Microplastic's effects on the marine environment

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Citation: Mayuka B. Microplastic's effects on the marine environment. J Environ Chem Toxicol 2021; 5(6):1.

PERSPECTIVE

Plastics are synthetic organic polymers made from the polymerization of monomers taken from crude oil or natural gas. Since the invention of the first modern plastic, 'Bakelite,' in 1907, a variety of low-cost manufacturing processes have been perfected, allowing for the mass manufacture of a wide range of lightweight, durable, inert, and corrosion-resistant polymers. These characteristics have led to the widespread usage of plastics in nearly limitless applications. Plastic manufacturing has expanded dramatically since mass production began in the 1940s, with 230 million tonnes of plastic produced globally in 2009, accounting for 8% of global oil output. While the socioeconomic advantages of plastic are numerous, this useful resource has become a growing source of environmental concern. Primarily, the durability of plastic, which makes it such a desirable material to work with, also makes it very resistant to deterioration, making it difficult to dispose of plastic garbage. Exacerbated by the widespread usage of throw-away "user" plastics, the amount of plastic in municipal garbage accounts for 10% of all waste created globally.

While some plastic garbage is recycled, the most of it winds up in landfills, where it might take decades for it to degrade. Plastics, which are entering the marine environment as a result of indiscriminate waste, are of special concern. Despite the fact that plastics are a globally recognised contaminant with regulations in place to reduce the amount of plastic trash entering the marine environment, it is estimated that up to 10% of all plastics manufactured end up in the seas, where they can persist and accumulate.

Environmental study has long focused on the impact that massive plastic trash, sometimes known as "macroplastics," might have on the marine ecosystem. The prevalence of macroplastics in the marine environment is an aesthetic issue with commercial implications for the tourism sector, a danger for many maritime businesses since plastic may cause entanglement and equipment damage, and considerable environmental issues. The injury and death of marine birds, mammals, fish, and reptiles as a result of plastic entanglement and ingestion, the transport of non-native marine species to new habitats on floating plastic debris, and the smothering of the seabed, preventing gas exchange and creating artificial hard-grounds as a result of sinking plastic debris are all examples of macroplastics' environmental impact. Microplastics, which include microscopic plastic granules used as scrubbers in cosmetics and air-blasting, as well as minute plastic pieces formed from the breakdown of macroplastics, have been a growing source of environmental concern in recent years. Small plastic particles were initially discovered in the open ocean in the 1970s, and a revived scientific interest in microplastics over the last decade has revealed that these pollutants are pervasive and ubiquitous in the marine environment, with the potential to damage biota. Microplastics are considered accessible to species throughout the food chain due to their microscopic size.

They are prone to attaching watery organic contaminants and the leaching of harmful plasticisers because to their composition and relatively wide surface area. Ingesting microplastics may thereby introduce toxins to the base of the food chain, where they have the ability to bioaccumulate. The goals of this review are to summarise the properties, nomenclature, and sources of microplastics, discuss the routes by which microplastics enter the marine environment, assess the methods by which microplastics are detected in the marine environment, determine spatial and temporal trends in microplastic abundance, and assess the environmental impact of microplastics.

While macroplastic trash has long been a source of environmental concern, microscopic plastic pieces, fibres, and granules, together known as "microplastics," have only been recognised as a pollutant in their own right after the turn of the century. Microplastics have been ascribed with dimensions of 10 mm, 5 mm, 2–6 mm, 2 mm, and 1 mm, with diameters changing from research to study. This mismatch is especially significant when comparing data on microplastics, emphasising the importance of developing a scientific standard. Andrady has proposed that the term "mesoplastics" be added to scientific nomenclature to distinguish between tiny plastics visible to the naked eye and those only perceptible by microscopy.

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Received: December 12, 2021, Accepted: December 26, 2021, Published: December 31, 2021

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