

# Status of the Short-finned Pilot Whale, *Globicephala macrorhynchus*, in Canada\*

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The Short-finned Pilot Whale, *Globicephala macrorhynchus*, appears to be in the northern limits of its normal range in the waters off British Columbia, and does not inhabit the waters off the east coast of the country. No COSEWIC designation is required regarding its status in Canadian waters. World-wide, one population of Short-finned Pilot Whales, off northern Japan, is currently considered at risk. Insufficient information is available to accurately evaluate its status elsewhere, and it is taken in small numbers both directly and incidentally in fisheries.

Dans le présent rapport, les auteurs examinent la biologie générale, le statut à l'échelon mondial et la gestion du globicéphale du Pacifique (*Globicephala macrorhynchus*), tout en accordant une attention particulière au statut de l'espèce dans les eaux canadiennes. Il semble que les eaux situées au large de la Colombie-Britannique constituent la limite septentrionale de l'aire de répartition du globicéphale du Pacifique et que l'espèce ne fréquente pas les eaux hauturières sur la côte est du Canada. Compte tenu du statut de l'espèce dans les eaux canadiennes, il n'est pas nécessaire de placer celle-ci dans une catégorie du CSEMDC. Sur la scène internationale, une population au large du nord du Japon est actuellement considérée comme en danger. Il n'y a pas assez de renseignements afin d'évaluer avec précision son statut ailleurs. Quelques spécimens sont capturés en petit nombre directement et comme prises accidentelles aux pêches.

Key Words: Short-finned Pilot Whale, Globicéphale du Pacifique, *Globicephala macrorhynchus*, Canada, status, cetacean, North Pacific.

This review summarizes the current state of knowledge of the Short-finned Pilot Whale, *Globicephala macrorhynchus* Gray, 1846, with special reference to its status and management in Canadian waters. This review has been undertaken by request of the Fish and Marine Mammal Subcommittee of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). It is the mandate of COSEWIC to review the status of all Canadian species listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES has taken a conservative approach to cetacean management by listing all species under either Appendix I or II. Species listed under Appendix I are considered threatened or endangered; those listed under Appendix II, although not considered threatened, warrant regulation in international trade. Listing species such as the Short-finned Pilot Whale under Appendix II functions to prevent unregulated international trade of threatened species, since non-specialists may not be able to easily distinguish among products from different cetacean species.

The taxonomic history of the genus *Globicephala* is complicated (see Hershkovitz 1966). Two species

of Pilot Whales are currently recognized world-wide; the Long-finned Pilot Whale (*Globicephala melas*), and the Short-finned Pilot Whale (*Globicephala macrorhynchus*). In the North Pacific, a separate species, the Pacific Pilot Whale (*Globicephala scammoni*) was formerly recognized (Bree 1971). Although there are historical records of Long-finned Pilot Whales off Japan (Kasuya 1975), only Short-finned Pilot Whales are thought to be currently present in the North Pacific. The existence of two forms of Short-finned Pilot Whales off Japan however, termed northern and southern forms, has been noted (Kasuya et al. 1988). Both Short-finned and Long-finned Pilot Whales are found in the North Atlantic, although only Long-finned Pilot Whales are found in the waters off eastern Canada.

The maximum recorded length for the Short-finned Pilot Whale appears to be 6.10 m for males, and between 5.25-5.50 m for females (Perrin and Reilly 1984). The shape of the head is bulbous, and the forehead sometimes overhangs the rostrum; there is no distinct beak (Leatherwood et al. 1988). The projection of the front of the melon over the rostrum occurs when the animal reaches a length of about 240 cm, at an age of about two years (Yonekura et

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al. 1980). The dorsal fin, being generally broader than it is tall, is distinctive (Figure 1). The falcate fin is usually rounded at the tip, and set well forward of the midpoint of the back. The pectoral flippers are long and sickle shaped. The tail stock is elongated and laterally compressed, and the flukes are notched and concave along the rear margin.

The colouration on the dorsal and lateral surfaces is dark grey, brown or black. In most individuals, this is broken by a light grey area, termed a saddle patch, located behind the dorsal fin (Figure 1). Miyashita et al. (1990) noted that of the two forms off Japan, only the northern form has the distinct saddle mark. There is a faint, lightly pigmented patch or blaze behind the eye, extending towards the anterior insertion of the dorsal fin (Yonekura et al. 1980). This patch is difficult to distinguish on live individuals seen from a distance, and disappears shortly after death. The ventral surface has a broad grey patch anterior to and between the flippers, which extends posteriorly as a thinning mid-ventral line, and disappears entirely about halfway to the distal tip of the flipper when pressed against the side of the body (Norris and Prescott 1961). The umbilical and genital areas are also surrounded by small grey patches. Distinguishing between the two species of Pilot Whales is difficult in the field. As the names imply, proportional flipper lengths in the two species generally differ. In Short-

finned Pilot Whales, the flippers, from the anterior insertion to tip, range from 15.8 to 18.9% of the total body length, while in Long-finned Pilot Whales, this figure is 21.9 to 26.2% (Yonekura et al. 1980). From stranded or skeletal specimens, Short-finned can often be distinguished from Long-finned Pilot Whales by the fewer number of teeth; 7-9 in each side of the upper and lower jaws, as opposed to 9-12 in Long-finned Pilot Whales (Bree 1971).

### Distribution

The Short-finned Pilot Whale is found world-wide in tropical and warm-temperate seas (Leatherwood and Dahlheim 1978). In the western Atlantic they occur from New Jersey, south throughout the Gulf of Mexico and the Caribbean Sea, to São Paulo, Brazil (Casinos and Bou 1980; Mead and Potter 1987; Schmiegelow and Filho 1989). This species has not been recorded from the Canadian east coast. In the eastern Atlantic there are records from as far north as Spain and France, and as far south as 15°S on the African coast (Collet and Duguay 1987; Nores and Perez 1988). This species is found throughout the Indian Ocean (Leatherwood et al. 1991).

In the eastern Pacific, Short-finned Pilot Whales have been reported as far north as the Alaskan Peninsula and the Gulf of Alaska (Orr 1951; Home 1980), down the coast of the Americas as far south



FIGURE 1. Short-finned Pilot Whales off California. Photo by S. Leatherwood.

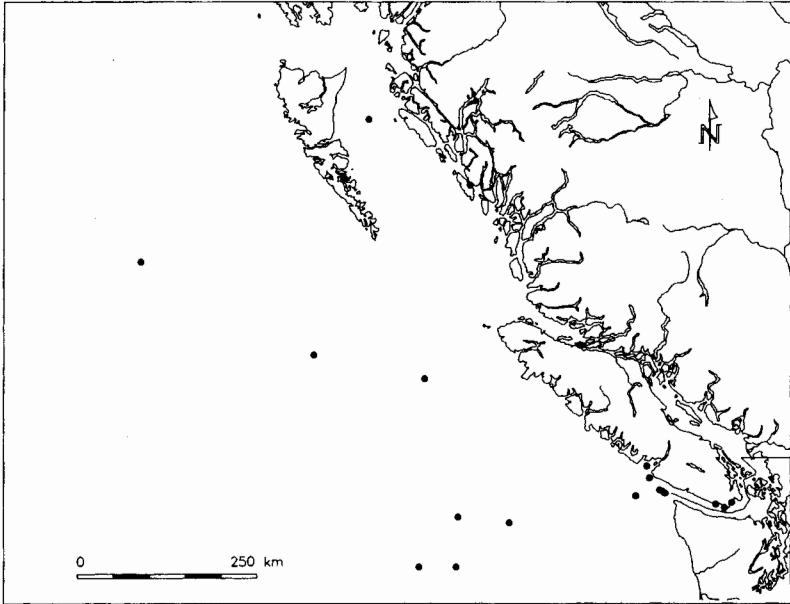


FIGURE 2. Records of Short-finned Pilot Whales in Canadian waters. No records from the Canadian east coast have been reported (Baird and Stacey 1993).

as Peru, and from the Hawaiian Islands (Scheffer and Slipp 1948; Shallenberger 1981; Van Waerebeek and Reyes 1986). In the western Pacific, Short-finned Pilot Whales are known from northern Japan (Wada 1988), to Tasmania (Nicol 1987).

Osgood (1901) and Wailes and Newcombe (1929) noted that Pilot Whales occurred regularly off the British Columbia coast. Some subsequent authors have accepted these early reports as authentic (Scheffer and Slipp 1948; Leatherwood and Dahlheim 1978; Home 1980), although Pike and MacAskie (1969) discounted them, believing them to be records of Killer Whales (*Orcinus orca*). Baird and Stacey (1993) recently reviewed and summarized the presence of Short-finned Pilot Whales in British Columbia waters (Figure 2), and noted that the infrequency of sighting records between 1954 and 1989 lend support to Pike and MacAskie's (1969) conclusions. However, as Shane (1985) noted, warm water El Niño events may disrupt the distribution of Short-finned Pilot Whales, and their presence in more northerly waters could increase during such periods (see Movements, below). In total, only 21 occurrences of Short-finned Pilot Whales have been reported from British Columbia waters to 1989, only one of which is a stranding record, that of a single individual (Pike and MacAskie 1969; Spong et al. 1972; D. F. Hatler 1972 [The mammals of Pacific Rim National Park. Unpublished report, National and

Historic Parks Branch, Western Region, Calgary, Alberta]; Baird and Stacey 1993). Baird and Stacey (1993) concluded that Short-finned Pilot Whales should be considered rare in British Columbia waters; they are represented by only a few records in most, but not all, years. They caution however, that little sighting effort is made in the continental slope and offshore areas that characterize the general habitat of Short-finned Pilot Whales, so the species may be more common in B.C. waters than records indicate.

## Protection

### International

The Short-finned Pilot Whale is listed under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973 (CITES) (see Birnie 1982). Such listing allows for the regulation of international trade between members and non-members of the convention by requiring export permits from the country of origin. There appears to be no current international trade in Short-finned Pilot Whale products however. The International Whaling Commission (IWC) regulates the taking of whales in accordance with the current Schedule provisions, but whether this Commission's mandate covers the Short-finned Pilot Whale is unclear, as members of the Commission are divided as to whether "whale" refers to all cetaceans, or only to some species (Klinowska 1987, 1991).

### National

**Canada:** Until they were replaced in 1993, the Cetacean Protection Regulations of the Fisheries Act of Canada of 1867 protected at cetacean species from hunting. "Hunting" was defined as "to chase, shoot at, harpoon, take, kill, attempt to take or kill, or to harass cetaceans in any manner", and could only be undertaken under licence. Aboriginal "hunting", however, could be undertaken without licences. The Cetacean Protection Regulations were replaced with the Marine Mammal Regulations of the Fisheries Act in early 1993. These regulations appear to provide no more or less protection by stating only that "no person should disturb a marine mammal except when under... the authorities of these regulations." No provisions for regulation of incidental catches in fishing operations exist. In terms of participation in the International Whaling Commission, Canada is not currently a member, having withdrawn in 1982 (IWC 1982).

**United States:** All cetaceans are protected through the Marine Mammal Protection Act of 1972, as well as through the Packwood-Magnuson Amendment of the Fisheries and Conservation Act and the Pelly Amendment of the Fisherman's Protective Act.

### Population Size(s) and Trends

No world-wide population estimates are available. In the recent IUCN cetacean Red Data Book, Klinowska (1991) noted that insufficient information is available to classify the world-wide status of this species. Using gel electrophoresis, Wada (1988) found significant differences in allelic frequencies between the northern and southern forms of the Short-finned Pilot Whale off Japan, implying that animals inhabiting localized areas may be reproductively isolated, and should be managed independently. Similar work does not appear to have been undertaken on this species elsewhere. In the western North Pacific, estimates for both the northern (5344, 95% CI 819-9669) and southern (53 003, 95% CI 18 409-87 597) forms off Japan have been presented (IWC 1987); based, however, on only five survey cruises in each area during 1984 and 1985. Subsequent estimates presented by Miyashita (*in press*) appear to indicate a decline in both populations, with 4 239 in the northern stock and 24 474 in the southern stock. The population in northern Japanese waters is currently considered at risk (IWC 1987; Perrin 1988; see Limiting Factors, below). Leatherwood and Reeves (1983) noted that the population of Short-finned Pilot Whales in the eastern tropical Pacific has been estimated at 60 000 individuals. Shallenberger (1981) notes that Pilot Whales are the most commonly observed small "whale" in the Hawaiian Islands. In areas where the range of this species overlaps with that of Long-finned Pilot Whales, estimates of abundance based on surveys

are generally confined to estimates for the genus, since species identification of animals in the field is difficult (*see* Hain et al. 1985).

### Habitat

Short-finned Pilot Whales generally inhabit warm temperate and tropical offshore waters, although there are also some records of individuals spending long periods in shallow inshore areas (Home 1980). Short-finned Pilot Whales have been recorded in areas with water temperatures as high as 29.2°C (Miyazaki and Wada 1978). Kasuya and Marsh (1984) noted that in the western North Pacific, they occur in waters with surface temperatures greater than 15°-16°C. Sea surface temperatures noted for six records from British Columbia waters range between 8° and 16°C (Baird and Stacey 1993).

### General Biology

#### Reproduction

Perrin and Reilly (1984) reviewed reproductive parameters of this and other delphinids. There is a wide range of variation in many of the reproductive parameters of Short-finned Pilot Whales, probably because data has been summarized from several different populations. Extensive research on the life history and reproductive biology of this species has been undertaken off the coast of Japan, utilizing animals taken in fisheries. The following summary of information derived from these fisheries as well as from studies elsewhere follows through the life history of Short-finned Pilot Whales, including gestation, birth, weaning, growth, sexual maturity, and longevity.

Kasuya and Marsh (1984) found in their study that gestation lasts an average of 452 days. A single calf is usual (Kasuya and Marsh 1984), although Norris and Prescott (1961) noted several sightings of adults with two young, and suggested that multiple births may occasionally occur. Alternatively, such sightings may simply indicate periods of alloparental care, as is commonly observed with Killer Whales (*see* Waite 1988). Length at birth has been said to range between 122-146 cm (Caldwell et al. 1971a; Yonekura et al. 1980). Kasuya and Marsh (1984), studying the southern form of Short-finned Pilot Whales off Japan, estimated the mean length at birth as 139.8 cm, the neonatal sex ratio as approximately 1:1, with weaning occurring over an extended period. The first solid food may be taken as early as six months, and nursing continues to at least 2.75 years of age, with some animals possibly continuing to nurse until the age of 10 to 15 years (Kasuya and Marsh 1984).

For females, the mean age and length at attainment of sexual maturity has been estimated as nine years and either 301 or 316 cm (for animals from the central U.S. and Pacific coasts of Japan, respectively) (Kasuya and Marsh 1984; Mead and Potter

1987). At this age growth has almost ceased; off the Pacific coast of Japan the asymptotic length of 364.0 cm is reached at age 22 years for females (Kasuya and Matsui 1984). For males, the mean age and length at attainment of sexual maturity has been estimated at about 15 years and about 414 or 475 cm (for animals from the Pacific coast of Japan and central U.S. coast, respectively) (Kasuya and Marsh 1984; Mead and Potter 1987). Off the Pacific coast of Japan, males show a secondary growth spurt at age nine, and attain an asymptotic length of 473.5 cm at 27 years of age (Kasuya and Matsui 1984). The adult sex ratio is biased towards females; mortality for males is greater than for females (Kasuya and Marsh 1984). Marsh and Kasuya (1984, 1986) have found that females off Japan exhibit an extended post-reproductive period, with no pregnancies occurring in 76 females which were 36 years of age or older. Twenty-four percent of the 245 mature females examined had ovaries similar to those found in post-menopausal humans. Dentinal and cemental growth layers are deposited annually (Kasuya and Matsui 1984). The age of the oldest individuals examined from this fishery was estimated at 62 years for females and 45 years for males. Mean longevity for animals off Japan is estimated as 22.26 years for females and 12.11 years for males (Kasuya and Marsh 1984). Kasuya and Marsh (1984) found that breeding off Japan is diffusely seasonal, with a single peak in parturition in July-August. They suggest that the mating system is polygynous.

#### Movements

Individual Short-finned Pilot Whales can be photo-identified, based on dorsal fin shape and distinctive markings on the dorsal fin and saddle patch. This technique has been used for behavioural and population studies in two areas in the eastern North Pacific, off the California coast and in Hawaii, and off Japan (Shane 1984; Patten and Samaras 1985; Shane and McSweeney 1990; Miyashita et al. 1990). Shane and McSweeney (1990) used this technique to study site fidelity off California and Hawaii. Their results suggest a relatively high degree of site fidelity, at least seasonally, with resightings of individuals both within and between years (Shane and McSweeney 1990). From examination of animals killed in fisheries off Japan, Kasuya and Marsh (1984) suggest that females probably do not leave their mother's school, while males likely migrate between schools after weaning. Leatherwood et al. (1987) note that the population off southern California may have two components: some individuals appear to stay year-round in the area of the California Channel Islands and show an affinity for the coastal heads of deep submarine canyons, while others are seen in deeper waters offshore for most of the year. During the inshore movements of squid in late winter and early spring, some of the Short-

finned Pilot Whales that are normally found offshore appear to move inshore (Leatherwood et al. 1987), forming large concentrations over the squid spawning areas. Numbers in inshore waters thus appear to peak in winter and spring. Shane (1984) suggests that inshore movements in the Catalina Island area were interrupted by the 1982-1984 El Niño warm water event. Movements in the eastern North Pacific north of latitude 40°N appear to be related to incursions of warm water (Leatherwood et al. 1987). The only records from British Columbia waters are from late spring through early fall, although it is difficult to determine if this accurately reflects their presence, since sighting effort is much lower in winter months (Baird and Stacey 1993).

#### Behaviour

Pilot whale groups range from single individuals to aggregations of several hundred (Irvine et al. 1979; Shallenberger 1981). Norris and Prescott (1961) noted that group structure can be categorized into three functional behaviours: travelling or hunting, feeding, and loafing. Short-finned Pilot Whales are frequently encountered "loafing" at the surface, resting with their dorsal fin and head visible (Leatherwood et al. 1988). "Play" behaviour often occurs at such times, including spyhopping, taillobbing, and occasionally breaching. Norris and Prescott (1961) reported an individual playing with kelp. When startled during "loafing" behaviour, Pilot Whales can be extremely difficult to approach for the rest of the day (Walker 1975). Travelling or hunting schools are characterized by animals spread out in a broad rank up to two miles in width, but only one or a few whales in depth, with individuals occasionally gathered in subgroups. In feeding schools, individuals tend to remain fairly independent of one another, exhibiting quick erratic movements during pursuit of food.

Short-finned Pilot Whales generally travel no more than four or five knots in the open ocean, although they are capable of rapid swimming (Norris and Prescott 1961). When beginning a long dive, the tail stock is exposed in an arching roll, and the flukes are often lifted above the surface (Reilly and Shane 1986). Norris and Prescott (1961) noted that the longest dive recorded from their observations was four minutes, fifty seconds. Among the species considered "blackfish" [Killer Whales, False Killer Whales (*Pseudorca crassidens*), Melon-headed Whales (*Peponocephala electra*), Pygmy Killer Whales (*Feresa attenuatay*), and Pilot Whales]. Pilot Whales are the least acrobatic (Leatherwood et al. 1988). Pilot Whales generally do not bowride on vessels (Walker 1975). Reilly and Shane (1986) report that the majority of sounds produced by the highly vocal Short-finned Pilot Whale are below 15 kilohertz.

Conspecific agonistic behaviour is evident towards smaller individuals, who frequently have numerous scars and tooth marks (Norris and Prescott

1961). Short-finned Pilot Whales have been recorded in association with several other species of cetaceans, including Bottlenose Dolphins (*Tursiops truncatus*), Rough-toothed Dolphins (*Steno bredanensis*), Northern Right Whale Dolphins (*Lissodelphis borealis*), Pacific White-sided Dolphins (*Lagenorhynchus obliquidens*), Risso's Dolphins (*Grampus griseus*), Common Dolphins (*Delphinus delphis*), and Grey Whales (*Eschrichtius robustus*), as well as California Sea Lions (*Zalophus californianus*) and seabirds (Norris and Prescott 1961; Leatherwood 1974; Kasuya and Marsh 1984; Reilly and Shane 1986; Au and Pitman 1988; Baird and Stacey 1993). Shane (1987) observed Risso's Dolphins apparently acting aggressively towards Short-finned Pilot Whales off California. Shallenberger (1981) noted that oceanic White-tipped Sharks occasionally follow Pilot Whales in the Hawaiian Islands.

Short-finned Pilot Whales feed primarily on squid. Perryman and Foster (1980) reported that Short-finned Pilot Whales have been observed chasing dolphins (*Delphinus delphis* and *Stenella* spp.) in the eastern tropical Pacific, and suggest that on occasion they may feed on young dolphins.

### Limiting Factors

Actual predation by Killer Whales has not been observed (Jefferson et al. 1991), although remains of Short-finned Pilot Whales have been recovered from Killer Whale stomach contents off Japan (Nishiwaki and Handa 1958). Kasuya and Marsh (1984) described a possible interaction between Killer Whales and Short-finned Pilot Whales, where an aggregation of Pilot Whales and Bottlenose Dolphins became tighter as Killer Whales approached. Reilly and Shane (1986) reported that predation by sharks also occurs.

Short-finned Pilot Whales are taken in small numbers in fisheries, both directly and incidentally, throughout their range. During the nineteenth century, Short-finned Pilot Whales were frequently killed in the tropical Atlantic by pelagic whaling crews, both for practice, and to obtain meat and watch oil (Leatherwood and Reeves 1983). Off Japan, small numbers are taken incidentally in fisheries, while several hundred are taken annually in directed harpoon and drive fisheries (Ohsumi 1972, 1975; IWC 1991, 1992). Numbers taken in recent years have ranged from 569 in 1988 to 167 in 1990 (IWC 1990, 1992). Leatherwood and Reeves (1983) noted that small-scale hand-harpoon fisheries in the West Indies began in the 1930s, where they continue today (Reeves 1988). Catches have been reported from Cuba, Dominica, Martinique, St. Lucia and St. Vincent (Mitchell 1975; Price 1985). Those animals taken are used primarily for meat for human consumption, and for cooking oil (Caldwell et al

1971b). Caldwell and Caldwell (1975) report that on average, 224 individuals were taken in the fishery at St. Vincent between 1962 and 1974. Small numbers are taken incidentally in fisheries off Sri Lanka, as well as being directly taken by Lamalera whalers (Leatherwood et al. 1991). Hall and Boyer (1989, 1990) report that small numbers have been taken in the tuna purse-seine fishery in the eastern tropical Pacific. Miller et al. (1983, cited in Shane 1984) noted that between 4-12% of the estimated winter population off Catalina Island were being killed annually in a local squid fishery. Three individuals were incidentally caught in an experimental fishery in international waters offshore of British Columbia in 1957 (Pike and MacAskie 1969). One of these individuals was shot and taken aboard, while the other two escaped. Between 1983-1987, six individuals were incidentally caught in Canadian waters, and an additional five individuals in adjacent international waters, in an experimental fishery for Flying Squid (*Ommastrephes bartrami*) (Jamieson and Heritage 1987, 1988; Baird and Stacey 1993). This fishery has been discontinued. Some Pilot Whales (both Short- and Long-finned) were killed incidentally in the U.S. Swordfish drift gill-net fishery off the U.S. northeast coast (Anonymous 1991). Diamond et al. (1987) report on two individuals killed in a shark/swordfish drift gill-net fishery off southern California. Van Waerebeek and Reyes (1986) noted that small numbers have been killed incidentally in gill nets off Peru, as well as being taken in other fisheries in that area. As of 1983 a total of 226 individuals had been live captured world-wide for captivity (IWC 1984).

Relatively high levels of several heavy metals and organochlorines have been recorded in tissues from Short-finned Pilot Whales (Gaskin et al. 1974; Taruski et al. 1975; O'Shea et al. 1980; Wagemann and Muir 1984). However, the role which environmental contaminants play in the mortality of marine mammals is largely unknown. Some contaminants, such as mercury, have both natural as well as anthropogenic sources.

The two species in the genus *Globicephala* are among those cetaceans recorded to mass strand most frequently, and *G. macrorhynchus* has been recorded to mass strand on numerous occasions (Norris and Prescott 1961; Caldwell et al. 1970; Hall et al. 1971; Sergeant 1982). A variety of circumstances may contribute to mass strandings. Mitchell (1975) noted that mass strandings may significantly affect the size of local populations.

Pathology in the Short-finned Pilot Whale has been discussed by Benirschke and Marsh (1984). Hall et al. (1971) report on bacteria isolated from stranded individuals. Parasites recorded from this species include the cestodes *Monorygma* sp., and *Phyllobothrium* sp., and the trematodes *Nasitrema*

*globicephalae* and *Nasitrema lanceolata* (Neiland et al. 1970; Walker 1975), although the exact role of these parasites in natural mortality is unknown. Morimitsu et al. (1987) have implicated the cranial parasites *Nasitrema gondo* in mass strandings off Japan. Caldwell et al. (1971a, 1971b) report that the barnacles *Conchoderma auritum* and *Xenobalanus globicipitus*, as well as cyamids and remoras have been found on this species.

### Evaluation

Baird and Stacey (1993), in their review of this species off the B.C. coast, note that the Short-finned Pilot Whale is a rare but regular visitor to Canadian waters. No serious threats to its status in Canadian waters are apparent. As such, no COSEWIC status designation is required.

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### Literature Cited

- Anonymous.** 1991. United States progress report on cetacean research June 1990 to April 1991. Document SC/43/ProgRep USA submitted to the IWC Scientific Committee.
- Au, D. W., and R. L. Pitman.** 1988. Seabird relationships with tropical tunas and dolphins. Pages 174–212 in *Seabirds and other marine vertebrates*. Edited by J. Burger. Columbia University Press, New York.
- Baird, R. W., and P. J. Stacey.** 1993. Sightings, strandings and incidental catches of Short-finned Pilot Whales, *Globicephala macrorhynchus*, off the British Columbia coast. Reports of the International Whaling Commission Special Issue 14: 475–479.
- Benirschke, K., and H. Marsh.** 1984. Anatomic and pathologic observations of female reproductive organs in the short-finned pilot whale, *Globicephala macrorhynchus*. Reports of the International Whaling Commission Special Issue 6: 451–455.
- Birnie, P.** 1982. Legal measures for the prevention of "pirate" whaling. International Union for Conservation of Nature and Natural Resources (IUCN) Environmental Policy and Law Paper 19: 1–163.
- Bree, P. J. H. van.** 1971. On *Globicephala sieboldii* Gray, 1846, and other species of pilot whales. *Beaufortia* 249: 79–87.
- Caldwell, D. K., and M. C. Caldwell.** 1975. Dolphin and small whale fisheries of the Caribbean and West Indies: occurrence, history, and catch statistics - with special reference to the Lesser Antillean island of St. Vincent. *Journal of the Fisheries Research Board of Canada* 32: 1105–1110.
- Caldwell, D. K., W. F. Rathjen, and M. C. Caldwell.** 1970. Pilot whales mass stranded at Nevis, West Indies. *Quarterly Journal of the Florida Academy of Sciences* 33(4): 241–243.
- Caldwell, D. K., H. Neuhauser, M. C. Caldwell, and H. W. Coolidge.** 1971a. Recent records of marine mammals from the coasts of Georgia and South Carolina. *Cetology* 5: 1–12.
- Caldwell, D. K., M. C. Caldwell, W. F. Rathjen, and J. R. Sullivan.** 1971b. Cetaceans from the Lesser Antillean island of St. Vincent. *Fishery Bulletin, U.S.* 69(2): 303–312.
- Casinos, A., and J. Bou.** 1980. On a massive stranding of short-finned pilot whale, *Globicephala macrorhynchus* Gray, 1846, on Margarita Island (Venezuela). *Scientific Reports of the Whales Research Institute* 32: 145–148.
- Collet, A., and R. Duguy.** 1987. French research on cetaceans. Pages 41–44 in *The European Cetacean Society Report of the 1987 Meeting*. Edited by J.W. Broekema and C. Smeenk. Hirtshals, Denmark.
- Diamond, S. L., J. P. Scholl, and D. A. Hanan.** 1987. Drift gill net observations for the 1985-86 fishing season. National Marine Fisheries Service Southwest Region Administrative Report SWR 87-4.
- Gaskin, D. E., G. J. D. Smith, P. W. Arnold, M. V. Louisy, R. Frank, M. Holdrinet, and J. W. McWade.** 1974. Mercury, DDT, dieldrin, and PCB in two species of Odontoceti (Cetacea) from St. Lucia, Lesser Antilles. *Journal of the Fisheries Research Board of Canada* 31: 1235–1239.
- Hain, J. H. W., M. A. M. Hyman, R. D. Kenney, and H. E. Winn.** 1985. The role of cetaceans in the shelf-edge region of the northeastern United States. *Marine Fisheries Review* 47(1): 13–17.
- Hall, J. D., W. G. Gilmartin, and J. L. Mattsson.** 1971. Investigations of a Pacific pilot whale (*Globicephala scammoni*) stranding on San Clemente Island. *Journal of Wildlife Diseases* 7: 324–327.
- Hall, M. A., and S. D. Boyer.** 1989. Estimates of incidental mortality of dolphins in the eastern Pacific fishery for tropical tunas in 1987. Reports of the International Whaling Commission 39: 321–322.
- Hall, M. A., and S. D. Boyer.** 1990. Incidental mortality of dolphins in the tuna purse-seine fishery in the eastern Pacific ocean during 1988. Reports of the International Whaling Commission 40: 461–462.
- Hershkovitz, P.** 1966. Catalog of living whales. United States National Museum Bulletin 246.
- Home, W. S.** 1980. Pacific pilot whales: repeated, localized sightings in southeastern Alaska. *Wasmann Journal of Biology* 38(1-2): 18–20.
- Irvine, A. B., M. D. Scott, R. S. Wells and J. G. Mead.** 1979. Stranding of the pilot whale, *Globicephala macrorhynchus*, in Florida and South Carolina. *Fishery Bulletin, U.S.* 77(2): 511–513.
- IWC.** 1982. International Whaling Commission Report 1980-1981. Reports of the International Whaling Commission 32: 3–7.
- IWC.** 1984. Report of the sub-committee on small cetaceans. Reports of the International Whaling Commission 34: 144–160.
- IWC.** 1987. Report of the sub-committee on small cetaceans. Reports of the International Whaling Commission 37: 121–128.
- IWC.** 1990. Report of the sub-committee on small cetaceans. Reports of the International Whaling Commission 40: 144–157.



- IWC. 1991. Report of the sub-committee on small cetaceans. Reports of the International Whaling Commission 41: 172-190.
- IWC. 1992. Report of the sub-committee on small cetaceans. Reports of the International Whaling Commission 42: 178-228.
- Jamieson, G. S., and G. D. Heritage. 1987. Experimental flying squid fishing off British Columbia, 1985 and 1986. Canadian Industry Report of Fisheries and Aquatic Sciences 179.
- Jamieson, G. S., and G. D. Heritage. 1988. Experimental flying squid fishery off British Columbia, 1987. Canadian Industry Report of Fisheries and Aquatic Sciences 186.
- Jefferson, T. A., P. J. Stacey, and R. W. Baird. 1991. A review of killer whale interactions with other marine mammals: predation to co-existence. Mammal Review 21(4): 151-180.
- Kasuya, T. 1975. Past occurrence of *Globicephala melaena* in the western North Pacific. Scientific Reports of the Whales Research Institute 27: 95-110.
- Kasuya, T., and H. Marsh. 1984. Life history and reproductive biology of the short-finned pilot whale, *Globicephala macrorhynchus*, off the Pacific coast of Japan. Reports of the International Whaling Commission Special Issue 6: 259-310.
- Kasuya, T., and S. Matsui. 1984. Age determination and growth of the short-finned pilot whale off the Pacific coast of Japan. Scientific Reports of the Whales Research Institute 35: 57-91.
- Kasuya, T., T. Miyashita, and F. Kasamatsu. 1988. Segregation of two forms of short-finned pilot whales off the Pacific coast of Japan. Scientific Reports of the Whales Research Institute 39: 77-90.
- Klinowska, M. 1987. The status of marine mammals in the southern North Sea. Pages 75-95 in Reasons for Concern - Proceedings of the 2nd North Sea Seminar '86. Edited by G. Peet. Amsterdam.
- Klinowska, M. 1991. Dolphins, porpoises and whales of the world - the IUCN Red DataBook. IUCN, Gland, Switzerland.
- Leatherwood, J. S. 1974. A note on gray whale behavioral interactions with other marine mammals. Marine Fisheries Review 36(4): 50-51.
- Leatherwood, J. S., and M. E. Dahlheim. 1978. Worldwide distribution of pilot whales and killer whales. Naval Ocean Systems Center Technical Report 295.
- Leatherwood, S., and R. R. Reeves. 1983. The Sierra Club handbook of whales and dolphins. Sierra Club Books, San Francisco.
- Leatherwood, S., B. S. Stewart, and P. A. Folkens. 1987. Cetaceans of the Channel Islands National Marine Sanctuary. National Oceanic and Atmospheric Administration, Channel Islands National Marine Sanctuary.
- Leatherwood, S., R. R. Reeves, W. F. Perrin, and W. E. Evans. 1988. Whales, dolphins, and porpoises of the eastern North Pacific and adjacent Arctic waters - A guide to their identification. Dover Publications, Inc., New York.
- Leatherwood, S., W. P. Prematunga, P. Girton, D. McBrearty, A. Ilangakoon, and D. McDonald. 1991. Records of the "Blackfish" (killer, false killer, pilot, pygmy killer, and melon-headed whales) in the Indian Ocean Cetacean Sanctuary, 1772-1986. Pages 33-65 in Cetaceans and cetacean research in the Indian Ocean Sanctuary. Edited by S. Leatherwood and G. Donovan. United Nations Environment Programme Marine Mammal Technical Report 3. Nairobi.
- Marsh, H., and T. Kasuya. 1984. Changes in the ovaries of the short-finned pilot whale, *Globicephala macrorhynchus*, with age and reproductive activity. Reports of the International Whaling Commission Special Issue 6: 311-335.
- Marsh, H., and T. Kasuya. 1986. Evidence for reproductive senescence in female cetaceans. Reports of the International Whaling Commission Special Issue 8: 57-74.
- Mead, J. G., and C. W. Potter. 1987. Life history of the short-finned pilot whale (*Globicephala macrorhynchus*) in the western North Atlantic. Paper SC/39/SM22 submitted to the IWC Scientific Committee.
- Mitchell, E. Editor. 1975. Report of the meeting on smaller cetaceans Montreal, April 1-11, 1974. Journal of the Fisheries Research Board of Canada 32: 889-983.
- Miyashita, T. In press. Distribution and abundance of some globicephalid cetaceans in the waters adjacent to Japan. Reports of the International Whaling Commission Special Issue.
- Miyashita, T., T. Kasuya, and K. Mori. 1990. An examination of the feasibility of using photo-identification techniques for a short-finned pilot whale stock off Japan. Reports of the International Whaling Commission Special Issue 12: 425-428.
- Miyazaki, N., and S. Wada. 1978. Observation of cetacea during whale marking cruise in the western tropical Pacific, 1976. Scientific Reports of the Whales Research Institute 30: 179-195.
- Morimitsu, T., T. Nagai, M. Ide, H. Kawano, A. Naichuu, M. Koono, and A. Ishii. 1987. Mass stranding of odontoceti caused by parasitogenic eighth cranial neuropathy. Journal of Wildlife Diseases 23(4): 586-590.
- Neiland, K. A., D. W. Rice, and B. L. Holden. 1970. Helminths of marine mammals, I. the genus *Nasitrema*, air sinus flukes of delphinid cetacea. Journal of Parasitology 56(2): 305-316.
- Nicol, D. J. 1987. A review and update of the Tasmanian cetacean stranding record to the end of February 1986. University of Tasmania Environmental Studies Working Paper 21.
- Nishiwaki, M., and C. Handa. 1958. Killer whales caught in the coastal waters off Japan for recent 10 years. Scientific Reports of the Whales Research Institute 13: 85-96.
- Nores, C., and C. Perez. 1988. Overlapping range between *Globicephala macrorhynchus* and *Globicephala melaena* in the northeastern Atlantic. Mammalia 52(1): 51-55.
- Norris, K. S., and J. H. Prescott. 1961. Observations on Pacific cetaceans of Californian and Mexican waters. University of California Publications in Zoology 63(4): 291-402.
- Ohsumi, S. 1972. Catch of marine mammals, mainly of small cetaceans, by local fisheries along the coast of Japan. Bulletin of the Far Seas Fisheries Research Laboratory 7: 137-166.



- Ohsumi, S.** 1975. Review of Japanese small-type whaling. *Journal of the Fisheries Research Board of Canada* 32: 1111-1121.
- Orr, R. T.** 1951. Cetacean records from the Pacific coast of North America. *Wasmann Journal of Biology* 9(2): 147-148.
- Osgood, W. H.** 1901. Natural history of the Queen Charlotte Islands, British Columbia. *Natural History of the Cook Inlet region, Alaska*. North American Fauna 21.
- O'Shea, T. J., R. L. Brownell, Jr., D. R. Clark, Jr., W. A. Walker, M. L. Gay, and T. G. Lamont.** 1980. Organochlorine pollutants in small cetaceans from the Pacific and South Atlantic Oceans, November 1968-June 1976. *Pesticides Monitoring Journal* 14(2): 35-46.
- Patten, D. R., and W. F. Samaras.** 1985. Pilot whales of Catalina Island, California. *In* Abstracts of the Sixth Biennial Conference on the Biology of Marine Mammals, November 22-26, 1985, Vancouver, British Columbia.
- Perrin, W. F.** 1988. Dolphins, porpoises, and whales - an action plan for the conservation of biological diversity: 1988-1992. IUCN, Gland, Switzerland.
- Perrin, W. F., and S. B. Reilly.** 1984. Reproductive parameters of dolphins and small whales of the Family Delphinidae. Reports of the International Whaling Commission Special Issue 6: 97-133.
- Perryman, W. L., and T. C. Foster.** 1980. Preliminary report on predation by small whales, mainly the false killer whale, *Pseudorca crassidens*, on dolphins (*Stenella* spp. and *Delphinus delphis*) in the eastern tropical Pacific. National Marine Fisheries Service Southwest Fisheries Center Administration Report LJ-80-05.
- Pike, G. C., and I. B. MacAskie.** 1969. Marine mammals of British Columbia. *Fisheries Research Board of Canada Bulletin* 171.
- Price, W. S.** 1985. Whaling in the Caribbean: historical perspective and update. Reports of the International Whaling Commission 35: 413-420.
- Reeves, R. R.** 1988. Exploitation of cetaceans in St. Lucia, Lesser Antilles, January 1987. Reports of the International Whaling Commission 38: 445-447.
- Reilly, S. B., and S. H. Shane.** 1986. Pilot whale. Pages 133-139 *in* Marine Mammals of Eastern North Pacific and Arctic Waters. Edited by D. Haley. Pacific Search Press, Seattle.
- Scheffer, V. B., and J. W. Slipp.** 1948. The whales and dolphins of Washington State with a key to the cetaceans of the west coast of North America. *American Midland Naturalist* 39(2): 257-337.
- Schniegelow, J. M. M., and A. M. P. Filho.** 1989. First record of the short-finned pilot whale *Globicephala macrorhynchus* Gray, 1846, for the southwestern Atlantic. *Marine Mammal Science* 5(4): 387-391.
- Sergeant, D. E.** 1982. Mass strandings of toothed whales (Odontoceti) as a population phenomenon. *Scientific Reports of the Whales Research Institute* 34: 1-47.
- Shallenberger, E. W.** 1981. The status of Hawaiian cetaceans. Final Report, Contract MMC-77/23. Marine Mammal Commission, Washington, D.C.
- Shane, S. H.** 1984. Pilot whales and other marine mammals at Santa Catalina Island, California in 1983-84. National Marine Fisheries Service Southwest Fisheries Center Administration Report LJ-84-28C.
- Shane, S. H.** 1985. Detailed observations of a single pod of pilot whales and sightings of other marine mammals at Catalina Island, California in winter 1984-5. Contract report to U.S. Marine Mammal Commission and National Marine Fisheries Service, Southwest Fisheries Center.
- Shane, S.** 1987. Risso's dolphins harass pilot whales. *West Coast Whales* 3(1): 3.
- Shane, S. H., and D. McSweeney.** 1990. Using photo-identification to study pilot whale social organization. Reports of the International Whaling Commission Special Issue 12: 259-263.
- Spong, P., H. Michaels, and L. Spong.** 1972. Field studies of the behaviour of the killer whale (*Orcinus orca*) II. Proceedings of the Ninth Annual Conference on Biological Sonar and Diving Mammals: 1-5.
- Taruski, A. G., C. E. Olney, and H. E. Winn.** 1975. Chlorinated hydrocarbons in cetaceans. *Journal of the Fisheries Research Board of Canada* 32: 2205-2209.
- Van Waerebeek, K., and J. C. Reyes.** 1986. *Abstract.* The first records of the short-finned pilot whales *Globicephala macrorhynchus* for Peruvian waters. Abstracts of the 14th Symposium of the European Association of Aquatic Mammals, Barcelona, 16-19 March 1986.
- Wada, S.** 1988. Genetic differentiation between two forms of short-finned pilot whales off the Pacific coast of Japan. *Scientific Reports of the Whales Research Institute* 39: 91-101.
- Wagemann, R., and D. C. G. Muir.** 1984. Concentrations of heavy metals and organochlorines in marine mammals of northern waters: overview and evaluation. Canadian Technical Report of Fisheries and Aquatic Sciences 1279.
- Wailles, G. H., and W. A. Newcombe.** 1929. Sea lions. *Museum Art Notes* 4(2): 43-50.
- Waite, J. M.** 1988. Alloparental care in killer whales (*Orcinus orca*). M.Sc. thesis, University of California, Santa Cruz.
- Walker, W. A.** 1975. Review of the live-capture fishery for smaller cetaceans taken in southern California waters for public display, 1966-73. *Journal of the Fisheries Research Board of Canada* 32: 1197-1211.
- Yonekura, M., S. Matsui, and T. Kasuya.** 1980. On the external characters of *Globicephala macrorhynchus* off Taiji, Pacific coast of Japan. *Scientific Reports of the Whales Research Institute* 32: 67-95.

Short-finned pilot whales are found in warm temperate to tropical waters of the world, generally in deep offshore areas. They do not usually range north of 50°N or south of 40°S. There is some distributional overlap with their long-finned relatives (*G. melas*), which appear to prefer cold temperate waters of the North Atlantic, Southern Hemisphere, and previously the western North Pacific. Only short-finned pilot whales are thought to inhabit the North Pacific, although distribution and taxonomy of pilot whales in this area are still largely unresolved. Status in World Register of Marine Species. Accepted name: *Globicephala macrorhynchus* Gray, 1846. Scientific synonyms and common names. *Globicephala macrorhynchus* Gray, 1846. Common names. The short-finned pilot whale (*Globicephala macrorhynchus*) is one of the two species of cetaceans in the genus *Globicephala*, which it shares with the long-finned pilot whale (*Globicephala melas*). It is part of the oceanic dolphin family (Delphinidae), though its behaviour is closer to that of the larger whales. Long-finned and short-finned pilot whales are often hard to tell apart. However, as their names indicate, short-finned pilot whale flippers are shorter than those of the long-finned pilot whale