

CITIZEN SAILOR/SCIENTISTS —

Having set sail from the Netherlands in 2013, Dutch cruisers Wietze van der Laan and Janneke Kuysters spent the past year sailing through large portions of the Pacific. Despite many happy memories, they became deeply concerned by the shocking amount of plastic garbage they observed during their travels. This article aims to spotlight the impacts of such debris in the world's oceans, and propose ways that cruising sailors can become involved in ongoing scientific research.

There is no such thing as coincidence. During long crossings on the open ocean we have become more and more annoyed by the large amounts of garbage we've seen floating around us. Not one day has passed when we haven't seen a large item of debris pass by us. "So how bad is this problem?" we often wondered.

Then we met Peter Hodum on remote Robinson Crusoe Island, a few hundred miles off the coast of Chile. He is a professor at the University of Puget Sound in Tacoma, WA, and was on the island doing fieldwork. Peter and others are researching the stomach contents of dead seabirds to see if, and how much, plastic is found there. Our conversation with him was short, but we've kept in touch since by email.

Three months later this relationship led to our visit to the Oceanic Institute of Hawaii Pacific University. There, we met David Hyrenbach, associate professor of oceanography, who seemed slightly amused by our curiosity in oceanic garbage. Cruisers who want to know more about plastic pollution in the oceans? It was the first time that a sailor had asked him such a question. With a sparkle in his eyes he said: "Plastic is a fantastic product. It has many good qualities that no other product has." That statement surprised us, but he continued: "However, we should only use it when it is really necessary. And reuse it endlessly. And not use it for single-use packaging."

"Where does the problem of the plastic soup in our oceans start?" Wietze asked. "With us, humans," David replied. "People use a lot of single-use plastic and that blows across ocean water or flows within it. UV and the movement of the water bleach it, and break it down into tiny pieces. There are five large gyres

in the world's oceans. Small pieces of plastic debris gather in these gyres. The smallest parts are found in the centers and the larger parts near the outer rims — styrofoam for instance."

"Ah," I said, "we saw pieces of that material while sailing from Chile to Easter Island. But in addition to styrofoam we also saw whole crates, plastic blocks, nets, you name it."

"That's right," said David, "you were on the north side of the gyre in the South Pacific." He explained that at any given time, the exact location of the Garbage Patch, or plastic soup is difficult to find. With drones and satellites, attempts have been made, but the particles are too small to be seen from that distance. Scientists make calculations based on models to establish the location of the plastic pollution. This year, the weather phenomenon El Niño inhibited the formation of a stable high-pressure area in the North Pacific. As a result, plastic debris will be more spread out than previously.

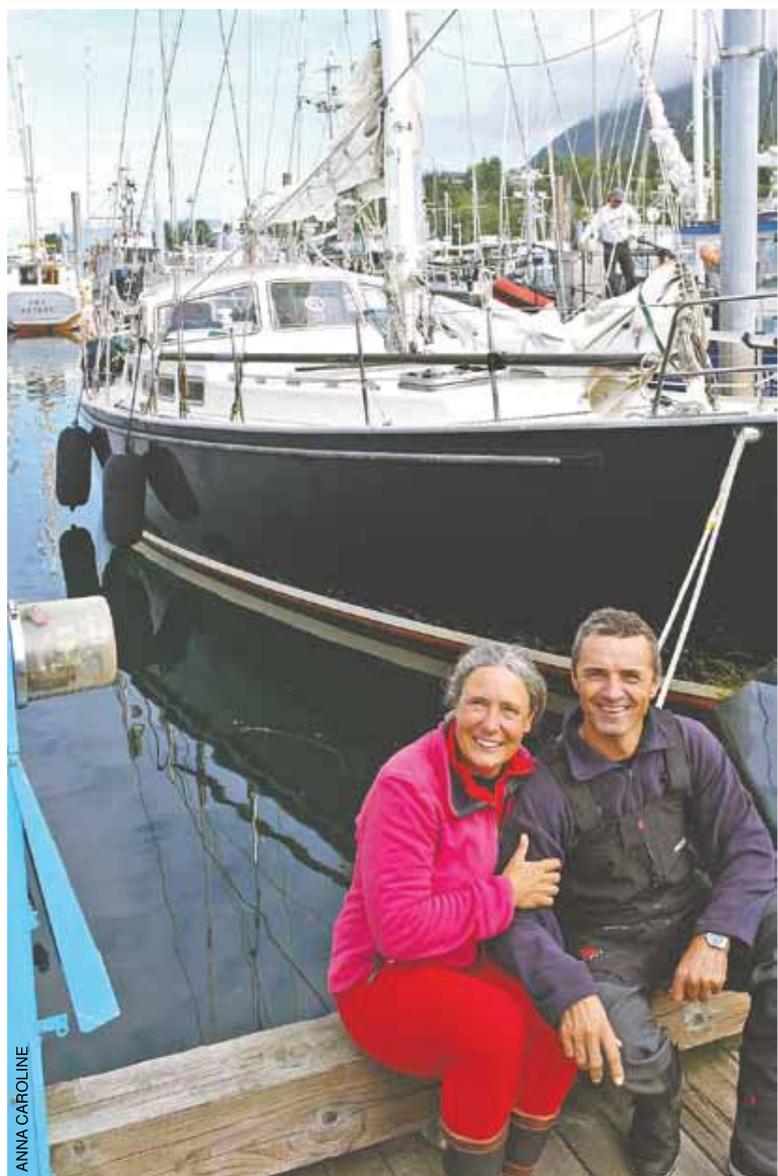
Added to this, in the North Pacific there are remnants from the Fukushima nuclear disaster of 2011. Debris from that catastrophe slowly washed across the North Pacific and is now floating off the coast of North America.

"How bad is this for birds and fish?" I asked the scientist. "Come with me," he said. David took

us to his lab, where he opened rows of containers. "We found this in the stomach of an albatross." In his hand I saw a plastic soldier that was at least four inches long with Japanese script on it. I was stunned. Lighters, beads, bits of plastic, bottle caps: the 'harvest' was seemingly endless.

David then showed us a map of the North Pacific. "For our research we don't kill animals. We have to find dead birds on the islands of the Hawaii archipelago and study them; albatrosses for

While sailing the Pacific aboard 'Anna Caroline', Dutch cruisers Janneke and Wietze became extremely concerned about plastic pollution.



ANNA CAROLINE

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CAN CRUISERS MAKE A DIFFERENCE?

instance. They fly from here to Alaska or Japan to find food. Then they return to feed their chicks. They find that food at sea, eating small organisms that float on or just below the surface. And so they also eat plastic." He opened a freezer and took out a dead albatross. "I am 100% sure that I will find plastic in the stomach of this albatross," he said with a sigh.

"Did the plastic kill the albatross?" Wietze asked. "No, it doesn't kill them," said David, explaining that research is being done into the amounts of plastic that are ingested by seabirds and the impact it has on them. "In albatrosses, we haven't found evidence that the plastic blocks the intestines, slows down growth, or has impact on the size of the organs. However, we did find pollutants in the fat of the seabird. And that doesn't belong there," he said in a sad voice.

Taking some smaller storm petrels from another freezer he continued: "These storm-petrels cannot regurgitate the contents of their stomach like the bigger albatrosses can. Plastic stays longer in these birds. Part of it will leave them in the natural way, but that is a very slow process. More and more we see that these smaller, poorly-studied seabirds have large amounts of plastic in their stomachs."

Before we met David we had searched for information online. You often find projects in which people collect large amounts of garbage from beaches. When we asked David about this, he smiled. "Beach cleanup projects are fine. But we are fighting the symptoms. We must address this problem at the source and make sure that less plastic is used." We talked about the moral and ethical aspects of plastic pollution. Even though the full effects on seabirds haven't been proven scientifically, that doesn't mean it is okay that there is such a high plastic content in their bodies.

David told us about the large amounts of plastic that have been found in the stomachs of other marine predators

such as sperm whales, tuna and dolphin. It is very troubling to realize that these ingested plastics and associated pollutants are probably moving up the food chain, leading to humans. Because the problems of ocean pollution are so vast, it is difficult to

imagine a viable solution. "If we were to stop the influx of plastic in the oceans now," David noted, "it would take 10 or 20 years before we would see any effect."

David explained that research on the location of the Garbage Patch(es)

More and more we see that these smaller and poorly-studied seabirds have large amounts of plastic in their stomachs."

and their effects on sea life is hampered by the high cost involved. Ships, crew, equipment ... it all costs money. But he also talked enthusiastically about a research trip he made on a sailboat, from Honolulu to San Francisco. "What was the most surprising thing for you?" Wietze asked. "How thoughtfully everything on board a sailboat is used," he replied. "Vegetables, water, fuel — everything was used to the fullest." But during that trip he saw a lot of plastic in the water.

This brings us to a related subject: the role cruisers can play in ongoing research. We, and other cruisers, sail in places that can be relevant to scientists. As we pointed out our future track on the map, David said, "You know, we rarely think about involving sailors." His comment seemed consistent with what we had found on the Internet. There are sailboats that participate in scientific research, but doing so requires a big commitment — drilling holes in the hull to take water samples and such. The average cruiser would not be interested



Here in California, most sailors have heard about the North Pacific Gyre. Surprise! There are also four others.

in doing that. However, we read with great interest about last year's Mega Expedition, which involved Transpac boats returning from Hawaii to the West Coast. Each boat dragged a 'trawl' for a few hours per day to take samples. This effort resulted in a treasure of information that is still being analyzed. We explained to David that we've heard of other individual initiatives also. But so far no projects that involve large groups of offshore sailors.

"Nowadays we call that Citizen Science," said David, "as it involves non-

The extent to which seabirds are affected by ingesting plastic particles is being studied actively by various research groups.



JAN ANDRIES VAN FRANKER

CITIZEN SAILOR/SCIENTISTS —



Wietze soon found out that it's not easy to snap useful photos of floating debris from the bouncing deck of a sailboat.

scientists in research."

We were enthused to hear that because in a little more than a week we'd be joining a large group of sailboats that would cross from Hawaii to Alaska or

"The good thing is that if we can take the plastic from the oceans, we can recycle it."

Canada. "How can we make good use of this opportunity?" we asked David. He thought about it, and soon a plan came together. The aim of our crossing study would be to find out to what extent sailboat crews can make useful observations, and can work together with David's

research team.

We asked all the departing boats to log sightings of large pieces of plastic, note the position, and also take pictures. David had an extra assignment for us. "I want to know how much plastic there is in the stomachs of flying fish. This can become a source of plastic content in the stomachs of sea-

birds: the prey brings the plastic with it." He gave us a research ruler and instructions for opening up the fish. Loaded with information, we said goodbye.

Soon afterward, we explained our research plan to crews from the departing boats, who reacted positively to our request for participation. In addition, David promised to connect with the Hawaii Yacht Club next year, so he can have more lead time to set up a project with the yachts that pass through next season.

On our first day at sea, we saw a large piece of plastic. We noted its lat-long position and described it, but taking a picture was difficult, as

it moved past us faster than we could react. Through the daily radio net we heard similar comments from other boats. But everybody kept trying. We also looked for flying fish, but we were disappointed. Ironically, on previous crossings we would trip over dead flying fish every morning when we inspected *Anna Caroline's* deck. But on this trip we found none.

In the spray that frequently came over the bow we found small squids. We

put one of them beside a ruler and cut it open. But apart from a nasty black stain we found nothing to measure. What a pity.



Scientist David Hyrenbach examines a frozen bird. He and his colleagues are gravely concerned about plastics moving up the food chain.

Once the other cruisers arrived in Alaska, they sent us their information. We gathered it and sent it to David. Underway on the Inside Passage, just across the Canadian border, we met the Dutch sailing yacht *Bubbles*, whose owner, Leo Nagtegaal, is one of the sponsors of the widely publicized Ocean Cleanup, which was conceived by Dutch teenager Boyan Slat. As reported

WHAT CAN SAILORS DO?

What can you, as a cruiser, contribute to decreasing the amount of plastics in the oceans? With David Hyrenbach's help the authors made this checklist:

- Separation at the source: leave all unnecessary wrapping in the port of departure.
- Organic waste can be thrown into the sea.
- Keep plastic packaging on board in sealed plastic bags.
- Buy reusable plastic containers, cups, bags, etc.
- Glass bottles and jars: if you throw them overboard, they will sink. In that respect there is no direct danger to sea life. Nevertheless, it's probably best not to.
- Cans: If you have room on board to store full cans, there should be room aboard for the empties also. There is a plastic lining inside some cans. Those definitely need to stay on board. If there is no plastic in them, you can throw them overboard, because they sink. But it's better not to.
- Talk about the problems with others, and look for creative solutions. Awareness is important.

THOUGHTS FROM A NOTED A SCIENTIST

Jan van Franeker is a marine biologist and researcher with IMARES, part of Wageningen University in the Netherlands. He researches stomach content of fulmars in the Atlantic. The authors asked how he feels about involving cruisers in research on plastic pollution in the oceans. "Yes, we do get requests from individual boats," he said, "but so far not from groups."

As a real researcher he sees pros and cons. One advantage is that cruisers can observe and report on areas with concentrations of plastic waste. "We know of the five gyres, but there can be concentrations or eddies in other areas where we would like to do our research as well."

As Jan pointed out, the disadvantage of citizen science is that you have to train people very well and make sure that they work strictly according to a protocol. "Otherwise the results are a signal, but cannot be used by scientists," he says. "But I am happy that you are focusing on this subject in this way. Everything that leads to a decrease of plastic in the environment must be undertaken. Awareness is a first step."

CAN CRUISERS MAKE A DIFFERENCE?

ALL PHOTOS BY THE AUTHORS, EXCEPT AS NOTED

earlier in *Latitude 38*, this foundation is developing an installation with long 'arms' designed to filter the plastic particles from ocean water. With great enthusiasm Leo explained, "The good thing

During the passage to Alaska, Janneke kept a careful log of all large pieces of debris that she and Wietze observed.



is that if we can take the plastic from the oceans, we can recycle it. It will be a positive business case: scalable, autonomous and energy-neutral."

After a few weeks David sent us his enthusiastic thoughts about the observations: "I see possibilities for the future. The test was educational,

because we know now the practical problems we need to solve. The observations confirm my suspicion that the lack of a high-pressure area last summer has caused a bigger spread of the larger pieces of plastic. The number of observations is therefore lower than it would be otherwise. I can use this next year with the next group of sailboats that leave Hawaii for Alaska.

"So, where are you going next year?" he asked in an email. After we told him our plans, he asked if we would



Not all plastic recovered comes in large pieces. As these samples show, the elements break down debris into tiny pieces.

do bird observations for him. Of course! This year's research has taught us a lot. We are still not experts in this field, but we have become more and more aware of the world we live in and the impact we have on it.

— **janneke kuysters & wietze van der laan**

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