

## **Globicephala melas (Traill, 1809)**

English: Long-finned pilot whale

German: Grindwal

Spanish: Calderón negro

French: Globicéphale noir

Family Delphinidae

### **1. Description**

The body in pilot whales is robust, with a deep tail stock. The melon is exaggerated and bulbous and the beak is barely discernible or non-existent. The dorsal fin is wide, broad based, falcate and set well forward on the body. The flippers are long, slender, and sickle-shaped. A faint grey saddle patch may be visible behind the dorsal fin in southern Hemisphere specimens. In the North Atlantic, a thin whitish stripe can be visible in less than half of all adult pilot whales. A pale eye blaze is visible in one fifth of all adult pilot whales, most often in males (Bloch et al. 1993a). A grey midventral line extends to the front into an anchor-shaped chest patch and widens posteriorly to a genital patch. Sexual dimorphism exists with longer flippers and larger flukes in males (Bloch et al. 1993a). The long-finned pilot whale has a narrower skull than the short-finned species, with the maxillary bones exposed laterally along the full length of the rostrum (Olson, 2009).

Long- and short-finned pilot whales (*G. melas* and *G. macrorhynchus*) are difficult to distinguish at sea. However, the species differ, as the name suggests, in flipper length, skull shape and number of teeth. On average, the flippers reach 18-30% of the body length in long-finned pilot whales, but only 14-19% in short-finned pilot whales (Bloch et al. 1993a). Adults reach a body length of approx. 6.5 m, males being 1 m larger than adult females (Bloch et al. 1993b; Olson, 2009). Body mass reaches up to 1,300 kg in females and up to 2,300 kg in males (Jefferson et al. 2008).

### **2. Distribution**

<http://www.iucnredlist.org/details/9250/0/rangemap>

*Distribution of Globicephala melas: the species is "antitropical" in cold temperate and subpolar waters of all oceans except the North Pacific (Taylor et al. 2008; © IUCN)*

Two subspecies are recognized in some classifications (Rice, 1998):

*G. m. melas*: This subspecies ranges in the North Atlantic from Ungava Bay, Disko in western Greenland, 68°N in eastern Greenland, Iceland, the Faroes, and Nordland in Norway, south to North Carolina, the Azores, Madeira, and Mauritania, including the western Mediterranean (Rice, 1998 and refs. therein). It occurred as recently as the 8<sup>th</sup> to 12<sup>th</sup> century in northern Japanese waters (Olson, 2009).

According to Bloch and Lastein (1993) pilot whales on the western (Newfoundland) and eastern (Faroes) sides of the North Atlantic are distinguishable by minor external morphometric characters and may be geographically isolated from each other. However,

Fullard et al. (2000) concluded that despite genetic, morphometric, physiological and observational studies, it remains unclear whether any population substructure exists. They used eight highly polymorphic microsatellite loci to analyse samples from the US East Coast (Cape Cod), West Greenland, the Faeroe Islands and the UK. Although their results indicate that substructure does exist, and is particularly pronounced between West Greenland and other sites, the magnitudes of the various pairwise comparisons do not support a simple isolation-by-distance model. Instead, the patterns of genetic differentiation suggest that population isolation occurs between areas of the ocean which differ in sea surface temperature (Fullard et al. 2000).

*G. m. edwardii* (A. Smith, 1834): This subspecies is circumglobal in the Southern Hemisphere, ranging north to São Paulo in Brazil, Cape Province in South Africa, Iles Crozet, Heard Island, the southern coast of Australia, Great Barrier Island in New Zealand, and Arica (19°S) in Chile. Southward it extends at least as far as the Antarctic Convergence 47°S to 62°S and has been recorded near Scott Island (67°S, 179°W) and in the central Pacific sector at 68°S, 120°W (Rice, 1998 and refs. therein).

### 3. Population size

There is little information on stocks within the species, and there is no information on global trends in abundance (Taylor et al., 2008). The best northwestern Atlantic abundance estimate for *Globicephala* sp. covering most of the species' habitat stems from two 2004 U.S. Atlantic surveys: 31,139 whales (CV= 0,27; Waring et al., 2007). Based on surveys in the 1980's there are about 13,000 short-finned pilot whales off eastern Newfoundland. In the north-eastern Atlantic the number of pilot whales inhabiting the area between East Greenland, Iceland, Jan Mayen, Faroe Islands and off the western coasts of the British Islands and Ireland was estimated at around 778,000 by Buckland et al. (1993). However, in a more recent meeting, the North Atlantic Marine Mammal commission (NAMMCO, 2006) noted that there had been no assessment of pilot whales since 1994.

Estimates for Antarctic waters are in the order of 200,000 long-finned pilot whales (Bernard and Reilly, 1999 and refs. therein).

### 4. Biology and Behaviour

**Habitat:** The typical temperature range for the species is 0-25°C (Martin, 1994) and it may be found in inshore but mostly in offshore waters (Reyes, 1991 and refs. therein).

Around the Faroe Islands, pilot whales show a preference for the region over the border of the continental shelf (Bloch et al. 1993c; Bloch et al. 2003). In the the Alboran Sea, between the Mediterranean and the Atlantic Ocean, the average depth of encounters was 849 m, ranging from 300 to 1,800m, and reflecting the distribution of their preferred diet, pelagic cephalopods (Canadas and Sagarminaga, 2000).

In the southern hemisphere, off the coast of Chile, Aguayo et al. (1998) mainly sighted *G. melas* close to the coast, reflecting its preference for the edge of the continental shelf. Goodall and Macnie (1998) reported on sightings in the south-eastern South Pacific, which were clustered from 30-35°S, 72-78°W, the maximum being about 160 nm from shore.

In the southwestern South Atlantic, sightings clustered in two areas, 34-46°S and off Tierra del Fuego, 52-56°S. Here schools were found up to 1,000nm from shore. Fifteen sightings were from waters south of the Antarctic Convergence, from December to March. Only one sighting was made south of 44°S in winter, probably due to lack of effort in southern seas during the colder months (Goodall and Macnie 1998).

**Behaviour:** Mate (1989) tracked a pilot whale with an Argos satellite-monitored radio tag for 95 days in the western North Atlantic. Virtually all deep dives occurred at night, when the whale was likely feeding on squid. Surface resting occurred most often immediately after sunrise on a four- to seven-day cycle.

Bloch et al. (2003) tagged three long-finned pilot whales off the Faroe Islands (62 °N, 7°W) with satellite transmitters. After tagging, the whales separated and went in different directions. After 10 days, two of the whales were observed together in a pod, and after 19 days two were located at positions determined to be within 2.3 km of each other. The swimming speed of the whales was estimated at 0.2-14.5 km/hour, and they travelled average distances of 70-111 km with a maximum of 200 km per day.

Baird et al. (2002) radio-tagged 5 long-finned pilot whales in deep (>2000 m) waters of the Ligurian Sea, off the NW coast of Italy. During the day all 5 whales spent their time in the top 16 m of the water column, and visible surface activities consisted primarily of rest and social behaviour. Shortly after sunset two whales made several deep dives (max. 360 and 648 m) at high velocity, at a time when vertically migrating prey become more readily available.

**Schooling:** Pilot whales are highly social; they are generally found in pods of 110, but some groups contain up to 1,200 individuals (Zachariassen, 1993; Bloch, 1998). Based on photo-identification and genetic work, pilot whales appear to live in relatively stable pods like those of killer whales, and not in fluid groups characteristic of many smaller dolphins (Jefferson et al. 1993; Cañadas and Sagarminaga, 2000). They are social animals, with close matrilineal associations with 60% females.

The pods are often mixed with Atlantic white-sided dolphins (*Lagenorhynchus acutus*) and bottlenose dolphins (*Tursiops truncatus*) (Bloch et al. 1993c). When travelling, pods may swim abreast in a line several kilometres across. Short-finned pilot whales are often found in the company of bottlenose dolphins and other small cetaceans, although they have been known to attack them (Carwardine, 1995). Baraff and Asmutis (1998) described the association of an individually identified long-finned pilot whale with Atlantic white-sided dolphins over six consecutive years. Pilot whales were also observed in close association with fin, sperm and minke whales, and common, bottlenose, hourglass and possibly dusky dolphins (Goodall and Macnie, 1998).

Off the northwest coast of Nova Scotia, Canada, Ottensmeyer and Whitehead (2003) distinguished individuals on the basis of distinctive marks on the dorsal fin. Animals formed short-term associations over hours to days and long-term associations over years. Jankowski (2006) found that groups consisted of 14.5 whales on average, with a typical group size of 23 whales, which largely disassociates into its component units (typically 8 whales) within a day. Within-unit relationships typically lasted 4 years, but this is likely an underestimate.

*G. melas* is one of the species most often involved in mass strandings, e.g. on Cape Cod (Massachusetts, USA) beaches from October to January. Their tight social structure also makes pilot whales vulnerable to herding, and this has been taken advantage of by whalers in drive fisheries off Newfoundland, the Faroe Islands, and elsewhere (Jefferson et al., 1993). If

a whale of extreme social importance or strong filial bond strands due to pathological or navigational problems, others in the pod may strand also and then be unable to remain off the beach once removed due to a secondary social or "caring" response. This social response, however, was used successfully to keep a pod of long-finned pilot whales from repeated strandings by researchers in New Zealand: Because the "distress calls" of the beached young of the pod appeared to evoke a stranding response from the older whales, the younger whales were towed offshore and moored to buoys, an action which lured the older animals back out to sea (Bernard and Reilly, 1999 and refs. therein).

**Reproduction:** Mating occurs primarily in May-June and again at a lower rate in October in the North Atlantic (Desportes et al. 1993; Martin and Rothery, 1993). Calving and breeding can apparently occur at any time of the year, but peaks occur in summer in both hemispheres (Jefferson et al. 1993).

Goodall and Macnie (1998) reported that young were present in all areas of the south Pacific and South Atlantic, including the sub-Antarctic, where they were seen in January (summer), March and April (autumn) and October (spring), when a birth occurred, and in the Antarctic in summer, with a birth occurring at South Georgia in March (autumn).

**Food:** Primarily squid eaters, pilot whales will also take small medium-sized gregarious fish, when available (Desportes and Mouritsen, 1993; Jefferson et al. 1993). They feed mostly at night, when dives may last for 18 minutes or more and reach 828m depth (Carwardine, 1995, Heide-Jørgensen et al. 2002). In the western North Atlantic the main prey is the squid *Illex illecebrosus*, although cod (*Gadus morhua*) or Greenland turbot (*Rheinhardtius hippoglossoides*) may be eaten when squid is not available. Off the northeastern United States, Atlantic mackerel (*Scomber scombrus*) is thought to be an important prey item, at least during winter and early spring (Abend and Smith, 1997). Olson (2009) described the diet in the northwest Atlantic; it includes cod (*Gadus morhua*), turbot (*Scomber scombris*), herring (*Clupea harengus*), hake (*Merluccios bilinearis*; *Urophysis spec.*) and dogfish (*Squalus acanthias*). Mintzer et al. (2008), however, found that long-finned pilot whales off North Carolina feed predominantly on the long-finned squid (*Loligo pealei*).

The squid *Todarodes sagittatus* and species of the genus *Gonatus* are reported prey items of long-finned pilot whales in the eastern North Atlantic (Olson, 2009). Although squids are the predominant prey around the Faroe Islands, some fish, such as *Argentina silus* and *Micromesistius poutassou*, are taken too. The whales in this region do not appear to select cod, herring or mackerel, although they are periodically abundant (Reyes, 1991 and refs. therein; Desportes and Mouritsen, 1993; Bernhard and Reilly, 1999 and refs. therein).

Off the South Island of New Zealand, longfinned pilot whales feed exclusively on cephalopods, mainly arrow squid, *Nototodarus* spp., and common octopus, *Pinnoctopus cordiformis* (Beatson and O'Shea, 2009).

Werth (2000) described the feeding mechanism in captive juvenile long-finned pilot whales: Depression and retraction of the large, piston-like tongue generated negative intraoral pressures for prey capture and ingestion. Food was normally ingested without grasping by teeth, yet was manipulated with lingual, hyoid, and mandibular movement for realignment; suction was then used to transport prey into the oropharynx.

## 5. Migration

In the Northwest Atlantic, pilot whales move towards the shelf edge during mid winter through early spring, then move northward along the edge to George's Bank and Nova Scotia, arriving off Newfoundland in summer. The peak of the breeding season is said to be in August in Newfoundland waters, where the whales remain until late autumn. The inshore-off-shore movements of pilot whales in the western North Atlantic have been correlated with movements of their preferred prey, squid (Reyes, 1991 and ref. therein; Bernard and Reilly, 1999 and refs. therein). Jankowski (2006) used photo-identification data from two study sites 40 km apart, off the northwest coast of Nova Scotia, Canada, between 1998 and 2003, to investigate habitat utilisation. An average individual visits the study area for 1-2 days but may return over a 5 year period. Individuals are well-mixed between the two study sites. A satellite-monitored whale tracked for 95 days in the western North Atlantic was located during movements of at least 7,588 km and sighted from an aircraft several times in the company of other pilot whales (Mate 1989).

Site fidelity is also reported from the the Faroe Islands, where pilot whales occur all year round with a peak abundance in July-September. New tracking studies show a preference for the area over the border of the continental shelf (Bloch et al. 1993c; Bloch et al. 2003).

## 6. Threats

**Direct catch:** Drive fisheries for long-finned pilot whales in the Faroe Islands date back to the Norse settlement in the 9th century. Catch statistics exist from the Faroes since 1584, unbroken from 1709-today and showing an annual average catch of 850 pilot whales (range: 0 - 4,480) with a cyclic variation correlated with North-Atlantic climatic variations (Bloch and Lastein, 1995; Bloch, 1998). Considering the mobility of these animals, it seems likely that these catches are recruited from a larger area in the North Atlantic than previously assumed. This suggests that the whales are taken from a larger population than that estimated from coastal areas around the Faroe Islands, hence increasing the probability that the harvest is sustainable (Bloch et al. 2003). In Greenland, fisheries are minor (Butterworth, 1996).

**Incidental catch:** Incidental catches are reported from Newfoundland, the Mediterranean and the Atlantic coast of France, and according to Bernard and Reilly (1999 and refs. therein) there are probably more pilot whales taken incidentally than are presently documented. On the east coast of the USA, the foreign Atlantic mackerel fishery was responsible for the take of 141 pilot whales in 1988. This fishery was suspended in early May of that year as a direct result of this high take. More recently, most of the estimated marine mammal bycatch is from U.S. Atlantic EEZ waters between South Carolina and Cape Cod in the pelagic longline fishery. The average annual *Globicephala* spp. mortality in 2000-2004 was 70 animals (CV=0.37). The average annual estimated fishery-related mortality in the northeast mid-water trawl fishery during 2002-2004 was 8.9 (CV= 0.35) (Waring et al. 2007).

In British waters, long-finned pilot whales are accidentally caught in gillnets, purse seines and in trawl fisheries (Reyes, 1991 and refs. therein). The seas around Cornwall, SW Britain, are one of the most heavily fished areas of the UK, and Leeney et al. (2008) found that strandings of pilot whales around Cornwall have increased significantly since the mid-1970s, with seasonal peaks in stranding frequencies between November and January. Sixty-one % of investigated individuals were determined to have died due to bycatch in fishing gear.

A 1990 workshop to review mortality of cetaceans in passive nets and traps documented an annual kill of 50-100 *G. melas* off the Atlantic coast of France. Furthermore, pilot whales are also known to be taken incidentally in trawl and gillnet fisheries in the western North Atlantic and in swordfish driftnets in the Mediterranean (Jefferson et al. 1993). This seems to be still ongoing, as Lopez et al. (2003) report that around 200 cetaceans might be caught annually in inshore waters and around 1500 in offshore waters of Galicia (NW Spain), mainly small dolphins, as well as *Tursiops truncatus* and *Globicephala melas*.

Very few were reported taken incidentally in fisheries in the southern hemisphere (Reyes, 1991 and refs. therein). However, Zerbini and Kotas (1998) reported on cetacean-fishery interactions off southern Brazil. The pelagic driftnet fishery is focused on sharks (families Sphyrnidae and Carcharinidae) and incidentally caught species include 15 *G. melas* in 1995 and 1997. Authors conclude that the driftnet fishery may be an important cause of cetacean mortality and that a systematic study should be carried out in order to evaluate the impact of this activity.

**Overfishing:** Commercial fisheries for squid are widespread in the western North Atlantic. Target species for these fisheries are squid species which form a large part of the diet of pilot whales, making these vulnerable to prey depletion (Taylor et al. 2008).

**Ship strikes:** Since high speed ferries were introduced in the Canary Islands in 1999, their number has grown steadily, and collisions with cetaceans have been reported ever since. While true numbers of collisions remain unknown, estimates range from approx. 10 to 30 cetaceans killed every year. Present knowledge indicates that the sperm whale is the species most frequently hit, but baleen, beaked and pilot whales are affected as well (Weinrich et al. 2005)

**Pollution:** Long-finned pilot whales off the Faroes, France, UK and the eastern US appear to be carrying high levels of DDT and PCB in their tissues, and where whales are consumed by humans, this leads to high-level burdens of organohalogenes among residents, e.g. at the Faroes (Faengstroem et al. 2005). In other parts of their distributional range, e.g. off Newfoundland and Tasmania, very low levels of DDT were detected. Heavy metals such as cadmium and mercury also have been found in pilot whales from the Faroes. Because these contaminants accumulate in tissues over time, older animals and especially adult males tend to have higher concentrations (Borell and Aguilar, 1993; Caurant et al. 1993; Caurant and Amiard-Triquet, 1995). Combinations and levels of these pollutants may one day play a role in stock differentiation (Reyes, 1991 and refs. therein; Bernard and Reilly, 1999 and refs. therein; Frodello et al. 2000; Nielsen et al. 2000).

Weisbrod et al. (2000) characterised organochlorine bioaccumulation in pilot whales collected from strandings in Massachusetts and caught in nets. Whales that stranded together had more similar tissue-levels than animals of the same gender or maturity, reflecting pod-fidelity. The high variation in tissue concentrations among individuals and pods, and the similarity within a stranding group suggest that pilot whale pods are exposed to a large range of pollutant sources, such as through different prey and feeding locations (Desportes et al. 1994).

**Noise pollution:** The military makes extensive use of underwater sound in order to find targets such as ships and submarines, and some active military sonar systems are known to use very loud sources. However, in part because these systems are classified, the characteristics of such sound sources have rarely been published, and there have been few

studies of their effects on cetaceans. Although Rendell and Gordon (1999) could not show any deleterious consequences for the species, recordings of vocalisations indicated short-term vocal responses of long-finned pilot whales to the sound source. However, in 2005, three mass stranding events occurred in Tasmania, Australia, involving approximately 145 long-finned pilot whales. The first occurred six hours before the arrival of two Royal Australia naval vessels, the second event began just over an hour after the vessels began using high frequency (50–200 kHz) sonar in the vicinity of the stranding. A behavioral reaction to the sonar facilitating the second and third stranding events could not be ruled out (Parsons et al. 2008).

## 7. Remarks

**Range states** (Taylor et al. 2008): Algeria; Argentina; Australia; Belgium; Brazil; Canada; Chile; Denmark; Falkland Islands (Malvinas); Faroe Islands; France; French Southern Territories (the) (Crozet Is.); Germany; Greenland; Heard Island and McDonald Islands; Iceland; Ireland; Italy; Libyan Arab Jamahiriya; Malta; Morocco; Namibia; Netherlands; New Zealand (Antipodean Is., Chatham Is., North Is., South Is.); Norway; Peru; Portugal (Azores, Madeira); South Africa (Marion-Prince Edward Is., Western Cape Province); South Georgia and the South Sandwich Islands; Spain; Sweden; Tunisia; United Kingdom; United States (North Carolina); Uruguay.

The only current fishery for long-finned pilot whales is undertaken in the Faroe Islands. Although this fishery has been actively pursued since the 9th century, catch levels have not shown evidence of depletion of the stock as occurred off Newfoundland. ICES and NAMMCO as well as the IWC, have concluded that with an estimated population size of 778,000 in the eastern North Atlantic and approximately 100,000 around the Faroes (Buckland et al. 1993; NAMMCO, 1997) the Faroese catch will not deplete the population. Pilot whales seem to utilise a larger area around the Faroes (Desportes et al. 1994; Bloch et al. 2003), which according to these sources also reduces any threat.

*Globicephala melas* is considered as “Data Deficient” by the IUCN. The species is listed on CITES Appendix II.

The North and Baltic Sea populations have been listed in Appendix II of CMS. However, data on long-range movements in the NW and NE Atlantic suggest that these stocks should also be included in App. II of CMS. Range states concerned are the US, Canada, Greenland, Iceland, Norway, Ireland and the UK.

Attention should also be paid to the western North Atlantic population(s), in particular migration between US and Canadian waters, formerly depleted by overhunting and now facing increasing incidental mortality in trawl fisheries (Reyes, 1991 and refs. therein).

As noted above, pollution (including noise pollution) by-catch and mass strandings may be a threat to the species and warrant further investigation. Population size and migratory patterns, including home-range sizes are insufficiently known. For recommendations on South American stocks, please see Huckle-Gaete (2000) in Appendix 1.

Please also see a report on the long-finned pilot whale posted on the web by the North Atlantic Marine Mammal Commission: <http://www.nammco.no>

## 8. Sources

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