

**Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.**

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**Choking on Plastic**

Nineteen years ago, a sailboat returning from Hawaii and the Transpacific yacht race, decided to take a shortcut back to the west coast. They took a more northerly route, across the less traveled North Pacific Subtropical Gyre. As Charles Moore and his crew crossed this large stretch of ocean, they noticed that a sea of plastic often surrounded them.

In the week that it took the sailboat to cross the North Pacific Gyre, they rarely saw a patch of ocean without plastic and other marine debris. Shampoo and soap bottles, plastic bags and water bottles, fishing floats and Styrofoam, as far as they could see. One of the crewmembers called this “the Great Pacific Garbage Patch”.

The name stuck and, combined with the press conference they held when they arrived back in California, brought global attention to the issues of plastic in the sea and the impacts the plastic was having on marine life. Charles Moore and his crew weren't actually the first people to notice the plastic, but they were the first to announce this to the media.

Currents in all of the world's oceans flow in gyres or circular patterns, clockwise in the northern hemisphere and counterclockwise in the southern hemisphere, driven by global wind patterns. And anything floating around in the ocean can accumulate over time in these gyres.

Fishermen and sailors had noted debris in this part of the North Pacific for years, as had scientists from Alaska ten years earlier. In 1998, NOAA published a report, which described the high probability of the existence of “a large area concentrating plastic waste debris in the North Pacific”.

The initial media reports described the patch as larger than the state of Texas, which gave the impression that plastic literally covered the entire sea surface in the area they sailed through.

Several oceanographic voyages subsequently traversed the gyre and sampled the water along the way. They discovered that there wasn't a big island or mound of plastic and other debris, but they did recover plastic in virtually every net tow they took across 1500 miles of ocean. Most of the plastic was in small pieces, a few millimeters across, like confetti, and much of it was actually beneath the surface.

Additional investigation of the plastic and other particles revealed that as this material breaks down and degrades, it releases an entire cocktail of constituent chemicals that may prove be harmful to marine organisms. Some of the debris is also absorbing or concentrating other contaminants in seawater, chemicals like DDT and PCBs. This makes these small particles more dangerous when consumed by animals throughout the food chain, fish, turtles, marine birds, seals, sea lions and whales.

With additional observations and sampling, it has become clear that the North Pacific Gyre actually consists of two separate fields of debris, the Western and Eastern Pacific Garbage Patches. These each spread across hundreds of miles of ocean, one lying between Japan and Hawaii, and one between Hawaii and California. These aren't fixed masses of debris, however, that can be clearly delineated. As winds and currents change, the debris moves around and circulates, accumulating more toxins, gradually breaking down, with some of it slowly sinking.

Following the announcement of the presence of the Great Pacific Garbage Patch, and the realization that each ocean has its own circular gyre, it seemed only a matter of time before concentrations of marine debris would be discovered in other oceans as well. Somewhat surprising, nearly 45 years ago, a North Atlantic garbage patch had been documented. In 2011, a team of scientists led a sampling cruise across the South Pacific and found plastic and other debris scattered across 3000 miles of this ocean.