

## Mesoplodonts – Beaked Whales: Introduction and Sources

Mesoplodont whales are relatively small, ranging in size between 3.9 and 6.2 m. Their body is spindle-shaped, with a small, triangular dorsal fin located about two thirds between the beak and the tail. The flippers are small and narrow and fit into pigmented depressions in the body. The unnotched flukes are usually straight across the trailing edge or even slightly convex. A single pair of external throat grooves may aid in suction feeding. The head is small and tapered and the melon is also small, blending into the beak without a crease. The blowhole is semicircular with the ends pointed forward. Most species show sexual dimorphism, as only adult males have functional teeth (tusks) and show excessive and conspicuous body scarring resulting from the usage of these teeth by other males in intraspecific fights (Pitman, 2009).

The distribution of many Mesoplodon species is known almost entirely from records of stranded individuals. This situation is due to the difficulty in making specific identifications of these animals at sea and the relative rarity of sighting them at all (Mead, 1989). Until today, *M. bowdoini*, *M. perrini*, *M. traversii*, *M. ginkgodens* and *M. hectori* have almost never been identified alive in the wild (Pitman, 2009). Furthermore, the distributional conclusions that are drawn from stranded animals are tentative due to the likelihood that these animals were diseased and strayed from their normal range. It is only when there is a large sample of strandings that have come from the same area that relatively firm distributional conclusions can be drawn. Care must also be taken in the weight which one gives to negative distributional data. In some cases there may be animals frequenting the waters and stranding upon the shores but there has not been enough cetological research in the area to bring the strandings to the attention of scientists (Mead, 1989).

Unfortunately, correct identification of mesoplodont specimens also seems to be fraught with difficulties. Dalebout et al. (1998) report that to assist in the species-level identification of stranded and hunted beaked whales, they compiled a database of 'reference' sequences from the mitochondrial DNA control region, for 15 of the 20 described ziphiid species. Reference samples for eight species were obtained from stranded animals in New Zealand and South Australia. Sequences for a further seven species were obtained from a previously published report. This database was used to identify 20 'test' samples obtained from incompletely documented strandings around New Zealand. Their analyses showed that four of these specimens (20% !) had initially been misidentified. Much of the research on mesoplodont whales is fairly recent: *M. peruvianus* was first described in 1991, *M. perrini* in 2002 and *M. bahamondi*, described in 1995, turned out to be the same species described by John Gray in 1874, as *M. traversii* (Gray, 1874) then forgotten by science since 1875 upon being registered equivocally as a mere synonym of *M. layardii*. There are surely more surprises to be expected.

### Populations size

According to Pitman (2002) so few mesoplodonts have been reliably identified at sea that it is impossible to accurately determine the population status of any species, although, based on stranding data, at least some species may not be as rare as the sightings records suggest. *M. grayi*, *M. layardii* and *M. densirostris* seem to be widespread and fairly common, whereas e.g. *M. bowdoini*, *M. perrini*, *M. traversii* and *M. hectori* are rather rare (Pitman 2009).

The best available abundance estimate of beaked whales for the western North Atlantic stock is 3,196, whereas the estimate for the northern USA Atlantic is 2,600 and for the southern USA Atlantic 596 (data from 1998, in Waring et al. 2001).

Most published estimates of abundance or density are based on visual line-transect studies that found narrower effective strip widths and lower trackline detection probabilities for beaked whales than for most other cetaceans. Published density estimates range from 0.4-44 whales per 1,000 km<sup>2</sup> for small beaked whales and up to 68 whales per 1,000 km<sup>2</sup> for large beaked whales (Barlow et al. 2006).

### **Habitat**

According to Pitman (2002) mesoplodont whales normally inhabit deep ocean waters (>2000m deep) or continental slopes (200-2000 m) and only rarely stray over the continental shelf. Whereas *M. densirostris* is found in all tropical and warm temperate oceans, most species are restricted to one or two broad ocean areas. The distribution of *M. perrini* could be considered localized (C.D.MacLeod, pers. comm. to author, 2003).

### **Migration**

*M. layardii* may undertake some limited migration to lower latitudes during winter (Pitman, 2002) and *M. bidens* may undergo migration in the eastern Atlantic (MacLeod et al. unpublished).

### **Food**

Mead (1989) reports that all beaked whales feed primarily on deep-water mesopelagic squid, although some fish may also be taken (Pitman, 2002; MacLeod et al. 2003). Most prey are probably caught at depths exceeding 200m via suction, as the dentition is much reduced and the mouth and tongue are highly adapted for this feeding method (Pitman, 2002). Diving durations of 20–45min have been reported, after which groups of animals surface together and stay within one body length of each other (Pitman, 2002).

Stomach samples of three beaked whale genera *Hyperoodon*, *Mesoplodon* and *Ziphius* primarily contained cephalopod and fish remains, although some also contained crustaceans. *Mesoplodon* spp. were found to contain the most fish, with some species containing nothing but fish remains, while the southern bottlenose whale (*Hyperoodon planifrons*) and Cuvier's beaked whale (*Ziphius cavirostris*) rarely, if ever, contained fish. Of cephalopods identified, Histioteuthid, Gonatid, Cranchiid and Onychoteuthid species usually contributed most to prey numbers and biomass. There was a wide range of species and families of cephalopods recorded from stomach contents, with no obvious preference for bioluminescent prey species, vertical migrating prey species or prey species with specific body conditions. Whales of the genus *Mesoplodon* generally contained smaller prey, such as cephalopods under 500g in weight, compared with other beaked whales. *Hyperoodon* and *Ziphius* frequently contained much larger cephalopods with many important species having a mean weight of over 1000g. This suggests that *Mesoplodon* occupies a separate dietary niche from *Hyperoodon* and *Ziphius*, which may be an example of niche separation. In contrast, *Hyperoodon* and *Ziphius* appear to occupy very similar dietary niches but have geographically segregated distributions, with *Hyperoodon* occupying cold-temperate to polar waters and *Ziphius* occupying warm-temperate to tropical waters (MacLeod et al. 2003)

## Threats

Although there has never been a directed fishery, some animals are occasionally taken by opportunistic whalers, or die in drift nets and lost fishing gear, as well as in longline fisheries (Pitman, 2002; 2009). Off the north-east US coast, 46 fishery-related mortalities were observed in the pelagic drift gillnet fishery between 1989 and 1998: 24 Sowerby's, 4 True's and 17 unidentified beaked whales (Waring et al. 2001).

Currently, the biggest threat to mesoplodonts may be anthropogenic noise sources associated with airgun arrays (seismic exploration) and military mid-frequency sonar (2-10 kHz). Necropsies of mass-stranded beaked whales exposed to these sound sources lead to the hypothesis that mortality may be caused by gas-bubble disease induced by behavioural responses to acoustic exposure (Cox et al. 2006). The authors conclude further that current monitoring and mitigation methods for beaked whales are ineffective for detecting and protecting them from adverse sound exposure. However, Moretti et al. (2006) tested passive acoustic detection of beaked whales (*M. densirostris*) using distributed bottom-mounted hydrophones in the Bahamas, a first promising step in that direction.

Evidence from stranded individuals of several similar species indicates that they have swallowed discarded plastic items, which may lead to starvation and eventually death (Taylor et al. 2008).

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