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**IMPACTS OF MARINE DEBRIS ON BIODIVERSITY: CURRENT STATUS  
AND POTENTIAL SOLUTIONS**

## **Key Messages**

Marine habitats throughout the world are contaminated with man-made items of debris and solid waste. This report reviews the current state of knowledge of the effects of marine debris, and provides a preliminary assessment of the impact on ecosystems and biodiversity. It seeks to inform the Parties and other participants in the CBD on the nature of this emerging issue and potential strategies to address it, following discussion the discussion at SBSTTA 16 (UNEP/CBD/SBSTTA/16/6). Section 1 of the report provides a systematic assessment of research to date in the fields of marine biology and ecology and examines the evidence of its effects on marine species and ecosystems. Section two addresses potential solutions, drawing on waste management experience and practices, and providing examples of approaches that can be used to reduce land-based sources of marine debris.

## **Defining marine debris**

Marine debris is any persistent, manufactured or processed solid material discarded, disposed of, or abandoned in the marine and coastal environment. While this definition encompasses a very wide range of materials, most items fall into a relatively small number of material types such as plastic/polystyrene pieces, rope/cord/nets, cotton swabs, and light weight food packaging (OSPAR, 2007). Marine debris commonly stems from shoreline and recreational activities, ocean/waterway activities, smoking, and dumping at sea (Ocean Conservancy, 2010). Impacts to biodiversity are most commonly associated with the following debris types:

- Rope and netting (24 %)
- Fragments (20 %)
- Packaging (17 %)
- Other fishing debris (16 %)
- Microplastics (11 %)
- Paper (0.64 %)
- Glass (0.39 %),
- Metal (0.39 %)

## **Why is this issue important?**

Small plastic particles (fragments less than 5mm in diameter) are of concern because they may be ingested by a wide range of organisms and may cause adverse physical effects. A horizon scan of global conservation issues recently identified microplastic as one of the top global emerging environmental issues. Plastic items fragment in the environment due to exposure to ultraviolet light and do not biodegrade.

Plastic particles breaking down into nano-sized particles may also impact the bottom of the food web upon which the ocean and global climate depend. It has been reported that nano-polystyrene beads can inhibit photosynthesis and cause oxidative stress in algae. Fragments as small as 2µm have been identified in research studies. Some of the highest densities in micro and nano-sized particles are reported in the open ocean and abundance is increasing.

There is growing concern that small plastic fragments represent a toxicological challenge. Plastics contain a variety of potentially toxic chemicals, such as bisphenol-A (BPA) or flame retardants amongst others. Evidence exists of the release of these chemicals to humans from plastic food or beverage containers. Other research indicates plastic debris can absorb persistent organic pollutants (POPs) from the ocean and that these chemicals can reach high levels of concentration. While a direct link between plastic marine debris and chemical effects on marine organisms would be very difficult to demonstrate experimentally, if such effects were to occur they would be no way of reversing their impacts.

### **Impacts to marine biodiversity**

Research to date describes impacts of marine debris on 663 species. Over half of the species assessed document entanglement *in* and ingestion *of* marine debris. When considering the types of material reported, three quarters of all studies reviewed described encounters involving plastic debris. Of the 120 marine mammal species listed on the IUCN Red List 54% are known to have been entangled in or have ingested plastic debris. The following species are frequently cited in the reports and studies reviewed:

- *Callorhinus ursinus* (Northern fur seal)
- *Zalophus californianus* (California sea lion)
- *Fulmaris glacialis* (Northern fulmar)
- *Chelonia mydas* (Green Turtle),
- *Eubalaena glacialis* (North Atlantic Right Whale)
- *Caretta caretta* (Loggerhead Turtle)

### **Strategies to address the challenge of marine debris**

The potential for debris to travel considerable distances, and to accumulate in habitats far from its point of origin, presents a distinct challenge to management of this issue. Prevention at source is therefore the key to reducing marine debris and its associated impacts. One method by which this can be addressed is to take a more coordinated approach to the sources and end-of-life-management of waste packaging and plastics.

Examples of proactive policies and programs that have been successfully used to reduce, recycle and better manage wastes include:

- Extended producer responsibility (EPR);
- Deposit return programs;
- Other economic instruments such as fees charged on single use plastic bags;
- Viewing wastes as resources;
- Engaging with corporations and industry associations on sustainability;
- Encouraging reuse and reduction through better product and packaging design;
- Appropriate labeling; and,
- Working with coastal communities to build marine debris awareness

## **Conclusions**

Biodiversity loss is known to be strongly driven by habitat change, over exploitation, pollution, invasive species and climate change (Secretariat of the Convention on Biological Diversity, 2010). Given the numbers of species and the substantial proportion of some populations that are affected by marine debris, coupled with the frequency of entanglement, ingestion and debris related dispersal, it is likely that marine debris is a significant contributor to the myriad anthropogenic stresses acting on habitats and biodiversity. The effects of marine debris include increased risk of local extinction. For species at risk such as the Hawaiian Monk Seal (*Monachus schauinslandi*), Loggerhead turtle (*Caretta caretta*) and White Chinned Petrel (*Procellaria aequinoctialis*), marine debris has the potential to be an important contributor to species level decline and extinction. It is increasingly evident that marine debris is having a significant impact on ecosystems, species diversity, and ultimately on the important services we depend on from the world's oceans and coastal regions.

**Full report available on: <http://www.unep.org/stap>**