

Marine Debris and Cetaceans



The scale of the problem

Marine debris¹ is a growing, global problem. Since its advent, plastic in the form of solid waste materials has become ubiquitous in all oceans of the world and is a growing problem. Human detritus dumped from vessels and sea platforms, blown from landfills, spilling from industrial outfalls and discarded by coastal communities does not just foul beaches and threaten human health and safety. As it pervades the sea, it kills or maims countless marine animals through entanglement or ingestion and destroys wildlife habitats by smothering the seabed and disturbing benthic communities by mechanical scouring. Pieces of marine debris can also transport invasive species between oceans and facilitate the transfer of persistent organic pollutants into the food web.

Plastic and synthetic materials are the most common types of marine debris and cause the most problems for marine animals. At least 267 different species are known to have suffered from entanglement or ingestion of marine debris, including many cetacean species, although the extent of the threat remains unclear.

The threat to cetaceans

Macro debris

Many studies conducted across the world show that large (macro) debris is ubiquitous in the world's oceans and on its shorelines. Higher quantities are found in the mid-latitudes and tropics, with particular concentrations associated with shipping lanes, fishing areas and ocean convergence zones. As floating debris becomes trapped in oceanic gyres², surface 'garbage patches' can assume vast dimensions. Concentrations of marine debris may occur in areas that are important for cetaceans, such as convergence zones where prey may be abundant.

The threat from entanglement in plastics is well known for seals and turtles and the threat from plastic ingestion is well characterised for some bird species. Entanglement of cetaceans is also a well known impact of discarded 'ghost' nets and other marine debris, although its significance as a conservation issue needs more elucidation. A less well investigated cause of marine mammal morbidity and mortality is ingestion of plastic debris, although it is known to kill, even in small quantities.

The last comprehensive review of ingestion of marine debris by cetaceans (whales, dolphins and porpoise), which was conducted more than twenty years ago, documented incidents involving sixteen species of odontocetes.³ Since then little consideration has been given to this issue, although incidents of plastic ingestion affecting at least six more species, were identified in a recent literature search.⁴ By far the most commonly ingested items are plastic bags and plastic sheeting while items such as drinking straws, bottle caps, portions of discarded fishing net and synthetic rope are also regularly found.

Table 1 provides an overview of significant incidents of plastic ingestion by cetaceans. The most obvious effect of ingestion is interference with alimentary processes. Whilst the evidence is still far from comprehensive, it appears that sperm and beaked whales may be especially vulnerable to ingestion of plastic debris and that this may be due to their reliance on suction-feeding for prey capture. It has been suggested that plastic waste may be of such prevalence in some parts of the oceans today to affect some species of beaked whales at the local aggregation and population levels and this deserves further investigation.

¹ 'Marine debris' and 'marine' litter are used interchangeably. UNEP defines marine litter as "any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment. Marine litter consists of items that have been made or used by people and deliberately discarded into the sea or rivers or on beaches; brought indirectly to the sea with rivers, sewage, storm water or winds; accidentally lost, including material lost at sea in bad weather (fishing gear, cargo); or deliberately left by people on beaches and shores."

² Large systems of rotating ocean currents that tend to concentrate marine litter.

³ Walker, W.A. & Coe, J.M. 1990. Survey of marine debris ingestion by odontocete cetaceans. In: R.S.Shomura and M.L. Godfrey (eds) *Proceedings of the Second International Conference on Marine Debris*, 2-7 April 1989, Honolulu, Hawaii. Volume 1. US Dept. of Commerce. NOAA Tech. Memo. NMFS, NOAA-TM-NMFSSWFSC- 154. pp 747-774

⁴ Simmonds, M.P. 2011 Eating Plastic - a preliminary evaluation of the impact on cetaceans of ingestion of plastic debris. IWC/SC/63/E3REV

Micro debris

Microplastic marine debris, defined as plastic particles smaller than 5mm, are found in every ocean. They are both intentionally produced (for example as 'scrubbers' in cleaning products) or form from the incomplete breakdown of larger plastic debris. Research indicates that they enter food webs via inadvertent ingestion, including by filter-feeding marine invertebrates. Thus, pervasive organic pollutants (POPs), such as the PCBs, and other contaminants that adsorb to microplastics, enter the marine food web. The overall impact and consequences of this exposure are not clear but, considering the exposure to organic compounds already documented in cetaceans, may be of concern.

What is being done?

The United Nations Environment Programme (UNEP) has taken the lead globally in addressing marine debris with a series of initiatives and partnerships. In 2003, UNEP established a '**Global Initiative on Marine Litter**' to provide an "international platform for the establishment of partnerships, co-operation and co-ordination of activities for the control and sustainable management of marine litter". It is coordinated by UNEP's Regional Seas Programme (RSP) and its Global Programme of Action **for the Protection of the Marine Environment from Land-based Activities** (GPA).⁵

In 2009, UNEP produced a detailed analysis of the regional activities undertaken so far. "**Marine Litter: A Global Challenge**" contained a number of recommendations including enhanced coordination between UN and other agencies, civil society, the scientific community, academia, the private sector and NGOs to address marine litter.⁶ It also recommended efforts to enhance a systematic knowledge of the sources, amounts, trends, fates and impacts of marine litter on the marine and coastal environments.

Marine Debris and the Law

- Several international agreements prohibit dumping of garbage at sea, regulate transport of hazardous waste and control land-based sources of marine pollution. These include MARPOL⁷, the London Dumping Convention and Protocol⁸ and the Basel Convention;⁹
- Several regional agreements address marine debris. These include CCAMLR¹⁰, OSPAR¹¹, UNEP's Cartagena Convention and its LBS Protocol¹² and the Northwest Pacific Action Plan (NOWPAP) on Marine Litter, as well as eleven other existing Regional Seas initiatives on marine debris;
- EU law mandates action on marine litter via EU Directive 2008/56/EC art 3(1) and Commission Decision 2010/477/EU, art 1. 121;
- Several Regional Fisheries Management Organisations (RFMOs) have adopted resolutions or recommendations on marine debris. These include the Indian Ocean Tuna Commission (IOTC), the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC) and the Inter-American Tropical Tuna Convention (IATTC);
- The Convention on Migratory Species (CMS) will consider a resolution on marine debris at its 10th Conference of the Parties in November 2011;¹³
- FAO's Code of Conduct for Responsible Fisheries addresses lost or abandoned fishing gear;¹⁴
- The Intergovernmental Oceanographic Commission of UNESCO worked with UNEP/RSP to develop joint *Guidelines on Survey and Monitoring of Marine Litter*;¹⁵

The UN General Assembly has also adopted several resolutions recognizing the adverse effects of marine debris and calling for action to address the problem.

⁵<http://5imdc.files.wordpress.com/2010/04/unep-marine-litter.pdf>

⁶ UNEP, 2009. *Marine Litter: A Global Challenge*, Nairobi: UNEP. 232 pp.

⁷ International Convention for the Prevention of Marine Pollution from Ships (MARPOL 73/78)

⁸ Convention for the Prevention of Marine Pollution by Dumping of Wastes and other Matter 1972 (London Convention) and the 1996 Protocol to the Convention (London Protocol)

⁹ Convention on the Trans-boundary Movements of Hazardous Wastes and Their Disposal (Basel Convention).

¹⁰ Commission for the Conservation of Antarctic Marine Living Resources

¹¹ [The Convention for the Protection of the marine Environment of the North-East Atlantic](#)

¹² Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region (Cartagena Convention, 1996) and Protocol on Marine Pollution from Land-based Sources and Activities (LBS Protocol).

¹³ *Draft Resolution on Marine Debris (doc StC37/21)*

¹⁴ *FAO Code of Conduct for Responsible Fisheries*. Rome, FAO. 2011. 91 p <http://www.fao.org/docrep/013/i1900e/i1900e.pdf>

¹⁵ Cheshire, A.C., Adler, E., Barbieri, J., Cohen, Y., Evans, S., Jarayabhand, S., Jetic, L., Jung, R.T., Kinsey, S., Kusui, T.E., Lavine, I., Manyara, P., Oosterbaan, L., Pereira, M.A., Sheavly, S., Tkalin, A., Varadarajan, S., Wenneker, B. and Westphalen, G., 2009. *UNEP/IOC Guidelines on Survey and Monitoring of Marine Litter*. UNEP Regional Seas Reports and Studies, No. 186; IOC Technical Series No. 83. Nairobi: UNEP. 120 pp.

For more information about marine debris and plastic pollution please go to the websites of the Marine Conservation Society: <http://www.mcsuk.org/> and the Plastic Oceans Foundation: <http://www.plasticoceans.net/the-foundation/>

Table 1: Examples of serious incidents of plastic ingestion by cetaceans¹⁶

- In 2008, two male sperm whales stranded along the northern California coast were found to have large amounts of fishing net scraps, rope, and other plastic debris in their stomachs. One animal had a ruptured stomach, the other was emaciated. Gastric impaction was suspected as the cause of both deaths. The animals contained 134 different types of nets, all made of floating material.
- In 2004, a dead Cuvier's beaked whale was found washed ashore on the Isle of Mull, Scotland. The entrance to its stomach was completely blocked by a cylinder of tightly packed shredded black plastic bin liner bags and fishing twine.
- An immature, highly emaciated male, Cuvier's beaked whale stranded at Biscarosse, France, in 1999. Its stomach contained 33kg of plastic, estimated to consist of 378 separate plastic items, including seven supermarket plastic bags and two plastic sheets. Another Cuvier's beaked whale that stranded in North Uist, Scotland in 1999 contained the remains of at least six plastic bags or refuse sacks, one of which was recorded as 'tightly screwed up and apparently jammed in the entrance to the stomach'.
- Out of 42 harbour porpoises bycaught or stranded in 2002 and 2003 on the Turkish western Black Sea coast, plastic debris was found in five stomachs. One animal contained plastic bags and sheeting with dry weight of 40.9g. In 1997, a small harbour porpoise found dead near Pictou, Nova Scotia was found to have its oesophagus blocked by a balled up piece of black plastic.
- In 1993 a juvenile pygmy sperm whale exhibiting unusual behaviour was found to have considerable plastic debris in its stomach.
- A study of the stomach contents of 23 cetaceans stranded in the Canary Islands between 1996 and 2006, found five animals with plastic debris in their stomachs with the bigger plastic items inside the deep-diving squid-feeding whales.
- Plastic debris ingestion was examined in a large sample (106) of franciscana dolphins incidentally captured in the artisanal fisheries of the northern coast of Argentina between 2007 and 2010. Twenty-eight percent of the dolphins had plastic debris in their stomachs.
- In addition, between 1963 and 1986, the following were recorded¹⁷:
 - One sperm whale of 38 examined from a mass stranding in Oregon had 1 litre of tightly packed trawl net in its stomach.
 - A pygmy sperm whale that came ashore in Texas had 'pounds of plastic bags clogging its stomach chambers'.
 - A Gervais's beaked whale that came ashore in New Jersey had its stomach full of plastic.
 - A Pacific white-sided dolphin from Long Beach, California, had a stomach that was half full of four plastic bags, two plastic bottle caps and various organic materials.
 - The stomach of a common dolphin stranded in Los Angeles County had one partial red balloon (3x13cm), one piece of clear plastic (8x13cm), and kelp fronds in its stomach.
 - A Risso's dolphin found stranded on the shore at Martha's Vineyard in Massachusetts had a plastic bag in its throat.
 - A Dall's porpoise from Venice Beach, California, had its stomach 'jammed with debris' including 13 pieces of clear plastic sheet, 3 heavy clear plastic bags, 2 plastic bread bags and two plastic sandwich bags.

¹⁶ Simmonds, M.P. 2011 Eating Plastic - a preliminary evaluation of the impact on cetaceans of ingestion of plastic debris. IWC/SC/63/E3REV

¹⁷ Sourced from reference in footnote 3.