Stiv Wilson with plastic bottle found in South Atlantic Gyre. Photo by Jody Lemmon

SEA *of* PLASTIC

BY TERRY WARD

Finding ways to reduce our use of plastics isn't easy, but it can be done.

The oceans, we know, mirror the sky. When it's stormy overhead, the swells reflect that gunmetal gray. And when the skies are cerulean, a sailor's delight, likewise, so is the ocean's surface.

Unfortunately, the oceans also share a lot in common with our land, where we deposit millions of tons of garbage every year. Like a sprawling liquid landfill, this water world we love receives a constant tide of trash – we've seen it floating by on the surface while fishing and we've collected it from reefs while diving.

"The source (of marine trash) is literally every coastline," says researcher and marine scientist Dr. Marah J. Hardt. "Most of what ends up in the ocean is coming from land, storm drains, and beaches – and from people being really, really careless."

Ocean garbage materializes as many things, from lobster and crab pots that get caught on whale's fins, to commercial nets, plastic shopping bags, and plastic toys adrift in the seas. But for all the metal and paper rubbish in the water, it is plastic that has the longest lifespan. A plastic water bottle can take more than 400 years to break down, and nylon fishing line needs more than six centuries to disappear. To understand why plastics take so long to degrade – and why they are such a menace to our oceans – you must first understand how they break down.

Marine debris being collected by members of the Algalita Expedition.

"Plastic breaks down through weathering, sun, and salt water into these tiny pellets smaller than a BB," Hardt says. "It's the smallest unit plastic will break down into." In other words, plastic never completely disappears; it just becomes smaller over time. And unfortunately, says Hardt, those tiny particles of plastic look a lot like the fish eggs and plankton that are the main source of nourishment for many marine animals, including baitfish and birds.

Since 1997, Captain Charles Moore of the Algalita Marine Research Foundation in California has made numerous trips to the North Pacific gyre, an area of intense plastics accumulation caused by converging ocean currents that lies about 1,000 miles off the California coast, halfway between San Francisco and Hawaii.

"It's a toilet bowl effect, but it never flushes," says Moore of his explanation of the gyre. "It's an atmospheric, high pressure system that rotates in a clockwise system and traps debris from the Pacific Rim that's floating around in the Pacific."

The confluence of garbage in a gyre is not something that can be seen from space, even though it is estimated to be twice the size of Texas.

"Some people picture these things like an ice breaker going through garbage," says Moore about places like the Great Pacific Garbage Patch. But seeing the North Pacific Gyre did not hit him "like an a-ha moment."

"It was the fact that I couldn't go on deck without seeing something floating by, some piece of manmade debris," he said of sailing through this part of the ocean. "I was always able to spot something within a few minutes of being up there. And I realized it had to be all around me."

During Moore's trips to the area in the late 1990s, he trawled for invertebrates and found evidence of plastics in the creatures. And in 2009, he returned to the North Pacific Gyre with a research crew to trawl for lantern fish – baitmass fish that live at the depths of the sea and surface at nighttime to feed. "Of 671 fish collected in trawls, mostly lantern fish, we found that 35 percent of them had ingested plastic," said Moore of Algalita's most recent research in the area. One fish, no bigger than a pinkie finger, was full of 84 bits of plastic, he says.

"They are a baitmass," says Moore of lantern fish. "So if we are affecting them we are affecting everything else."

Thoughts like this can seem very gloom and doom indeed, especially to those of us who love nothing more than a fresh fillet cooked on the grill. But for people like Captain Moore and Hardt who study the health of our oceans, it is clear that there is only one way to start turning the tide in our favor.

"Source reduction is the only answer," says Moore. And the good news

is that there are many ways to start doing your part. Take fishing gear, for example. A former commercial fisherman, Captain Moore still fishes recreationally and has this advice for fellow anglers: "I mostly fish for my own consumption, and I know how frustrating it is to snag your tackle. You want to cut it. But you need to retrieve as much of your line and lost tackle as you possibly can," he says. "The hooks and lines get caught on fish and birds and go on killing. That's why it's called ghost fishing; it's a big problem."

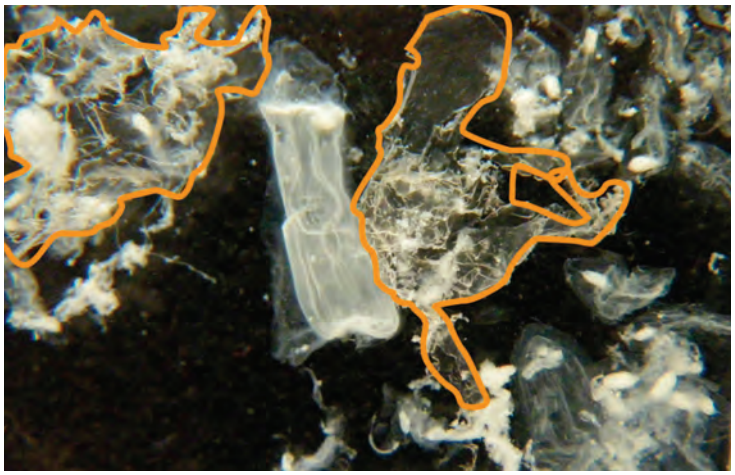
When you want to add new line to your reel, he says, don't throw your old damaged line into the water. "It doesn't biodegrade," he says. His advice is to roll it up and take it home and dispose of it there.

"Source reduction is the only answer."

When your line gets hung, take the time to free it. "Move the boat to the other side of the reef, pull from a different angle," he says. "A lot of times, it's the angle of the pull that keeps you from retrieving the line." And if that fails, says Moore, pull in as much line as possible before breaking it.

Even for people prone to just soak up the sun on the beach, he says, something as simple as making sure your towels and clothing don't get swept away by an incoming wave does a lot more than save you the cost of new beach gear.

"The fleece jacket is made from Dacron, and that stuff lasts forever under water," says Moore. "It can be as damaging as lost fishing gear."



This microscopic photo shows tiny bits of plastic and plankton. Can you tell which is which? The fish can't either. (The plastic is outlined in yellow.)

In addition to more careful fishing etiquette, Hardt says that reducing your plastic footprint is critical toward helping the cause.

"Don't take plastic bottled water on your boat. Get one of those big coolers, and everyone can have a nice metal water bottle to refill," says Hardt. "For every liter of bottled water we use, it takes three liters of water to make the plastic that's holding your one liter. And these used plastic bottles are the kinds of things that blow overboard really easily. Try to shift from any sort of disposable type of gear."

You can take things a step farther, says Hardt, by being a voice in your community. "Talk with your city council to make sure storm drains have the correct filters in place so garbage doesn't get washed into the ocean."

Finding bits of plastic in fish digestive systems such as this rainbow runner is all too typical.

Anna Cummins, a California-based marine scientist, discovered the scope of the ocean rubbish accumulations first-hand when she and her husband, Dr. Marcus Eriksen, crossed the North Pacific Gyre in 2008. In early 2010, the pair sailed a 72-foot racing sloop on a 1,700-mile journey across the North Atlantic from St. Thomas to Bermuda and the Azores to research plastic accumulation in the Sargasso Sea as part of the 5 Gyres Project – a collaborative effort undertaken by the Algalita Marine Research Foundation and Pangaea Explorations that studies the plastics accumulating in the world's major circular current systems, or subtropical ocean gyres.

"The Sargasso Sea (a region in the middle of the North Atlantic Ocean) is where you can see it look more like a garbage patch," says Cummins. "It collects in these big mats." Some of the things they found while trawling included bottle caps, shotgun shells, buckets, and unidentifiable fragments of 'rice grain size' plastic. "What's remarkable to note when you're crossing this massive area, is that no matter where you drop the net and skim on the surface, you're going to find plastic," says Cummins.

And while she agrees with most scientists that a practical way to clean up these masses of ocean trash does not currently exist, Cummins says that people can help by going to places that act like nets for the trash in the ocean – beaches in places like Hawaii, the Azores, and Bermuda – to collect trash on the shore.

Educating youth is also high on Cummins' priorities, and she recently returned from a presentation to high school students in Alaska to educate them on ocean garbage. The session ended with a coastal cleanup session, she said, that took place on the islands near Sitka. "At first it looked beautiful (the beaches), but when you got down and started digging through weeds it was filled with plastic particles," she says of the area. "We found a pen from Japan, bottles, bottle caps, fragments, fishing related debris, Styrofoam."

Targeting the next generation for the awareness campaign is the key to Cummins' work, and her adventures continue. In late 2010 she and Eriksen navigated through the South Atlantic Gyre looking for plastic and signs of fish ingestion while making the crossing from Rio de Janeiro to Cape Town.

Big news in 2010 was the Plastiki Expedition – the crossing from San Francisco to Sydney, Australia, of a 60-foot-long catamaran made from more than 12,000 plastic bottles and other reclaimed materials that was as much about awareness as adventure (see page 32).

"The Plastiki was very much about sparking the imagination and curiosity in people and enabling a platform to inspire people to dream and live their own dreams," says the ship's British skipper, Jo Royle.

"With the Plastiki, we didn't take the off-the-shelf solution," she says about the ship's construction. "And as such, we moved a lot slower over water. One reason we were out there was to prove we can really use different materials, and we tested it by sailing it across the world's largest ocean."

The Plastiki's sails were made from post-consumer plastic. "The guy

Debris on Kamilo Beach on the Big Island of Hawaii.

"We're living in an age where we're so aware and really able to make a difference by our consumer choices."

who made them, a good friend now, thought I was some raving hippie when I told him what I was after," says Royle. But the sailcloth he created was very high performance and "probably stayed in shape better than Dacron," says Royle – a concept in ingenuity that's a lesson in sustainability, too.

"It's always been about cost," says Royle of general economics and affordability considerations when building a boat. "But it should be more and more about the cost not economically, but the cost of nature as well."

With the recycling of plastics and how to combat their accumulation in the ocean her obsession during her years preparing for the Plastiki, says Royle, she learned more than she ever imagined about her day to day consumption.

"The main lesson I've learned is how unaware we are of the synthetic world we're living in," she says, "And that it's too easy to pick up one-use items."

"As western females, we pump 200 different chemicals into the ocean every year because of the cosmetics we're using," she says. "I used to use this body scrub that it turned out had tiny pieces of plastic in it. And I thought, wow, I've just been using that without thinking of it. Then you become aware of it and it's pretty scary how many chemicals are around us each day."

But she echoes the same hopeful sentiment of everyone fighting for the cause. As consumers, says Royle, we are so empowered to join the good fight for our oceans' health.

"We're living in an age where we're so aware and really able to make a difference by our consumer choices," says Royle, admitting that living completely plastic-free, which she set out to attempt for two weeks, was pretty much impossible.

"Plastic is everywhere and it's become a part of life. It was only invented 100 years ago, and every item is still with us today. It's going to be our legacy," she says. "But it's not that every beach and ocean is covered in plastic. It's not so negative that we can't do anything about it, we have the power to change it."

The decomposed body of this albatross shows plastic bottle caps that were caught in its stomach and digestive system.

Start by reducing your consumption of single-use plastics, she says, such as taking reusable bags to the grocery store when you shop. Single-use plastic, Royle says, is the biggest offender, and is responsible for an estimated 60 percent of the plastic that ends up in the ocean. This includes plastic bags, bottles and bottle tops, and food containers – the kinds of things you buy, use, and then throw away.

Another important outlet, says Royle, is adventure – no surprise from the woman who, like her peers, sets off to sail across the world's oceans as part of making her point.

"Adventure is a good platform because you can come back as a storyteller," she says. "As divers and boaters and fisherman, the stories are really important."

And telling the story of the glory of our oceans and the garbage that threatens them – and more importantly, what we are doing to fight it – is the right place to start.