

Poop and Prey: What researchers are finding about gray whales

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Oregon State University researchers estimate that gray whales feeding off the Oregon Coast consume up to 21 million microparticles per day, a finding informed in part by poop from the whales.

Microparticle pollution includes microplastics and other human-sourced materials, including fibers from clothing. The finding, just published in the journal *Frontiers in Marine Science*, is important because these particles are increasing exponentially and predicted to continue doing so in the coming decades, according to researchers Leigh Torres and Susanne Brander.

Microparticle pollution is a threat to the health of gray whales, in addition to obstacles related to increased boat traffic and loss of prey.

“These are quite scary numbers,” said Leigh Torres, an associate professor at Oregon State and an author of the paper. “I think they should raise concern for people who care about the marine environment or about their own environment and exposure to microplastics.

“Little by little we are all getting exposed to more and more microplastics. That’s inescapable at this point across all ecosystems, including right off our coast here in Oregon.”

Susanne Brander, an associate professor and ecotoxicologist at Oregon State and co-author of the study, said the findings reinforce the need to curb the release of microparticles because of the adverse impacts they have on organisms and ecosystems.

“This issue is gaining momentum globally and some states, such as California, have taken important steps,” Brander said. “But more action needs to be taken, including here in Oregon, because this problem is not going away anytime soon.”

The study focused on a subgroup of about 230 gray whales known as the Pacific Coast Feeding Group. They spend winters in Baja California, Mexico and migrate north to forage in coastal habitats from northern California to southern British Columbia from June through November.

Since 2015, Torres, who leads the Geospatial Ecology of Marine Megafauna Laboratory in the OSU Marine Mammal Institute, and her team, including doctoral student Lisa Hildebrand, have used drones and other tools to study the health and behavior of this subgroup of gray whales off the Oregon Coast. As part of this work, they collect poop samples from the gray whales.

For the new study, the researchers collected zooplankton, which are an important food supply for gray whales, and commercial and recreational fish.

“We had determined the caloric content of several zooplankton species, so next we wanted to know what their microparticle loads might be to get a more complete picture of the quality of these prey items,” Hildebrand said.

Brander, Hildebrand and members of Brander’s Ecotoxicology and Environmental Stress Lab analyzed the microparticle loads in 26 zooplankton samples collected from whale feeding areas and found microparticles in all of them. A total of 418 suspected microparticles were identified, with fibers accounting for more than 50% of them.

Torres and Hildebrand then combined that data with known estimates of energetic requirements for lactating and pregnant female gray whales to quantify how many zooplankton and microparticles they consume in a day. That yielded estimates that lactating and pregnant whales consume between 6.5 million and 21 million microparticles per day.

“It’s a wake-up call that whales are getting that much microplastic from what they eat,” Torres said. “It’s likely that humans are also getting a lot of microplastics from our own fish diet.”

Torres notes that the microparticle consumption estimates are likely conservative because they only account for what the whales consume from zooplankton.

Gray whales likely ingest more microparticles directly from the water and seafloor sediment because they are filter feeders that engulf large amounts of water while consuming prey and also use suction feeding to obtain prey from the seafloor.

Analysis of the poop samples provided a window to what kind of microparticles these gray whales were digesting. The researchers analyzed five poop samples and found microparticles in all of them. Similar to zooplankton, the majority of the microparticles were fiber.

The researchers also found that the microparticles in the poop were significantly larger than those found in the zooplankton, leading them to believe the larger particles came from the water or sediment, not the prey (too small to consume these larger particles).

The findings raise concerns for Torres, whose past research has shown that this subgroup of gray whales is skinnier than other groups of gray whales.

“These whales are already stressed out with boats driving around all the time and the risk of getting hit by one of those boats,” she said. “They might also have less prey around because of changes in the environment, like less kelp. And now the quality of the prey might be poor because of these high microplastic loads.”

Brander and Torres are continuing their investigations by studying the effects of microfibers on zooplankton that are an important food source for whales and fish in Oregon waters.

“That all can lead to being poorly nourished and having poor health,” Torres said, “That can lead to stunted growth, smaller body size, lower ability to have calves and animals not using this habitat anymore. All of those are areas of significant concern.”

Other authors of the paper are Julia Parker, Elissa Bloom, Robyn Norman, Jennifer Van Brocklin and Katherine Lasdin. They are all from Oregon State and in the colleges of Agricultural Sciences, Engineering and Science. Brander is also affiliated with Oregon State’s Coastal Oregon Marine Experiment Station at the Hatfield Marine Science Center in Newport.

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