**Hyperoodon ampullatus (Forster, 1770)**

English: North Atlantic bottlenose whale, northern bottlenose whale
German: Dögling, Entenwal
Spanish: Ballena nariz de botella del Norte
French: Hyperoodon boréal

Family Ziphiidae

## 1. Description

Northern bottlenose whales are the largest beaked whales in the North Atlantic and reach 10 m (and possibly up to 11.2 m) body length. Their body mass can reach 7,500 kg (Jefferson et al. 2008). Body shape is robust and they have a large, bulb-shaped forehead and short, dolphin-like beak. Their colour is chocolate brown to yellowish-brown, being lighter on the flanks and belly. Some of this colouration is believed to be caused by a thin layer of diatoms. Mature males have a squared-off forehead, which turns white after sexual maturity is reached, whereas in females and immature males it is rounded and brown (Bloch et al. 1996). Older females have a white band around the neck (Jefferson et al. 2008). Males possess a single pair of conical teeth at the tip of the lower jaw, rarely visible in live animals, especially if the mouth is closed (Gowans, 2002).

## 2. Distribution

http://www.iucnredlist.org/apps/redlist/details/10707/0/rangemap

*Distribution of* Hyperoodon ampullatus*: North Atlantic Ocean, normally in water deeper than 1,000m (Taylor et al. 2008; © IUCN).*

The North Atlantic bottlenose whale is found in the subarctic North Atlantic from Davis Strait, Jan Mayen, west coast of Spitsbergen, and Bjornøya, south to Nova Scotia and the western side of the British Isles (Rice, 1998).

In the eastern part of their distributional range, there are no confirmed records from Novaya Zemlya, the Barents Sea or the coast of Finnmarken in northern Norway (Mead, 1989). There are few records east of the Norwegian Sea and from the Mediterranean (Rice, 1998). One specimen was reportedly caught in the North Sea during the period 1938-1972 and Kastelein and Gerritis (1991) observed an animal off The Netherlands, however the shallow southern North Sea may not be part of its native range. Strandings are reported from the coasts of Belgium, The Netherlands, Denmark, France and England (Boschma, 1950; De Smet, 1974; Duguy 1990, Van Gompel 1991, Kinze et al, 1998). Lick and Piatkowski (1998) report on a stranding in the southern Baltic Sea. Gowans (2002) also includes the Azores into the range of the species.

In the western North Atlantic, Lucas and Hooker (2000) report recent strandings from Sable Island, Nova Scotia and further strandings have been reported from as far south as Rhode Island (Mead, 1989; Reyes, 1991).

Past reports of *H. ampullatus* in the temperate and subarctic North **Pacific** seem to have been due to confusion with *Berardius bairdii*, because both species are known colloquially as "bottle-nose whales" (Rice, 1998).

## 3. Population size

**Stocks:** There seem to be certain pockets of abundance, for example: around "the Gully", between Sable Island and Nova Scotia; in the Arctic Ocean, between Iceland and Jan Mayen, southwest of Svalbard and east off Iceland-north off the Faroes; and in Davis Strait, off northern Labrador, especially around the entrance to Hudson Strait and Frobisher Bay (Carwardine, 1995).

For statistical consideration Christensen (1976) assumed that all the bottlenose whales caught east of Greenland belonged to a single population, while Mitchell (1977) defined Cape Farewell (Greenland) to divide west and east North Atlantic catches. Recently some limited evidence for stock structure is emerging. Animals in The Gully, off Nova Scotia seem to be largely or totally distinct from the population off northern Labrador: they are smaller and appear to breed at a different time of year (Whitehead et al. 1997). Gowans (2009) suggests that different length distributions in whales found in different areas of the Atlantic indicates possible geographical isolation. Furthermore, genetic studies indicate reproductive isolation between bottlenose whales in the Gully and Labrador, the latter seem to be more related to their conspecifics from Iceland (Dalebout et al. 2006).

**Population size:** The total number of northern bottlenose whales off the eastern U.S. coast is unknown (NEFSC 2007) and this holds true for most of their range. Barlow et al. (2006) list the reasons: mostly unknown population structure, a knowledge gap with respect to distribution, difficulties in estimating correction factors for missed animals due to long dive times and a lack of dedicated surveys.

Whitehead et al. (1997) estimate that approximately 230 *H. ampullatus* use the Gully, a prominent submarine canyon on the edge of the Nova Scotia Shelf, throughout the year. Approximately 57% of the population reside in a 20 x 8 km core area at the entrance of the canyon at any time. Gowans et al. (2000) analysed data from 11 years of photo-identification records to estimate the population size using mark-recapture techniques and found no significant change in population size over time. Sex ratio was roughly 1:1, with equal numbers of sub-adult and mature males. The population was recently estimated to contain about 163 animals (95% confidence interval 119-214), with no statistically significant temporal trend (Whitehead and Wimmer, 2005).

Estimates for Icelandic and Faroese waters are 3,142 and 287 whales respectively, although allowance was not made in the analysis for animals not observed because of their long dives (Reyes, 1991). Gunnlaugsson and Sigurjonsson (1990) estimate 5,827 whales at high latitudes in the Northeastern Atlantic and NAMMCO has calculated the population size of this species in the eastern part of the North Atlantic to be around 40,000 individuals (NAMMCO Annual Report 1995).

A study by Christensen and Ugland (1984) resulted in an estimated initial (pre-whaling) population size of about 90,000 whales, reduced to some 30,000 by 1914. The population size by the mid-1980's was said to be about 54,000, nearly 60% of the initial stock size.

## 4. Biology and Behaviour

**Habitat:** *H. ampullatus* is most common beyond the continental shelf and over submarine canyons, in deep water (>1,000m). It sometimes travels several kilometres into broken ice fields, but it is more common in open water. Few whales were caught over the continental shelf off Labrador and in waters less than 1,000m deep off the west coast of Norway. In the surrounding waters of Iceland, the whales were sighted at surface temperatures between -1.3°C and +0.9°C (Reyes, 1991).

**Behaviour:** The northern bottlenose whale is a curious animal: it will approach stationary boats and seems to be attracted by unfamiliar noises, such as those made by ships' generators. This, combined with its habit of staying with wounded companions, made it especially vulnerable to whalers. These deep divers can remain submerged for an hour, possibly as long as 2 h (Reeves et al. 1993, Bloch et al. 1996). Hooker and Baird (1999) showed that northern bottlenose whales in a submarine canyon off Nova Scotia exhibit an exceptional diving ability, with dives approximately every 80 min to over 800 m (maximum 1,453 m) depth, and up to 70 min in duration. Sonar traces of non-tagged, diving bottlenose whales in 1996 and 1997 suggest that such deep dives are not unusual. This shows that they may make greater use of deep portions of the water column than any other mammal so far studied. Many of the recorded dives of the tagged animals were to, or close to, the sea floor, consistent with benthic or bathypelagic foraging.

**Reproduction:** Northern bottlenose whales have a calving peak in April (Jefferson et al. 1993).

**Schooling:** Most pods contain at least 4 whales, sometimes with as many as 20, and there is some segregation by age and sex (Mead, 1989, Jefferson et al. 1993). Northern bottlenose whales in the Gully also form small groups. Associations within age/sex classes (female /immature, subadult male and mature male) were significantly higher than associations between different classes. Females and immature bottlenose whales formed a loose network of associations, showing no preferential associations with particular individuals or those from specific age/sex classes nor any long-term bonds. Mature and subadult males had stronger associations with individuals in their own class, and associations between some males lasted for several years, although males also formed many short-term associations. Overall the social organization of northern bottlenose whales in the Gully appears to resemble that of some bottlenose dolphins, *Tursiops truncatus*, living in shallow, enclosed bays (Gowans et al. 2001).

**Food:** Although primarily adapted to feeding on squid, these whales also eat fish, sea cucumbers, starfish, and prawns. They apparently do much of their feeding on or near the bottom (Jefferson et al. 1993; Mead, 1989). Hooker et al. (2001) found a high proportion of the squid *Gonatus steenstrupi* in the stomachs of two bottlenose whales stranded in eastern Canada. They also collected remote biopsy samples from free-ranging bottlenose whales off Nova Scotia and determined fatty acid composition. Overall, the results of these techniques concurred in suggesting that squid of the genus *Gonatus* may form a major part of the diet of bottlenose whales in the Gully (Hooker et al. 2001).

Stomach content analysis by Clarke and Kristensen (1980) on a specimen stranded on the Faroe Islands showed that while the cephalopods found included six cold water species which were probably taken in deep water within the vicinity of the Faroes, they also included one species, *Vampyroteuthis infernalis*, which is a warmer water species and probably ranges little further north than 40°N. This suggests the whale had been much further south in the Atlantic

than the Faroes at 62°N just before its stranding or that the distribution pattern of this cephalopod is not that well known. The stomach contents examined in the Faroese show more diversity with 13 species eaten than those from a whale stranded in Denmark (Clarke and Kristensen, 1980) and from whales shot off Labrador and Iceland, which contained only one species, *Gonatus fabricii*. Santos et al. (2001) report on stomach contents of bottlenose whales stranded in the North Sea. Their results are in agreement with those of previous authors in that cephalopods in general, and *G. fabricii* in particular, are the main prey of the northern bottlenose whale.

## 5. Migration

Migratory movements are poorly documented, as are stock relations among the animals found in apparently disjunct centres of spring and summer abundance (Reeves et al. 1993). In the eastern part of the range *H. ampullatus* probably moves north in spring and south in autumn; in the west, at least some animals are believed to overwinter at lower latitudes. There may also be some inshore-offshore movements (Carwardine, 1995).

In the western North Atlantic, bottlenose whales are present during much of the year in The Gully and in the Labrador Sea. Bottlenose whales in The Gully appear to be largely non-migratory, and this population of a few hundred whales might be vulnerable to the environmental degradation associated with nearby oil and gas production (Reeves et al. 1993). However, Gowans et al. (2000) found that over the summer field season, individuals emigrated from, and re-immigrated into the Gully, spending an average of 20 days within the Gully before leaving. Approximately 34% of the population was present in the Gully at any one time. Individuals of all age and sex classes displayed similar residency patterns although there were annual differences as individuals spent less time in the Gully in 1996 than in 1990 and 1997. Sighting rates were similar in all years with extensive fieldwork, indicating little variability in the number of whales in the Gully each summer.

Mitchell (1977) suggested that in the western North Atlantic, *H. ampullatus* may forage into the Northeast Channel and the Gulf of Maine in winter months.

A southward migration, better known in the eastern North Atlantic begins in July, when animals are moving south from the Norwegian Sea, and continues to September. The increase of strandings on the British coasts and on the North Sea coasts probably reflects part of this summer migration, which remains unknown in the northwest Atlantic. There is evidence from the distribution of catches that a northward migration occurs in the eastern North Atlantic in April-July (Reyes, 1991 and refs. therein). Bottlenose whales occur all year round in the Faroes, but with a distinct peak a fortnight around 1 September pointing at a very synchronized southernly migration route (Bloch et al. 1996).

This is further supported by MacLeod et al. (2004): Strandings of northern bottlenose whales on the coasts of the UK and the Republic of Ireland were lowest in April and highest in September. The number of strandings between months differed significantly from an even spread, with more strandings between July and October. Most strandings in late summer and autumn occurred on North Sea coasts and their stomach contents included the squid *Gonatus fabricii*, which is found only in more northern waters. This suggests that these whales may be migrating southward at this time of year.

Evidence of migratory movements of beaked whales in the Northeast Atlantic was obtained from an examination of historical strandings data from the United Kingdom and the Republic

of Ireland, and from whaling records from the Faroes, Iceland and the Norwegian Sea. There is strong evidence to suggest that beaked whales, particularly northern bottlenose whales, undertake regular migrations, moving south-west in late summer and autumn and moving north-east in late winter and spring (MacLeod and Reid, 2003).

## 6. Threats

**Direct catch:** Northern bottlenose whales have traditionally been the most heavily hunted of the beaked whales. Some hunting has been done by the British and Canadians, but by far the major bottlenose whaling nation was Norway: 65,800 were caught by Norway in the period 1882-1972 (Reeves et al. 1993, Bloch et al. 1996). They have also been hunted in a drive fishery in the Faroe Islands, with over 800 taken there (Bloch *et al*. 1996). Early on, they were hunted primarily for oil, but later mainly for animal feed. The northern bottlenose whale is said to have been twice overexploited by Norwegian hunting, in the periods 1880-1920 and 1938-1973. No hunting has been conducted by Norway since 1973 (Jefferson et al. 1993, Reyes, 1991). It was included in the IWC Schedule in 1977 and classified as a provisional Protected Stock with zero catch limits (Reyes, 1991).

Mitchell (1977) considers that the population was severely depleted in both the early and modern whaling periods. At present some are taken in the Faroe Islands, on average 2.2 whales per year in the period 1709-2002. However, there are reports that this limited catch probably does not constitute a significant threat to the species (Reyes, 1991; NAMMCO, 1995).

**Incidental catch:** None reported (Reyes, 1991).

**Overfishing:** There are no major fisheries for squid in the Northeast Atlantic, but future developments could represent some threat for a population which is still recovering from heavy losses due to whaling.

**Pollution:** In 2003, five years after major oil and gas development near The Gully a Marine Protected Area on the Scotian Shelf, eastern Canada, skin and blubber biopsy samples of bottlenose whales showed an increase in cytochrome P4501A1 (CYP1A1) protein expression, potentially coincident with recorded oil spills. A range of PCB congeners and organochlorine compounds were detected, with concentrations similar to other North Atlantic odontocetes. Concentrations were higher in whales from The Gully than from the Davis Strait, with significant increases in 4,4'-DDE and trans-nonachlor in 2002-2003 relative to 1996-1997 (Hooker et al. 2008).

**Habitat degradation:** Whitehead et al. (1997) report that threats to the population in The Gully include commercial shipping, fishing and oil and gas developments. One discovery of commercial interest, the Primrose Field, lies about 5 km from the core area of this population. The population is vulnerable because of its small size, location at the extreme southern limit of the species' range, and year-round dependence on a small and unique sea area.

**Noise pollution**: McQuinn & Carrier (2005) report that noise levels from 3-D seismic oil & gas exploration reached highest average sound pressure level (RMS) in the Sable Island Gully Marine Protected Area (MPA) of 145 dB re 1 µPa at 90 m depth, 50 km from the seismic array. It was estimated that sound levels in the MPA would have been between approximately 153 and 157 dB when the vessel was at its closest approach to the Gully in the eastern portion of the survey block. The "worst case" sound level at the Gully MPA boundary, i.e., 0.8 km

from the source, extrapolated from near-field measurements would have been approximately 178 dB, 14 dB higher than originally predicted in the EA and close to the 190 dB safety criteria. Measured sound levels were also significantly higher than the model predictions at several other stations and showed significant variability around the mean values. This demonstrates the importance of using accurate model input data, of using field validation to verify the model predictions and of the need to measure the variability around the mean sound level estimates.
There seem to be two important areas for beaked whales on the Atlantic Frontier: The Shetland-Faroes Channel and an area to the south-west of the Faroes, including the northern end of the Rockall Trough. These areas are linked by a corridor of suitable beaked whale habitat approximately 80km long and 50km wide at its narrowest point. During movements between the two areas, this narrow corridor may form a bottleneck through which the beaked whales must pass. Noise pollution, which has the potential to impact a large area simultaneously, in this bottleneck area during migrations may have a disproportionately large impact on beaked whales on the Atlantic Frontier (MacLeod and Reid, 2003).

There are a number of exercise areas for submarine and other naval vessels in UK waters, particularly in the coastal waters of Scotland, including a submarine testing site in Gairlochhead, near Glasgow. A number of northern bottlenose whale strandings over the past few decades were clustered around this particular site. A torpedo testing range in the Sound of Raasay in Scotland is also adjacent to the site of an unusual occurrence in shallow waters (less than 10m) of two normally deep-water (i.e. >250m) northern bottlenose whales in 1998 (Parsons et al. 2007).

## 7. Remarks

Range States: Azores; Belgium; Canada; Cape Verde; Denmark; Faroe Islands; France; Germany; Greenland; Iceland; Ireland; The Netherlands; Norway; Portugal; Spain; Svalbard and Jan Mayen; Sweden; United Kingdom; United States of America (mod. from Taylor et al. 2008)

*H. ampullatus* is categorised as "Data Deficient" by the IUCN (Taylor et al. 2008). It is listed in appendix II of CMS as well as in Appendix I & II of CITES.

## 8. Sources


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