



The biodiversity of the world's oceans is severely threatened by the dumping of waste at sea, but Boyan Slat might have a solution

Ocean plastic clean-up

BY ASHLEY COATES

¹ In 1998 Charles Moore, an oceanographer, was sailing across the North Pacific when he made an unwelcome discovery. 'As I gazed
⁵ from the deck at the surface of what ought to have been a pristine ocean, I was confronted, as far as the eye could see, with the sight of plastic,' Moore wrote in *Natural History*
¹⁰ magazine. 'It seemed unbelievable but I never found a clear spot. In the week it took to cross the subtropical high, no matter what time of day I looked, plastic debris was floating
¹⁵ everywhere – bottles, bottle caps, wrappers, fragments.'

What he stumbled on became known as the Great Pacific Garbage Patch or 'Pacific trash vortex'. It is

²⁰ thought to be anywhere between the size of Texas (270,000 sq miles) to several times that size.

The difficulty of measuring such a large area of ocean means exact
²⁵ data are hard to come by, but the latest research suggests the vortex has a 386,000-sq-mile 'heart', surrounded by a 1.4 million-sq-mile outer periphery of trash. The extent
³⁰ and range of contaminants is also little understood, but scientists estimate the high-density core now has an alarming one million pieces of plastic per sq km.

³⁵ Ticking time bomb

By some estimates, the ratio of plastic to small animal matter (known

as zooplankton) in these so-called 'gyres' is around 6:1 by weight. At
⁴⁰ the core of the vortex, this can be as high as 48:1. Zooplankton is an important component of the ocean ecosystem, providing nourishment for the smallest fish to the biggest
⁴⁵ whales, meaning much of the micro plastic matter ends up being ingested. Perhaps most alarmingly for people who eat fish on a regular basis, scientists have recently found
⁵⁰ micro plastics in the bodies of fish, not just in their stomachs. A group of Malaysian and French scientists found 36 pieces of potentially harmful micro plastics in a study of
⁵⁵ 120 mackerel, mullets, anchovies, and croakers.



Described as a 'ticking time bomb' by marine scientists, the Great Pacific Garbage Patch is believed to have grown by five times in the past 10 years and will become a greater risk to life as the plastic degrades further.

It's a problem that caught the imagination of a then 16-year-old schoolboy from the Netherlands, Boyan Slat. Slat was on holiday in Greece when a diving trip brought him face-to-face with the problem of ocean plastics. 'I could see more plastic bags than fish on that scuba dive,' he says. 'I had to do a high-school science project that year and I decided to really dedicate myself to this issue. Everybody told me it would be impossible to clean up, the main problem being that the plastic is extremely dispersed over a wide area.'

80 TED TALK

Slat dropped out of a degree in Aeronautical Engineering in order to pursue the idea, but the initial reception was not positive. He contacted 300 companies looking for support but only one replied, telling him it was 'a terrible idea'.

A hugely popular TED Talk saw the teenage Slat gain worldwide fame, and funding for his designs soon followed, some of it crowd-funded, and some of it from high-profile investors such as PayPal co-founder Peter Thiel and Salesforce chief executive Marc Benioff.

'Being an outsider and not having worked on this before allowed me at least to consider clean-up as an idea that would work. When I started, there was this consensus that "you could never clean this up, that the problem

is way too big, the ocean is way too rough, there is the issue of bycatch..." etcetera.'

The key idea that makes Slat's concept different to other schemes is the principle of 'letting the sea do the work' by having ocean currents run into V-shaped screens that filter out small plastics. When the system is fully operational, the plastics can then be loaded onto small vessels and taken back to land for recycling.

Ocean Clean Up Foundation

Today Slat's Ocean Clean Up Foundation employs more than 70 people and has around \$30m (£23m) in funding. But the task confronting Slat and his team will require a great deal more than this. Although it's hard to gain accurate data, today's estimates suggest roughly five trillion tonnes of plastics are now floating in our oceans. Seven million tonnes are dumped into the sea each year.

Having tested a prototype model of its system in the North Sea last year, the Ocean Clean Up announced that it plans to conduct a trial in the Pacific later this year, and start a full clean-up operation there next spring.

'We're starting with the North Pacific gyre simply because it is the largest accumulation of plastic. A third of all ocean plastic can be found in that area. It will still be an experimental system, operating for one year. We'll gather data and improve the system continuously,' Slat tells me. 'The goal then is to move onto the other four ocean gyres and replicate the process, albeit with slightly less rubbish to deal with in each vortex. We expect to be ready for a scale-up in late 2019, so in 2019–2020 we expect to get a fleet of around 50 systems in that one patch, which are able to clean up around 13 per cent of the patch every year.'

A holistic approach

I ask Slat what has troubled him the most about the situation facing our oceans. 'Definitely the degradation,' he says. 'Plastic

doesn't really go away by itself. The concentration of plastic is rapidly increasing in the gyres. Even if you were to close off the tap, and no more plastic entered the ocean, that plastic would stay there, probably for hundreds of years.'

The degradation of ocean plastics isn't only a threat to sea life, it also leads to the release of chemicals that are known to be harmful to humans when they enter the food chain. Much of our older marine waste is now breaking down into more toxic and hard-to-remove substances, and reaching parts of the sea previously thought to be relatively pristine.

It is now thought that around four billion plastic microfibrils lie on the sea floor. 'Today 95 per cent of the plastic is large stuff and only five per cent is small dangerous micro plastics,' says Slat. 'What is going to happen over several decades is that micro plastic matter may increase twentyfold, which would be quite a big issue.'

But Slat says there is more than just cleaning up. 'We might work on ways to prevent plastic getting into the ocean in the first place. We published a study in *Nature* last year, showing that 86 per cent of the plastic is coming from Asia, and coming from a relatively small number of rivers in those areas. So, in the future, we could do something there within those river mouths. To me that seems like a logical future expansion of what we are doing.' <<

