

Ocean Plastic is Creating New Communities of Life on the High Seas

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Coastal plants and animals have found a new way to survive in the open ocean ~ by colonizing plastic pollution. "The issues of plastic go beyond just ingestion and entanglement," said researcher. "It's creating opportunities for coastal species' biogeography to greatly expand beyond what we previously thought was possible."

Gyres of ocean plastic form when surface currents drive plastic pollution from the coasts into regions where rotating currents trap the floating objects, which accumulate over time. The world has at least five plastic-infested gyres, or "garbage patches." The North Pacific Subtropical Gyre, between California and Hawai'i, holds the most floating plastic, with an estimated 79,000 metric tons of plastic floating in a region over 610,000 square miles. While "garbage patch" is a misnomer ~ much of the pollution consists of microplastics, too small for the naked eye to see ~ floating debris like nets, buoys and bottles also get swept into the gyres, carrying organisms from their coastal homes with them.

A NEW OPEN OCEAN

The authors call these communities neipelagic. "Neo" means new, and "pelagic" refers to the open ocean, as opposed to the coast. Scientists first began suspecting coastal species could use plastic to survive in the open ocean for long periods after the 2011 Japanese tsunami, when they discovered that nearly 300 species had rafted all the way across the Pacific on tsunami debris over the course of several years. But until now, confirmed sightings of coastal species on plastic directly in the open ocean were rare.

For this discovery, researcher teamed up with Ocean Voyages Institute, a nonprofit that collects plastic pollution on sailing expeditions, and a pair of oceanographers. The oceanographers, created models that could predict where plastic was most likely to pile up in the North Pacific Subtropical Gyre. One advantage of the institute, now a fellow at the American Association for the Advancement of Science ~ pointed out, is the low carbon footprint of its vessels. "It can take a lot of energy to get out to the middle of the ocean with a gas-powered boat," researcher said. "So they use large-cargo sailing vessels to go around and remove plastics from the open ocean."

During the first year of the COVID-19 pandemic, Ocean Voyages Institute team managed to collect a record-breaking 103 tons of plastics and other debris from the North Pacific Subtropical Gyre. Those shipped some of those samples to SERC's Marine Invasions Lab. There, researcher analyzed the species that had colonized them. Those found many coastal species ~ including anemones, hydroids and shrimp-like amphipods ~ not only surviving, but thriving, on marine plastic.

A SEA OF QUESTIONS

For marine scientists, the very existence of this "new open ocean" community is a paradigm shift. "The open ocean has not been habitable for coastal organisms until now," said researcher. "Partly because of habitat limitation ~ there wasn't plastic there in the past ~ and partly, we thought, because it was a food desert."

The new discovery shows that both ideas do not always hold true. Plastic is providing the habitat. And somehow, coastal rafters are finding food. Now, scientists have another shift to wrestle with: How these coastal rafters could shake up the environment. The open ocean has plenty of its own native species, which also colonize floating debris. The arrival of new coastal neighbors could disrupt ocean ecosystems that have remained undisturbed for millennia. "Coastal species are directly competing with these oceanic rafters". "They're competing for space. They're competing for resources. And those interactions are very poorly understood."

And then there is the invasive-species threat. Scientists have already seen that begin to play out with Japanese tsunami debris, which carried organisms from Japan to North America. Vast colonies of coastal species floating in the open ocean for years at a time could act as a new reservoir, giving coastal rafters more opportunities to invade new coastlines.

"Those other coastlines are not just urban centers....That opportunity extends to more remote areas, protected areas, Hawaiian Islands, national parks, marine protected areas".

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