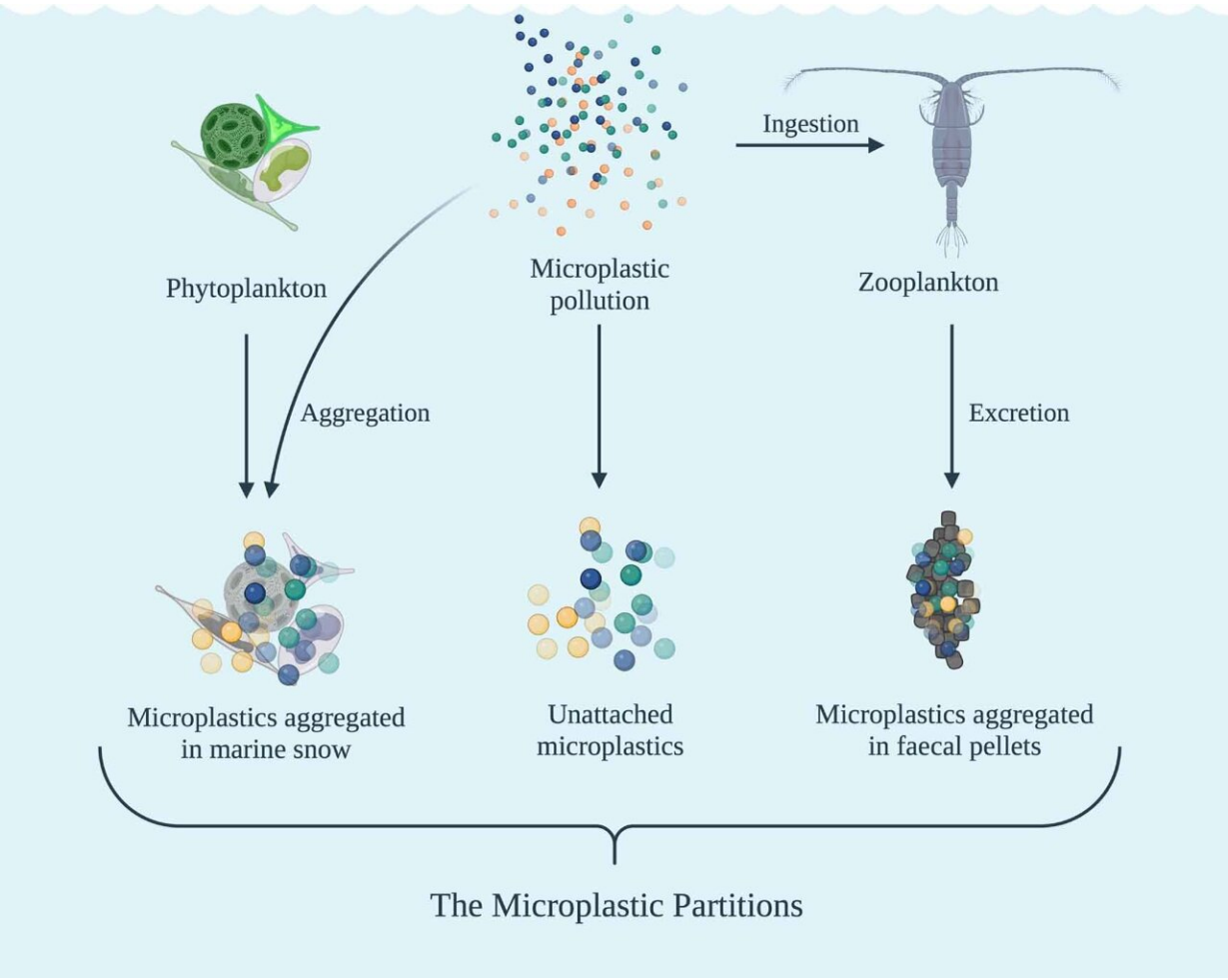
Ambitious targets are needed to end ocean plastic pollution by 2100, analysis finds

May 24 2024, by Alex Epshtein



The biological microplastic aggregation processes considered in this study and how they are formed. Adapted from Coyle et al (2020), with permission from Elsevier. Credit: *Environmental Research Letters* (2024). DOI: 10.1088/1748-9326/ad472c

A collaboration between researchers at Imperial College London and GNS Science, suggests that reducing plastic pollution by 5% per year would stabilize the level of microplastics—plastics less than 5 mm in length—in the surface oceans.

However, the modeling shows that even reducing pollution by 20% per year would not significantly reduce existing microplastics levels, meaning they will persist in our oceans beyond 2100.

Microplastics have been found to be circulating in all of the Earth's oceans and some of the greatest concentrations of them are thousands of miles from land. These tiny particles of plastics can be hazardous to marine life and they find their way back from our oceans into human food systems.

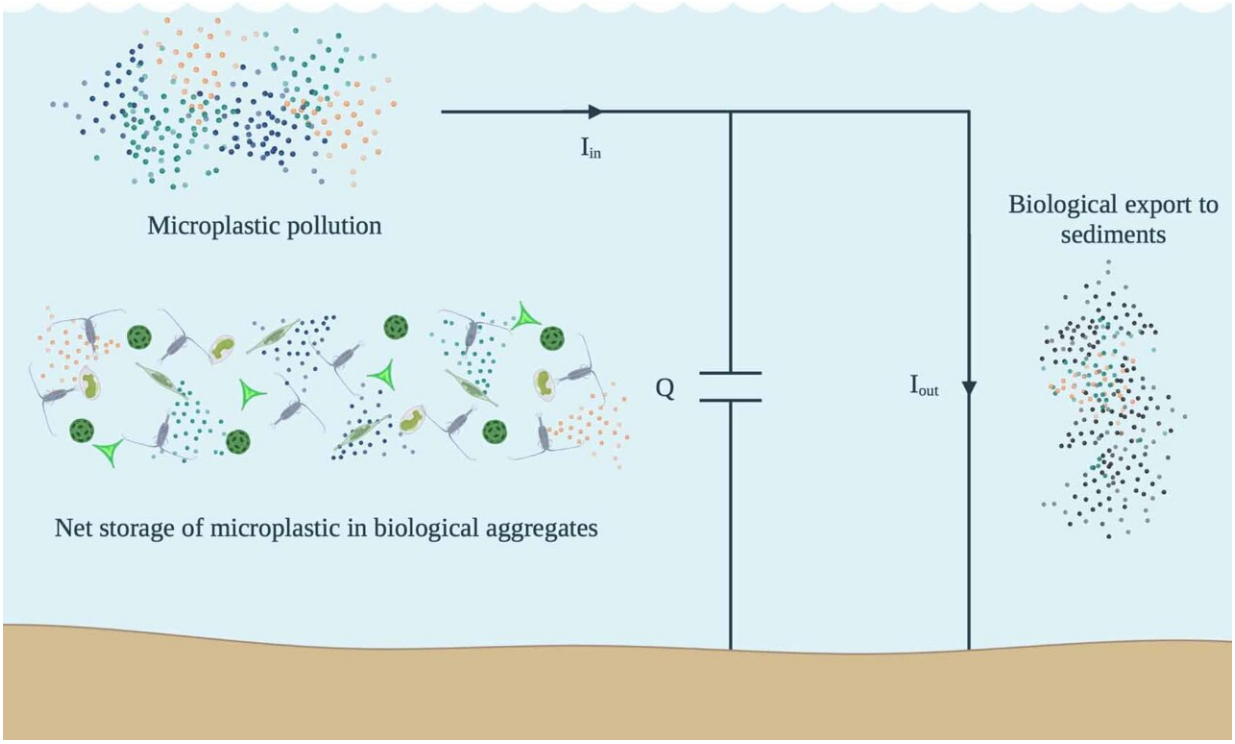
The United Nations Environmental Assembly (UNEA) are aiming to adopt a legally binding resolution to completely eradicate the production of plastic pollution from 2040, including ocean microplastics.

The researchers developed a model to predict the impact on ocean microplastics of eight different scenarios of plastic pollution reduction over the next century, starting from 2026 up to 2100.

The results, published in *Environmental Research Letters*, show that if countries reduce plastic pollution by more than 5% each year, the amount of microplastics in the ocean could stabilize, rather than continue to increase.

First author Zhenna Azimrayat Andrews, who completed the work for her MSc in Environmental Technology at the Center for Environmental Policy, Imperial College London, said, "Plastic is now everywhere in the environment, and the ocean is no exception. While our results show that microplastics will be around in the oceans past the end of the century,

stabilizing their levels is the first step towards elimination."



Schematic illustrating the biological microplastic capacitor. Credit: *Environmental Research Letters* (2024). DOI: 10.1088/1748-9326/ad472c

Removing microplastics from the ocean's surface

Microplastics pose the greatest threat when they accumulate in the surface ocean, where they are consumed by ocean life, including fish that we may eat. One way microplastics can be removed from the surface ocean is by clumping together with tiny living organisms or waste material, like organic debris or animal droppings. These clumps can sink down into the deep ocean, taking the microplastics with them.

The team's calculations, combined with real-world observations and testing of the model, suggest that the buoyancy of the microplastics prevents these clumps from sinking, trapping them near the surface. Understanding how these clumps affect the levels of microplastics in the ocean is important for setting goals to reduce plastic pollution.

As marine life holds onto microplastics near the surface, even if the level of pollution produced every year is reduced, there would still be microplastics in the surface ocean for centuries. When they do sink, they will subsequently last in the deeper levels of the ocean for much longer, where their impacts are not well known.

Azimrayat Andrews said, "There can never be a completely successful removal of microplastics from all depths of the ocean, we kind of just need to live with it now. But the current global output of plastic pollution is so great, that even a 1% annual reduction in pollution would make a big difference overall."

Setting ambitious and realistic goals

The researchers' model is the first study that examines the efficacy of plausible treaty reduction targets. The large reductions required to reduce contamination indicate that a more coordinated international policy is necessary, rather than the UN's proposed goal of 0% plastic pollution by 2040.

Azimrayat Andrews said, "If we want to move towards a lower plastic society, change needs to happen at a higher level. These changes should happen on an industrial level, as no single individual should have the weight of the world on their shoulders.

"Therefore, we need a more sustainable lifestyle integration, rather than people having to make individual choices, and so organizations like the

NHS don't have this pressure to become zero plastic in 10 years because the UN said so. National organizations will need to reduce their plastic use, but systemic change in industrial and commercial sectors could allow more grace for organizations like the NHS in the meantime."

The researchers hope their analysis will help inform UN negotiations, which are planned throughout the year.

More information: Zhenna Azimrayat Andrews et al, Slow biological microplastics removal under ocean pollution phase-out trajectories, *Environmental Research Letters* (2024). DOI: 10.1088/1748-9326/ad472c

Provided by Imperial College London