FLOATING JUNKYARD

Plastic pollution is turning parts of the ocean into a deadly dump

Back in 1997, Charles Moore was smack in the middle of the Pacific Ocean heading home after a sailing race. "I was as far away from civilization as I could get," he says. So he was surprised by what he saw around his boat. "I would go on deck day after day for a week and see bits of plastic floating in the water," he says. "There was no getting away from it."

Moore had sailed into an area of swirling water currents known as the *North Pacific Gyre*. Much of the garbage that ends up in the Pacific Ocean gets trapped in this enormous whirlpool-like region (*see Nuts & Bolts, p. 17*). The "Great Pacific Garbage Patch" now holds approximately 3.5 million tons of waste.

The vast majority of trash in the garbage patch is made of plastic, much of which has broken down into pieces less than 1 millimeter (.04 inches) wide. "The most common bits are plastic film from packaging and plastic bags," says Moore. The drifting plastic can be devastating to sea life. Scientists estimate that plastic debris kills roughly 1 million seabirds and 100,000 marine animals like dolphins and sea turtles each year.

After returning from his voyage, Moore founded the Algalita Marine Research Foundation to study marine pollution. Scientists from the organization and other institutions are learning more about the dangers of this ocean dump.

DEADLY DUMP

Some of the waste in the ocean, such as broken fishing lines and nets, has been dumped from ships at sea. But roughly 80 percent of the debris originates on land. Rivers and overflowing storm drains and sewage systems all carry garbage to the ocean.

Plastic makes up roughly 80 percent of ocean waste. "You see bottle caps, toothbrushes, and fast-food forks," says Moore. One reason is that plastic takes a long time to *biodegrade*. Natural processes eventually break down the material, but plastic can drift for hundreds of years.

Large pieces of floating plastic can kill sea animals by entangling them. But scientists believe an even bigger problem is that animals and seabirds such as albatrosses ingest the debris. "They may mistake [the plastic] for food or it may have food attached to it," says Myra Finkelstein. She is a biologist and *environmental toxicologist* from the University of California at Santa Cruz who studies the effects of substances that accumulate in the bodies of animals. Ingested plastic pieces can kill the animals by puncturing their digestive tracts. That's especially dangerous for albatross chicks. Albatross parents pick up food from the ocean and spit it up for their chicks on land to eat. Any plastic that the parents have picked up gets regurgitated too.

Finkelstein studies albatross chicks on Midway Island in the North Pacific. "Every single chick that we have looked at has plastic in its stomach," says Finkelstein. "I have even pulled toothbrushes out of chicks that are trying to throw them up."

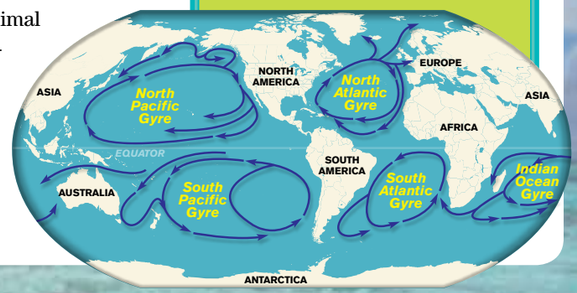
TOXIC WASTE

Scientists are now finding that ingested plastic poses another threat too. "Plastic can leach toxic chemicals into the animal that eats it," says Finkelstein. Manufacturers add many different *plasticizers* to plastic products. These chemicals give plastics their

nuts&bolts

The *North Pacific Gyre* is an area of swirling water currents in the Pacific Ocean. Floating ocean debris gets sucked in here by a huge set of currents that spin clockwise between the coasts of Japan and the United States. Smaller rotating currents concentrate the waste into the zone, now known as the garbage patch.

Although the North Pacific Gyre is the most famous ocean dump, four similar gyres exist in the world's oceans. All of them are likely hotspots for trash.



TRAPPED! A Hawaiian monk seal tries to escape from a tangle of discarded fishing gear.

MICHAEL PITTS/NPL/MINDEN PICTURES; MAP: JIM MCMAHON

videoextra

Watch conservationist Charles Moore talk about the Great Pacific Garbage Patch at: http://planetgreen.discovery.com/videos/g-word-pacific-ocean-trash-vortex.html

STUFFED BIRD: The skeleton of a dead albatross shows its stomach was filled with plastic pieces.

BEACH CLEANUP: About 400 students and volunteers turn up to remove litter from Venice Beach in California.

characteristics, such as flexibility, transparency, or durability. But some of the chemicals, such as phthalates and bisphenol A (BPA), show signs of being harmful to living organisms. For instance, BPA can disrupt the normal functioning of an animal's hormone system, affecting its ability to reproduce.

In addition, plastics can pick up toxins, such as the pesticide DDT, from the water. "Plastics are sponges for chemical pollution," says Moore. Scientists at the Algalita Foundation are studying fish around the patch to determine if chemicals from the plastics are leaching into fish. "We found a rainbow runner the size of a finger with 84 small pieces of plastic in its stomach," says Moore.

CUT OFF THE SOURCE

Scientists are searching for ways to clean up the garbage patch. Because much of the plastic is tiny, removing it from the water is next to impossible without harming sea life. Instead, they are looking for onshore solutions.

One step is to remove trash from the coasts. Zach Gold, a 16-year-old from Santa Monica, California, does his part by cleaning up beaches and rivers around Los Angeles County. "You couldn't [walk] more than 20 feet without seeing a piece of Styrofoam or a cigarette butt lying on the beach," he says.

Moore says the biggest challenge in reducing the amount of plastic waste is decreasing use and increasing recycling. In 2008, only 6.8 percent of the plastic produced in the United States was recycled. "We have to provide a better infrastructure for taking plastic back," says Moore. In the U.S., 63 pounds of plastic packaging per person is thrown away each year. "I [also] would recommend stopping the use of single-use plastics, like plastic water bottles, and especially plastic bags at the grocery store," says Gold. "These items are getting used for an hour at most, and they can end up in the environment for hundreds of years."

—Britt Norlander

GARBAGE DUMP

Millions of tons of trash are caught in the swirling Pacific Ocean currents between Japan and the United States. Most of this floating garbage comes from the roughly 200 billion pounds of plastic people use each year, of which some 10 percent ends up in the ocean. Much of the trash comes from the land, brought by sewage systems and rivers. The rest, like fishing gear, comes from ships at sea. Since a plastic bottle can take as long as 500 years to break down, it can swirl in the garbage patch for a very long time.

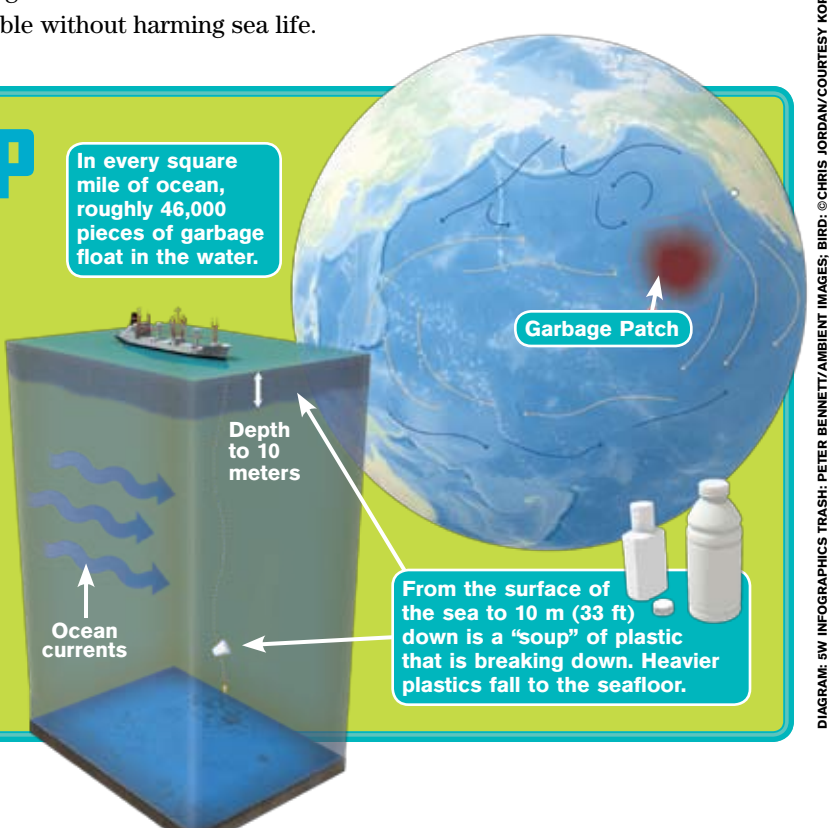


DIAGRAM: 5W INFOGRAPHICS TRASH: PETER BENNETT/AMBIENT IMAGES; BIRD: ©CHRIS JORDAN/COURTESY KOPEIKIN GALLERY