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## **To what extent do anthropogenic activities contribute to cetacean strandings around the British Isles?**

### **Introduction**

The order Cetacea belongs to the class Mammalia and includes whales, dolphins and porpoises. It contains ninety species, all of which are marine except for five species of freshwater dolphins. Modern cetaceans can be divided into two suborders, Mysticetes (baleen whales) and Odontocetes (toothed whales). Mysticetes have no teeth. Instead they have baleen plates suspended from the roof of the mouth, which are used to filter out plankton. Odontocetes have teeth and they also have the ability to use echolocation to actively seek out their prey.

Resident species and migratory species can be found in the waters around the British Isles and the most common of these are harbour porpoises (*Phocoena phocoena*), common dolphins (*Delphinus delphis*), bottlenose dolphins (*Tursiops truncatus*) and killer whales (*Orcinus orca*), all of which are odontocetes. In addition to these resident species, there are also many migratory species that pass by the British Isles each year on their way to and from the Arctic. These include larger odontocetes such as sperm whales (*Physeter macrocephalus*), as well as many of the mysticetes such as the small minke whale (*Balaenoptera acutorostrata*) and the much larger humpback whale (*Megaptera novaeangliae*).

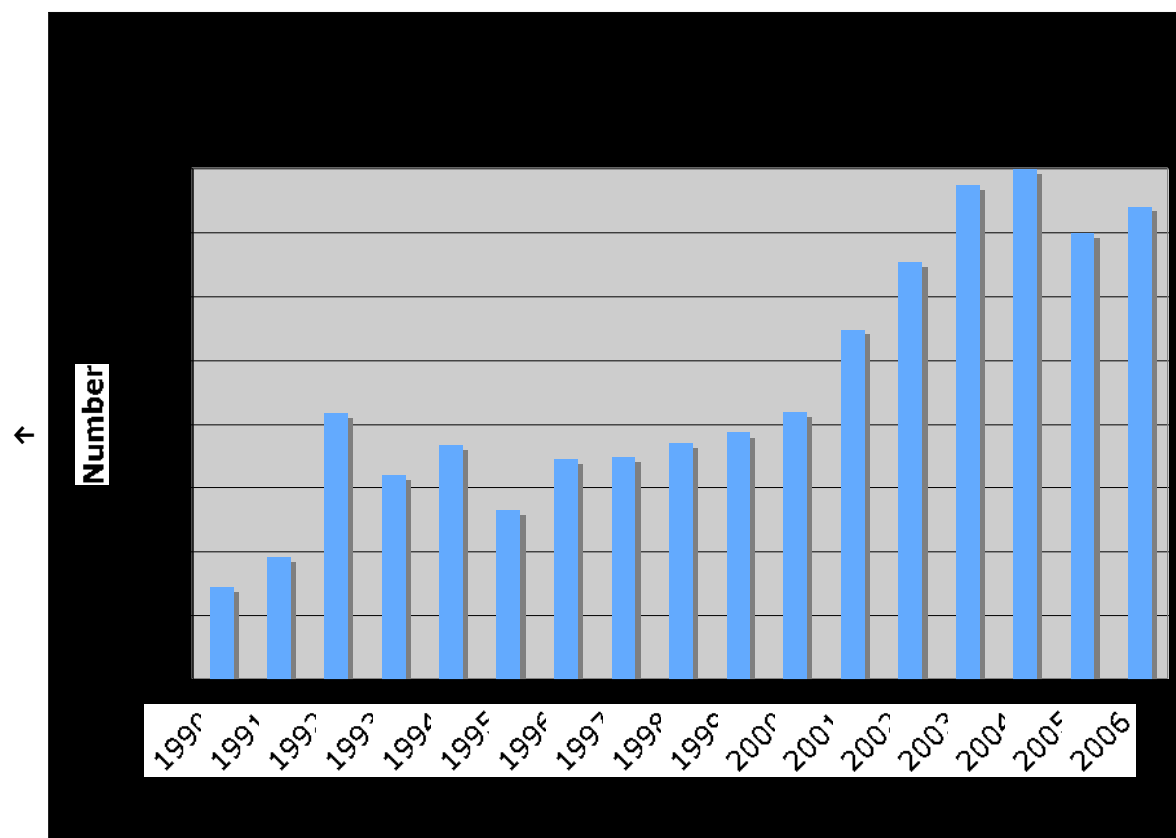
In 1990, the UK Department of the Environment (then DETR and now DEFRA) setup a long term monitoring programme involving the post-mortem examination of UK stranded cetaceans. For this paper, I will review four research papers outlining the trends in cetacean strandings around the UK coastline in the UK, between the years 2000 and 2006.

### **Research**

The methods used for collecting and analysing stranded cetaceans were as follows: The first point of contact would usually be members of the public reporting the presence of a stranded cetacean to a national hotline. If dead, the carcass would then be collected by a local organisation and transported to a laboratory for post-mortem examination. In the case of carcasses that were too large to transport, the post-mortem examinations were conducted at the site of the stranding, and in the case of live strandings, rescuers would first attempt to free the animal, and if unsuccessful, the carcass would then be examined.

The decision to carry out a post-mortem on the carcass would then be based on its state of decomposition, and if it was in good enough condition, its body and organs would be systematically examined and tissue samples would be collected for further analysis and archiving. Where possible a probable cause of death would then be assigned.

From the year 1990 to 2004, the total number of reported strandings progressively increased from 144 to 799, and since then the number has remained fairly stable (see Figure 1). The dramatic increase is thought to be mainly due to a greater public awareness and vigilance leading to a greater reporting effort (Jepson et al, 2005).



Entanglement in fishing gear has been the major cause of death for the majority of strandings from the time when post-mortem investigations were first conducted in 1990 to 2006. Harbour porpoises and common dolphins were most affected, and this probably reflects their relative abundance and lifestyle in that they are shallow living species feeding on small fish around the waters year round. Strandings of minke whales and striped dolphins were also bycatch related. Bycatch has been responsible for the deaths of between 22% and 30% of the cetaceans examined at post-mortem each year.

Between 2000 and 2004, physical trauma as a result of attack by bottlenose dolphins was the most common cause of death of harbour porpoises, and it accounted for the cause of death of between 8% and 15% of all cetaceans examined at post-mortem each year. Most of these cases were found in Wales near Cardigan Bay and in Scotland near Moray Firth, both of which are areas where there is a large resident bottlenose dolphin population.

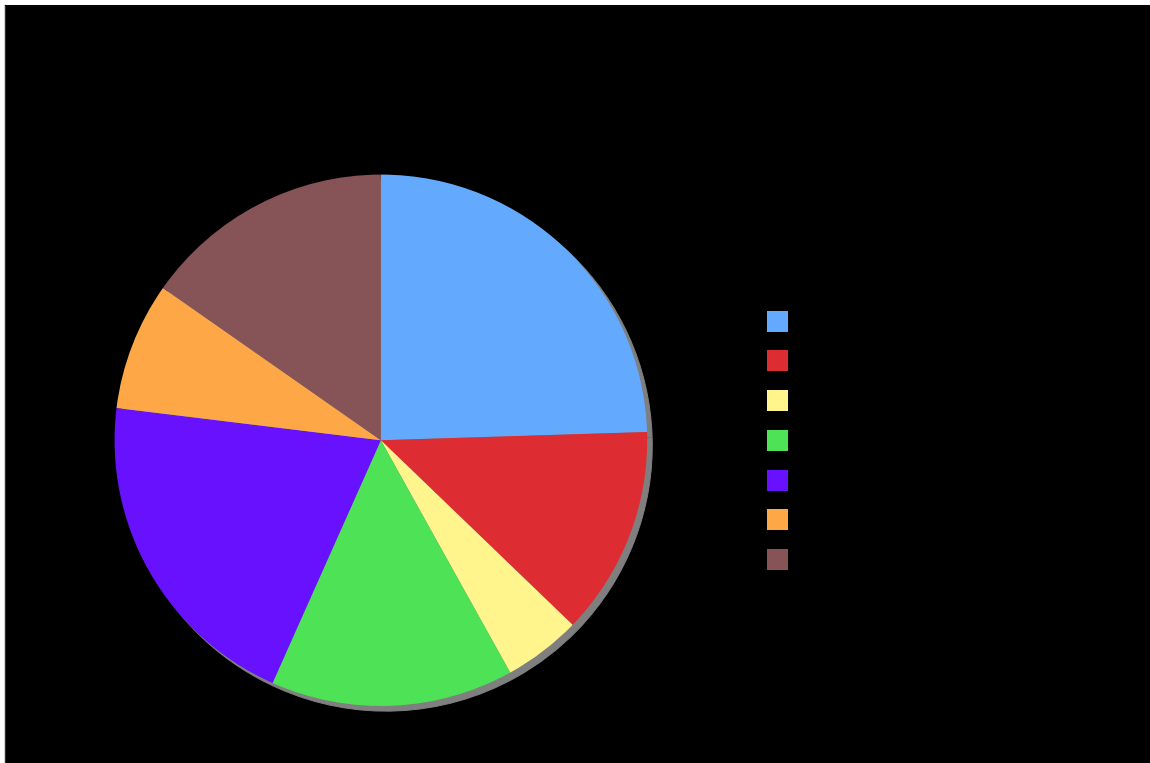
The other main cause of physical trauma not attributable to entanglement in fishing gear or attack by bottlenose dolphins is boat strike, however, this is fairly rare, with usually only a few cases each year.

Starvation was attributed as the cause of death in animals that were severely emaciated in the absence of any other underlying disease or trauma (Jepson et al, 2005). The most vulnerable species were harbour porpoises and starvation accounted for the cause of death of cetaceans ranging from 8% in 2004 to 22% in 2006.

Death as a result of infectious disease was attributable to about 20% of stranded cetaceans examined at post-mortem each year. The majority of these were due to parasitic infections of the lungs resulting in severe airway obstruction, pulmonary haemorrhage or secondary bacterial or fungal infections. Other causes of death by infectious disease were gastric or enteric parasitic or bacterial infections (Sabin et al, 2005).

The pathological and toxicological data collected on stranded harbour porpoises enabled some investigations to be carried out on the effects of exposure to pollutants on animal health. It was found that the harbour porpoises that died of infectious disease had significantly higher levels of polychlorinated biphenyls (PCBs) than apparently healthy individuals that died from physical trauma. This evidence suggests that PCB exposure may impair immune function causing increased susceptibility to viral, parasitic, bacterial and fungal infections (Jepson et al, 2005).

Live stranding was attributed as the cause of death in animals that were known or suspected to have live-stranded while in apparent good health and nutritional status (Sabin et al, 2005), and on average it was the cause of death of 12% of cetaceans examined at post-mortem each year. It is not known what causes an animal to live strand, but in most cases it is thought to be due to disorientation caused by some kind of illness. In larger species, a live stranding can be fatal even for a short while because the weight of the organs on land can cause severe internal damage.



The ability of some cetaceans (especially deep-diving species) to suffer potentially fatal gas embolism has been demonstrated, but there is much uncertainty of the mechanisms that produce these intravascular bubbles and of the factors that influence their initiation and persistence (Jepson et al, 2005). There is some circumstantial evidence linking this disorder to sonar activity, and one theory is that if the animal is spooked by sonar at depth, it may rush to the surface causing this kind of injury, thought to be a type of decompression sickness. As a cause of death, this only accounts for a few cases around the British Isles each year. This is possibly because the majority of cetaceans in the UK waters are comparatively shallow diving species and the continental shelf around the UK is relatively wide and shallow.

### Summary

In terms of anthropogenic activities, fishing is the greatest threat to cetaceans but due to its indirect effect, it is very difficult to quantify. Trauma caused directly by entanglement in fishing gear is responsible for about a quarter of all strandings and small shallow living odontocetes such as harbour porpoises and common dolphins are most vulnerable. Fishing is also indirectly responsible for strandings. It is thought that a reduction in resources has led to increased attacks by bottlenose dolphins on harbour porpoises in recent years in an effort to limit the competition for these resources. It also appears that starvation as a cause of death is on the increase too, particularly in neonatal harbour porpoises.

Disease is also the cause of death for a large proportion of strandings. Some preliminary investigations suggest that the presence of manmade toxins such as PCBs lowers the immunity of an individual to parasitic, bacterial, viral and fungal infections.

Recently it has also been suggested that sonar activity can frighten deep diving species causing them to surface too quickly and induce gas embolism. While this is an issue that does not have a great affect on cetaceans around the British Isles, it needs to be addressed in other parts of the world.

### **Bibliography**

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