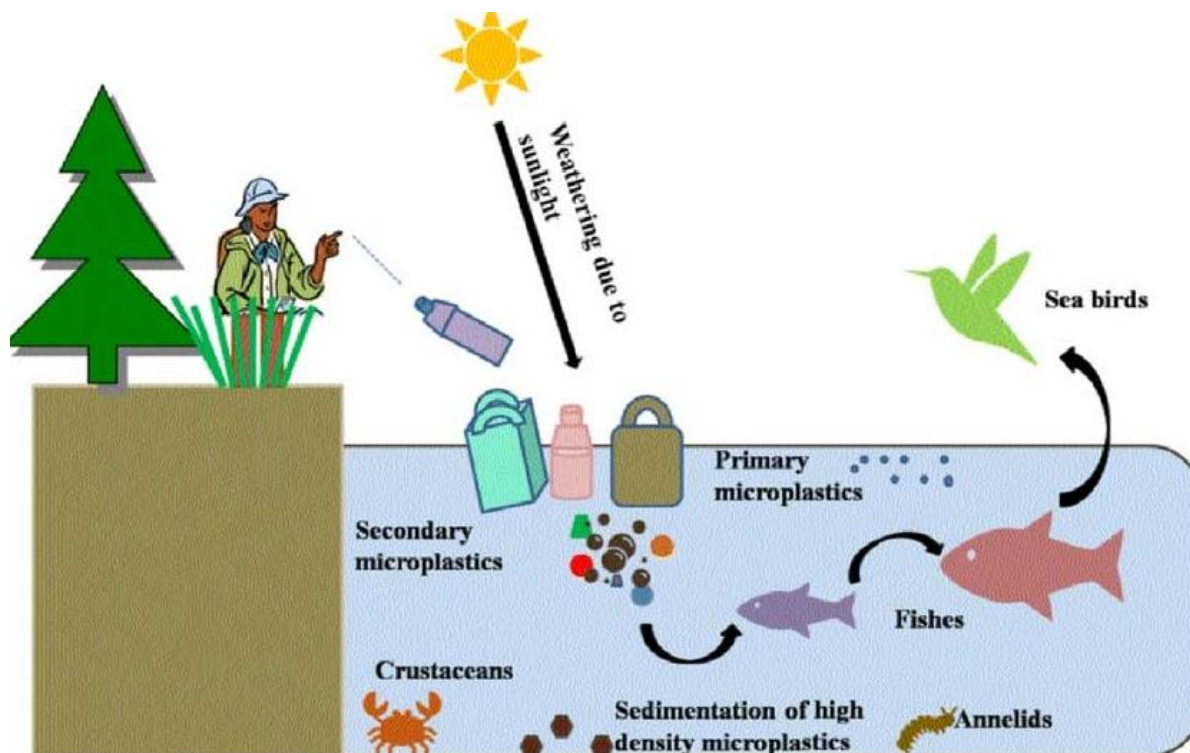


Look Out! The Invisible Threat of Microplastic



The term "Microplastic Pollution" is new to many of us. When the plastic debris degrades into particles less than 5 mm in diameter, the particles are called microplastics. Although it's a relatively new term in environmental studies in Bangladesh, it is being widely discussed in the scientific community of the world because of its widespread abundance and highly hazardous effects. These evil particles are found everywhere from the air to deep into the ocean. However, Atmospheric and riverine transport, gravity, stormwater, and disasters facilitate the accumulation of microplastics in the water bodies and the final destination is the Ocean. As a result, aquatic ecosystems are more vulnerable to microplastic pollution. By consumption of fish and other seafood, human beings are also being exposed to microplastic pollution. Even microplastic is being inhaled and causing different respiratory problems.

History of Plastic: The fully synthetic plastic material was first launched in the market by a clever Belgian chemist and marketer Leo Baekeland in 1907. Since then, plastic manufacture has increased dramatically due to its lightweight, great strength and widespread use while being less expensive than other alternatives. However, the waste management approach, on the other hand, has not been evolved in lockstep with the exponential growth of plastic production. As a result, plastic garbage ends up in the environment, particularly in estuarine and marine habitats. Because of the high persistence of plastics, marine plastic debris influences not only organisms but also ecosystem services and products like fisheries, navigation, and tourism, which might have a detrimental impact on the economy and society. Plastic waste progressively turns into microplastics in the environment by weathering processes such as photo-degradation, oxidation, and mechanical damage.

Types and Sources: Microplastics can be roughly classified into two types, Primary Microplastics and Secondary Microplastics. Plastic particles that are already 5.0 mm or smaller when they enter into the environment are considered primary microplastics. Plastic pellets and microbeads from plastic factories, microfibers from garment factories, cleaning agents and dermal exfoliators from cosmetic factories are the main contributors to primary microplastics. They are released directly or indirectly into the environment via domestic discharge, sewage, industrial effluents, and spills. Primary microplastics are usually produced in commercial activities in huge quantities. Synthetic fibers produced in garment industries are considered to be one of the most abundant microplastic types found in the environment.

On the other hand, when bigger plastic waste breaks down into small particles is referred to as secondary microplastics. They are usually irregular in shape and unintentionally produced by the degradation process of the environmental factors after being released into the environment. The main driver of degradation is UV radiation which breaks the chemical bond within the polymer. Mechanical forces such as waves, wind, and abrasion also facilitate plastic degradation. Biological degradation by microorganisms is another process of producing secondary microplastics. Daily used polythene, one-time plastic crockeries, and packaging materials are the main sources of secondary microplastics in the environment.

Pathways into the Ecosystem: A study by Lebreton et al. (2017) found that 1 to 2.5 million tons of plastic debris are generated annually around the globe from improperly managed garbage. They described Asia as the hotspot for plastic pollution. The top 20 most polluting rivers are situated in Asia and cover 67 percent of the worldwide riverine plastic emissions into the ocean. Irrawaddy in Myanmar and the Ganges in India are the most prominent among them.

Because of the physicochemical properties of microplastics, they can readily accrete a complex composition of contaminants that are usually present in the ambient environment. As a result, plastic debris in marine environments is recovered globally with significant amounts of Persistent Organic Pollutants (POPs), Polychlorinated Biphenyls (PCBs), Polycyclic Aromatic Hydrocarbons (PAHs), Polybrominated Diphenyl Ethers (PBDEs) and heavy metals. These are highly toxic chemical compounds that are extremely harmful to the whole ecosystem. These compounds can bioaccumulate throughout the ecosystem from the primary producers to human beings.

Health Hazards: Chemical compounds adsorbed on the surface of microplastics are highly carcinogenic, mutagenic, and geno-toxic to living organisms. They also include endocrine-disrupting chemicals that can cause reproductive and birth defects in organisms. They are also responsible for diabetes, obesity, and cardiovascular diseases in humans.

Roachman et al. (2013) examined the effect of organic pollutants adsorbed on microplastics in a marine fish species (*Oryzias Latipes*). According to the study, the fish absorbed and bioaccumulated dangerous chemicals, leading to behavioral and oxidative stress as well as liver inflammation. Predator-prey interactions increase the transmission of toxins at higher concentrations to the higher trophic level and thus human beings become exposed to

microplastic pollution. Microplastic can enter the human body through regular food items, seafood, plastic bottles and other utensils, personal care products, air pollution, etc. In some recent studies microplastics are detected in human blood.

It is a matter of concern that in many of the studies conducted on the beach sediments and ocean water of Bangladesh, microplastics are detected in a considerable amount. We have detected microplastics in the Gastrointestinal Tract of fish collected from our western coastal region where the abundance of microplastics was relatively higher than in many other studies conducted worldwide.

Remedies: Although microplastic pollution is a relatively new concept in Bangladesh, we are at a critical point to delay in taking steps towards stopping microplastic pollution. The government may control the use of one-time plastic utensils and other plastic materials where possible. Besides, governmental and non-governmental organizations can organize training or awareness-raising programs. Here, 3R (Reduce, Reuse and Recycle) is a useful method to stop microplastic pollution. As a conscious citizen, for the very first we have to reduce the use of plastic. Instead, we can use jute products. Secondly, reuse plastic utensils, and last but not the least, all the plastic materials must enter into the recycling process so that a single piece of plastic entering into the environment can be minimized. Plastic factories must be made aware to inhibit the entrance of plastic resins into the environment. Garment factories must use effluent treatment plants. Goncalves, (2020) stated that by 2050, the ocean will contain more garbage than fish. Microplastic pollution is now a transboundary issue and every nation should come forward to mitigate the threat resulting from this nearly invisible pollutant.

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