

Microplastics: No small problem for filter-feeding ocean giants

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Feeding manta with plastic in water, Indonesia. Credit: Elitza Germanov, Marine Megafauna Foundation

Plastic pollution has recently gained increasing attention for its effects on marine mammals, fish and birds. However, it is still not fully understood to what extent small pieces of plastic, known as microplastics, impact marine life and ecosystems.

Microplastic pollution is a major threat to filter-feeding animals such as manta rays, whale sharks and baleen whales, according to a new study published in the journal *Trends in Ecology & Evolution*. These iconic animals are at risk of exposure to microplastic contamination and associated toxins.

The paper, authored by researchers from the Marine Megafauna Foundation, Murdoch University (Australia), University of Siena (Italy) and Hawai'i Institute of Marine Biology, stresses the significant risks microplastics pose to megafauna since these need to swallow hundreds to thousands of cubic meters of water daily in effort to capture plankton. They can ingest microplastics directly from polluted water or indirectly through contaminated prey.

Filtering of indigestible plastic particles can block nutrient absorption and cause damage to the digestive tract of animals. Additionally, plastic-associated chemicals and pollutants can accumulate over decades and alter biological processes, leading to altered growth, development and reproduction, including reduced fertility.

Lead author Elitza Germanov, researcher at the Marine Megafauna Foundation and PhD student at Murdoch University: "Despite the growing research on microplastics in the marine environment, there are only few studies that examine the effects on large filter feeders. We are still trying to understand the magnitude of the issue. It has become clear though that microplastic contamination has the potential to further reduce the population numbers of these species, many of which are long-lived and have few offspring throughout their lives."

"It is vital to understand the effects of microplastic pollution on ocean giants since nearly half of the mobulid rays, two thirds of filter-feeding sharks and over one quarter of [baleen whales](#) are listed by the IUCN as globally threatened species and are prioritized for conservation", she adds.

It is challenging to assess plastic concentrations through conventional methods usually used to study animal diets, such as stomach analysis or collection of egested material, as these rely on opportunistic observations and are unsuitable for threatened species. However, using non-lethal sampling of small amounts of tissue (biopsy), researchers are now able to test for chemical tracers.

Professor Maria Cristina Fossi from the University of Siena, one of the first scientists who studied this problem, and colleagues reported an average of 0.7 plastic items per cubic meter of water around the Baja California peninsula, an important feeding ground for endangered whale sharks. The researchers estimated that whale sharks may be ingesting 171 items on a daily basis. Meanwhile in the Mediterranean Sea, [fin whales](#) are thought to swallow microplastic particles in the thousands per day.

"Our studies on [whale sharks](#) in the Sea of Cortez and on fin whales in the Mediterranean Sea confirmed exposure to toxic chemicals, indicating that these filter feeders are taking up microplastics in their feeding grounds. Exposure to these plastic-associated toxins pose a major threat to the health of these animals since it can alter the hormones, which regulate the body's growth and development, metabolism, and reproductive functions, among other things", says Professor Fossi who co-authored this paper.

Filter feeders are considered to be at high risk of exposure since many inhabit some of the most polluted waters, namely in the Coral Triangle

region, Bay of Bengal, Gulf of Mexico and Mediterranean Sea.

"As plastic production is projected to increase globally, future research should focus on coastal regions where [microplastic](#) pollution overlaps with the critical feeding and breeding grounds of these threatened animals. Many areas are biodiversity hotspots and of economic importance due to fisheries and marine tourism. Targeting these with the backing of local government and industry will help ensure efforts to mitigate the plastic threat are employed to their fullest", Germanov concludes.

Elitza Germanov, Andrea Marshall, Lars Bejder, Maria Cristina Fossi and Neil R Loneragan 'Microplastics: No small problem for filter feeding megafauna' is published on 6 February 2018 and available here: [DOI: 10.1016/j.tree.2018.01.005](https://doi.org/10.1016/j.tree.2018.01.005)

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