

Ecological Risks of Microplastics in Offshore Environmental

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Abstract

Microplastics are small plastic particles in the environment that are generally smaller than 1 mm (0.039 in) down to the micrometre range. They can come from a variety of sources, including cosmetics, clothing, and industrial processes. Two classifications of microplastics currently exist: primary microplastics are manufactured and are a direct result of human material and product use, and secondary microplastics are microscopic plastic fragments derived from the breakdown of larger plastic debris like the macroscopic parts that make up the bulk of the Great Pacific Garbage Patch. Both types are recognized to persist in the environment at high levels, particularly in aquatic and marine ecosystems. Because plastics do not break down for many years, they can be ingested and incorporated into and accumulated in the bodies and tissues of many organisms. The entire cycle and movement of microplastics in the environment is not yet known, but research is currently underway to investigate this issue.

Keywords

Microplastics, Source, Pollution.

1. Introduction

Plastic in the oceans is one of the world's ten biggest pressing environmental problems, which are pointed out by the United Nations Environment Program[1]. Plastic garbage in the ocean is from the trash can, mismanagement of the landfill, tourism and fishing. Some material will sink into the ocean floor, other plastic float long distances. Due to the plastic sturdiness and durability, not biodegradable plastic garbage in the ocean, only through physical action makes the form smaller and smaller fragments of the toxic and retained in the ocean[2]. These fragments due to solar radiation (light degradation, embrittlement) or wave etc, even lower often less than 1 cm diameter, and under the effect of long-term physical, chemical, breaks down into smaller pieces of plastic or particles, when its less than 5 mm diameter can be defined as the micro plastic[3].

2. The main source of micro plastic offshore environment

Two classifications of microplastics currently exist: primary microplastics are manufactured and are a direct result of human material and product use, and secondary microplastics are microscopic plastic fragments derived from the breakdown of larger plastic debris like the macroscopic parts that make up the bulk of the Great Pacific Garbage Patch[4]. Offshore is the most active area of human activity. On the one hand, human activities produce the large amount of plastic waste and sewage collection in coastal zone, or may be through the river to the estuary and coastal transport; On the other hand the ocean exists under the action of a large number of plastic garbage in the ocean currents, tidal migration in coastal zone were stranded[5]. For terrestrial input, the sewage discharge and garbage dumps are the main source of micro plastic. Plastic is less essential substance in the human daily life[6]. All kinds of industrial raw materials, food packaging bags, shopping bags, detergents, skin care products such as plastic garbage everywhere, life of landfills or sewage treatment plant, and part of the discharged into the environment, finally into the ocean or coastal zone[7]. Larger pieces of plastic by the late environmental cracking into micro plastic and some living skin detergent products contained a large amount of micro plastic components or certain industrial raw materials, because of its small size, low density, why not easy separation removal from wastewater, which together with the sewage discharge, into the environment. On the one hand, is the shipping and

offshore activities such as plastic pollution, for example, sea fishing boats or ships to transport itself plastic hull and the breakage of the plastic device, equipped with the ships of industrial raw materials for resin leakage occurred in the process of maritime transport, etc., can lead to plastic pollution. Human activity in the coastal zone itself, on the other hand, populated areas such as bathing, farms, ports, saltworks, also can produce plastic or micro plastic pollution. Because of human activities in these areas produced a large number of pieces of plastic or micro plastic, lead to accumulate in the coastal area[8]. For example, in the United States, Panama, Asia, Australia, the coastal waterfront of buoy (expanded polystyrene) and aquaculture facilities, after been damaged thousands of fine particles can form micro plastic, become a local coastal zone is an important source of micro plastic pollution[9].

3. The influence of micro plastic on the coastal ecological environment

Looked from the present study, the plastic bring water, land, such as environmental pollution, not only because of its ability to carry all kinds of pollutants, also influence and participate in the migration transformation and cycle of substance in the environment, damage to the organism, may impact on the ecological environment[10]. Through the literatures and the results of this study, to say the micro plastic around the sea, coastal zone, the land, even the polar bodies of water, sediment and soil in all kinds of organisms. In coastal areas, micro plastic mainly concentrated in the estuary, water culture zones, and in some tourist beaches, estuaries, in particular, due to the inland had a greater influence on the input, micro plastic pollution not allow to ignore. Environment of micro plastic found in large Numbers for a long time, in the light, such as weathering, chemical and microbiological, at the same time of aging, may also release poisonous and harmful material such as plastic additives into the environment, harmful organisms. At present, micro plastic effects on organisms more and more are confirmed, including plankton, swimming, benthic animals, and some birds, and even some large Marine animals, such as seals, whales are to some extent, affected by the micro plastic, directly or indirectly. Environment, for example, can cause some biological plastic or micro plastic deformed larva or eating lead to false feed state cannot eat, eventually lead to intestinal blockage starved to death[11].

Furthermore, plastic particles may highly concentrate and transport synthetic organic compounds (e.g. persistent organic pollutants, POPs), commonly present in the environment and ambient sea water, on their surface through adsorption. This change can be persistent organic pollutants (POPs) are more likely to lead to the surface adsorption of hydrophobic, therefore the environment of the micro plastic can be used as the carrier of some persistent organic pollutants. Microplastic composite surface with pollutants compared with single micro plastic, will increase to a certain extent of biological risk[12]. When feeding the organisms carrying poisonous and harmful pollutants micro plastic, will lead to the poisonous and harmful pollutants in the enrichment of some micro plastic adhesion pollutants enter the organisms may produce more toxic. For example, a complex micro plastic and persistent organic pollutants (POPs) in Japan medaka, the influence of the function of the endocrine system, and the phenomenon of abnormal reproductive cell proliferation.

Adsorption of poisonous and harmful pollutants such as remobilised micro plastic in the food web transmission at the same time, also indirectly caused by these pollutants at different trophic levels of enrichment in the organism, in these sea creature types included many human edible seafood, thus caused potential risk to human health, thus further endanger human body health[13]. Neves et al. (2015) through the research on coastal fish in Portugal, think Japan mackerel (*Scomber japonicus*) is more species, feeding micro plastic should be as Marine strategic guiding Framework (the Marine Strategy Framework Directive, MSFD) on Marine garbage in monitoring and investigation of the indicator species[14].

4. Microplastics pollution prevention and control

Micro plastics has become a new type of pollutants in the Marine and coastal environment, has important effects on the Marine ecological environment. In recent years, scientists have been trying to

develop and perfect the various biodegradable plastics[15]. Although used by countries around the world production of biodegradable plastic raw material, some contain cellulose, some containing starch and synthetic polymer, and some contain natural fibers such as flax, coconut shell, but most is just the fiber and polymer blend. After cellulose decomposing, tens of thousands, almost invisible to the naked eye plastic particles remains clear. Therefore, these so-called biodegradable plastic can be degraded completely 100%, and the degree of degradation and degradation time required and is directly related to the surrounding environment. Therefore, biodegradable plastics in the short term can not completely replace the common plastic.

To strengthen the supervision of the micro plastic pollution in the environment is an important part of the protection of Marine ecological environment. Enterprises should regulatory plastic usage, and used released annual report; Enterprises should by setting clear goals and deadlines, improve the resource efficiency and recovery rate, to reduce the environmental impact of plastic products, Improve the public participation and attention, don't throw rubbish casually, in order to prevent the garbage into the ocean. Because the plastic particles can be intake of Marine organisms, and through the food chain potentially toxic accumulation and transfer, so you need to take measures to make up the knowledge gap, a better understanding of all kinds of plastic absorption and transfer ability of persistent, toxic and biological accumulation[16].

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