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# Marine mammals and fisheries interactions in Indian seas

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Incidental capture of marine mammals in fishing gear is a major cause of concern. The International Union for Conservation of Nature (IUCN) identified bycatch as one of the serious threats to the marine mammals. The International Whaling Commission (IWC) estimated that at least 308,000 dolphins and porpoises are killed in bycatch every year in the world oceans. The Indian seas support 26 species of cetaceans and one species of sirenian. Until 2003, knowledge on marine mammals of India was restricted to incidental catch of different species in fishing gear. Between 2003 and 2012, the Central Marine Fisheries Research Institute (CMFRI) undertook a research project on marine mammals and conducted extensive visual sighting cruises onboard FORV *Sagar Sampada* in the Indian EEZ and contiguous seas to explore diversity, distribution and ecological characters of this mega fauna. The project also undertook a survey on the marine mammals that are incidentally captured by fishing gear.

However, the extent of mortality caused due to fishing has not been properly documented so far. The available records are limited to a few beachcast specimens published occasionally in grey literature. The records that are available in the Indian seas for the last 200 years are consolidated in Table 1. The table does not show the number of marine mammals that had been caught so far, as the actual numbers must have been higher by an order of several magnitudes. Most of these records have stated that the capture is mainly by gillnets. In 2001, Government of India listed all marine mammals under Wildlife (Protection) Act. Under the act, capture and trade on marine mammals is punishable. This act has considerably reduced intentional capture of the mammals, but incidental capture still remains an issue. In 2007, the CMFRI estimated that 9,000 to 10,000 cetaceans are incidentally caught every year, mostly by gillnets along the Indian coast. .

While Table 1 is in no way a total estimate of the number of kills by the fishery, it indicates the species that are relatively more vulnerable to fishing. The spinner dolphin, common dolphin, bottlenose dolphin, humpback dolphin, pilot whale and dugong have been recorded in relatively large numbers in the beachcast specimens over the years, indicating the vulnerability of these species to fishing. The maps generated by the CMFRI on the distribution of marine mammals in the Indian seas shows that the first four species, along with finless porpoise have been distributed in large numbers in the coastal and nearshore waters, whereas several other species are relatively oceanic. Hence, it is not a surprise that those species that are distributed nearshore are encountered in greater frequency and numbers in fishing operations. Stomach content analysis of the beachcast samples has confirmed the coastal feeding habit of these species. For example, the stomach content of bottlenose dolphin incidentally caught in Gulf of Mannar (southeast coast of India) consisted of fishes like *Saurida tumbil*, *Sphyræna* spp., *Ilisha* spp., *Trichiurus* spp., *Polynemus* spp., and *Stolephorus* spp, which are commonly found in the coastal fisheries. The stomach contents of humpback dolphin collected from southwest coast of India also consisted of dominant fishery groups such as *Nemipterus* sp, *Saurida* sp and *Lactarius lactarius*. Thus the intense interaction of a few species of dolphins with coastal fisheries is evident.

Table 1. Bycatch of marine mammals in Indian seas

Species	Number in catch
Blue Whale <i>Balaenoptera musculus</i>	63
Bryde's Whale <i>Balaenoptera edeni</i>	14
Minke whale <i>Balaenoptera acutorostrata</i>	3
Humpback whale <i>Megaptera novaeangliae</i>	9
Fin Whale <i>Balaenoptera physalus</i>	30
Sperm whale <i>Physeter macrocephalus</i>	32
Pygmy sperm whale <i>Kogia breviceps</i>	3
Dwarf sperm whale <i>Kogia sima</i>	3
Killer whale <i>Orcinus orca</i>	5
False killer whale <i>Pseudorca crassidens</i>	21
Pygmy killer whale <i>Feresa attenuata</i>	2
Melon-headed whale <i>Peponocephala electra</i>	5
Short-finned pilot whale <i>Globicephala macrorhynchus</i>	152
Cuvier's beaked whale <i>Ziphius cavirostris</i>	2
Spinner dolphin <i>Stenella longirostris</i>	332
Spotted dolphin <i>Stenella attenuata</i>	5
Striped dolphin <i>Stenella coeruleoalba</i>	2

Rough toothed dolphin <i>Steno bredanensis</i>	2
Indo-Pacific bottlenose dolphin <i>Tursiops aduncus</i>	201
Long-beaked common dolphin <i>Delphinus capensis</i>	300
Humpbacked dolphin <i>Sousa chinensis</i>	156
Risso's dolphin <i>Grampus griseus</i>	11
Finless porpoise <i>Neophocaena phocaenoides</i>	68
Irrawady dolphin <i>Orcaella brevirostris</i>	24
Dugong <i>Dugong dugon</i>	477

For advocating measures to reduce incidental kills by fishing gear, the marine fisheries setting in India needs to be recognized. Marine fisheries have very important roles for food supply, food security, income generation and employment. About one million people work directly in this sector, producing about 4 million tonnes annually. The value of fish catch at production level is about US \$ 4.4 billion and India earns nearly US \$ 3 billion by exporting fish and fishery products. As it is not mandatory for the fishermen to declare details of fishing operations and catches, monitoring the marine mammal – fisheries interaction is not easy. In the absence of information on fishing grounds, bycatch and discard of marine mammals, it is difficult to quantify the number and recognize the species of marine mammals caught by fishing gear. To develop time series database on incidental capture, stranding and beach cast marine mammals, the potential role of fisheries organizations such as Central Marine Fisheries Research Institute and fisheries departments of state governments, who regularly record fish landings along the Indian coast, should be explored. With support from Ministry of Environment and Forests, Government of India and Wildlife Conservation authorities, a mechanism needs to be developed for collection of data on incidental capture, stranding and beachcast marine mammals.

Possible modifications of fishing gear and strategies in gillnet fisheries such as lowering the net height, changing the mesh size, changing the hanging ratio of the net and increasing the gap between the bridle may reduce bycatch of cetaceans in gillnet. However, management of cetacean bycatch problem is not simply a matter of designing effective by-catch reduction devices. It is important to recognize that marine mammal conservation can take place only with the support and participation of fishermen. If fishermen want, they can avoid by-catch of marine mammals. A skilled fisherman knows the area of marine mammal's occurrence and he can avoid those areas from fishing. There is a need to create awareness among fishermen and public on the importance of mammals in the marine ecosystems, their status and threats, and the need for conservation. Training to fishermen, wildlife managers and non-governmental organizations should be organized on handling the live strandings and dead carcasses of marine mammals. Fishermen should be encouraged to report live or dead marine mammals caught in fishing gear.

Conservation of marine mammals could be achieved by integrating the agenda into fisheries regulatory mechanisms. The fisheries regulatory instruments such as Code of Conduct for Responsible Fisheries and Ecosystem-based Fisheries Management, which have conservation of endangered animals enshrined in the articles, need to be put in place. Establishment of Marine Mammal Sanctuaries should be initiated where populations of dolphins and dugong are abundant. The articles on conservation of endangered animals need to be suitably amended into the Marine Fisheries Regulation Act of state governments. A National Action Plan on Marine Mammals is needed for India.