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Records of killer whales in the western North Atlantic, with emphasis on eastern Canadian waters

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ABSTRACT

Published records of killer whales, *Orcinus orca*, in the western North Atlantic, from central Labrador (about 55°N) south to the West Indies, were compiled. We also compiled unpublished records, with emphasis on eastern Canadian waters, from statistics of Canada's east-coast shore whaling industry, data from Canadian whale sighting and tagging cruises in 1966-1973, the files of the Arctic Biological Station and other sources.

Although killer whales were taken only rarely by whalers in southern Labrador, Newfoundland and Nova Scotia, these whales were known to frequent the whaling grounds. In addition to the written and verbal reports of observations by the whalers, the wounds and scars on mysticetes landed at the whaling stations provide evidence of encounters with killer whales (though there is no way of telling where or when the attempts at predation occurred).

Killer whales enter embayments along the coast of Newfoundland and are known from as far up the St. Lawrence as the Saguenay River confluence. In the past at least, they apparently preyed on the formerly large population of white whales, *Delphinapterus leucas*, in the St. Lawrence Estuary. There are few records from Nova Scotia and the Bay of Fundy. In New England, killer whales are sighted annually off Cape Cod, particularly in autumn, presumably as they follow migrating bluefin tuna, *Thunnus thynnus*, inshore. Winter records from the southeast U.S., the Bahamas and the West Indies support the hypothesis that at least some killer whales in the western North Atlantic undertake a north-south seasonal migration. However, there are also summer records in the Caribbean region. Therefore, two or more stocks may occur in the Northwest Atlantic or the migration scheme may be complicated.

INTRODUCTION

Miller and Kellogg (1955, p. 661) noted that killer whales, *Orcinus orca*, had been recorded from the "coast of Greenland" and from Lancaster Sound, Baffin Bay and Davis Strait south to New Jersey. Hall and Kelson (1959) stated only that killer whales range from Greenland south to New Jersey. Leatherwood *et al.* (1976, pp. 84-86) described the species' range in the western North Atlantic as extending from the polar pack ice in the north to Florida and the Lesser Antilles and into the Gulf of Mexico in the south. They considered

the species "far more common" in the cooler waters from about New Jersey north. Peterson (1966, p. 374), however, considered killer whales to be "not common in eastern-Canadian waters," while Banfield (1974, p. 265) described them as "of regular occurrence" along the Canadian Atlantic coast, including the Gulf of St. Lawrence. The accounts of eastern Canadian distribution and movements by Peterson (1966), Leatherwood *et al.* (1976) and IWC (1982) come largely from Sergeant and Fisher (1957) and Sergeant *et al.* (1970), who summarized sighting, stranding and cap-

ture records for this area. In reporting the stranding of a killer whale in the Bahamas, Backus (1961) summarized 14 other stranding events involving killer whales in eastern North America and mentioned some sightings off Florida and Texas (Moore 1953; Caldwell *et al.* 1956). Katona *et al.* (1983) described the occurrence of killer whales in the Gulf of Maine and off southeast Canada. IWC (1982, p. 618) claimed that "a review of the North Atlantic distribution suggests a preference for coastal and continental-shelf waters." "Migrating trends and population size are unknown for the northwest Atlantic stock" (Mitchell 1974).

In this paper we have compiled records of killer whales in the western North Atlantic from central Labrador (about 55°N) south to the equator. Our search for information was more thorough for eastern Canadian waters than for areas south of the U.S.-Canadian border, in view of Katona *et al.*'s (1988 - this volume) comprehensive coverage of the latter. Elsewhere we have summarized information on killer whales from the eastern Canadian Arctic and adjacent waters north of 55°N (Reeves and Mitchell 1988a - this volume) and from 19th-century whaling grounds throughout the North Atlantic (Reeves and Mitchell 1988b - this volume).

In the absence of effort directed at locating killer whales (e.g. censuses and inventories) or of a fishery for them (historically or currently), and considering their apparently wide-ranging movements and/or occurrence, no clear impression has developed concerning the migrations, stock divisions, if any, and relative abundance of killer whales in the western North Atlantic. The photodocumentation efforts now underway (e.g. Lyrholm *et al.* 1987) should eventually provide evidence with which to test various hypotheses. The present paper is a summary of previous work and is not intended to reconcile or revise the somewhat disparate views on killer whale distribution and migration in the western North Atlantic published previously (see references cited above). It is intended to serve as a

background for discussion rather than as a conclusive, analytical treatment.

MATERIALS AND METHODS

Literature search

An extensive search was made of the literature. Citations given under *Orcinus orca* (and other permutations of the scientific name for the killer whale) in the systematic index of Zoological Record, 1864-1973, were obtained and reviewed. We searched the CAN/SDI data base of the National Science and Engineering Research Council (Canada) for *Orcinus* references, 1970-1986. In addition, we used the *Orcinus* cards in the Delphinidae section of the Remington Kellogg subject card catalogue in the Kellogg Library, U.S. National Museum. Our own libraries and research files contained some references to North Atlantic killer whales which were not found in any of the systematic searches. Records for eastern Canadian waters resulting from this search are listed in Table 1 (Appendix 1) and shown in Figure 1. Place names in Canada are shown in Figure 2.

File search

The administrative files of the Arctic Biological Station (ABS), 1954 to present, contain letters, memoranda, reports and other documents on many fisheries subjects. We searched the Marine Mammals (8-1 for 1954 to 1961; 12-1 for 1962 on), Marine Mammal Observations and Catch Records (12-1-1), Marine Mammal Strandings (12-1-3), Whales (8-1-3 for 1954 to 1961; 12-6 for 1962 on) and Dolphins (12-6-5) files for information on North Atlantic killer whales (Table 1; Fig. 1).

Newspaper search

News clippings obtained from a long-standing (late 1960's to present) service subscription (Bowden's, Toronto) were indexed by species. This search emphasized major newspapers in St. John's, Newfoundland, Halifax, Nova Scotia, Boston, Massachusetts, and many other port cities from Newfoundland

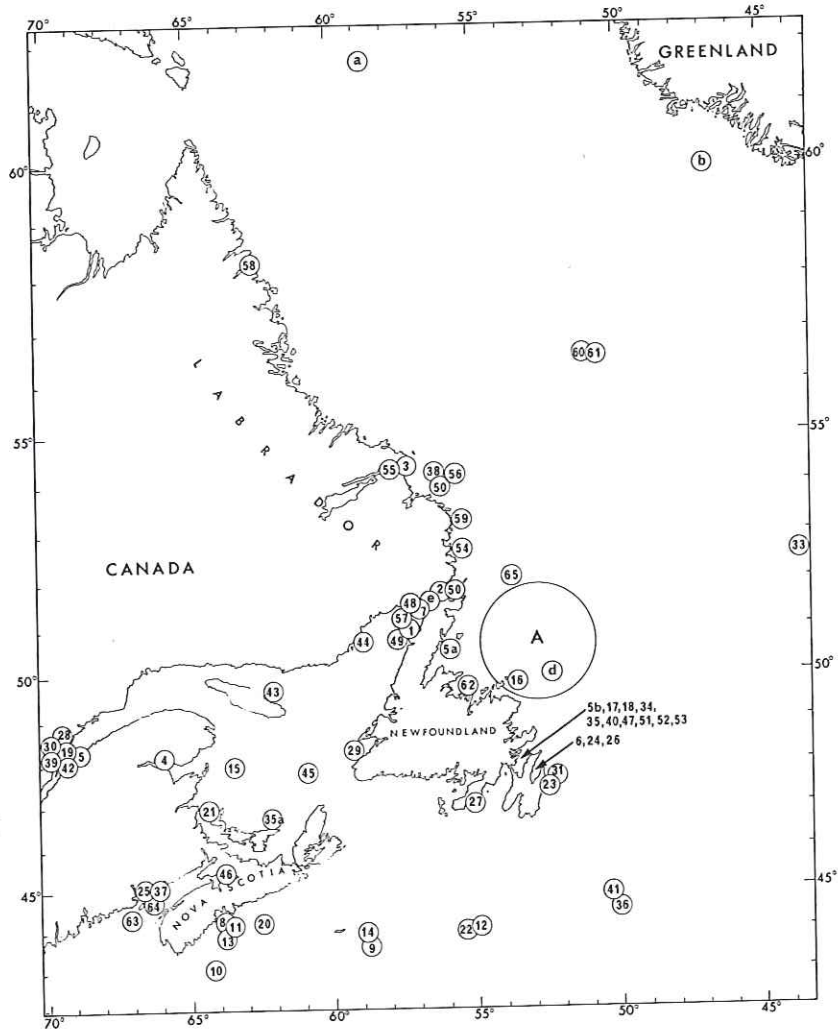


Fig. 1. Eastern Canadian waters, with positions of killer whale records from Tables 1, 3 and 4. Numbers are keyed to entry numbers in the tables. Note that the circle marked "A" contains all the positions of sightings listed in Table 3; it does not contain the full extent of the South Dildo and Williamsport whaling grounds (compare with Mitchell 1974, Fig. 5-1). The letters a, b, d and e refer to records in Table 4.

south to and including part of New England. The search profile was tailored to retrieve original records of sightings, strandings and other occurrences of cetaceans in a part of the Northwest Atlantic. All clippings are in Mitchell's library, and those containing relevant references to North Atlantic killer whales are cited in Table 2 (Appendix 1). The need for evaluating news clippings critically is exemplified by the record of a 9-ft, 600-lb "killer whale" stranded at Islesboro, Maine, in August 1968 (Portland Press Herald, 9 August 1968) and that of a "killer whale" entangled in a cod trap at Heart's Desire, New-

foundland, in April 1985 (Atlantic Fisherman, Pictou, Nova Scotia, 12 April 1985). Photographs published with the news accounts reveal these to have been an Atlantic white-sided dolphin, *Lagenorhynchus acutus*, and a pilot whale, *Globicephala melaena*, respectively.

CPUE data from whaling stations

A standard catch-per-unit-of-effort (CPUE) form developed in Canada was distributed to captains of catcher boats at South Dildo (1967-72) and Williamsport (1968-72), Newfoundland, and Blandford, Nova Scotia

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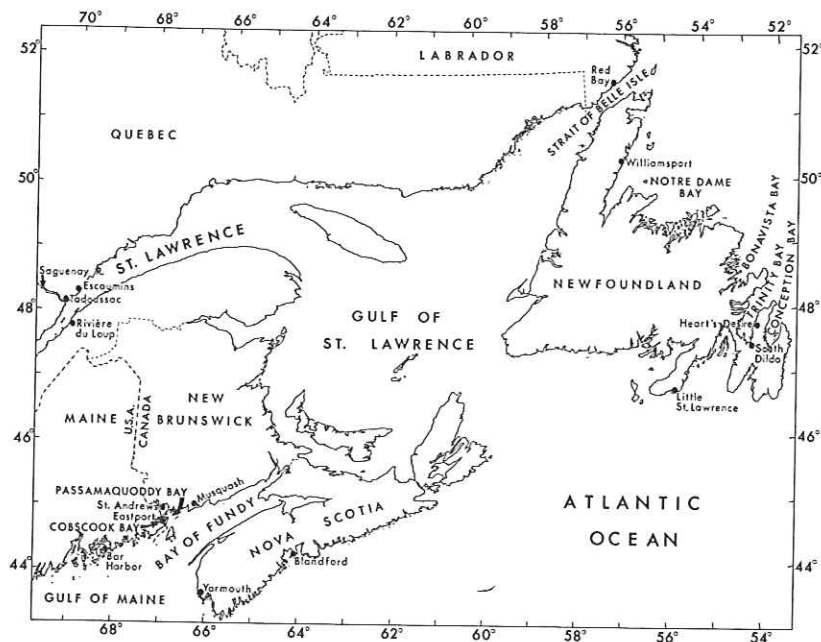


Fig. 2. Eastern Canadian waters showing place names mentioned in text.

(1966–72) (see Mitchell and Brown 1976, pp. 168 and 173–174). Although this form called for information mainly on commercial and protected species, Mitchell explicitly requested that the captains also provide information on small and medium-sized cetaceans that were not targets of the fishery.

Census and tagging cruises

Between 1966 and 1973 Mitchell conducted whale censusing and tagging cruises throughout the western and central North Atlantic (Mitchell 1974). A crude summary of the coverage achieved in the 1966–69 cruises is shown in a tabular form in Mitchell (1973, Table 7).

RESULTS

Whaling records from Newfoundland and southern Labrador

Modern mechanized whaling began at Newfoundland and Labrador in the late 1890's. The whalers, whose principal quarry were the Balaenopteridae and the sperm whale, *Physeter catodon*, became well acquainted

with the killer whale. At Little St. Lawrence whaling station, Millais (1907, p. 193) was told stories about killer whales and sharks tearing at the carcasses of killed whales, even while the carcasses were fastened to the catcher boats. One crewman claimed to have lanced as many as 10 killer whales while standing on the ship's bow, apparently during one of these scavenging episodes.

R. L. Stevenson (1951MS), the inspector at Hawke Harbour (approx. 53°N, 55°50'W), reported on 25 June 1951:

“Catcher Sukha lost one killed inflated flagged whale east of Belle Isle yesterday. Killer whales reported in vicinity and is cause given for loss. Those killers are responsible for many a hale and hearty whale much less one served on a platter as it were, inflated and not a ship within miles.”

His entry for 11 July states:

“Killer whales are reported plentiful and thus far accounted for several flagged whales being lost. One 60 foot finback

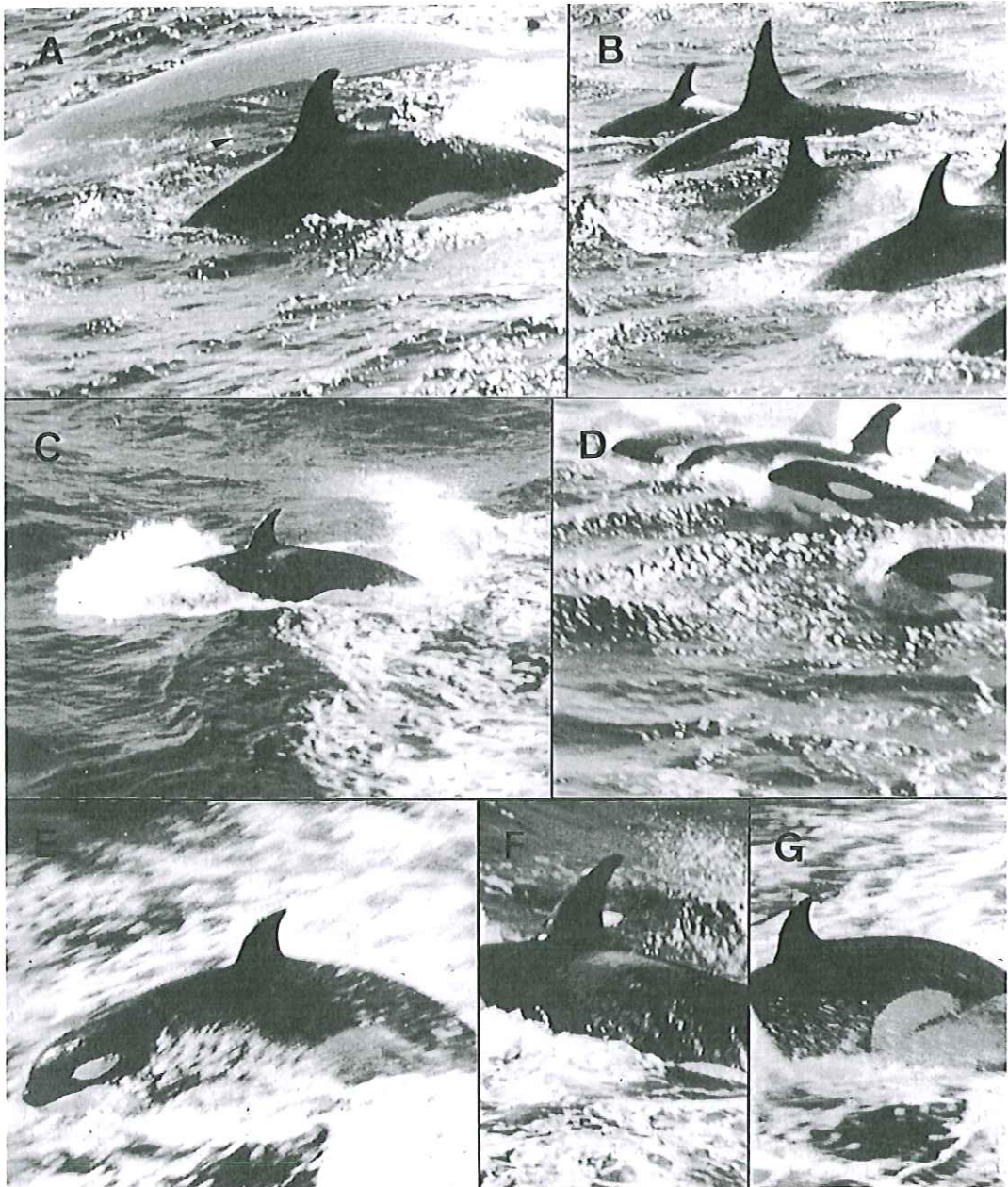


Fig. 3. A pod of killer whales, including an adult male [or two?], from a 16-mm film (Crawley Films Limited 1951/52). According to Sergeant and Fisher (1957) the animals were attracted to the blood of a harpooned fin whale off Williamsport in 1950. Used with permission of Crawley Films Limited and Imperial Oil Limited.

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[*Balaenoptera physalus*] delivered a few days ago had all skin and blubber removed from one side, from head to tail, as neat and clean as any flensing slip could do it."

Stevenson also claimed that a whale (fin or sperm) killed on 5 September "was badly scarred from encounters with killer whales when a yearling."

According to H. W. Holtan (pers. comm. to Mitchell, 28 September 1972), the plant manager at Hawke Harbour during the 1950's, killer whales were commonly encountered on the whaling grounds off southern Labrador and had a major effect on the availability of mysticetes to the whalers. He had seen attacks on blue whales, *Balaenoptera musculus*, and fin whales. Holtan considered 1956 a particularly "bad" year for whaling due to the interference of killer whales. He claimed two fin whales were killed [by whalers or killer whales?] inside Red Island, Hawke Bay (approx. 53°N, 56°W), only 100 m from the rocks, and many humpbacks, *Megaptera novaeangliae*, were driven close inshore that year as well. Holtan added that a solitary, large killer whale used to follow catcher boats into Hawke Harbour, taking bites from towed whales. The whalers finally killed this individual, apparently using dynamite concealed in meat.

Sergeant and Fisher (1957) noted that the whalers working out of Hawke Harbour and Williamsport were familiar with killer whales. These authors assumed the observation of a single killer whale near Hawke Harbour on 14 August 1951 was "doubtless to be associated with the whaling activity there." They also pointed out that a pod of killer whales shown in a film (Crawley Films Limited 1951/52) was attracted by the presence of a harpooned fin whale off Williamsport in the 1950 whaling season. The film shows a pod containing at least six killer whales, including one large male (Fig. 3).

A technician aboard a catcher boat out of Dildo reported in 1966:

"About killer whales. I believe that they are very active at some point on the migration of these fin whales. Nearly every fin whale I have seen this year has had some kind of deformity of the flippers, as if chunks had been bitten or torn out of them, and with many there are parallel scars one to two inches apart leading to the 'wound'. In most cases the flipper has healed over, but in the case of one smallish whale we took there were fresh scars, again parallel and one to two inches apart, on the flippers. I have seen shark bitten white whales and fish, and the scars are different. I am fairly certain that these deformities are healed killer-whale bites" (Clive Nicol *in litt.*, 7 June 1966).

Nicol had been stationed at the Blandford whaling station during the previous season (1965). His field notes refer to possible killer whale damage on only three of some 83 fin whales examined at Blandford that year. One was described as "flippers and flukes scarred and bitten — killer whales?" (F52, 52-ft male, 24 August); another, "the tip of one flipper had been taken off — looked like a bite" (F10, 53-ft male, 3 July); and the third, "had only half a tail — one whole fluke was missing" (F11, 62-ft female, 6 July) (C. Nicol, unpublished field notes in EDM files). Still another whale (F43, 61-ft female, 11 August) had "healed scars on flank", sketched as 5 or 6 parallel but broken linear marks up to 6 inches long. Examples of killer whale damage on fin whales are shown in Figure 4.

Sergeant and Fisher (1957) noted that three killer whales were taken by Trinity Bay whalers, all in June. There are discrepancies between Sergeant and Fisher's (1957) text (p. 97) and Table III (p.100). The 22-ft male recorded on 9 June in either 1956 (text) or 1955 (table) was "captured" or "taken" (text) or "stranded" (table). Sergeant and Fisher's (1957, p. 101) Table IV lists four captures at Newfoundland from 1947 to 1955: one each in 1947, 1953, 1954 and 1955. The International Whaling Statistics (IWS) are given as the source for the three kills listed on their table

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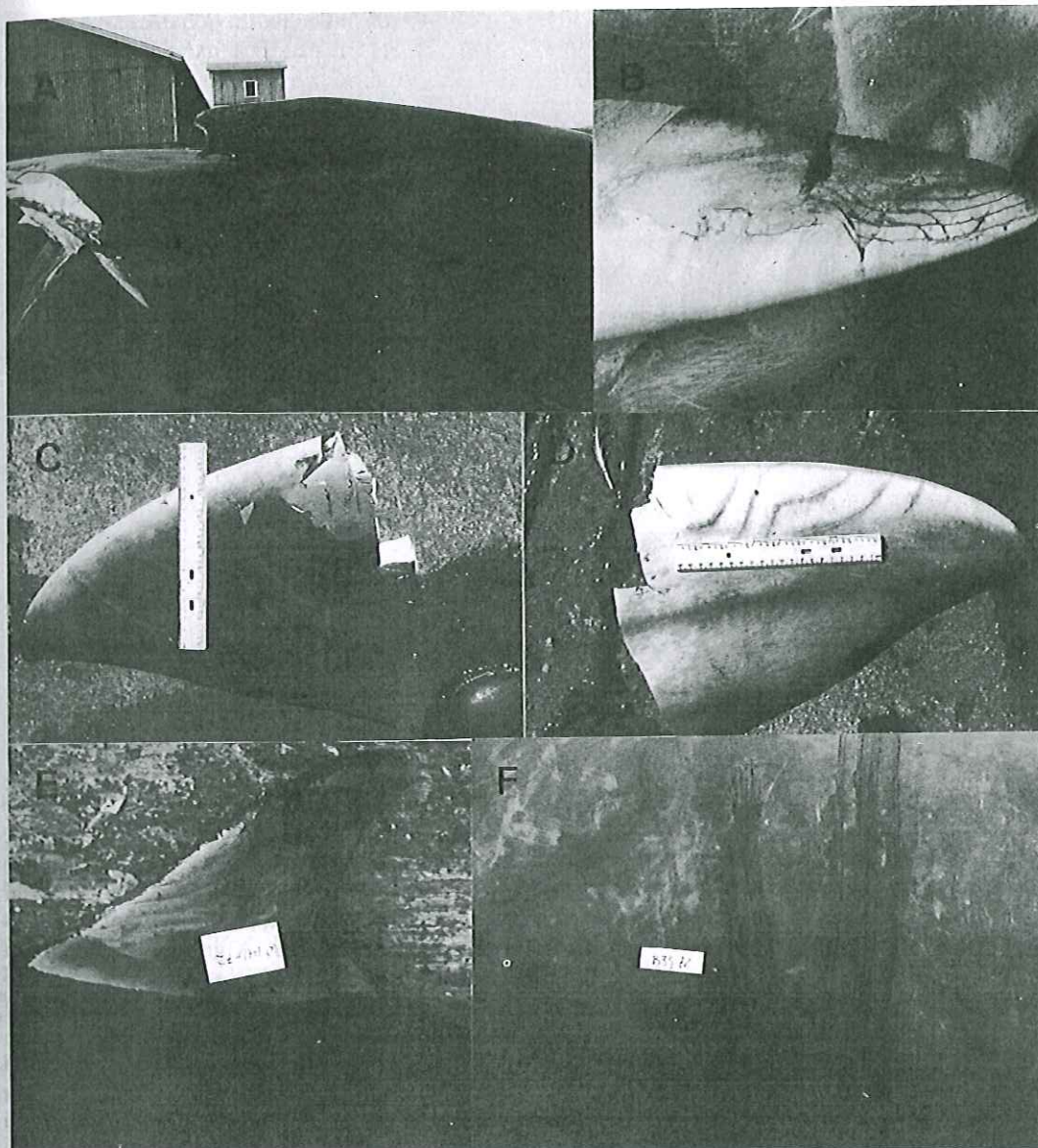


Fig. 4. A selection of views of wounds and scars on fin whales taken at Canadian east-coast whaling stations. A. The left flipper of a 17.7-m female fin whale taken at Dildo, 10 July 1972. Chunks are missing from the tip of the flipper, although the tissue appears to be well healed. The tooth-rake scars provide clear evidence that the whale was attacked by killer whales. Photograph by George Horonowitsch, DR55-72/28. B. Right flipper of a 17.35-m male fin whale taken at Williamsport, 27 October 1971. The technician who examined the specimen estimated the distance between the lines as about 2 cm. Photograph by Barry Peers, WR121/13A. C. Left flipper, in dorsal view, of a 14.95-m male fin whale taken at Dildo, 1 September 1972. The distance between lines was about 4 cm. D. Ventral view of the same flipper as shown in C. Photographs by G. Horonowitsch, DR68-72/18A, 20. E. Dorsal fin of an 18.1-m female fin whale taken at Williamsport, 7 October 1972. Photograph by Don Thomas, WR24-72/32. F. Scars on the body of an 18.23-m female fin whale taken at Blandford, 20 June 1972. Photograph by Eric Shoubridge, BR17-72/13.

III. However, our checking of all issues of the IWS since 1948 (and Mitchell's 1975a [pp. 69–73] cumulative, corrected summary of IWS killer whale listings) accounted only for the 1955 record. We also checked the available original "whale statistics" forms submitted to the Bureau of Whaling Statistics, but these contained no useful information on the killer whale catches.

The three killer whales caught in 1957 in Conception Bay (Table 1, Record No. 6) were taken by a vessel engaged primarily in catching minke whales, *Balaenoptera acutorostrata* (Sergeant 1963). Other killer whales may have been taken by this fishery for minke whales and long-finned pilot whales, *Globicephala melana* (Sergeant 1962), which began in 1947 and was centered in Trinity, Bonavista, Conception and Notre Dame bays. No systematic effort to sample and document catches was made prior to 1952, the first season that Sergeant worked in the field on this fishery. The timing of the few documented captures of killer whales — all in June (Table 1) — has been taken to suggest that these whales are more closely associated with minke whales than with pilot whales. Sergeant (1962) stated that the first herds of pilot whales arrive in the bays in mid-July, with some remaining until late October. In contrast, the intensive whaling for minke whales began in late May or June (Sergeant 1963). "No instances have been reported of killer whales ... associated with pilot whales either inshore or offshore during the summer" (Sergeant 1962, p. 29).

Whaling records from Blandford, Nova Scotia

The modern whaling station at Blandford began operations in 1964 and continued through 1972 (Mitchell 1974). During this period three killer whales were taken (Table 1, Record Nos. 12, 14 and 20). Unfortunately, none of the whalers at Blandford recorded sightings of killer whales on the CPUE forms. An observer aboard the catcher *Harøyfjord* reported having seen "two distant black fins that a Norwegian said belonged to female killers" during the 1964 season on the whaling

grounds off Nova Scotia (Charles D. Grant *in litt.*, 15 September 1964, ABS files).

CPUE data from Newfoundland whaling stations

Although all vessel captains in the fishery were asked to record sightings of non-target species, few cooperated. The killer whale sightings provided are shown on Table 3 (Appendix 1) and Figure 1 (inside the circle marked "A"). These are at least sufficient to corroborate the remarks by Stevenson concerning the problems caused by the killer whales to the whalers (see above). It should be emphasized that the numbers of whales reported for these sightings clearly have been rounded and thus should not be taken as precise values (Fig. 6).

Sightings on census and tagging cruises

Census and tagging cruises (Mitchell 1973, 1974) conducted during 1966–1973 resulted in a total of only five encounters with killer whales (Table 4, Appendix 1; Fig. 1 – points a, b, d and e). The largest group, consisting of 15–16 animals, including two large males and three or four calves, was in the middle of southern Davis Strait in late August 1966. At least one of the calves was noted to have a yellowish cast to its "white" post-ocular patch. One male's dorsal fin had a deformed, wrinkled posterior border. A group of at least ten killer whales seen just west of Cape Farewell in mid-August 1967 contained two (possibly three) large males and three calves. The calves had yellowish post-ocular patches. One of the males had wrinkles or corrugations along the rear border of its dorsal fin.

Other records from southern Labrador and Newfoundland

As the above discussions on whaling make clear, particularly in combination with the records listed in the tables and plotted in Figure 1, killer whales are not uncommon near the coasts of Labrador and Newfoundland. During the past three decades, when some effort has been made to investigate cetacean strand-

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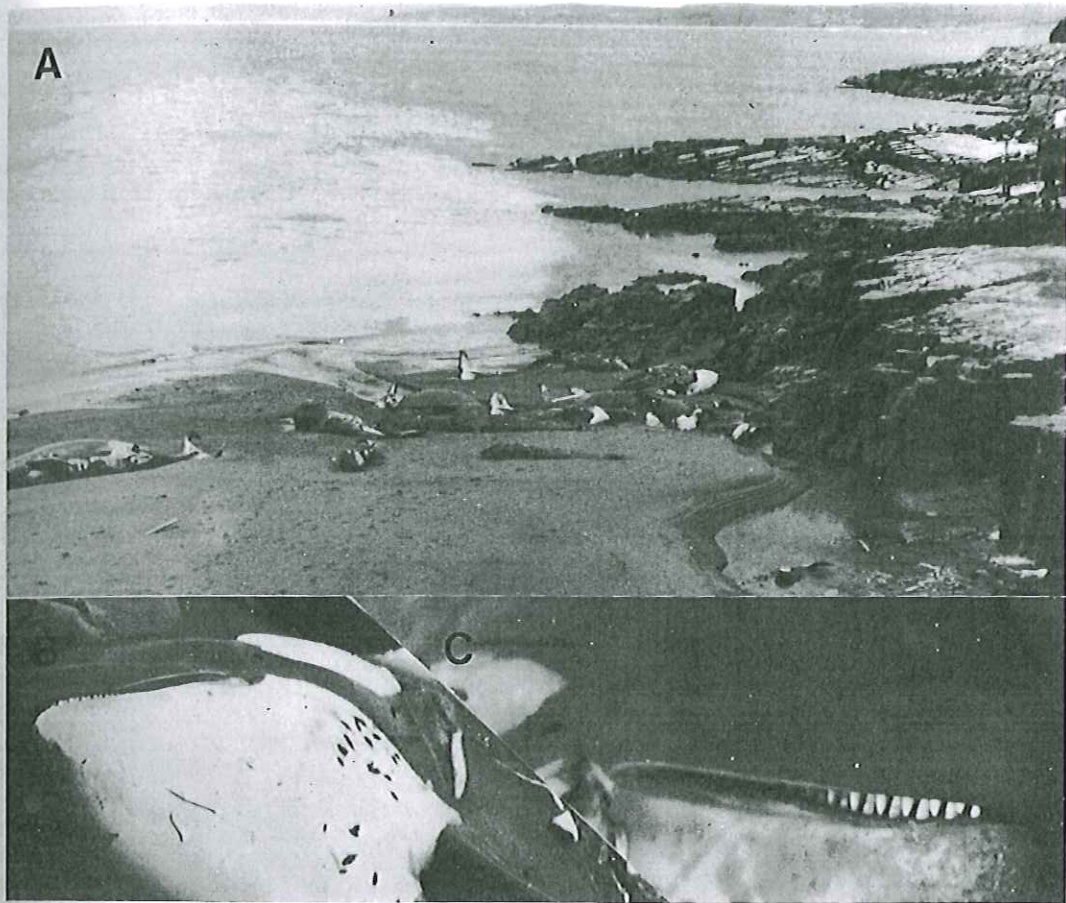


Fig. 5. The remains of some of the 19–25 killer whales which mass stranded at New Melbourne, Trinity Bay, Newfoundland on 27 April 1957. As Dearden (1958) noted from his first-hand examination and as can be seen in the photograph (A), the pod consisted of both large and small individuals. Portions of the eyepatch of two different individuals are shown in B and C. Photographs courtesy of D. E. Sergeant.

ings, the average interval between reported strandings or ice-entanglements of killer whales in Newfoundland has been about five years (Table 1). The stranding of at least 19 (possibly as many as 25) killer whales in Trinity Bay in April 1957 (Dearden 1958; Fig. 5) is one of the few mass strandings of this species recorded in the world's literature (Table 5, Appendix 1). Both this record and that of two animals "stranding" off southwest Newfoundland in March 1975 (Mitchell 1976) probably are cases of ice-related or ice-entanglement. They demonstrate that killer whales may

overwinter near Newfoundland at least occasionally, but whether forced or by choice is unclear. Blue whales also are commonly ice-entrapped off southwest Newfoundland in late winter (e.g. Mitchell 1977a, 1978; Beamish 1979). That killer whales intentionally remain in or at least return early in the spring to these latitudes is suggested by the observations at the spring sealing grounds mentioned by Sergeant and Fisher (1957), who corrected Allen's (1880, pp. 651–652) misinterpretation of Carroll's (1873) description of "swordfish" preying on harp seals, *Phoca groenlandica*.

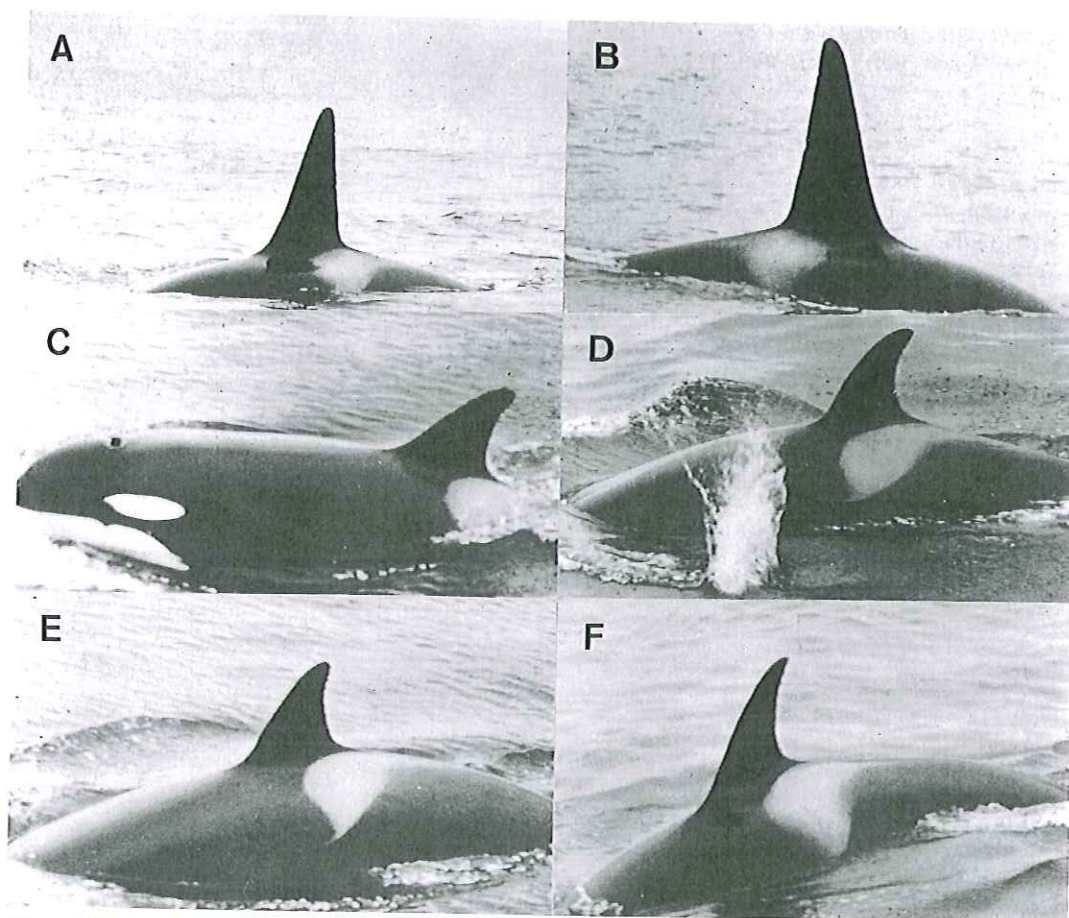


Fig. 6. Members of a pod of eight killer whales observed on the whaling grounds for fin whales, about 40 naut. miles ENE of Fourche Harbour, Newfoundland, 23 July 1972. Kenneth C. Balcomb, a whaling technician aboard the *Fumi* at the time, reported that the killer whales approached the catcher boat and bit at the lips, tongue, flippers and flukes of a dead fin whale while the crew was attempting to secure it alongside (*in litt.* to S. Leatherwood, 11 January 1987). Balcomb judged the pod to consist of one adult male (about 25 ft long) (A, B), one female accompanied by two calves of different sizes, another female with a young calf and two other subadults/females. Panel C is of a young whale showing the eyepatch shape; D, E and F are different subadults/females in the pod. The CPUE sighting form submitted by the whaling company for this time and date listed "10" killer whales, showing that the numbers given on the CPUE forms were rounded (see text). Photographs by K. C. Balcomb.

River and Gulf of St. Lawrence

There are sufficient reports of killer whales in the estuary and Gulf of St. Lawrence to suggest that these whales are regular visitors there (Table 1; Fig. 1). They are not commonly observed in most areas, however, and we would expect their abundance in the river and gulf to be in the tens rather than hundreds at any given time. This view is based on the re-

sults of Mitchell's census and tagging cruises conducted during 1966-77, a cliff-top cetacean observation programme based at Escoumins during 1973-75 (Mitchell *et al.* 1982 MS), boat-based behaviour studies near Escoumins in 1985 and 1987 (Mitchell unpublished data), observational studies in 1979 by Edds and Macfarlane (1987), aerial and boat surveys by Sears and co-workers during 1976-87 (Sears

1977, 1980; Sears and Williamson 1982; Wenzel and Sears 1988 – this volume) and the number and nature of the opportunistic sightings shown in Table 1.

Vladykov (1944, p. 121) claimed killer whales “infested” the St. Lawrence during spring and fall, when they supposedly had a dramatic effect on the white whale or beluga, *Delphinapterus leucas*, population in the estuary. As many as 40 killer whales reputedly had been seen during one of these attacks. Detailed notes made by R. Lagueux, Director of the Tadoussac Salmon Hatchery, from interviews with old beluga hunters and boatmen in the Tadoussac area, include consistent descriptions of killer whales (locally called *espaldons*, meaning “swordfish”, or *orques epaulards*, *fide* Prefontaine 1930) attacking white whales at the Saguenay confluence, particularly in autumn (R. Lagueux *in litt.* to D. E. Sergeant, 15 September 1959, ABS files). L. Evans (*in litt.*, 25 September 1962, ABS files) reported in 1962 that at least one killer whale, distinguished from other species by “the pronounced back fin and its agility in surfacing,” had been seen occasionally over a three-year period in the mouth of the Saguenay River between Tadoussac and Lark Reef (the species identifications, however, must be considered doubtful, *fide* L. Evans, pers. comm., 21 April 1987). Yachtsmen had told Evans of seeing “a small pack” of killer whales between Tadoussac and Riviere du Loup in summer 1961. One of these informants claimed to have seen killer whales drive a group of white whales into shallow water on the south shore “and cut up at least one beluga.” No attacks on white whales (or other cetaceans) have been described since the early 1970’s, when whale watching and observational studies of whales began in this area. However, the size of the white whale population in the St. Lawrence has declined from at least 5,000 in the late 19th century (Reeves and Mitchell 1984) to about 500 at present (Sergeant 1986). To the extent that white whales and other cetaceans attracted killer whales into the estuary historically, the diminution of this food source might help ex-

plain the infrequency of killer whale sightings in the area during recent years.

Sergeant and Fisher (1957, p. 97) concluded on the basis of two sightings of single individuals in June 1951 (their Table III) and numerous [but unsubstantiated?] sight records made by personnel of H.M.C.S. *Labrador* in the same region in June 1955 that “many killer whales pass through the Strait [of Belle Isle], following the large rorquals.” This assertion has been repeated by other authors (e.g. Leatherwood *et al.* 1976) as has Sergeant and Fisher’s (1957) claim that killer whales migrate along the east coast of Newfoundland in June and pass the Strait of Belle Isle in June and July, with some continuing along the Labrador and into the Arctic (Peterson 1966; Katona *et al.* 1983, pp. 111–112). A local fisherman reported that he had never seen a killer whale and that the species is not common around Red Bay in the Strait of Belle Isle (Reg Moores, pers. comm., 30 September 1979). We have seen nothing in the available records to suggest that killer whales frequent the Strait of Belle Isle or any other part of the St. Lawrence system in large numbers at present. This is in spite of the fact that some populations of large rorquals could be expected to have increased since the early

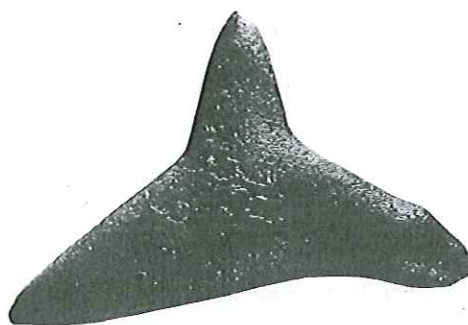


Fig. 7. Stone sculpture of what has been interpreted to be a killer whale effigy, one of two found in graves at Port au Choix, Newfoundland. Tuck (1970) has suggested that the maritime Archaic Indians who inhabited the archaeological site at Port au Choix some 4,000 years ago had a killer whale cult. Photograph courtesy of James A. Tuck.

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1950's, particularly those of blue whales and humpbacks, neither of which was exploited significantly in the last episode of whaling at Newfoundland and Nova Scotia. It is interesting that the "Red Paint People", who lived along the northwest coast of Newfoundland 4,000 years ago, may have had a killer whale "cult" similar to that of some groups in the Pacific Northwest (Tuck 1970; Fig. 7).

Scotian Shelf, including Bay of Fundy

There are few reports of killer whales from the Scotian Shelf and Bay of Fundy, and we believe the species occurs only sporadically and in low numbers in these areas, at least near the coast. The statement in IWC (1982, p. 618) that a "concentration" of killer whales has been noted in the Bay of Fundy is spurious. Gaskin (1983, p. 249) described the killer whale as a "possible sporadic visitor" to the Quoddy region of New Brunswick and Maine. True (1904) published photographs of a 25-ft, 4-in. male, one of two killer whales (initially reported as "large finback whales") which apparently became entrapped and were killed at Eastport, Maine, around 2 March 1902 (also see Katona *et al.* 1983, pp. 112-113). According to a newspaper report quoted by True, the two whales had been seen in different parts of Passamaquoddy Bay for a month before the entrapment, and in late February had swum up the "Concook River" [Cobscook Bay?].

Although their species identifications of at least harbor porpoises, *Phocoena phocoena*, and balaenopterids were considered suspect by Schevill (1968), Neave and Wright (1968) listed sightings of killer whales made by the watch-keeping officer on a ferry operating between Bar Harbor, Maine, and Yarmouth, Nova Scotia, between December 1965 and November 1966. Four killer whales were reported to have been seen in July, one in September and three in October.

Sightings of a killer whale were reported in various parts of the Bay of Fundy in summer 1982. Of particular interest is the penetration of a killer whale deep inside Passamaquoddy Bay, where it was seen near St. Andrews on 19-20 August (Olsen 1982 MS; Mrs. R.

McCarroll, pers. comm., 22 April 1987). It may have been the same whale as that reported near Musquash on 7 July (Table 1, Record No. 37) and in Head Harbour Passage off Eastport, Maine, later in August (Fig. 8).

New England

In his description of colonial whaling off Cape Cod, Dudley (1725, pp. 264-265) described the killer whale as a predator on young whales. Apparently killer whales sometimes robbed the early New England shore whalers of their catch, just as they did the modern shore whalers farther north (see above). Dudley noted that the New England whalers took killer whales for their oil, at least occasionally. A "whale killer" was "taken" at Nantucket in early January 1817 (Trenton, N. J., *Federalist*, 27 January 1817). This specimen, a young individual, judging by its reported length of 12 ft, "lived two days after it was taken from the shoal on which it was stranded." An attempt was made to transport it alive to Boston, but it was finally killed "for the purpose of more convenient transportation." It was on exhibit at the Washington Gardens in Boston as of 15 January.

Captain N. E. Atwood of Provincetown stated that the killer whale "visits our bay [Cape Cod Bay] occasionally in small schools" (Allen 1869, p. 205). He added that they sometimes came into Provincetown Harbor in summer and that the "horse-mackerel" fled inshore from fear of the killer whales. True (1884, p. 633) claimed that killer whales were "frequently seen on the New England coast, and in the fall enter[ed] the harbors." He noted that they were caught occasionally, "but with no regularity", at Provincetown (also see Stevenson 1904, p. 192). Seamen who were non-whalers also attempted to harpoon killer whales when the opportunity arose (e.g. summer 1847, probably near Cape Cod, Osborn and Warren 1931, p. 43).

A killer whale stranded at Harpswell, Maine, on 14 November 1904 (Norton 1930); another at Tenant's Harbor on 14 December 1957 (Mairs and Scattergood 1959).

A large pod (15-25 animals) was seen and

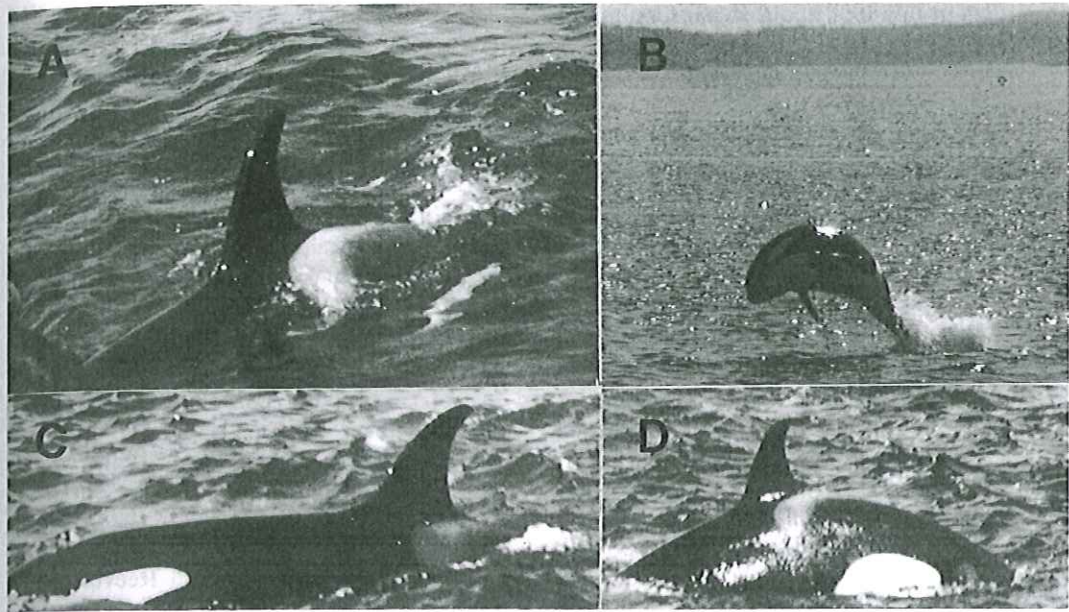


Fig. 8. Several photographs of a killer whale observed near Eastport, Maine, in the lower Bay of Fundy, August 1982, showing left views (A–D) of post-dorsal saddle, eyepatch and flank patch. Photographs by Porter V. Turnbull.

photographed off Provincetown in early September 1966, apparently associated with the arrival of schools of bluefin tuna, *Thunnus thynnus* (Van Petersilge 1966). There were at least two large males in the pod. The whales were observed from Charlie and Stormy Mayo's 38-ft fishing boat, the "Chantey". Van Petersilge claimed that killer whales "are not common" off Provincetown but "are observed on an average of once a summer" there. Charlie Mayo reportedly witnessed a dramatic attack by a pod of killer whales on a school of tuna just off Race Point "several years ago" (Van Petersilge 1966). The coincidence in arrival times of killer whales and tuna off Cape Cod has been noted by others (e.g. Leatherwood *et al.* 1976, p. 86; Katona *et al.* 1983, p. 111), and it has been suggested that the whales "regularly follow parts of the tuna's migrations" (Katona *et al.* 1983).

The University of Rhode Island's Cetacean and Turtle Assessment Program, 1978–82, produced few new sightings of killer whales in New England (Winn 1982). The largest group seen was one of 40 animals (including one

calf) off Cape Ann, Massachusetts, on 5 September 1979.

Katona *et al.* (1983, p. 111) summarized the killer whale's presence in New England waters as follows: "Within the Gulf of Maine, killer whale sightings are most common from about mid-July to September on Jeffreys Ledge and between the Isles of Shoals and Provincetown." For additional records and interpretations, see Katona *et al.* (1988 – this volume).

Mid-Atlantic states

DeKay (1842, p. 135) claimed to have seen killer whales off the coast of Long Island, New York, "on several occasions." He believed that they had been more numerous in the area when there were more right whales, *Eubalaena glacialis*, available as prey. A 24-ft specimen stranded alive and later died on a clam flat in Orient Harbor, Long Island Sound, 11 January 1944 (Connor 1971, p. 40). The skull of this specimen is in the Whaling Museum at Cold Spring Harbor on Long Island (F. P. Schmitt *in litt.*, 26 April 1973). A large male killer whale was harpooned by

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fishermen in July 1958 about 35 naut. miles off Montauk, Long Island (Cook and Wisner 1963). It followed the fishing boat for about 20 naut. miles. Winn (1982, p. 172) reported one observation off Montauk, sometime during 1978–82.

There are a few records for New Jersey. Rhoads (1903, p. 23) claimed killer whales were "often" found off this coast, and he had seen pods of 4–6 animals near Beach Haven and Atlantic City. However, he had no records of strandings or captures. A large, old specimen (about 30 ft) stranded at Barnegat in January 1909 (True 1909).

A badly mutilated carcass of a killer whale washed ashore at Wildwood Crest, N. J., 27 January 1941 (Ulmer 1941). It was thought to be a male, about 20 ft long. The skull is specimen No. 20722 in the Academy of Natural Sciences of Philadelphia. A group of five whales reported as killer whales were shot in fishing nets off Pt. Pleasant Beach, Ocean County, in December 1949, but Ulmer's examination of one specimen proved them to have been pilot whales, *Globicephala melaena* (Reeves and Ulmer 1976). Ulmer suspected that another report of "killer whales" off Harvey Cedars, Long Beach Island, in 1962 might have been another similar case of misidentification (Reeves and Ulmer 1976).

The four sightings in this area reported by Winn (1982, p. 172) were far off the New Jersey coast, generally near the continental shelf edge and continental slope.

For additional records and interpretations, see Katona *et al.* (1988 – this volume).

Southeastern and Gulf states

Published and some unpublished records from this area were compiled by Schmidly (1981, pp. 89–92). The killer whale has been judged "rare" between Georgia and Cape Hatteras (Caldwell and Golley 1965, p. 27). A cranium in the Charleston Museum (No. 37.58) is said to have been obtained from South Carolina in 1937. Also, Brimley (1946) reported a sighting off New River Inlet, North Carolina, in March 1934, noting that the species was known locally as "porpoise kil-

ler". A large killer whale (estimated length 24 ft) stranded alive at Kill Devil Hills, North Carolina, on 19 September 1974 (Reeves 1976). It was towed to sea by the Coast Guard and released. Winn (1982, p. 172) plotted three sightings near the Outer Banks, one near the shelf edge and two on the coast. These were made during 1978–82. Some records from Florida and the Gulf of Mexico are listed in Table 6, Appendix 1 (also see Katona *et al.* 1988 – this volume).

Bahamas and West Indies

There are a few records of killer whales in the Bahamas, principally during January–June (Backus 1961; Table 6). Killer whales have been taken in low numbers, but fairly consistently, in the fisheries for small odontocetes in the Lesser Antilles (Caldwell and Caldwell 1975; Price 1985; Reeves 1988; Table 6). In addition to the records shown in Table 6, Erdman *et al.* (1973) tabulated their accumulated records from the northeastern Caribbean Sea: 25 in February, two in March, ten in June and ten in July. The records in Table 6, arranged by month, suggest that killer whales are observed off Florida and the Bahamas and in the Caribbean Sea and Gulf of Mexico mainly from December to July. For more records and interpretations, see Katona *et al.* (1988 – this volume).

DISCUSSION AND CONCLUSIONS

In the foregoing text and tables we have summarized records from various sources available to us. When combined with the records given in our other papers (Reeves and Mitchell 1988a, 1988b – this volume) and the papers by Lien *et al.* (1988 – this volume), Wenzel and Sears (1988 – this volume), Katona *et al.* (1988 – this volume) and Heide-Jørgensen (1988 – this volume), no obvious pattern of distribution and movements emerges which is free of effort bias. We conclude, provisionally, that killer whales are uncommon in the western North Atlantic relative to other medium-sized and large cetaceans, and that they may be numerically few.

Mitchell's (1973, 1974) extensive ship cruises conducted during the late 1960's and early 1970's resulted in few sightings (Table 4), as did Winn's (1982) intensive aerial surveys of the U.S. continental shelf south to Cape Hatteras. Although the combined total of available records may seem large, it must be borne in mind that it is a cumulative total and that a given whale or group of whales may have been responsible for several (or many) discrete records.

To help interpret the records, we have attempted to frame a series of hypotheses concerning killer whale migrations and stock separation in the North Atlantic which fit the available data. They are necessarily speculative, for we have no empirical evidence of individual movements or of morphological differences (e.g. pigmentation) or behavioural differences (e.g. acoustic dialects) between populations within the North Atlantic.

Special characteristics of killer whales

Killer whales differ in important ways from most other cetaceans. They appear not to be limited by water temperature or depth: they occur along ice edges and in loose pack ice as well as in the tropics, and in areas of deep water far offshore. Thus, with respect to the variety of habitats they occupy, killer whales can be regarded as among the most wide-ranging of cetaceans. Ice formation and movement, together with land masses, seem to be the only physical barriers affecting their distribution.

There is no evidence that killer whales follow a strict migration schedule, as do many mysticetes and some other odontocetes. The migrations of these other species often appear to be dictated by a well-defined calving or breeding season (with little feeding in the case of some mysticetes) at low latitudes in winter and intensive feeding at high latitudes in summer. The species *Orcinus orca* probably preys on the greatest variety of nektonic organisms of any cetacean, from small schooling fishes and cephalopods to large tunas, pinnipeds, sea turtles and cetaceans, from the smallest porpoises to the largest whales (see IWC

1982, Appendix 4, for a partial list of food items). This versatility implies that the movements of killer whales are not necessarily closely regulated by any particular oceanographic or biological factors. Competition for mammalian prey (and other large-bodied prey such as tuna) is limited. Leopard seals, *Hydrurga leptonyx*, sea lions and large sharks prey on phocids (e.g., Siniff and Bengston, 1977; Boulva and McLaren 1979; Ainley *et al.* 1981; LeBoeuf *et al.* 1982; Brodie and Beck 1983), and sharks are known to prey on harbor porpoises, *Phocoena phocoena*, and other small cetaceans (e.g. Arnold 1972; Corkeron *et al.* 1987). It seems doubtful that predation on small cetaceans by false killer whales, *Pseudorca crassidens*, and other "blackfish" (Perryman and Foster 1980) is significant enough to put these species in serious competition with killer whales, except possibly in some local situations. Humans are major competitors for many of the killer whale's prey resources. Thus, fluctuations in abundance of fishes, pinnipeds, cetaceans and other organisms caused by overfishing or other factors may influence local distributions and abundances of killer whales.

A basis for stock separation

If all killer whales are equally adept at preying on a large spectrum of organisms, ignoring for the moment that different populations of killer whales might have evolved into "specialists" preying on local concentrations of prey, and if our reasoning is correct that killer whales face few physical barriers, what are the principal factors shaping their distribution? In light of the species' cohesive pod structure documented in the Northeast Pacific (e.g. Bigg 1982; Balcomb *et al.* 1982; Kirkevold and Lockard 1986), we suggest that intraspecific social factors may account for the maintenance of discrete killer whale pods, and for the emergence of different stocks or "communities" (*sensu* Ford and Fisher 1982). By this view, killer whales would exhibit some degree of apparent territoriality, maintained by inter-pod or inter-community aggression, signaling, and/or other aspects of social, repro-

ductive or feeding behaviour. As feeding generalists, the whales would be capable of preying on whatever is available at a given season in a particular area. For example, off Newfoundland ice-breeding seals would be available in large numbers in March and April, followed by the migratory rorquals arriving in late spring and remaining through the summer and autumn. A variety of fishes, cephalopods, pinnipeds and cetaceans might be consumed during "lean" periods between pulses of abundance of migratory prey. Regarding the question of killer whales preying on harp seals and hooded seals, *Cystophora cristata*, at the breeding and molting grounds, D. E. Sergeant (*in litt.*, 22 December 1987) told us that he has observed killer whales in the ice fields only once (Table 1, Record No. 65). This is in spite of extensive searches, shipboard and aerial, over many years.

There are other possible ways of explaining stock separation in killer whales (assuming there are different stocks). Killer whales evolved long after a diversity of mysticetes and other odontocete groups were well established in the world's oceans. Thus, it seems likely that their evolution may have been driven to some degree by the availability of diverse, abundant and widespread cetacean resources as prey. By this reasoning, it is fair to assume that the killer whale's historical zoogeography has been shaped by the animal's role as a predator on other cetaceans, and we would expect its migratory behavior to accord, in whole or in part, with that of its principal or preferred prey. Just as some wolf packs follow caribou herds and some lion prides follow ungulate communities through an annual migration cycle, some pods of killer whales may migrate with populations of whales which, because of their own reproductive and energetic imperatives, adhere to a fairly strict migration schedule and route. Such specialization would force some pods of killer whales to undertake lengthy latitudinal migrations, often along continental coasts. (This would not preclude them from preying opportunistically on locally and seasonally abundant non-cetacean resources.) If there is

an evolutionary sequence in the development of killer whale feeding patterns, this "migratory pattern" may have been established earliest, with the "sedentary" groups splitting off and becoming specialists associated with specific regions or communities of prey.

Some pods or communities of killer whales, however, appear to be primarily piscivorous, e.g. "residents" in Greater Puget Sound and Johnstone Strait (Balcomb 1978; Jefferson 1987), coastal pods off Norway and Iceland (Ingebrigtsen 1929, p. 15; Jonsgård and Lyshoel 1970; Dudok van Heel 1986). Their distribution appears to be related to the movements of some fish stocks, which in these areas are often inshore-offshore rather than latitudinal. Christensen (1984) suggested that the coastal population of killer whales off Norway has a distinct breeding season which may in some way be timed to take advantage of the energetic resources represented by seasonal concentrations of herring, *Clupea harengus*.

Hypotheses

We suggest the following hypotheses are worth considering in any attempt to explain killer whale stock identity in the North Atlantic:

1. As feeding generalists, some killer whales are essentially sedentary. The home range of a given pod or community is established on the basis of an area's overall productivity and thus the area's ability to satisfy the pod or community's nutritional requirements. Individual killer whales, particularly with the support of their pod-mates (assuming some or much hunting is done cooperatively), can prey on virtually any desirable food item. Some authors (e.g. Nishiwaki and Handa 1958; Rice 1968; Jonsgård and Lyshoel 1970) have suggested that the larger, more experienced killer whales most often prey successfully on mammals. However, Lopez and Lopez (1985) described what they interpreted as adult killer whales teaching juveniles to prey on southern elephant seals, *Mirounga leonina*, and southern sea lions, *Otaria flavescens*, and accounts of pods of killer whales attacking a blue whale

(Tarpy 1979) and humpbacks (Whitehead and Glass 1985) leave no doubt that young individuals also participate in such attacks. If the whales are limited by prey and energetic considerations alone, the sizes of community home ranges might vary, being relatively small in areas of high productivity and large in areas of low productivity. By this hypothesis, there may be many stocks of killer whales whose isolation is the result of their group cohesiveness and their traditional occupation of a certain area. This hypothesis is essentially like that proposed by Balcomb *et al.* (1982, p. 684; Balcomb and Bigg 1986), who referred to "regularly occurring pods" of killer whales off southern California; in Prince William Sound, Alaska; near Peninsula Valdez, Argentina (see Lopez and Lopez 1985); off the east coast of Newfoundland (apparently in reference to observations made by Balcomb from the *Fumi* on 23 and 29 July 1972, see Table 3; Mitchell unpublished data; Fig. 6); in the Bering Sea; and in the Caribbean Sea. These authors also claimed that the "regular occurrence" of killer whales off Japan, Iceland, Scotland, Norway and elsewhere implied the existence of "local populations" in these areas. It is unclear to us how the conceptual leap is made from "regular occurrence" to "local populations" in this instance. [Although Balcomb is said to have "photoidentified a pod that regularly occurs off the East coast of Newfoundland" (Balcomb *et al.* 1982, p. 684), we are unaware of any published or other evidence that the same animals have been resighted and photoidentified since July 1972. The photographs taken on 23 and 29 July 1972 cannot, by themselves, be taken as evidence of either the "regular occurrence" of killer whales in this area or the existence of a "local population."]

2. As feeding specialists, some killer whales associate with specific populations or complexes of prey. Thus, some killer whale communities may appear to be "non-migratory" due to the limited or circumscribed distribution of their principal prey. Certain groups of killer whales may specialize in exploiting migratory tuna stocks, others migratory stocks of porquals. By this hypothesis, an examination

of stock separation in bluefin tuna and/or humpback whales, for example, might be a useful step toward understanding the stock relationships of killer whales. Some groups of killer whales may be cold-adapted, remaining near the ice edge of southern Davis Strait and the Labrador Sea in winter and spring, then following the abundant pinnipeds and arctic cetaceans to northern feeding grounds in summer and autumn (Reeves and Mitchell 1988a – this volume).

3. There are at least two broad types of killer whale (aside from the two kinds discussed by Mitchell 1985) in the North Atlantic and other oceans: one that specializes in hunting marine mammals, at least in non-winter months and possibly throughout the year, and one that specializes in feeding on fish and invertebrates. Within these broad types, there may be further specialization, so that some of the piscivorous pods prey predominantly on a given fish species, or even stock of fish, and some of the carnivorous pods prey mainly on particular groups of pinnipeds or cetaceans. Killer whales off Norway and Iceland are regarded as serious competitors with humans for herring (Christensen 1982; Sigurjónsson 1984). Thus, the killer whales that associate with the Atlanto-Scandian herring stock might themselves comprise a stock of whales defined by this feeding specialization. Similarly, the killer whales known to prey on pinnipeds and cetaceans in Davis Strait, Baffin Bay and adjoining inlets and sounds (Reeves and Mitchell 1988a – this volume; Heide-Jørgensen 1988 – this volume) might be regarded as specialists at preying on mammals. This third hypothesis is in many respects a combination of the first two.

Evaluation

All of the above hypotheses can be evaluated directly by photodocumentation "tag-recapture" studies and indirectly by external morphological (Evans *et al.* 1982), acoustic (Ford and Fisher 1982; Moore *et al.* 1988 – this volume) and genetic (e.g. Hoelzel and Dover in press) analyses. The general, and relatively simple, question that will help

decide which hypothesis most closely fits all the data, is whether individual whales and pods have been resighted repetitively in the same or widely different regions. It is important to stress and bear in mind, however, that residence in a given area is not proven by a series of resightings in the same season, or by the presence of some killer whales (not documented as the same individuals) in an area throughout the year. Thus, repeated sightings of recognized animals year after year in an area do not necessarily prove the existence of a local, "resident" population of killer whales there. Rather, they demonstrate some short-term site tenacity during a specific season but do not preclude the possibility of long-distance migrations and a "transient" life-style for such killer whales.

In other parts of the world, particularly the Northeast Pacific and the Antarctic, pigmentation features have been categorized and quantified for comparisons among killer whale populations (Evans *et al.* 1982). Implicit in such analyses is the belief that differences in, for example, post-ocular patch morphology, are a direct reflection of relative genetic affinity within and between pods or communities.

For example, in the North Atlantic the preponderance of *a*-type post-ocular patches in the small Icelandic-Norwegian sample (for alphanumeric terminology, see Figs. 1 and 3 in Evans *et al.* 1982) is probably due to limited sampling. A Monaco specimen does not accord with any of the Icelandic-Norwegian specimens (Richard 1936: pl. 4, Fig. 9). Some animals from the Northwest Atlantic (e.g. True 1904) also have an *a2* type of post-ocular patch. (It would be useful to typify animals from the North American east coast and compare them with other groups). One Scandinavian specimen (Lütken 1887, pl. 1) has a post-ocular spot closely similar to *e*-type, but with the dorsal leg extended forward over the eye exactly as in Carl's (1946) Pacific specimen 2. Thus, it is not apparent that single features are adequate to define pods, communities or regional populations (stocks). There appears to be wide variability in post-ocular patch mor-

phology of killer whales in the North Atlantic.

The North Pacific populations (Evans *et al.* 1982, Fig. 3) show a broader spread in post-ocular patch morphology than do other documented populations. A California specimen (Jenkins 1932, pl. oppos. p. 194) has a rhomboidal post-ocular spot that resembles nothing illustrated in any of the above references. One 5.21-m female stranded 18 November 1961 at Newport Harbor, California (E. D. Mitchell unpubl. data, EDM F-321) had a post-ocular spot similar to type *a2* or *a4*, which also resembles Carl's specimen 1 (1946, Fig. 9). Carl's sample contains many variations not in the paper by Evans *et al.* (1982, Fig. 1) or in Evans and Yablokov's (1983) enumeration of post-ocular patch shapes. It would be interesting to relate the post-dorsal saddle and post-ocular patch patterns from Carl's sample and from various whaling-station records to the norm for these features from current studies, thus giving a historical perspective to the Vancouver Island population studies.

Small-scale pigmentation features common to one or a few delphinid species can be highly variable on an individual basis. As easily seen and interpreted continuous variables, they are useful in studies requiring identification of individuals, and they may be useful in characterizing separate geographic populations (Evans *et al.* 1982). However, the existence of parapatric or sympatric "communities" (Bigg 1982; Ford and Fisher 1982) or even subspecies (Mitchell 1985) dictates caution in using a discrete sample of pigmentation features "captured" photographically in a given area, since the sampled animals may be from two or more parapatric, reproductively isolated population units.

One other approach to identifying stocks is to consider trends in whale catches by region. For some commercially exploited cetacean populations it has been useful to compare the timing, size and trends of catches in one area with those in another to infer whether or not the same population was being exploited in the two areas. For North Atlantic killer whales, the evidence is insufficient. In the

only major commercial fishery for *O. orca*, the Norwegian multispecies fishery for minke, long-finned pilot, northern bottlenose (*Hyperoodon ampullatus*) and killer whales, there was a fairly consistent catch beginning in the 1940's (or earlier?). There was a dramatic increase in the 1960's, with a peak catch of 246 in 1970, and a sharp drop-off thereafter (Jonsgård 1977; Mitchell 1977b, Fig. 2). Considering the low net recruitment rate estimated for killer whales by Bigg (1982), we consider the cumulative catch over a 10-yr period preceding a steep decline in availability, with consistent or comparable effort, as in the multispecies fishery, a crude and conservative but useful estimate of initial population abundance. During 1961–1970, a total of 1,262 killer whales was taken in the Northeast Atlantic (excluding catches in Area XIII — Jonsgård 1977), and this demonstrates that in 1960 the Northeast Atlantic population of killer whales must have been greater than approximately 1,250 animals. It is interesting to compare this estimate with Dudok van Heel's (1986) observation of "a conservative total" of 1,000 to 1,200 killer whales off southeast Iceland in one day in October 1976. Assuming that Dudok van Heel's estimate is valid, it suggests that the 1960 population was much greater than 1,250. Since all but a few (54 in 1970–1972) of the killer whales taken in the Norwegian multispecies fishery were from areas east of 30°W and north of 45°N (Jonsgård 1977), it is not possible to compare catch trends between, for example, the Northwest and Northeast Atlantic, or between low-latitude and high-latitude areas.

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APPENDIX 1: Tables

TABLE 1
Sightings and other records of killer whales in eastern Canada, south of Labrador. See Figure 1 for locations.

Record No.	Date	Locality	Number of Whales	Details	Source
1	Early 1900s	St. John's Bay, Strait of Belle Isle	1	Large animal; possibly a sperm whale (?). Stomach contained 4-5 whole (harp) seals. Whale found after becoming trapped in ice.	H. C. R. Kean, <i>in litt.</i> to W. Templeman, 4 March 1960, ABS files
2	?	Belle Amours, Strait of Belle Isle	1	Captured; seal remains in stomach.	Weiz and Packard 1866, p. 272
3	17 July 1864	Groswater Bay, Labrador	1(+?)	A killer seen "moving rapidly to and fro in a school of grampus, as if engaged in combat with the latter, which were recognized by their small fins, only a foot high, which sometimes broke the surface of the sea" (juvenile and female killers?).	Packard 1891, p. 166
4	Summer 1941	New Richmond	5	Mass stranded. Report is unconfirmed.	H. U. F?. Smyth, Chambly, pers. comm. to D. E. Sergeant, 23 June 1971, ABS files
5	3 August 1942	Bic Island, lower St. Lawrence	1	"A lone bull"; "very large".	Wright 1962
5a	1950	Near Williamsport, Nfld.	6(+?)	At least 1 adult male in the group; attracted to the carcass of a porqual killed by whalers; 16mm film footage.	Sergeant and Fisher 1957
5b	27 April 1957	New Melbourne, Trinity Bay, 48°02'N, 53°14'W	19-25	Mass stranded alive but died; of 19 animals examined, 3 were males and 7 were females.	Dearden 1958
6	~ 1-10 June 1957	Conception Bay, Newfoundland	3	Taken by minke whaling vessel <i>Arctic Skipper</i> .	D. E. Sergeant, <i>in litt.</i> to Economics Br., Dept. of Fisheries, St. John's, ABS files
7	February 1960	Strait of Belle Isle, Green Island Cove, 51°22'N, 56°34'W	1	Specimen had a seal in stomach, teeth in both jaws.	Sergeant et al. 1970
8	28 June 1962	44°12'N, 63°41'W	2-4	Identification very uncertain; basis for i.d. not stated.	HMCS <i>Micmac</i> , Royal Canadian Navy, ABS files
9	19 May 1963	43°30'N, 58°48'W	3?	Identification unconfirmed; observer only described as killer whales, "brown black in color".	Royal Canadian Air Force flight crew, ABS files
10	10 August 1963	43°N, 64°15'W	6	Basis for identification not indicated.	Crew of Argus 20710, (Royal Canadian Air Force), ABS files

Table 1 (continued)

Record No.	Date	Locality	Number of Whales	Details	Source
11	19 August 1963	44°05'N, 63°31'W	2	"Sharp back fin, white patch behind eye, grey patch behind fin."	HMCS <i>Columbia</i> , Royal Canadian Navy, ABS files
12	31 May 1964	44°N, 55°W	1	20-ft pregnant female (male fetus, 3 ft long) landed at Blandford, N. S., whaling station.	Mitchell, unpublished data
13	23 August 1963	44°02'N, 63°50'W	3	"Sharp back fins, light patch behind fin"; whales "investigating downed aircraft target."	HMCS <i>Columbia</i> , Royal Canadian Navy, ABS files
14	27 June 1964	43°40'N, 59°W	1	Landed at Blandford, N. S., whaling station. 25-ft male.	Mitchell, unpublished data
15	9 August 1964	47°53'N, 63°27'W	2	Basis for identification not indicated.	Crew of M. V. <i>Harengus</i> , ABS files
16	24 April 1965	3 mi. S. of Funk I., Nfld.	3	2 adults, 1 smaller one; edge of pack ice.	G. Williamson, <i>in litt.</i> to D. E. Sergeant, 12 July 1965, ABS files
17	8-11 July 1965	Dildo Arm, Trinity Bay, Nfld.	5	Whalers unsuccessfully pursued this pod.	D. E. Sergeant, <i>in litt.</i> to Gordon Williamson, 20 July 1965, and to W. E. Schevill, 18 August 1965, ABS files
18	~ 1 June 1966	Mouth of Trinity Bay	~ 8	"Mixed herd of males and females."	Clive Nicol, <i>in litt.</i> , 7 June 1966
19	29 August 1966	Anse aux Basques, St. Lawrence Estuary	1	Near shore, in deep water. Chased and fired at by crew of a pilot boat, hit near the tail.	Margaret Elliot, <i>in litt.</i> , 8 September 1966
20	14 Sept. 1967	44°01'N, 62°26'W	1	6. 1-m male landed at Blandford, N. S., whaling station.	Mitchell, unpublished data
21	June 1968	Cape Wolfe, 46°53'N, 64°14'W, Prince Edward Island, Gulf of St. Lawrence	1	Photographs, stranded.	Sergeant <i>et al.</i> 1970
22	31 July 1968	44°N, 55°10'W	2	Identified by J. S. Beckett, based on size, fin shape, white ventrum. Observed at ~ 200 m.	P. W. Arnold, <i>in litt.</i> , 26 December 1968
23	13 August 1968	2 km off St. John's, Nfld.	4	One adult male.	Steiner <i>et al.</i> 1979
24	30 April 1970	47°47'N, 52°52'W	2	Surfaced almost under stern of vessel, identified by tall dorsal fins and black backs with white below; "the upward flange of white below/ behind the dorsal fin clearly seen."	R. G. B. Brown, <i>in litt.</i> , to D. E. Sergeant, 13 July 1970
25	18 August 1970	Near Blacks Harbour, N. B., lower Bay of Fundy	2 (+1?)	One adult male.	D. Christie, <i>in litt.</i> to D. E. Sergeant, 18 December 1970, ABS files; C. Majka, <i>in litt.</i> to D. E. Sergeant, 31 January 1971; D. Christie, <i>in litt.</i> , 23 March 1987; <i>New Brunswick Naturalist</i> 1(5): 27-28, September 1970

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Table 1 (continued)

Record No.	Date	Locality	Number of Whales	Details	Source
26	17 July 1971	Off Bauline, Conception Bay, Newfoundland	2	Taken by whaling catcher <i>Iversen</i> , 7.55-m male and 6.18-m female.	Mitchell, unpublished data
27	May 1974	Rock Harbour, Burin Peninsula, S. Nfld., 47°05'N, 55°10'W (just outside Cabot Strait)	1	Stranded alive, then died. Photograph.	Mitchell 1976; St. John's, Nfld., <i>Telegram</i> , 20 May 1974
28	August 1974	Off Les Escoumins, St. Lawrence Estuary	?	Possible sighting.	Mitchell <i>et al.</i> 1982MS
29	23 March 1975	Ship's Cove, SW Nfld., 48°12'N, 59°W	2	Ice-entrapped, males	Mitchell 1976, p. 444
30	Nov. 1975	Off Les Escoumins, St. Lawrence Estuary	?	Possible sighting.	Mitchell <i>et al.</i> 1982 MS
31	4 August 1976	~ 2 km off St. John's, Nfld.	4	One adult male. "Cooperative feeding" (on herring?).	Steiner <i>et al.</i> 1979
32	Summer 1977	"Newfoundland Coast" (not plotted on Figure 1)	1(+?)	Adult male. Photograph.	Katona <i>et al.</i> 1983, pp. 116-117
33	8 April 1978	52°30'N, 43°31'W	2	Observed at 100-150 m, from C. S. S. <i>Hudson</i> ; neither an adult male. Two breaches. Accompanied by a dolphin tentatively identified as <i>Lagenorhynchus acutus</i> . Water temp. 6.5°C.	Richard D. Elliot, <i>in litt.</i> to D. E. Sergeant, 20 April 1978
34	5 August 1979	Dildo Arm, Trinity Bay	1	Tagged with modified Discovery tag with streamer.	Mitchell 1981, table 4
35	20 August -1 Sept. 1979	Off Bonaventure Head, Trinity Bay	7 in a pod	Three were tagged with dacron streamer .410 whale marks.	K. Hay, <i>in litt.</i> , 12 Sept. 1979; also see Mitchell 1981, table 4
35a	October 1979	Off North Lake, Prince Edward Island, Canada	1	Seen.	Table 2
36	4 July 1982	44°28'N, 50°04'W, on Southeast Shoal, Grand Bank	10-12	3 adult males, 7-9 smaller whales, attacking humpback whales.	Whitehead and Glass 1985
37	7 July 1982	1½ naut. mile off Split Rock, just below Colson's Cove, near Musquash, New Brunswick, Bay of Fundy	1	Followed fishing boat for ~ 3 naut miles, coming up between boats and gillnets; salmon fishing season.	Al Abbott, pers. comm., 28 July 1982
38	25 July 1982	54°4' (?)N, 56°13'W	1	Observed by France Henry.	ABS files
39	15 August 1982	Off Tadoussac, St. Lawrence River	"Several"	Large dorsal fin and white post-ocular patch clearly seen.	B. Latapie and M. LeMay, <i>vide</i> J. Boulva, memorandum to D. E. Sergeant, 8 September 1982, ABS files
40	2 September 1982	S shore of Admiral's Cove, Newfoundland	1	6.5-m male stranded alive, then restranded dead.	Goodman 1984, table 1
41	25-26 June 1983	44°49'N, 59°10'W, on Southeast Shoal, Grand Bank	17	Included 3 adult males and 2 small calves, attacking humpback whales.	Whitehead and Glass 1985

Table 1 (continued)

Record No.	Date	Locality	Number of Whales	Details	Source
42	21 July 1983	St. Lawrence Estuary	7		R. Sears, F. Wenzel, <i>vide</i> Kathleen Blanchard, <i>in litt.</i> , 31 October 1983, ABS files
43	6 September (or 9 June) 1983	49°38'N, 62°08'W, N of Anticosti Island, Gulf of St. Lawrence	1	Seen by Marielle Forest. Breached. White ventrum, black back, ~30ft.	ABS files
44	3 July 1986	Near Murre Rocks, Mutton Bay, Gulf of St. Lawrence	2	Large males; one had a "floppy" dorsal fin (flopping to right); fishermen talking on radio about "strange" whales seen near Ile Plat at same time.	William Hansen, <i>in litt.</i> , 1 April 1987
45	Spring 1953	Mid-Gulf of St. Lawrence	"A pod"	Sighted.	Mowat 1984, p. 10
46	4 January 1950	~45°20'N, 63°30'W, Economy, Minas Basin, Nova Scotia	1	Stranded.	Sergeant and Fisher 1957, table III
47	April 1952	~48°00'N, 53°45'W, off southern Baccalieu Island, east coast Newfoundland	2	Among loose ice with harp seals.	Sergeant and Fisher 1957, table III
48	2 May 1953	~51°30'N, 57°00'W, Strait of Belle Isle	6	Swimming north along edge of an icefield.	Sergeant and Fisher 1957, table III
49	26 June 1951	50°40'N, 57°20'W, off Ingonchoix Bay, northwest coast of Newfoundland	1		Sergeant and Fisher 1957, table III
50	29 June 1951	51°35'N, 55°25'W, between White Islands and shore, Cape Bauld, northern Newfoundland	1		Sergeant and Fisher 1957, table III
51	June 1947	~47°45'N, 53°40'W, southern Trinity Bay, east coast of Newfoundland	1	Taken by whaling catcher.	Sergeant and Fisher 1957, table III
52	28 June 1954	~47°45'N, 53°40'W, southern Trinity Bay, east coast of Newfoundland	1	Taken by whaling catcher.	Sergeant and Fisher 1957, table III
53	9 June 1955	47°35'N, 53°40'W, Chapel Arm, southern Trinity Bay, Newfoundland	1	Stranded.	Sergeant and Fisher 1957, table III
54	3 July 1951	52°13'–53°00'N, 55°50'–55°55'W, between St. Charles Harbour, St. Lewis Sound and Hawkes Harbour, Labrador	3		Sergeant and Fisher 1957, table III
55	5 July 1951	54°10'N, 58°00'W in western Hamilton Inlet, Labrador	1		Sergeant and Fisher 1957, table III
56	16 July 1953	53°53'N, 55°53'W, off Hamilton Inlet, Labrador	1	Scavenging round longlining vessel.	Sergeant and Fisher 1957, table III

Table 1 (continued)

Record No.	Date	Locality	Number of Whales	Details	Source
57	17 July 1953	51°09'N, 57°00'W, off Ferolle Pt., Strait of Belle Isle	1	Scavenging round longlining vessel, eating dogfish.	Sergeant and Fisher 1957, table III
58	18 July 1954	58°00'N, 62°50'W, just outside Hebron Harbour, northern Labrador	1		Sergeant and Fisher 1957, table III
59	14 August 1951	53°15'N, 56°00'W, about 14 naut. miles north of Hawkes Harbour, Labrador	1		Sergeant and Fisher 1957, table III
60	10 October 1953	56°32'N, 51°00'W, Labrador Sea	4-6	Scavenging round weather ship.	Sergeant and Fisher 1957, table III
61	18 October 1953	56°25'N, 50°50'W	10-15 and 7-12	Two herds.	Sergeant and Fisher 1957, table III
62	16 June 1976	Near Paradise in Notre Dame Bay, north coast of Newfoundland	1	Stranded carcass, ~ 24-27ft. long.	Mike Hunter, <i>in litt.</i> to Director, 22 June 1976, ABS files
63	Mid July 1983 or 1984	On Southwest Bank, 28 naut. miles S of Grand Manan Is.	3-6	Seen at close range from fishing boat for 20-30 min.; boat engine shut down soon after sighting, and whales surfaced repeatedly on either side of boat.	W. Carry, reported by I. Carry, <i>vide</i> D. F. McAlpine <i>in litt.</i> , 10 Sept. 1987
64	Summer 1985	3 naut. miles NNE of Swallowtail Light, Grand Manan Is., Bay of Fundy	1	Seen from boat for several minutes - 4 blows observed.	Ken Ingersoll, <i>vide</i> D. F. McAlpine <i>in litt.</i> , 10 Sept. 1987
65	14 March 1970	~ 60 naut. miles E of N end of Belle Isle, Newfoundland	3	Surfacing in a lead through broken pack ice, a few mi. outside a patch of some hundreds of harp seals.	D. E. Sergeant personal communication, 22 December 1987

TABLE 2

Records of killer whales in the western North Atlantic, from North American east-coast newspapers, 1966-1986.

Date	Locality	Remarks	Source
Late August or early Sept. 1966	Off Provincetown and North Truro	Tuna driven close to shore; 15-25 killers including 2 large males. Photographs.	Springfield Union, 3 September 1966
1966	Provincetown area	"Killer whales... shut out the tuna fishermen here [Provincetown] by driving off the fish."	Boston Globe, 25 August 1967
Late August 1967	Provincetown area, Cape Cod Bay	Unspecified numbers sighted by Charles Mayo, charter boat captain - "drove the tuna into Cape Cod Bay where fishermen caught them... by the hundreds."	Boston Globe, 25 August 1967
~ 1968	General vicinity of Machias, Maine	Doubtful reports of 3 sightings of solitary killer whales.	News-Observer, Machias, Maine, 1 November 1972
Early August 1968	Isleboro, Maine	Photograph of a stranded 9-ft, 600-lb <i>Lagenorhynchus acutus</i> is misidentified as a killer whale.	Portland (Maine) Press Herald, 9 August 1968

Table 2 (continued)

Date	Locality	Remarks	Source
August 1975	Cape Cod Bay	A "pod" apparently present in the bay.	<i>Republican</i> , Springfield, Massachusetts, 16 May 1976
9 March 1976	Just N of equator (~9°N), ~ halfway between South America and Africa	A "school" seen, rammed a yacht.	<i>Speetator</i> , Brooklyn, N. Y., 24 March 1976; <i>The Western Star</i> , Corner Brook, Nfld, 12 March 1976
October 1979	Off North Lake, Prince Edward Island, southern Gulf of St. Lawrence	Single killer whale, est. length 25 ft, identified by fishermen. "...black back and white belly, came close to the boat as well as diving under it... gave off an unpleasant odor and swam alongside the boat, belly up."	Charlottetown, P. E. I., <i>Guardian</i> , 20 October 1979
Early October 1980	Massachusetts Bay	"Killer whales have moved into Massachusetts Bay, probably putting an end to the tuna fishing for the season."	<i>Boston Globe</i> , 3 October 1980
15 May 1982	27 naut. miles E of Provincetown, Massachusetts, on Stellwagen Bank	Sighting made by whalewatching boat from Center for Coastal Studies; one animal.	<i>Boston Globe</i> , 29 May 1982; 2 June 1982
22 May 1982	Off Graves Light, outside Boston Harbor	Reported by Coast Guard; one animal.	<i>Boston Globe</i> , 29 May 1982; 2 June 1982
23 May 1982	3 naut. miles off Marblehead Neck at Halfway Rock	Seen by a fish spotter; one animal.	<i>Boston Globe</i> , 2 June 1982
27-30 May 1982	Hingham Bay, Massachusetts	Single animal, approached boats. Est. height of dorsal fin 3 ft.; reportedly feeding on pollock.	<i>Boston Globe</i> , 29 May 1982; 2 June 1982
12-20 June 1982	Mount Desert Island/Frenchman Bay area, Maine	Documented with photographs; one animal.	Ellsworth, Maine, <i>American</i> , 1 July 1982
26 June 1982	Off Portsmouth, New Hampshire	One animal seen.	Ellsworth, Maine, <i>American</i> , 1 July 1982
2 September 1982	Quincy Bay, Massachusetts	Single individual seen, est. length 12 ft, described as a "baby". Photograph confirms it was not an adult male.	Quincy, Mass., <i>Patriot Ledger</i> , 3 September 1982; 9 September 1982; <i>Quincy Sun</i> , 30 December 1982
Late Sept. -late Oct. 1982	Provincetown Harbor	Est. length 15ft; struck at least twice by boats; towed to sea after "being caught in shallow waters near the Wellfleet Audubon Society's sanctuary"; friendly; one animal.	Worcester, Mass., <i>Telegram</i> , 3 October 1982; <i>New York Times</i> , 23 October, 14 November 1982; <i>Christian Science Monitor</i> (New England ed., Boston), 28 October 1982
26 August 1986	~ 12 naut. miles E of Plymouth, Cape Cod Bay	8 animals, incl. 1 large (est. 28ft) male, 1 female (?) (est. 18ft), 1 small calf, and several medium sized. Seen by whalewatchers and tuna fishermen. Said to have been 3rd <i>Orcinus</i> sighting in Cape Cod Bay since 1977.	<i>Boston Globe</i> , 29 August 1986; <i>Quincy Patriot Ledger</i> , 27 August 1986

TABLE 3

Killer whale sightings made from catcher boats at Newfoundland. See discussion of CPUE records in text. The positions of these sightings fall inside the circle marked "A" on Figure 1.

Date	Position	No. of Killer Whales	"Associated" Whales ¹	Water Temp.	Comments	Vessel
<i>DILDO 1970</i>						
June 14	49°20'N 51°00'W	100	15 fin 30 hump	2°C	The killer whales followed us all day, and made the fin whales very wild.	WESTWHALE 8
June 22	49°34'N 52°22'W	50	12 fin 75 hump	4°C	Killer whales around all day.	WESTWHALE 8
June 24	49°40'N 52°20'W	25	15 fin 12 hump	3°C	Killer whales made the fin whales very wild.	WESTWHALE 8
June 28	50°25'N 52°40'W	20	12 fin 25 hump	4°C	Killer whales following us all afternoon, making the fin whales wild and difficult to chase.	WESTWHALE 8
<i>WILLIAMSPORT 1968</i>						
July 12	50°46'N 55°04'W	15		6.6°C		FUMI
July 20	51°04'N 54°37'W	10	2 fin	6.8°C		FUMI
July 25	50°52'N 54°21'W	30		8.6°C		FUMI
<i>1972</i>						
July 18	50°23'N 53°54'W	30	20 fin 20 hump	6.6°C		FUMI
July 20	50°31'N 54°21'W	30	5 fin 20 hump	6.4°C		FUMI
July 21	50°43'N 50°30'W	30	10 fin 10 hump	7.2°C		FUMI
July 22	50°47'N 54°30'W	20	6 fin 10 hump	6.6°C		FUMI
July 23	50°53'N 54°17'W	1	15 fin 10 hump	6.8°C		FUMI
July 23	50°53'N 54°42'W	10	10 fin 10 hump	9.2°C	See Fig. 6	FUMI
July 29	51°38'N 54°03'W	30	20 fin	5.8°C		FUMI
July 31	51°39'N 54°03'W	30	15 fin 15 hump	6.4°C		FUMI
Sept. 2	51°26'N 53°52'W	30	8 fin	7.8°C		FUMI
Sept. 8	51°33'N 54°08'W	10	2 fin 1 hump	7.8°C		FUMI
Sept. 28	51°38'N 53°40'W	30	6 fin	4.8°C		FUMI
Sept. 28	51°55'N 54°00'W	30	15 fin 2 hump	4.8°C		FUMI

¹ Logged at same time and therefore in the general vicinity of the killer whales.

TABLE 4

Sightings of killer whales made on Canadian government strip-census and tagging cruises, 1966-72. See Figure 1 for the positions a, b, d and e.

Date	Position	Vessel	Comments
a. 28 August 1966	61°45'N 58°45'W	<i>William S</i>	Killers swimming SE slowly (3-4 knots), two large (6-7 m), 10 medium sized (3-4 m) and 3-4 small (2-3 m).
b. 16 August 1967	59°59'N 46°53'W	<i>Polarstar</i>	3 big males, 4 females, 3 calves.
c. 8 September 1967	16°29'N 16°32'W	<i>Polarstar</i>	2 animals (5-6 m).
d. 6 June 1969	49°52'N 52°25'W	<i>Polarstar</i>	7 animals, one large male (8-8.5 m) and at least 2 calves. Four females (?), 5-6 m in length. One female was killed.
e. 10 June 1969	51°24'N 56°50'W	<i>Polarstar</i>	3 animals, one 8.5 m and two 7 m.

TABLE 5
Published records of multiple or mass strandings and ice entrapments of killer whales, worldwide.

Date	Locality	No. of animals	Circumstances etc.	Source
13 June 1945	W. coast of Vancouver Is., B. C., Canada	20	Some still alive when found, but all died.	Carl 1946
14 Jan. 1941	Near Masset, Queen Charlotte Islands, B. C., Canada	11	All adults, apparently all died.	Cameron 1941 as cited in Carl 1946
28 Sept. 1944	Cherry Point, Vancouver Is., B. C., Canada	"A number"	"Temporarily grounded"; all but a newborn female escaped.	Carl 1946
6 June 1981	Austnesfjord, Lofoten, North Norway	14	5 escaped without help; the other 9 were successfully returned to the sea by people.	Haug and Sandnes 1982
?	West coast, North Island, New Zealand	16	7 males, 9 females.	Mitchell 1975b, fig. 38
27 April 1957	New Melbourne, Trinity Bay, eastern Newfoundland	19-25	"Apparently forced ashore by heavy ice"; remained alive on beach for 3 days.	Dearden 1958
March 1902	Eastport, Maine, U.S.A.	2	Became "trapped" in a cove; apparently killed by people.	True 1904
2 May 1955	Paraparauma Beach, New Zealand	17		Slijper 1958, as cited in Dudok Van Heel 1962, pp. 478-479
23 March 1975	Southwest Newfoundland	2	Males, ice-rafted.	Mitchell 1976, p. 444
Last wk. Sept. 1977	Usualuk, a small fiord on Kikertlung Island, ca 40 naut. miles from Pangnirtung, Baffin Island, Cumberland Sound, Canada	14	Trapped in saltwater lake, killed by hunters.	Mitchell 1979, p. 111
November 1972	Mud flats of San Sebastian, Tierra del Fuego, Argentina	4		Goodall 1978, pp. 214-215
"Probably a little earlier" than November 1972	West side of Bahia San Sebastian, Tierra del Fuego, Argentina	15	Skeletons found over 8 km stretch of beach.	Goodall 1978, p. 215
Early Sept. 1982	Mouth of Yukon River, western Alaska	4	Two females and 2 (reported to be) males.	Lowry <i>et al.</i> 1987
June 1984	On Nunivak Island, eastern Bering Sea	5	Four small individuals on the beach together, alive; one larger individual slightly seaward of the others, dead.	Lowry <i>et al.</i> 1987

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TABLE 6
Records of killer whales from Florida, West Indies, Bahamas and Gulf of Mexico.

Date	Locality	No. of whales	Details	Source
Jan. 1973	Landed at Barrouallie, St. Vincent, West Indies	1		Caldwell and Caldwell 1975
21 Jan. 1876	27°17'N, 78°41'W	+		Reeves & Mitchell 1988b
21 Jan. 1969	South Padre Island, Cameron County, Texas	1	Washed ashore dead. [Questionable].	Schmidly and Melcher 1974
Feb. 1947	26°21'N, about 2 naut. miles off Boca Raton, Florida in Gulf Stream	3	Sighted from a charterboat, one whale approached to within a few feet of the boat rolling from side to side.	Moore 1953
6 Feb. 1960	Off Marineland, St. Augustine, Florida	1	A single whale ca ½ mile offshore.	Layne 1965
19 Feb. 1952	Off Marineland, St. Augustine, Florida	6-8	Small herd observed approximately 100 yards offshore, probable mother calf pair.	Layne 1965
23 Feb. ?	Grampus Shoals, 8 km SE of Culebra Is., 18°13'N, 65°09'W	25	Attacking a large whale.	Erdman 1970
March 1948	24°41'N, 81°26'W, Summerland Key, Monroe County, Florida	1	Stranded.	Moore 1953
15 April 1981	Between South Point, Long Island, and Ragged Island, SE Bahamas	3-4	One male with "gigantically high fin."	William Hansen <i>in litt.</i> , 1 April 1987
30 April 1884	Off N end of St. Lucia, West Indies	1	Saw killers, got one.	Reeves and Mitchell 1988b
May 1968	Landed at Barrouallie, St. Vincent, West Indies	3		Caldwell and Caldwell 1975
May 1971	Landed at Barrouallie, St. Vincent, West Indies	3		Caldwell and Caldwell 1975
May 1974	Landed at Barrouallie, St. Vincent, West Indies	1		Caldwell and Caldwell 1975
13 May 1968	Off lee of St. Vincent	6	3 killed (adult female, juv. male, juv. female): stomachs contained remains of <i>Dermochelys coriacea</i> .	Caldwell and Caldwell 1969
20 May 1979	Ca 27°32'N, 82°41'W, near Anna Marie Island, outside Tampa Bay, Florida	1	Sighted by fisherman 2.5 km offshore in 9 m deep water, est. length 7.6 m.	SEAN, vol. 4 (5) 1979
27 May 1968	Ca 27°N, 76-77°W, E of the Bahamas	+	Unsuccessful chase.	Reeves and Mitchell 1988b
27 May 1956	6.5 naut. miles east of East Pass (Destin), Okaloosa county, Florida	1	Washed up on a beach, badly decomposed, est. remaining length 15 ft. (ca ¼ of posterior part of the body missing).	Caldwell <i>et al.</i> 1956
28 May 1866	Ca 17°30'N, 71°50'W of the southern tip of 1 central Hispaniola, Caribbean Sea	1	1 killed.	Reeves and Mitchell 1988b
30 May 1851	27°15'N, 79°11'W	+	Killers seen.	Reeves and Mitchell 1988b
30 May 1866	Off SW Hispaniola, Caribbean Sea	+	Lowered for killers, chase not successful.	Reeves and Mitchell 1988b
June 1960	Man O'War Cay, Great Abaco Is., Bahamas	1	Stranded alive, est. length 20 ft.	Backus 1961
June 1969	Landed at Barrouallie, St. Vincent, West Indies	4		Caldwell and Caldwell 1975
June 1972	Landed at Barrouallie, St. Vincent, West Indies	1		Caldwell and Caldwell 1975

Table 6 (continued)

<i>Date</i>	<i>Locality</i>	<i>No. of whales</i>	<i>Details</i>	<i>Source</i>
3 June 1872	28°28'N, 78°26'W	+		Reeves and Mitchell 1988b
4 June 1868	Ca 27°N, 69°W	+	1 sighted by whalers.	Reeves and Mitchell 1988b
July 1968	Landed at Barrouallie, St. Vincent, West Indies	3		Caldwell and Caldwell 1975
July 1971	Landed at Barrouallie, St. Vincent, West Indies	9		Caldwell and Caldwell 1975
29 July 1872	21°06'N, 77°05'W	+	Seen while sperming and blackfishing in the Caribbean Sea.	Reeves and Mitchell 1988b
26 Dec. 1921	Hollaway Creek near Everglades, Collier County, Florida	1		Moore 1953
?	N. of St. Thomas	?	2 sightings by a sport fisherman.	Erdman 1970
No date	Landed at Barrouallie, St. Vincent, West Indies	6	"Three adult killer whales (all females) and calves."	Price 1985
Summer 1951	35 naut. miles SE of Port Aransas, Texas	1	Sighted. [Questionable].	Gunter 1954
[Ca 1939]	Gulf Stream between Miami Beach and the Bahamas	1	Killed by a charterboat man.	Mowbray 1939 as cited in Moore 1953, p. 139
Ca 1934	26°02'N, near Hollywood, Florida	1	Harpooned and shot, finally let go after a struggle of several hours, est. length 30 ft.	Moore 1953
Spring 1948	15 naut. miles off St. Augustine	1	"A mammal with a high, triangular-shaped dorsal fin."	Moore 1953
Ca 1939	26°32'N, western edge of Gulf Stream near Boynton, Florida	1	Sighted.	Moore 1953
Ca 1934	26°43'N, in Gulf Stream off Palm Beach	+	Killer whales seen several times.	Moore 1953
Ca 1922	?	1	Sighted and photographed.	Mowbray 1922
[Ca 1910]	23°10'N, 82°18'W, Cojiman, Cuba	?	Stranded.	Cuni 1910 as cited in Schmidly 1981, pp. 26, 92