	Coastal
WFP0563	62462	Coastal
WFP0565	62463	Undetermined
WTN0001	632	Coastal
WTN0003	633	Coastal
WTN0004	4368	Undetermined