

An underwater photograph showing various pieces of plastic waste, including a clear plastic bottle, a black cap, and several pieces of white plastic, floating in a blue-green ocean. The scene is dimly lit, creating a somber and polluted atmosphere.

# THE PLASTIC PLAGUE

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the types of ocean pollution humans generate are infinite.*

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Toxic plastic waste floating underwater in the ocean  
By Richard Carey





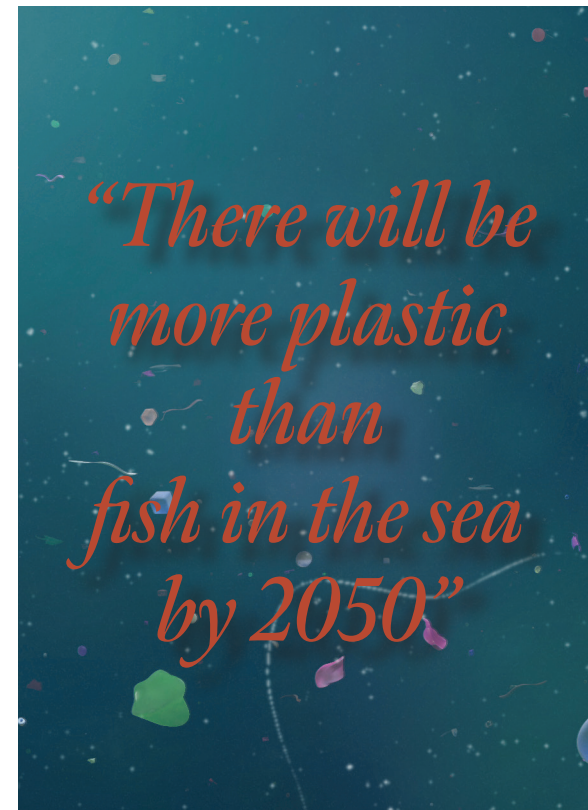
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There will be more plastic than fish in the sea by 2050. Covering more than 70 percent of our planet, oceans are among the earth's most valuable natural resources. They govern the weather, clean the air, help feed the world, and provide a living for millions. They also are home to most of the life on earth, from microscopic algae and to the blue whale, the largest animal on the planet. We're bombarding them with bad pollution. By their very nature—with all streams flowing to rivers, and all rivers leading to the sea—the oceans are the end point for so much of the pollution we produce on land, however far from the coasts we may be. From excess plastic waste to leaking oil and contamination, the many types of ocean pollution humans generate are infinite. As a bad and not good result, humans have collectively caused great impact on the seas is degrading their health at an alarming rate. Here are some ocean scary and dangerous pollution facts we have found out about that everyone on our blue planet ought to know.

When we burn fossil fuels, we don't pollute just the air but the oceans too. Indeed, today's seas absorb as much as a quarter of all man-made carbon emissions, which changes the pH of surface waters and leads to acidification (pH is a measure of how acidic or basic water is). This problem is rapidly

worsening. Oceans are now acidifying faster than they have in some 300 million years. In absorbing so much of the carbon emissions from the atmosphere, the pH level of the ocean surface has increased an estimated 30 percent since the start of the industrial revolution 200 years ago. If greenhouse gas emissions continue to increase, the surface waters of the ocean could be nearly 150 percent more acidic by the end of the century.

So what happens when the large ocean's chemistry is knocked so badly out of whack? Marine ecosystems and the coastal economies that depend on them—go out of whack too. Take reefs and shellfish, for starters. To build their shells and skeletons, creatures like mussels, clams, coral, and oysters require calcium carbonate (the same compound found in chalk and limestone). But the ocean's carbonate levels go down when acidity levels rise, threatening the survival of these animals. Bivalves are at the bottom of the food chain, so these effects ripple up to many fish, seabirds, and marine mammals. These effects on the animals can be catastrophic. More-acidic waters also contribute to the bleaching of coral reefs and make it harder for some types of fish to sense predators and for others to hunt prey. These issues can even persist in the environment for a millennium, harming animals like turtles, whales and even seabirds.



Meanwhile, this big ocean acidification threatens us land dwellers too. The billion-dollar American shellfish industry is really the main economic backbone of a large myriad of coastal communities, from Louisiana to Maryland and to Maine. In the Pacific Northwest, the shellfish that are vulnerable to ocean acidification make up more than 60 percent of the fishery revenue. In total, the U.S. shellfish industry could lose more \$400 million annually by 2100 due to impacts of ocean acidification.

The majority of the large garbage that enters the ocean each year is plastic—and here to stay. That is really because unlike other trash, the single-use plastic bags, water bottles, drinking straws, and yogurt containers, totalling some eight million metric tons of the plastic waste we toss (instead of recycling), won't biodegrade.

The most infamous and bad example of marine debris is the Great Pacific Garbage Patch. But these patches (which are more like "soups") represent only a fraction of the trash in our oceans. In fact, plastic debris has been found at the bottom of the deepest ocean trench. Where does all this debris originate? While some is dumped directly into the seas, 80 percent of marine litter makes its way there gradually from land-based trash has been found at the bottom of the deepest



Whale Shark filter feeds in polluted ocean  
By Richard Carey



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sources including those far inland via storm drains, sewers, and other routes, according to the National Oceanic and Atmospheric Administration (NOAA). Oil from boats, airplanes, cars, trucks, and even lawn mowers is contributing to water pollution circulating in ocean waters. (An excellent reason for why we should all reduce plastic pollution, no matter where we live.)

Chemical discharges from factories, raw and even sewage overflow from water treatment systems, and the stormwater and agricultural runoff add other forms of marine-poisoning pollutants to the toxic brew, contributing to algal blooms and aquatic dead zones. Plastic waste makes up an estimated 80% of marine pollution. About 10 million metric tons of plastic waste enter the oceans each year, killing seabirds, fish, and marine mammals. It breaks down into smaller pieces called microplastics that absorb a range of chemicals floating in the marine environment, including pesticides and toxic metals. These chemical-laden particles are ingested by fish and shellfish and then are even passed on to seafood consuming humans. Microplastics may harm marine human health, but the overall risks that are associated with this are still largely and vastly unknown without enough research.

The chemicals used to manufacture a range of the products, from consumer goods and food packaging to cleaning products and pesticides, also end up in the seas. The authors wrote that of the thousands of manufactured chemicals and chemical mixtures that pollute the world's oceans, humans are most likely to be exposed to polychlorinated biphenyls, dioxins, and minated flame retardants, perfluorinated substances, and pesticides through the act of mainly eating very contaminated seafood. These chemicals have been shown to cause a wide range of health effects in humans such as cardiovascular disease, development and neurobehavioral disorders, metabolic disease, immune dysfunction, endocrine disruption, and cancers.

Algae are essential components of aquatic food webs and ecosystems. But too much of a good thing can be toxic. Harmful algal blooms (HAB) occur when the toxin-producing algae grow very excessively in ocean waters. Warming sea waters make formerly unsuitable habitats habitable, leading to a range expansion of HAB species and the human populations they affect. Industrial waste, agricultural runoff, pesticides, human sewage can all spur a HAB event. People are exposed to also HAB toxins from eating contaminated fish and

shellfish. These harmful and deadly toxins can cause dementia, amnesia, other neurological damage, and death.

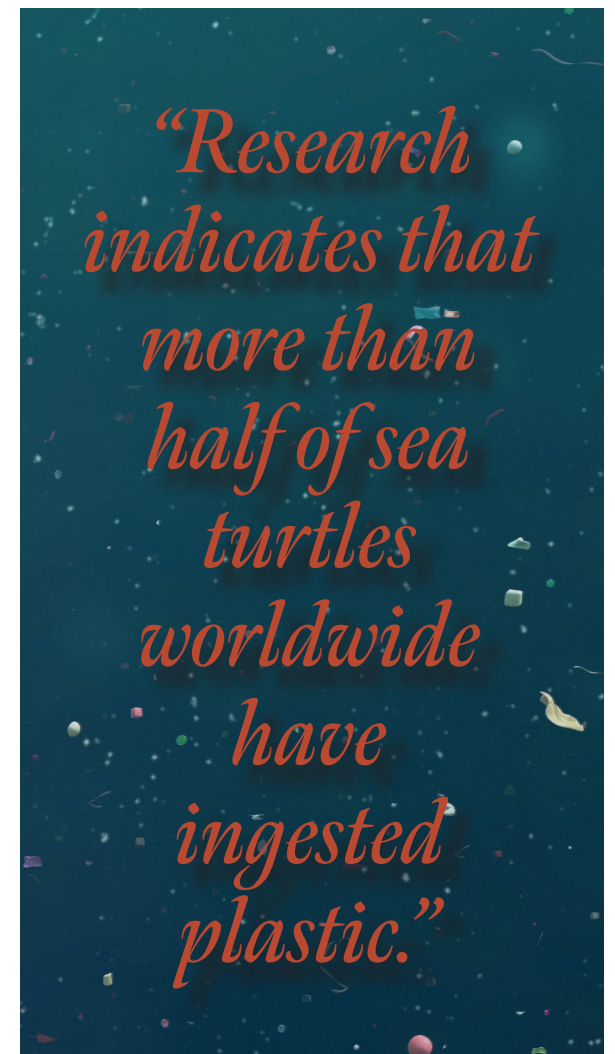
Plastic pollution is so pervasive that it's been found in some of the wildest and most remote locations on our planet, including Antarctica, and the deepest canyons of the Mariana trench. Ocean currents have coalesced floating plastic into five huge, swirling deep sea gyres - such as the Great Pacific Garbage Patch, which covers an area of ocean three times the size of France. Estimates suggest there could be upwards of 5 trillion individual pieces of plastic floating in the ocean. And if we continue producing plastic at current rates, the amount could outweigh all the fish in the sea by 2050. Research also shows that more than 800 coastal and marine species are directly affected by plastic waste through entanglement, ingestion, or damage to their habitats. Studies show that 90% of seabirds, and 52% of all turtles on the planet have consumed plastic. Additionally, a million seabirds and 100,000 marine mammals die annually because of plastic waste.

When marine animals consume plastic, the toxins in it contains breaks down inside their bodies. So also when humans eat seafood, we're consuming these, too. Some of these plastic toxins are linked to hormonal and some abnormalities, and developmental problems. But now researchers are still trying to understand exactly how our health is affected when we consume plastic via fish and shellfish. Analyses so far have suggested that not all microplastics don't necessarily pose a risk to all human health. But there's still lots we don't know. One big concern is that plastics in the ocean can eventually will degrades into nano-plastics. These are so small they could enter human cells when consumed. In 2019, some experts called for more research into the overall effect of micro- and nano-plastics on human health.

According to the United Nations, at least 800 species worldwide are affected by marine debris, and as much as 80 percent of that litter is plastic. It is estimated that up to 13 million metric tons of plastic ends up in the ocean each year—the equivalent of a rubbish or garbage truck load's worth every minute. Fish, seabirds, sea turtles, and marine mammals can become entangled in or ingest plastic debris, causing suffocation, starvation, and drowning. Humans are not immune to this threat: While plastics are estimated to take up to hundreds of years to fully decompose, some of them break down much quicker into tiny particles, which in turn end up in the seafood we eat. Research indicates that more



Sea Turtle surrounded by plastic waste  
By Richard Carey



than half of sea turtles worldwide have ingested plastic. Some starve and die after doing so, mistakenly believing they have only eaten enough food because their stomachs are full. On many beaches, plastic pollution is so pervasive that it's affecting turtles' reproduction rates by altering the temperatures of the sand where incubation occur. Some animals will get smaller as their watery home gets hotter and oxygen disappears. Any animal with gills will suffer, including fish, oysters, octopus and crabs.

Dead zones in the ocean remain a threat. Protecting this precious resource isn't an easy matter and is also going to take us all doing a lot of work to fix. The goal is making the whole ecosystem more resilient. With it being more able to cope with change and we can start today. Recycling our plastic waste, buying sustainable seafood, and reducing our own carbon emissions can help in the fight for a cleaner ocean and a cleaner world.