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Contaminants of Microplastics in the Marine Environment

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Abstract:

Pollution of microplastics is increasing internationally day by day, one should know the behaviour of pollution in marine context which is still developing and affecting the marine biota. The plastic debris called microplastics in marine environment as a pollutant has long been the area of environmental research. Microplastics are universally spread in marine environment and causing harm to the marine ecosystem. Microplastics are found in abundance near the coastlines and within the oceans. This paper discusses the routes of entrance of microplastic to the marine ecosystem, methods of evaluation of microplastics entering in the marine ecosystem and to discuss environmental heinous effect of microplastics.

Keywords: *Microplastics, Marine Biota, Marine litter, Plastic Ingestion*

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Introduction

Plastics are the polymers of monomers extracted from oil or gas and are synthetic organic polymers. Since 1940, production of plastics has been increased enormously. Plastic is an attractive material and its durability make it highly resistant to degradation thatswhy, it is problematic to dispose the plastic material. Plastics are internationally recognized pollutants of which 10% are entering the marine ecosysytem and eventually harming its sustainibility. Microplastics, are minute plastic particles produced by the breakdown of the macroplastics, are tiny and used as scrubbers in cosmetics and air blasting are increasing environmental concern day by day. In 1970s, it is first highlighted the microplastics fragments scattered over the ocean and later it was revealed that these microplastic fragments are omnipresent and have tendency to harm the marine biota.

Microplastics

Macroplastic debris focused on the environmental concern for some time, at turn of century, these fragments are collectively termed as microplastics which is universal pollutant not visible to naked human eye.

1. Primary microplastics

These are microscopic plastics, used in facial cleansers and cosmetics or as air blasting media. Microplastic scrubbers are used as exfoliating hand cleansers and facial scrubs. These plastics are different in shape, size and composition which is depending on the product.

2. Secondry microplastics

These are formed due to the breakdown of the larger plastic debris. The structural integrity of plastic debris can be reduced by the result of physical, biological and chemical processes. The smallest microparticles reportedly found in the ocean is 1.6 µm, still is is considered that microplastics can be futher breakdown into nano particles size. These nano plastics in the marine environment will be more significant in the field of researches in upcoming years. The sehlf life of these plasics is quite long.

Sources and Transfer of Microplastics into the Water Bodies

Marine litter is a result of improper disposal of plastic product which eventually gets transferred into the water bodies of various types. Approximately 80% of the plastic found in the marine poluutant is terrestrial. These plastics includes primary microplastics which is used in cosmetics and air blasting and other domestic uses. The plastic contamination occurs in number of industries which is then via sewage, flows to the bigger water bodies. A number of filteration systems have been installed in sewage outlets from which microplastics are paased. (Browne *et al.*, 2007). Other causes of plastic contamination in seas and oceans are due to natural factors such as extreme weather conditions such as flash flooding or hurricans. During transport, accidental spillage of the raw material may enter into the sea and ocean and may contaminate and cause harm to the aquatic biota.

Impact of Microplastics on the Marine Environment

Microplastics are the omnipresent pollutant and makes a biological impact on the organisms of marine environment. Because of their small size, it is found worldwide and making threat to biota and increasing scientific concerns. Due to the small size of microplastics they are ingested by marine organisms present in both pelagic and benthic ecosystems. It is challenging to observe microplastic ingestion in the wild, but it is reported the microplastics ingestion throughout the food chain (Cole *et al.*, 2011). There is list of laboratory experiments which demonstrate that marine biota such as zooplanktons, invertebrates and echinoderms, feed on microplastics along with their food.

Table 1: List of Laboratory Experiments Demostrating the Ingest Microplastics by Marine Biota.

Organism(s)	Microplastic (µm)	Identification technique
Copepods (Acartia tonsa)	7–70	Microscopy
Echinoderm larvae	10–20	Video observation
Trochophore larvae	3–10	Microscopy

(Galeolaria caespitosa)		
Scallop (Placopecten magellanicus)	16–18	Detection of 51Cr labelled particles

(Source: Bolton and Havenhand, 1998)

Review of Literature

Andrady, (2011) discussed the accumulation mechanism and serious effects of the microplastics on oceans and seas. Microplastics loaded by the concentrate level of POPs (persistent organic pollutants) can be ingested by the marine biota.

Franeker and Law, (2015) worked on seabirds, gyres and other global issues involved in plastic pollution. Fulmars are indicators of plastic contaminants.

Wang *et al.*, (2015) reviewed the behaviours of microplastics in the marine environment and classified the behaviours of microplastics as physical behaviours, chemical behaviours and biological behaviours. Concluded that with increasing production and improper disposal of plastics, the plastic pollution in the marine ecosystem will get worse. Strict lawe nforcement is the need of an hour.

Avio, Gorbi and Regoli, (2016) suggested that the futher studies should be carried out to in order to prevent marine detoriation and better understand factors influencing the flow of microplastics in marine organisms.

Law, (2017) stated that standard methods of sampling, its reporting is not being conducted in an efficient manner due to which detection of quantity and characters of marine microplastics is not taking place.

Mrowiec, (2017) presented a review on some of the physicochemical propertiesof plastic materials for the determination of their toxic effect on the aquatic environment.

Conclusion

It is clear by the previous studies that microplastics have become a major problem for the marine life as it is consumpted by the marine biota that gives an adverse effect on their health (e.g. mortality, morbidity and reproductive success) which remains unclear and these contaminants passes upto the food chain. It is the topic of significant concern about the microplastic ingestion along with the toxic chemicals to biota. Further studies should be done to fill the gaps in this field of research and there is need to reduce the use of microplastic that endangers the life of marine biota.

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