

Plastic Fish on Your Plate

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STORY AT-A-GLANCE

- › Fish may be actively seeking out plastic particles in the ocean to eat, mistaking them for food because of their odor
- › When microplastics exist in the ocean, they form a biological covering made of algae and other materials that smell like the food fish would normally eat
- › The study is the first to reveal not only that anchovy use odors to forage, but also that the odor of microplastic in the ocean induces foraging behaviors in schools of the fish

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It's estimated that close to 300 million tons of plastic are produced every year, more than half of which is for single-use products. Those discarded plastic bottles, bags, straws and other plastic waste end up largely in our oceans, to the tune of more than 8 million tons a year.¹ Carried along with the ocean's currents, swirling gyres of "plastic smog"² now cover about 40% of the world's ocean surfaces.³

While these heavily plastic polluted areas are often referred to as garbage patches in the sea, the problem is not limited to large debris. Perhaps even worse, it's estimated that 15 to 51 trillion pieces of [plastic are now in the ocean](#), reaching as far as the Arctic.

Once broken down by the elements, the plastic will turn into microplastic particles, which are less than 5 millimeters long. To understand the extent of the pollution, the

United Nations Environment Program described 51 trillion as "500 times more than the stars in our galaxy."⁴

According to Marcus Eriksen, a co-founder of the conservation group 5 Gyres, in the Huffington Post, "[I]f you were to stand on the bottom of the ocean in the middle of a gyre and look up, the water overhead wouldn't look clear ... What you'd see are these massive clouds. Clouds of micro- and nanoplastics stuck in the ocean's gyres."

Fish Are Actively Seeking Out Tiny Plastic Particles as Food

The tiny plastic particles filling up our oceans are not without consequence. It's long been known that various forms of marine life are ingesting the plastic, but this was thought to be an accident, or perhaps that they were drawn in by an aspect of its appearance. Research suggests, however, that fish may be actively seeking out the plastic particles, mistaking them for food because of their odor.⁵

When microplastics exist in the ocean, they form a biological covering made of algae and other materials that smell like the food the fish would normally eat. The study is the first to reveal not only that anchovy use odors to forage, but also that the odor of microplastic in the ocean induces foraging behaviors in schools of the fish. Study author Matthew Savoca, of the National Oceanic and Atmospheric Administration, told the Guardian:⁶

"When plastic floats at sea its surface gets colonized by algae within days or weeks, a process known as biofouling. Previous research has shown that this algae produces and emits DMS, an algal based compound that certain marine animals use to find food.

[The research shows] plastic may be more deceptive to fish than previously thought. If plastic both looks and smells like food, it is more difficult for animals like fish to distinguish it as not food."

More than 50 species of fish are known to ingest plastic debris, according to the researchers, who noted that the plastic can cause lethal and sublethal problems in fish

as well as serve as a "route for bioaccumulation of toxic compounds throughout the food web."⁷ Ingestion of micro- and nanoplastics by fish has been linked to intestinal blockage, physical damage, alterations in the intestines, change in behavior, change in lipid metabolism, transfer to the liver and more.⁸

Previous research has also shown that foraging seabirds are attracted to microplastics because of their smell. "Marine-seasoned microplastics produce a dimethyl sulfide (DMS) signature [the smell of algae] ... creating an olfactory trap for susceptible marine wildlife," the researchers noted.^{9,10}

How Much Plastic Are Fish Eating?

The Center for Biological Diversity noted that fish in the North Pacific are known to ingest 12,000 to 24,000 tons of plastic every year and, in a study of fish markets in California and Indonesia, one-quarter of the fish were found to have plastics in their guts.¹¹ Plastics and other man-made debris was also found in 33% of shellfish sampled.¹²

Writing in the journal *Integrated Environmental Assessment and Management*, researchers noted, "The potential for humans, as top predators, to consume **microplastics as contaminants in seafood** is very real, and its implications for health need to be considered."¹³

Savoca also noted that "our consume-and-dispose culture is coming back to haunt us via the fish we eat," and the next step will be to determine whether toxins accumulated in the plastic are transferring to the flesh of the fish and, thereby, to the humans who eat it.¹⁴

One 2014 study also found **microplastics** in oysters and mussels being sold at supermarkets. As a result, and since people ingest the entire oyster or muscle body, plastics in the gut and all, the researchers suggested that the average European who eats shellfish may consume 11,000 microplastics per year.¹⁵

That number is only likely to get worse if predictions by the World Economic Forum come true; they estimated that if waste-management practices don't change, there could be more plastic in the oceans than fish by 2050.¹⁶

Also disturbing, in a study of freshwater environments, 83% of the fish had plastic debris in their gut, mostly microplastics, particularly microfibers.¹⁷ The fish appeared to consume more microplastics near urbanized sections of the river and when fish ate a lot of the plastics, they appeared to eat a less diverse variety of other food items. So it's not only marine life in the oceans that are being harmed by plastic debris; freshwater creatures are also at risk.

Why Microfibers Are Disastrous for Marine Life

You may love your microfiber fleece, but [microfibers from clothing](#), which are released during washing, represent a significant part of the plastic pollution entering the oceans. So, ironically, the practice of recycling plastic bottles into clothing items, which is done by Patagonia and other outdoor companies as a way to reduce waste, may ultimately end up being environmentally destructive.

It's unknown what the environmental effects of microfiber pollution may be, but their irregular shape may make them harder for marine life to excrete than other microplastics (like microbeads).

It could be that the longer the particles stay inside a fish, the more chemicals may leach into its body. So, microfibers may be harming marine life via two mechanisms – physical blockage and chemical poisoning. One solution to the microfiber pollution problem would be to install filters in washing machines – similar to lint traps in dryers – that could catch the fibers prior to them being released with the [wastewater](#).

However, according to the Mermaids (Mitigation of Microplastics Impact Caused by Textile Washing Processes) project, whose goal is to cut microfiber shedding during washing by 70%, the apparel industry has been slow to respond in taking steps to stop microfiber pollution.¹⁸

A Mermaids report suggested special coatings may help to stop the loss of microfibers during washing, as well as recommended [laundry detergents](#) be reformulated to minimize fiber shedding.

Microbeads Are Another Environmental Disaster

Microplastic is often the result of larger pieces of plastic that become broken down. A separate but related issue is that of microbeads, which are tiny plastic pellets found in many personal care products.

Being so tiny, you might assume such plastics pose little environmental risk, but the opposite is actually true. Microbeads are so small they get flushed right down the bathroom drain and travel right through wastewater treatment plants, because the filters used are too small to catch them.

Research has only begun to reveal the extent of environmental pollution that microbeads have caused. In a 2012 survey of the Great Lakes, it was found that the area has "some of the highest concentrations of microplastic found in the environment, and microbeads were prevalent."¹⁹ Once in the water, microbeads easily absorb endocrine-disrupting and cancer-causing chemicals like PCBs.

Plastics may concentrate such toxins at levels 100,000 to 1 million times higher than the levels found in seawater.²⁰ The beads, which resemble fish eggs, are then eaten by many forms of marine life, including plankton, fish, seabirds and whales. According to one 2015 study, there may be as much as 236,000 tons of microbeads filling the water columns of our oceans.²¹

A report by the British Department for Environment Food and Rural Affairs (DEFRA) also found that eating just six oysters could introduce about 50 plastic microbeads into your body. One-third of the fish caught in the English Channel also contain microbeads, as do 83% of scampi sold in the U.K.²² Bans on microbeads have taken place in the U.S. and Canada, but not yet in the EU.

Our Disposable Culture Is Destroying the Oceans

Savoca suggested that changing the surface of plastics to be less hospitable to algae could stop making them smell so good to marine life,²³ but another solution would be to use less plastic in the first place, particularly in the case of single-use disposable products.

Data obtained by The Guardian suggests 1 million plastic bottles are purchased every minute worldwide. Worse still, this is expected to increase by 20% by 2021 and reach more than half a trillion sold every year by 2020.²⁴

Fewer than half of the plastic bottles purchased in 2016 were recycled, and only 7% were made into new bottles,²⁵ which means the rest end up in landfills or the ocean.

Americans also use 500 million straws daily, which doesn't even account for all of the straws that come attached to juice and milk cartons (including those handed out in school cafeterias).²⁶ Like plastic bags and bottles, straws are also commonly found littering coastlines and beaches.

Sadly, marine mammals are often found with straws lodged in their stomachs and sea turtles have been found with straws wedged in their nose. Plastic utensils and other food and beverage packaging are another major source of pollution and were found to make up 67% of the litter found in the San Francisco Bay area.²⁷

Like straws, oftentimes plastic utensils are added to carry-out orders even if customers don't request them, getting thrown out without ever being used (or used only once).

In the U.S., it's crucial that we rethink our throwaway society and become more sustainably creative. Ideally, seek to purchase products that are not made from or packaged in plastic. Another important point is to choose reusable over single-use, which is possible in most instances. Opting for the following will help you to inch closer to a minimal-waste lifestyle while keeping your share of plastics pollution out of the oceans:

Use reusable shopping bags for groceries

Take your own leftovers container to restaurants (or better yet, cook your own meals at home instead of eating at restaurants)

Bring your own mug for coffee, and bring drinking water from home in glass water bottles instead of buying bottled water

Request no plastic wrap on your newspaper and dry cleaning

Store foods in glass containers or mason jars rather than plastic containers and plastic freezer bags

Avoid disposable utensils and straws and buy foods in bulk when you can

Opt for nondisposable razors, washable feminine hygiene products for women, cloth diapers, handkerchiefs instead of paper tissues, rags in lieu of paper towels and infant toys made of wood rather than plastic

Avoid processed foods (which are stored in plastic bags with chemicals). Buy fresh produce instead, and forgo the plastic bags

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