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SHORT COMMUNICATION

The Detrimental Impacts of Plastic Pollution on Wildlife

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ABSTRACT

About 11 million tonnes of land-based plastic waste make its way into the ocean each year and affect also terrestrial habitats. Plastic pollution creates adverse problems for wildlife. Marine, coastal, and terrestrial species are affected. Animals can be entanglement or accidentally ingesting plastic. Plastic ingestion can block digestive tracts or pierce internal organs in wildlife. It can also choke and starve animals by thinking they're full of eating plastic or provoque wounds. Microplastics have been found in almost every vertebrate and invertebrate species. This material can lead to could cause liver and cell damage as well as disruptions to reproductive systems. In this brief review, we present the main impacts of plastics on wildlife and what we can do to decrease their negative impacts.

Keywords: Plastic; Animals; Ecosystems; Degradation

1. Introduction

Plastic is a synthetic and non-biodegradable material. It is derived from crude oil, natural gas, or coal [1–3]. Plastic is one of the most used materials worldwide, for different types of utilizations. There has been a rapid increase in global plastic production particularly in the last decade [4]. About 11 million tons of land-based plastic waste is disposed into the ocean and terrestrial habitats every year since only a small portion is recycled. By 2030 world's yearly production of plastics is estimated to be to the tune of 619 million tons, and in 2050 it is expected that there will be around 500 million tons of plastic waste in landfills and the environment [1,4].

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Plastics are ubiquitous in modern society and used in a wide range of applications due to their versatility, durability, and low cost. However, single-use plastics pose significant environmental challenges. Items like plastic bags, bottles, and packaging are frequently discarded after a single use, leading to large volumes of plastic waste. Improper disposal of plastic waste is a major environmental concern. Plastics are durable materials that can persist in the environment for hundreds of years, accumulating in landfills, water bodies, and natural habitats [5]. Plastic litter not only detracts from the aesthetic value of the environment but also poses serious threats to wildlife through entanglement, ingestion, and habitat destruction [1,3]. Plastic can be categorized between microplastics and macroplastics according to their size [6,7]. Microplastics are tiny plastic particles measuring less than 5 millimetres in size, often invisible to the naked eye. They can be intentionally produced at a small size (e.g., microbeads in personal care products) or secondary microplastics, which result from the breakdown of larger plastic items [1,4]. Macroplastics are larger plastic items, typically visible to the naked eye, measuring more than 5 millimetres in size. These can include items such as plastic bags, bottles, fishing nets, and other debris. Both forms of plastic pollution have detrimental effects on the environment and organisms [4,8,9]. In the last two decades, plastic debris has been found in 267 species of animals worldwide, particularly in species such as sea turtles, marine birds, and marine mammals, some of which are extremely threatened species [1,2].

In this brief review, the authors present the main impacts of plastics on wildlife.

2. Plastic waste and the environment

Plastic pollution poses a significant threat to wildlife around the world, but also to the environment. Already, its production involves the extraction and processing of fossil fuels, primarily oil and gas. This process contributes to carbon emissions and the depletion of finite resources. Additionally, the manufacturing of plastics often involves the release of pollutants into the air and water, contributing to environmental pollution [10]. The accumulation of plastic debris can alter habitats, such as coral reefs or coastal areas, affecting the availability of food and shelter for wildlife. Plastic pollution can also smother vegetation, disrupting ecosystems and reducing biodiversity [6,11]. In the soil, the presence of microplastics can lead to a decrease in nematode worms and microarthropods (e.g., oribatid mites, dipteran larvae, lepidopteran larvae and hymenopterans) that are key to the decomposition of organic materials and nutrient cycling in the soil [4]. Chlorinated plastics contain harmful chemicals (additives and monomers) that can contaminate the water leading to the poisoning of small invertebrates [4]. Not only the production but also the incineration of plastics contributes to greenhouse gas emissions, exacerbating climate change. Additionally, the presence of plastic debris in oceans can disrupt carbon cycling processes, further affecting the Earth's climate system [12].

3. Effects of Plastic wastes on Organisms

Many animals mistake plastic for food and ingest it. This can lead to internal injuries, blockages, and even death. Plastic debris can fill their stomachs, making them feel full and causing them to starve to death [2,8]. Marine animals such as turtles, seabirds, and fish are particularly vulnerable. Also, there are reported cases of accidental ingestion of plastic wastes by land mammals including elephants, hyenas, zebra, camels, and cattle. The ingestion also can occur because their prey has consumed plastic [4,9]. Animals by mistake plastic for food, spend more time foraging and less time on essential activities such as reproduction or migrating [13].

Animals often get entangled in plastic debris such as fishing nets, six-pack rings, and plastic bags. This can lead to injuries, amputations, or suffocation [5]. Marine mammals, birds, and turtles are commonly affected by entanglement, but terrestrial animals also can suffer entanglement [14,15]. Several species of birds are known to incorporate litter items into

their nests (e.g. bags, robes), which can lead to twine entanglement on nestlings' legs and beaks leading to starvation and death [8,13]. In the particular case of microplastics, they are often mistaken for food by a wide range of marine and terrestrial organisms, including zooplankton, fish, birds, and even larger mammals. Once ingested, microplastics can accumulate in the digestive tract, leading to blockages, internal injuries, malnutrition, and even death. They can also transfer harmful chemicals and pollutants to animals upon ingestion [1,11]. Also, they can bioaccumulate in the food chain, meaning that predators accumulate higher concentrations of microplastics than their prey. This bioaccumulation can magnify the impact of microplastics on higher trophic levels, including humans who consume seafood contaminated with microplastics [5,16].

In the sea plastic litter can smother marine life, preventing oxygen and nutrients flow and blocking light, reducing the numbers of organism and compromising the ecosystem services [4,17].

Plastics can leach harmful chemicals into the environment, including additives used in their production and toxic pollutants that adhere to their surfaces. These chemicals can contaminate soil, water, and air, posing risks to ecosystems, wildlife, and human health. When animals ingest plastic, these harmful chemicals can leach out and accumulate in their tissues, leading to various health problems including reproductive issues, developmental abnormalities, and compromised immune systems. Persistent organic pollutants (POPs) and endocrine-disrupting chemicals (EDCs) are of particular concern due to their potential to bioaccumulate and cause long-term harm. **Figure 1** represent some of the harmful effects of plastic in wild animals.

4. Plastic waste as a corridor to invasive species and diseases

Plastics can be vectors for diverse invasive species, from macrofauna to toxic microorganisms that can have harmful effects in the new environment where they are introduced [17,18]. Microplastics can serve as vectors for transporting harmful pathogens, such as bacteria and viruses, in aquatic and terrestrial environments. For example, the vector *Aedes* spp responsible for spreading diseases such as zika, dengue and chikungunya prefers man-made containers as plastic bags, buckets or tins for breeding [5,19]. This can potentially increase the spread of diseases among wildlife populations.

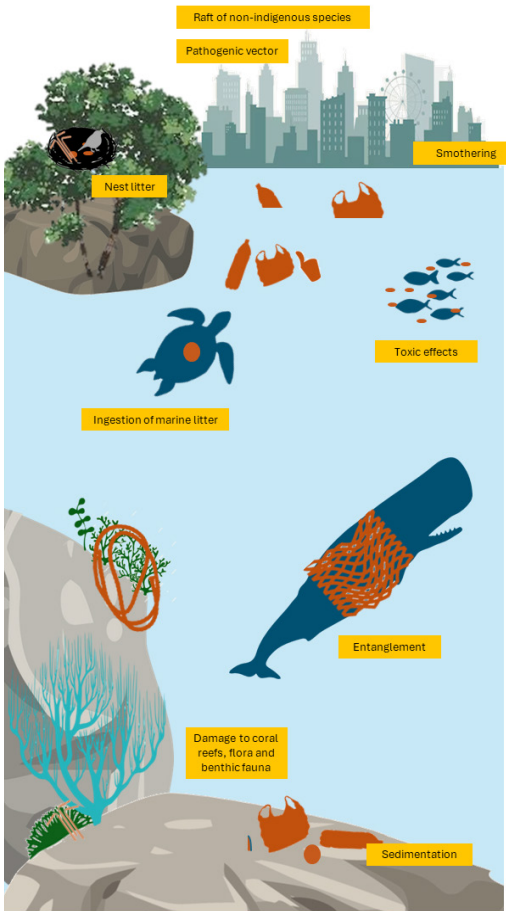

Figure 1: Plastic waste in the environment.

5. Conclusions

In conclusion, plastic pollution poses significant challenges to wildlife conservation efforts by degrading habitats, threatening endangered species, disrupting ecosystems, diverting resources, and undermining conservation goals. Addressing the problem of plastics requires comprehensive strategies that involve cooperation among governments, industries, communities, and individuals. This includes reducing plastic production, promoting alternatives to single-use plastics, improving

waste management infrastructure, implementing regulations and policies to reduce plastic pollution, and raising awareness about the environmental and human health impacts of plastics. Wildlife efforts include reducing plastic usage, recycling, proper waste management, and cleanup initiatives. Additionally, policies and regulations targeting single-use plastics and promoting sustainable alternatives should be implemented globally to address the issue.

Author Contributions

The contributions of all listed authors should be described here. Co-first authors should have a more detailed description of their involvement compared to the other authors.

Conflict of Interest

Not apliable.

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