

Microplastics in the seas

Concern is rising about widespread contamination of the marine environment by microplastics

By Kara Lavender Law¹ and Richard C. Thompson²

Plastic debris in the marine environment is more than just an unsightly problem. Images of beach litter and large floating debris may first come to mind, but much recent concern about plastic pollution has focused on microplastic particles too small to be easily detected by eye (see the figure). Microplastics are likely the most numerically abundant items of plastic debris in the ocean today, and quantities will inevitably increase, in part because large, single plastic items ultimately degrade into millions of microplastic pieces. Microplastics are of environmental concern because their size (millimeters or smaller) renders them accessible to a wide range of organisms at least as small as zooplankton, with potential for physical and toxicological harm.

Since its introduction in the published literature in 2004 (1), the term microplastic has been widely used to describe plastic fragments in the marine environment. Typically considered to be smaller than 5 mm in diameter, microplastics are ill defined by size, with ranges that vary between studies. In most open-water studies, microplastics are measured with plankton nets, and particles smaller than the net mesh (typically ~0.33 mm) can evade capture. In marine sediment, bulk sampling can retain particles of all sizes; however, efficient identification is a serious challenge in quantifying microplastic loads, especially with decreasing size. Spectroscopic analysis has identified individual fragments of common plastics as small as 20 µm in diameter.

The sources of microplastic include fragmentation of larger items entering by rivers, runoff, tides, winds, and catastrophic events, together with at-sea sources, including lost cargo and fishing and aquaculture gear. There are also direct inputs of microplastics as micrometer-sized particles, such as cosmetic beads and clothing fibers