

ATTACHMENT E.1

COLLISIONS BETWEEN SHIPS AND WHALES

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ABSTRACT

Although collisions with motorized ships are a recognized source of whale mortality, little has been done to compile information on the frequency of their occurrence or contributing factors. We searched historical records and computerized stranding databases for evidence of ship strikes involving great whales (*i.e.*, baleen whales and the sperm whale). Historical records suggest that ship strikes fatal to whales first occurred late in the 1800s as ships began to reach speeds of 13–15 kn, remained infrequent until about 1950, and then increased during the 1950s–1970s as the number and speed of ships increased. Of 11 species known to be hit by ships, fin whales (*Balaenoptera physalus*) are struck most frequently; right whales (*Eubalaena glacialis* and *E. australis*), humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter catodon*), and gray whales (*Eschrichtius robustus*) are hit commonly. In some areas, one-third of all fin whale and right whale strandings appear to involve ship strikes. To assess contributing factors, we compiled descriptions of 58 collisions. They indicate that all sizes and types of vessels can hit whales;

most lethal or severe injuries are caused by ships 80 m or longer; whales usually are not seen beforehand or are seen too late to be avoided; and most lethal or severe injuries involve ships travelling 14 kn or faster. Ship strikes can significantly affect small populations of whales, such as northern right whales in the western North Atlantic. In areas where special caution is needed to avoid such events, measures to reduce the vessel speed below 14 kn may be beneficial.

Key words: mortality, strandings, ship collisions, species conservation, right whales.

As steam-powered ship technology evolved in the 1800s, reports of ships striking whales began to appear (Allen 1916; Schmitt 1976, 1979). These collisions appeared to occur rarely; however, recent information suggests that ship strikes of whales may be more common than previously suspected and, in some cases, may constitute significant conservation issues.

Kraus (1990) reported that at least 20% (5 of 25) of endangered northern right whales (*Eubalaena glacialis*) found dead between 1970 and 1989 off the eastern United States and Canada had large propeller slashes or massive injuries indicating they were killed by ships. Of the living right whales for which good-quality photographs are available, 7% (12 of 168) had scars caused by ship strikes. An updated analysis (Knowlton and Kraus, in press) links ship strikes to 35% (15 of 43) of right whale deaths between 1970 and 1998, and to at least 47% (8 of 17) of their deaths from 1991 to 1998, a period when carcass recovery and necropsy efforts improved. Because there are only about 300 animals in the population (Knowlton *et al.* 1994, Caswell *et al.* 1999), ship strikes pose a serious threat to recovery and intensive management efforts have been undertaken in both the United States and Canada to reduce the number of vessel-related deaths (Marine Mammal Commission 1999).

Humpback whales (*Megaptera novaeangliae*) also may be struck by ships more frequently than previously thought in some areas. Wiley *et al.* (1994) found that 30% (6 of 20) of carefully examined humpback whale strandings along the U.S. Atlantic coast between 1985 and 1992, most of which were near the Chesapeake Bay, had injuries caused by ships.

In some areas recurring ship strikes involving hydrofoils and high-speed vessels (*e.g.*, those that operate at speeds of 28 kn and higher) also suggest ship collisions may be relatively common in some areas. After several collisions between ferries and sperm whales in the Canary Islands, one of which caused the death of a passenger, André *et al.* (1997) tried unsuccessfully to deter sperm whales from ferry routes by broadcasting low-frequency sounds. Five collisions in the Sea of Japan between high-speed jetfoil ferries and what were thought to be whales also were reported, two of which resulted in injuries to several passengers and three of which involved vessel damage (Honma *et al.* 1997).

Although this information suggests that collisions between ships and whales are more common than previously thought, no attempt has been made to compile information on the frequency of such collisions, the types of vessels

involved, the speed of ships when whales were hit, collision locations, the behavior of whales immediately before being struck, or other potentially relevant factors. The lack of such information has hampered efforts to evaluate the significance of ship strikes for whale populations and to develop appropriate mitigation measures. Therefore, we compiled and analyzed information on the nature and extent of collisions between motorized ships and large whales from four sources: (1) historical collision records, (2) recent whale stranding records, (3) anecdotal accounts from vessels involved in collisions, and (4) data on the number and speed of ships.

METHODS

We focused on collisions between motorized vessels and great whales (*i.e.*, baleen whales and the sperm whale, *Physeter catodon*). Collisions with vessels under sail were excluded from the analysis because of data limitations and a lack of evidence that such collisions cause significant injuries to whales.

Historical collision records—To assess collisions with whales before 1951, we reviewed newspaper clippings, early stranding records, and scientific publications. It was not possible to verify independently the accuracy of these reports, except in rare cases where photographs of struck animals accompanied the reports. To minimize error, we considered only accounts citing vessel crew members whose descriptions indicated that the struck whale was seen clearly (*e.g.*, it was caught on a ship's bow or seen thrashing off the stern). Historical whale stranding records from the early 1600s to 1915 along northeastern North America (Allen 1916), and from 1913 to 1966 for the British Isles (Harmer 1927; Fraser 1934, 1946, 1953, 1974) were also reviewed for reports of ship strikes or stranded whales with massive injuries, such as fractured skulls and severed tails. We found no other long-term data sets for large-whale strandings before the 1970s.

Recent stranding records—We searched computerized stranding databases for all records of whales killed or possibly killed by ships. These included records for the U.S. Atlantic and Gulf of Mexico coasts (maintained by the Division of Mammals, National Museum of Natural History, Smithsonian Institution, Washington, DC), Italy (maintained by the Centro Studi Cetacei, Museo di Storia Naturale di Milano), and France (the Institut de la Mer et du Littoral, La Rochelle). Stranding records for southern right whales (*E. australis*) in South Africa (Best *et al.*, in press) also were examined.

From each database, we generated a list of the species, date, location, and nature or source of injury for each identified or possible ship strike. Records were attributed to ship strikes when they reported either (1) massive blunt impact trauma (*e.g.*, fractures of heavy bones including skulls, jaws, or vertebrae) or apparent propeller wounds (*i.e.*, deep slashes or cuts into blubber on the dorsal aspect, or (2) a dead whale on the bow of a ship. Given the force needed to break large whale bones, it was considered unlikely that fractured jaws, skulls, or vertebrae were caused by anything other than ship collisions. Similarly, it was assumed that long, deep, parallel slashes were caused by ship

propellers. Dead whale stranding records ascribed to ship strikes were summed and the total was compared to the total number of dead whale strandings for that species from all causes. Time frames for searches varied by database depending on the year in which well-organized stranding response efforts began and the last year for which data entry was relatively complete.

Anecdotal accounts—To examine factors contributing to ship strikes, we compiled accounts describing observed collisions between ships and whales from published literature, a request for collision descriptions posted on the Internet (marmam@uvvm.uvic.ca), and inquiries to whale biologists, government officials, and mariners likely to have documented such events. We also reviewed newspaper clippings, articles, and unpublished first-hand accounts of vessel collisions with various species of marine life gathered by William C. Cummings (5948 Eton Ct., San Diego, CA 92122), who published a request for descriptions of such events in *Yachting* (March 1974) and *Sea Frontiers* (July–August 1974).

The following information was recorded from each event whenever available: date; time; location; species of whale struck; whether the struck whale was seen before the collision; a description of the impact; fate of the whale or signs of injuries; type, name, and size of the vessel; vessel speed and weather conditions at the time of the collision; and vessel damage. When a vessel's name was provided, Lloyds Registry of Shipping was used to determine and/or verify vessel length. It was not possible to verify other information. To ensure account accuracy, we included only descriptions based on the crew of vessels involved in collisions, witnesses to the collisions aboard a nearby vessel, or individuals who, as part of their official duty, investigated cases of whales brought into port on bows of ships or other reported ship strikes. In many cases, event summaries were provided to individuals reporting the event to verify their accuracy.

Struck whales were assigned to one of five fate categories: killed, severe injury, minor injury, no apparent effect, or unknown fate. Whales were listed as killed if they were seen dead on a vessel's bow or described as having been cut into pieces and sank. Whales struck with reports of blood in the water or bleeding wounds were considered severely injured. Whales seen alive after a collision with fresh wounds exposing blubber or thrashing off the stern but with no mention of blood in the water or bleeding wounds, were categorized as receiving a minor injury. Whales seen swimming away after being hit with no visible marks and with behavior similar to that observed before the whale was hit (*e.g.*, resuming feeding) were considered to have sustained no apparent injury. The fate of whales not seen after a collision and lacking any report of blood in the water was considered to be unknown.

Historical data on the number and speed of ships—We determined the number of motorized vessels 100 gross tons or larger registered by Lloyds Register of Shipping in the last year of each decade from 1880 through the 1990s (The Committee of Lloyds Register 1890, 1950; Lloyds Register of Shipping 1992). We also examined the maximum sustained speed of more than 1,400 passenger vessels built for trans-Atlantic service in decades from the 1830s to the 1970s

(Smith 1978). These speeds were based on the average speed of each vessel's fastest trans-Atlantic crossing. For each decade, we determined the number of passenger ships built for trans-Atlantic crossing, their average maximum sustained speed, and the percentage that were able to maintain speeds above 15 kn and 20 kn.

RESULTS

Evidence of ship collisions was found for 11 species of great whales. Overall, fin whales (*Balaenoptera physalus*) were hit most frequently. Collisions with northern and southern right whales, humpback whales, gray whales (*Eschrichtius robustus*), and sperm whales were relatively common in some areas. There were comparatively few collision records for minke whales (*B. acutorostrata*), blue whales (*B. musculus*), and sei whales (*B. borealis*). Records for Bryde's whales (*B. edeni*) and bowhead whales (*Balaena mysticetus*) were rare.

Historical Evidence of Collisions

There were few accounts of motorized ships hitting whales before 1951. The earliest account we found involved the steamship *Munroe* moored in Narragansett Bay, Rhode Island, in 1877. According to Allen (1916), the captain reported that, "by some curious accident," a small whale, possibly a minke whale or small fin whale, became caught between the ship's propeller and stern while the ship lay at dock. To dislodge the animal, whose vigorous struggles to free itself raised the ship's stern, the captain started the engine. The propeller then "inflicted such injuries upon the whale's head that it rushed upon a shoal . . . and became stranded." Between 1885 and 1950, we found only 14 accounts of collisions between moving ships and whales (Table 1). Several cases involved whales caught on the ship's bow.

Allen (1916) described five ship collisions from 1885 to 1915. One involved a sailing vessel, the schooner *Adelia T. Carleton*, in June 1904; four others involved motorized vessels (Table 1). One collision, involving the *Admiral Sampson*, "just grazed (a whale, which) came up almost immediately astern and followed along for some distance as though bent on revenge." The other collisions were more serious. The *Lawrence* struck a whale that was seen off the stern "rolling about as if in distress" after being hit at a speed of about 13 kn; the *Graecian* struck a whale "with such force as to cut the animal into two parts"; and the *Waldimir Reitz* hit a whale head-on "knocking a four-foot hole in the (ship's) bow."

Allen (1916) also reported two finback whales were found floating in Massachusetts Bay in July 1842. After being towed to shore and stripped of blubber, both were found to have broken lower jaws. He reported that "it was supposed that the two had been fighting, and so had fatally injured each other, but the usual peaceable nature of this species is rather against such a supposition." He noted no other injuries typical of recent ship strikes among ap-

Table 1. Records of collisions between motorized ships and whales prior to 1951.

Year	Species struck	Fate of whale	Vessel (name/type)	Location	Source
1885	unidentified	unknown	<i>Alexander M. Lawrence</i> , No. 4/pilot boat	20 mi east of Nantucket, MA, USA	Allen 1916
1896	sperm whale?	killed	<i>Seminole</i> /liner	Off Sandy Hook, NJ, USA	Schmitt 1979
1903	unidentified	unknown	<i>Puma</i> /steamship	Placenta Bay, Newfoundland	Allen 1916
1904	unidentified	killed	<i>Swazi</i> /steamship	Atlantic Ocean	Anonymous 1904
1906	unidentified	injured?	<i>Admiral Sampson</i> /steamship	Off Chatham MA, USA	Allen 1916
1908	unidentified	killed?	<i>St. Louis</i> /liner	Off Newfoundland, Canada	Schmitt 1979
1908	sperm whale	killed	<i>Kensington</i> /liner	Off Newfoundland, Canada	Anonymous 1908
1910	unidentified	killed	<i>Pallenzai</i> /steamship	North Atlantic	Anonymous 1910
1913	unidentified	unknown	<i>Waldmir Reitz</i> /cargo ship	Off Newfoundland, Canada	Allen 1916
1912-1915	unidentified	killed	<i>Gracian</i> /steamship	Off U.S. East Coast	Allen 1916
1926	unidentified	killed	<i>Berengaria</i> /liner	North Atlantic	Schmitt 1979
Mid-1930s	unidentified	killed	<i>Maungani</i> /steamship	Near Raratonga, South Pacific	W. Cummings ^a
1940	baleen whale	killed	<i>New Orleans</i> /tanker	Off Cape Hatteras, NC, USA	Burgess 1940
1940-1945	sperm whale	killed	U.S. destroyer	North Atlantic	Slijper 1962
1950	Bryde's whale	killed	tanker	Red Sea, Egypt	Anonymous 1950

^a William C. Cummings, unpublished data held by the Marine Mammal Commission, 4340 East-West Highway, Rm. 905, Bethesda, Maryland, 20814, U.S.A. 28 April 1999.

proximately 200 records compiled for five whale species (finback, right, sei, blue, and little piked or minke).

Records of 164 large whale strandings in the British Isles from 1913 to 1966 (Harmer 1927; Fraser 1934, 1946, 1953, 1974) included no evidence of ship strikes even though some strandings were attributed to other human causes (*e.g.*, commercial whaling, shootings, and possibly anti-submarine warfare) and one record mentions broken rib and flipper bones. Because rib and flipper bones are thinner than skulls and jaws and subject to breaking as dead animals roll in the surf, we did not consider such injuries as evidence of a ship strike.

Other than Allen (1916), the first references we found in the scientific literature to whales being killed or injured by ships involved events in the 1950s. Gilmore (1959) cited reports of flukeless humpback whales and gray whales off California in the 1950s and speculated on ship collisions as the cause. Slijper (1979) noted four cases of ships colliding with what were thought to be sleeping sperm whales in the 1950s.

Stranding Records

Since the mid-1970s, marine mammal stranding programs have provided a basis for documenting collisions between ships and whales. Indeed, the value of stranding records to document such human-related mortality was among the fundamental reasons cited for the need to improve stranding programs (Geraci and St. Aubin 1979).

United States—Along the U.S. Atlantic coast (Maine to Dade County, Florida), 407 strandings of seven whale species were recorded between 1975 and 1996. Overall, 14% (58 of 407) of the records indicate vessel collisions as the known or possible cause of death (Table 2). Evidence of ship collisions, however, was limited to five species: fin whales (33%, 31 of 92 stranding deaths), northern right whales (33%, 10 of 30 stranding deaths), humpback whales (8%, 10 of 123 stranding deaths), minke whales (5%, 5 of 105 stranding deaths), and sei whales (67%, 2 of 3 stranding deaths). None of the six Bryde's whales or 48 sperm whales revealed signs of a ship collision. Although there were no blue whale strandings during the search period, a dead blue whale was brought into Narragansett Bay, Rhode Island, on the bow of a tanker on 3 March 1998, bringing to six the number of species with vessel-related injuries recorded along the U.S. Atlantic coast. Ship strike locations were distributed broadly for most species; however, for humpback whales, all but one occurred between the Delaware River and Ocracoke Island, North Carolina. Between those points, 25% (9 of 36) of the humpback whale strandings involved vessel injuries.

A high proportion of struck right whales and humpback whales were calves and juveniles: 75% of the eight struck right whales whose ages could be estimated were calves or juveniles; 80% of the 10 struck humpback whales were ≤ 11 m, lengths considered to be three years of age or less (Stevick 1999).

Table 2. Whales killed or possibly killed by vessel collisions from stranding records of dead whales along the U.S. East Coast (Maine to Dade County Florida): 1975–1996. Data from the Cetacean Distributional Database, Smithsonian Institution, Washington, DC.

Date	Location	Comments
Northern right whale (<i>Eubalena glacialis</i>); 33.3% of records (10 of 30):		
4/15/76	Cape Cod, MA	Calf, large bruise
11/5/76	Portland, ME	Floating unrecovered, propeller cuts on back
3/5/79	Long Island, NY	Juvenile, severed tail
2/21/83	Island Beach, NJ	Juvenile, severed tail
8/7/86	Cape Cod, MA	Juvenile, five large propeller cuts from left ventral side around to middorsal area
3/12/91	Fernandina Beach, FL	Juvenile, fractured skull and gillnet around tail
1/5/93	St. Augustine, FL	Calf, reported when hit, series of propeller slashes from dorsal peduncle to head, and lower left flank to throat
12/6/93	Virginia Beach, VA	Floating unrecovered, propeller gash on right side
1/30/96	Sapelo, GA	Adult recovered floating offshore, shattered skull
3/10/96	Cape Cod, MA	Adult, 3-m gash on back
Humpback whale (<i>Megaptera novaeangliae</i>); 8.1% of records (10 of 123):		
2/5/90	Nags Head, NC	11.1-m female, broken mandible and head damage
11/8/91	Island Beach, NJ	9.0-m male, three propeller cuts on head, fractured occipital condyle
2/14/92	Virginia Beach, VA	8.6-m male, propeller wounds, fractured mandible and eye socket
4/16/92	Assateague Is., MD	8.9-m female, disarticulated skull, blunt trauma
4/22/92	Hatteras, NC	8.9-m female, extensive skeletal damage
10/9/92	Metompkin Is., VA	8.7-m female, bruising around axilla, dislocated mandible
4/10/94	Ocracoke, NC	No length, axillary hemorrhage ventral to left pectoral, hemorrhage to posterior third of mandible
4/2/96	Virginia Beach, VA	7.2-m female, fractured mandible, appeared emaciated
5/9/96	Cape Henlopen, DE	6.7-m female, deep propeller cuts behind blowhole
11/3/96	Corolla, NC	8.4-m male, acute trauma to skull, blunt trauma to left lateral peduncle, fractured left squamosal
Fin whale (<i>Balaenoptera physalus</i>); 33.7% of records (31 of 92):		
4/13/75	Newark Bay, NJ	Floating near harbor
5/27/75	Brigantine, NJ	Stranded on beach
1/28/76	Groton, CT	Stranded on beach
10/18/79	Baltimore, MD	Brought into port on bow of Russian cruise ship
1/7/80	Portsmouth, VA	Floating near harbor
2/17/80	Philadelphia, PA	Floating in harbor
3/31/81	Norfolk, Va	Brought into port on bow of ship, later determined to have been hit off Atlantic City, NJ
4/23/82	Portsmouth, VA	Stranded on beach
6/7/82	Hog Island, VA	Stranded on beach

Table 2. Continued.

Date	Location	Comments
Fin whale (<i>Balaenoptera physalus</i>); 33.7% of records (31 of 92):		
8/2/82	Elizabeth City, NJ	Brought into port on bow of ship, hit off Boston, MA
1/24/83	Norfolk, VA	Brought into port on bow of ship, bruising evident, reportedly hit off New York
1/25/83	Norfolk, VA	Floating near harbor, bruising evident
7/31/83	Manhattan, NY	Possible ship strike brought into port on bow of ship
10/14/83	Fire Island, NY	Slashes on left ventral side, possible ship-strike
3/7/84	Baltimore, MD	Brought into port on bow of ship, bruising evident
8/27/85	Montauk, NY	Floating with propeller slashes, possible ship strike
5/6/86	Hoboken, NJ	Brought into port on bow of cruise ship
7/2/86	Delaware River, NJ	Reportedly struck by container ship
8/18/87	Boston, MA	Folded in half forward of dorsal fin on right side, likely brought into port on bow of ship
1/15/88	Marshfield, MA	Identified as possible ship collision
1/24/88	Cape Hatteras, NC	Stranded on beach
5/4/88	Deal, NJ	Boat hit found floating
7/14/89	North Kingstown, RI	Fractured lower jaw, line entangled on right flipper
11/25/90	Curtis Bay, MD	Stranded, ship strike mark mid-lateral on left side
6/2/92	Long Beach Is., NJ	Stranded on beach, several fractured vertebrae
7/31/92	Port Newark, NJ	Floating near harbor, fractured vertebrae in midsection
3/12/94	Virginia Beach, VA	Stranded on beach
8/1/95	30 mi SE of Cape Cod, MA	Carried to St. George, Bermuda on the bow of a cruise ship after being hit, bruising and spinal injuries
11/14/95	Charleston, SC	Brought into port on bow of ship, fractured skull
4/18/96	Penns Grove, NJ	Floating in Delaware River, broken vertebrae, blunt trauma to right pectoral fin and surrounding area
7/14/96	Elizabeth, NJ	Floating near harbor, bow impact to left flank
Sei whale (<i>Balaenoptera borealis</i>); 66.7% of records (2 of 3):		
5/13/88	Baltimore, MD	Brought into port on bow of ship, damaged skull
11/17/94	Boston, MA	Brought into port on bow of container ship
Minke whale (<i>Balaenoptera acutorostrata</i>); 4.8% of records (5 of 105):		
7/8/75	Boothbay, ME	Stranded, body heavily bruised
10/2/75	New Harbor, ME	Floating and towed to shore
5/13/88	Duxbury Beach, MA	Stranded, one large gash and three smaller gashes
3/15/92	St. Johns River, FL	Propeller strike from a large vessel
10/1/93	Sandbridge, VA	Left mandible broken
Bryde's whale (<i>Balaenoptera edeni</i>); 0% of records (0 of 6)		
Sperm whale (<i>Physeter catodon</i>); 0% of records (0 of 48)		

Table 3. Whales killed or possibly killed by vessel collisions from stranding records of dead whales in Italy: 1986–1997. Data from the Centro Studi Cetacei, Museo di Storia Naturale di Milano, Italy.

Date	Location	Comments
Fin whale (<i>Balaenoptera physalus</i>); 20% of records (8 of 39):		
6/23/86	Livorno, Tuscany	Floating 5 mi offshore with propeller cuts on back
6/28/86	Livorno, Tuscany	Floating offshore between Corsica and Italian mainland with propeller wounds on back
5/22/87	Olbia, Sardinia	Brought into port of Olbia on bow of ship
5/20/89	Olbia, Sardinia	Struck by ferry near entrance to Olbia harbor
4/28/90	Porto Torres, Sardinia	Struck by ship 1.5 mi from port, seen alive with a deep wound on back and found dead a day later
4/30/91	Genova, Liguria	Brought into port on bow of ferry
5/20/94	Cagliari, Sardinia	Stranded with propeller wounds on right side, fractured right flipper
5/25/95	Livorno, Tuscany	Brought into port on bow of ship, fractured jaw and other wounds
Minke whale (<i>Balaenoptera acutorostrata</i>); 33% of records (1 of 3):		
7/31/97	Genova, Liguria	Stranded with fractured skull
Sperm whale (<i>Physeter catodon</i>); 6% of records (4 of 71):		
4/27/87	Savona, Liguria	Stranded with propeller wounds
1/16/88	Cagliari, Sardinia	Stranded with propeller wounds
1/24/97	Messina, Sicily	Stranded with propeller wounds, fractured skull
8/9/97	Ischia, Campania	Stranded, three deep wounds

The blue whale found on a ship's bow in 1998 also was a juvenile. Data to assess ages of most other struck whales were not available.

Along the U.S. Gulf of Mexico coast (Texas to Monroe County, Florida), there were 31 dead whale strandings involving four species from 1975 through 1996: 2 sei whales, 4 minke whales, 8 Bryde's whales, and 17 sperm whales. Only one stranding was identified as a possible ship strike—a sperm whale with propeller wounds found in Louisiana on 9 March 1990. The database included evidence of at least two other species struck by ships in the Gulf of Mexico: a northern right whale calf found dead in Texas on 30 January 1972 before our search period, and a live humpback whale seen swimming off Naples, Florida, on 19 February 1994 with fresh propeller wounds.

Italy—Stranding records for Italy from 1986 through 1997 listed 113 dead whales involving three species (Table 3). Overall, 12% (13 of 113) cited ship collisions as the known or possible cause of death, including 20% (8 of 39) of the fin whales, 6% (4 of 71) of the sperm whales, and 33% (1 of 3) of the minke whales. Ferries serving Corsica and Sardinia off Italy's west coast were implicated in several vessel-related deaths. There also was a record of a sperm whale hit by a hydrofoil on 2 September 1992 off Sicily and last seen alive with "superficial wounds."

Table 4. Whales killed or possibly killed by vessel collisions from stranding records of dead whales in France: 1972–1998. Data from the Institut de la Mer et du Littoral, La Rochelle, France.

Date	Location	Comments
Fin whale (<i>Balaenoptera physalus</i>); 22% of records (16 of 72)		
7/5/72	Med. Sea, off Calvi (N. Corsica)	18-m male hit by a ferry, seen dead floating at sea
9/3/72	Med. Sea, Nice	12.6-m male hit by ferry <i>La Corse</i> , brought into port on bow of ship
8/30/73	Med. Sea, between France and Corsica	15-m animal hit by ferry <i>La Corse</i> , brought into port on bow of ship
9/10/74	Med. Sea, between Menton and Antibes	15-m animal cut through middle, seen floating offshore for 3 d
4/3/76	Med. Sea, Toulon	14.3-m male hit by merchant ship, brought into port on bow of ship, several ribs and cervical vertebra broken
10/19/76	Atl. O., Bay of Biscay, Lorient	12.5-m female stranded alive, large propeller cuts on back, probable ship strike
9/19/82	Med. Sea, Villeneuve les Maguelonnes	13.5-m animal stranded dead, cut through middle of the back, probable ship strike
1/21/85	Med. Sea, Port La Nouvelle La Franqui	18-m male stranded alive, large propeller cuts on its back, probable ship strike
11/10/86	Med. Sea, Fos sur Mer	16-m animal hit by tanker, brought into port on bow of ship
5/13/91	Atl. O., Bay of Biscay, Donges	18.8-m male hit by tanker <i>Edouardo LD</i> , brought into port on bow of ship, broken jaw
9/9/93	Med. Sea, St. Tropez	Hit by ship, seen dead floating at sea
9/9/93	Med. Sea, Toulon	16-m female hit by ferry <i>Ile de Beaute</i> , brought into port on bow of ship
7/19/94	Atl. O., English Channel, Le Havre	14.5-m male hit by merchant ship <i>Fidelio</i> , brought into port on bow of ship
9/26/95	Med. Sea, Fos sur Mer	18-m female hit by merchant ship <i>Japan Senator</i> , brought into port on bow of ship
7/26/96	Med. Sea, between France and Corsica	14-m male hit by a ferry <i>Danielle Casanova</i> , brought into port on bow of ship
2/24/97	Med. Sea, Marseille	5.2-m male stranded alive, large hematosis on right side of thorax, possible ship strike
Sei whale (<i>Balaenoptera borealis</i>); 0% of records (0 of 2)		
Minke whale (<i>Balaenoptera acutorostrata</i>); 0% of records (0 of 17)		
Humpback whale (<i>Megaptera novaeangliae</i>); 0% of records (0 of 6)		
Sperm whale (<i>Physeter catodon</i>); 0% of records (0 of 30)		

France—French stranding records for the period 1972 through 1998 included 127 dead whales of five species (Table 4). Overall, 13% (16 of 127) of the records listed ship strikes as a known or possible cause of death. For fin whales, vessel-related injuries were noted in 22% (16 of 72) of the strandings,