

Chapter 9

Plastic Pollution and Its Impact on Aquatic Fauna

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ABSTRACT

Plastic pollution is the buildup of unwanted plastic products in the environment by its abundant and limitless use by a greedy human population in various ways. Plastics are usually made of chains of monomer units of ethylene and propylene linked together. Plastics are durable and resistant to degradation and tend to accumulate where they are disposed. One more disaster this material causes is the release of toxic chemicals with time which badly affects the ecosystem where it is dumped. Same is the case with aquatic ecosystem, because tons of plastic wastes are dumped into it in one way or the other. The major threats of this menace on aquatic ecosystem include ocean acidification, degradation of water quality, increase in number of invasive species, overfishing, pollution and choking of water bodies, habitat degradation, loss of aesthetic value, blocking of sea routes, and above all, it badly affects plant and animal life there.

INTRODUCTION

Pollution can simply be defined as the introduction of contaminants into the natural environment that causes adverse changes. It is the addition of any unwanted substances to the environment at a faster rate than it can be dispersed, diluted, decomposed or recycled. Pollution is known to be there with the humankind ever since groups of people first congregated and remained for a long time in any one place, but present situation is worse as it has grown to unprecedented levels due to rapid industrialization and

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advance of science and technology and hence now has become a universal problem. Pollution is often categorized as point source or non-point source. Any substance, as certain chemicals or waste products, that renders the air, soil, water, or other natural resource harmful or unsuitable for a specific purpose is known as pollutant. Pollutants, the components of pollution, can be either foreign substances, energies (such as noise, heat or light) or naturally occurring contaminants (like volcanic eruptions, dust etc).

One of the greatest inventions ever introduced to mankind is the invention of plastic, which has revolutionized every aspect of our world. Its inception dates back to the mid-1800 when chemists all over the world began experimenting with a substance known as rubber. Plastic being low cost, and a synthetic polymer of resin, is highly versatile, durable and resistant to external shocks. Its use over past 50-60 years has escalated too fast and mainly engaged in packaging, building and construction, electrical equipments, automotive components, agriculture and medical equipments, etc. Plastic is being used in almost every item used in our day to day life (Sebille *et al.*, 2016). Its production is continuously increasing, with annual production estimated at 300 million tons and it is expected to increase up to 33 billion tons till 2050 (Sussarellu *et al.*, 2016). The usage of plastic in such enormous quantities is a leading cause of this pollution in almost all types of ecosystems. Pollution of the environment with plastic is a global problem, with plastic debris contaminating habitats from the poles to the equator and from the shoreline and sea surface to the deep sea. Plastic pollution results from a highly heterogeneous mixture of litter types differing in origin, size, shape and polymer type. Some of the items that are thrown away after single-use, discarded ropes and nylon nets etc. form main polluting agents. The majority of this litter originates from the land with rivers providing an important pathway to the sea (Thompson, 2017).

Plastics are usually made of chains of monomer units of ethylene and propylene linked together. These are synthetic polymers, the most common being: polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC) polyethylene terephthalate (PET) and polystyrene (PS). They can be made into a vast range of inexpensive, light-weight and durable products that bring numerous societal benefits. This has resulted in an exponential increase in global demand, from around 5 million tonnes in the 1950s to over 300 million tones today (Thompson, 2017). These are non-biodegradable and tend to accumulate in the natural environment rather than decomposition (Geyer *et al.*, 2017). Due to this property plastics become long lasting and remain as a sort of “plastic dust”, which with the advent of time-release toxic chemicals like cadmium, lead, benzene, dioxins etc and contaminate the environment where it exists. These toxic chemicals are ingested by the fauna present there and result in endocrine disruption and cancer causing mutations and other dreadful disorders. Being used in huge quantities in man’s everyday life in different forms, the biggest problem with plastics is its disposal. Though the plastic is dumped off in landfills or in the nearby water bodies, they constitute important source of pollution for the aquatic ecosystem (Pavani and Rajeshwari, 2014). It has been found that marine ecosystems are especially exposed to plastic pollution as tons of plastic wastes are disposed off in rivers and oceans. When plastic reaches the oceans a fraction of its debris is submerged into deep sea floor, while other lighter fractions remain floating and suspended in the water column and accumulate along the coastal belts.

In addition, when these plastic materials on the surface of water are exposed to atmospheric variables like ultra violet rays, sea water and other physical forces such as wave actions, these debris gradually breaks down into micro-sized plastic particles called microplastics, which is even more dangerous for aquatic fauna. Microplastics are classified as plastics that are smaller than 5 mm wide and any plastic debris found over 5 mm wide are classified as macroplastics to help classify samples in studies. Microplastics are also known as primary plastics, which are plastics that are directly disposed into the environment (Mendoza, 2018). Microplastics are almost of the same size as that of food particles and

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