





CLEANING UP OUR SEAS

WE NEED TO CLEAN UP OUR OCEANS. BIOLOGIST ANNA TURNS INVESTIGATES THE GLOBAL SCALE OF PLASTIC POLLUTION, WHILE TOBY HODGES LOOKS AT HOW THE TOP SAILORS AND EVENT ORGANISERS ARE LEADING THE CHARGE FOR CHANGE. WE ASK HOW EVERY SAILOR CAN BE PART OF THE SOLUTION

F

rom lost fishing nets down to microscopic particles from cosmetics, every piece of plastic ever produced is still on this planet. An astonishing 300 million tonnes of plastic items are produced worldwide every year, it never biodegrades and scientists

estimate that as much as four per cent washes into or is dumped at sea every year.

Once in the oceans, plastic may get broken down by sunlight and wave action into millimetre-sized microplastic debris, but this can be just as much, or more, of a hazard to marine mammals, seabirds, fish and other creatures as they can mistake it for food.

But with a growing number of campaigns about plastic pollution, hard-hitting documentaries exposing the problem, and inventions to help collect debris, we are finally paying attention to the far-reaching effects of plastic pollution. As consumers, we all have the potential to make a positive impact, and as sailors we can play an important part.

So what is the scale of the problem and what can we all do to help keep our oceans clean?

Richard Thompson is professor of marine biology at the University of Plymouth, heading up the International Marine Litter Research Unit. He first coined the phrase 'microplastics' in 2004. Thompson is optimistic that we can gradually change the way we produce, use and dispose of plastic but he says there's no quick fix: "We can't manage without plastics because they bring too many societal benefits, so going plastic-free isn't the answer.

"It's complex but solvable. Ultimately, it's about designing and using plastic differently. It's crucial that we design plastic items with end-of-life in mind, especially single-use items that are used so fleetingly and yet make up 40 per cent of plastic produced.

"Single-use plastics is a key proportion of marine litter and therefore a great starting place to address the issue of ocean plastics," says Thompson.



UNEP

The garbage patches

Eight million tonnes of waste plastic ends up in the sea each year from land (Prof Jenna Jambeck, University of Georgia, Science, 2015) and 50 per cent of litter found on beaches globally consists of single-use items or fragments of them. That is rapidly increasing year on year according to Ocean Conservancy.

In 1997, just 90 years after the invention of plastics, sailor Charles Moore discovered huge accumulations of plastic waste on the surface of the North Pacific as he crossed from Hawaii to California. What was named the Great Pacific Garbage Patch is now known to be one of five main subtropical gyres or circulating systems of ocean currents that draw floating debris into a huge vortex. These patches are growing so fast that they're visible from space, according to the UN environmental programme. The heart of the Great Pacific Garbage Patch is estimated to be one millions square kilometres (386,000 square miles).

Bold solutions are needed for such a huge problem and a 23-year-old Dutch inventor is one of those who thinks he has one. Boyan Slat, the founder of The Ocean Cleanup Foundation, has designed 62-mile-long floating, curved barriers which rely on ocean currents to funnel waste together ready for collection by boat. He plans to clean up

'SINGLE-USE PLASTICS IS A KEY PROPORTION OF MARINE LITTER AND SO A GREAT STARTING PLACE TO ADDRESS THE ISSUE OF OCEAN PLASTICS'

Professor Richard Thompson, who first coined the phrase 'microplastics', says it's crucial to design plastic items with end-of-life in mind



Lloyd Russell



the 7.25m tonnes of extractable plastic floating in these gyres within five years in one of the largest environmental rescue operations yet. “We need a combination of prevention and clean up, soon,” says Slat.

But Richard Thompson believes the solution lies more in systemic change: “If I were placing money and effort in terms of solutions, I would put 99 per cent into reducing the input and one per cent into clean-up. As less plastic enters the environment, we could spend more on clean-up.”

What you don't see

It's not just the plastic that's floating on the surface that we need to consider. Thompson's team has discovered microplastics locked inside Arctic sea ice and in deep ocean trenches. It's ubiquitous. “We find microplastic everywhere we look. Plastic is pervading habitats a long way from human civilisations in pieces that even tiny microscopic marine animals called zooplankton can eat. It isn't possible to cleanse all of those habitats, so the priority must be to reduce the input of plastic to the ocean,” says Thompson.

“We still don't have a great understanding of how plastic moves around – computer models make predictions but what we really need is data.”

To understand more, Thompson has been working 

PLASTIC IN THE OCEAN



80%
of marine litter
is plastic

Over
5 trillion
pieces of plastic are
estimated to be floating
worldwide

It is predicted that by 2025,
155 million
tonnes of plastic will enter
our ocean each year

8-12
million
tonnes of plastic
currently enters our
seas every year

480
billion
plastic bottles were sold
in 2016 – of which only
1 in 5
was recycled

1 million
seabirds and
100,000
marine mammals
die each year from getting tangled
up in, and/or eating plastic

1 in 3
species of marine
mammal has been
found entangled in
marine litter
(A Plastic Ocean)



PLASTIC: A HISTORY

Once claimed to be a wonder material, plastic is cheap, versatile and, above all, durable. The world's first fully synthetic plastic, Bakelite, was invented in 1907 by Belgian Leo Baekeland.

In the 1950s, the disposable polythene bag arrived – the ultimate cheap convenience item – and by the 1980s plastic water

bottles entered the mass market.

Today, around one million plastic bottles are bought every minute, a figure that is predicted to rise 20 per cent by 2021 as our 'grab and go' culture spreads to China and Asia. Convenience comes at a price and plastic could become our most worrying legacy if we continue to use it for single-use products.

closely with sailors and scientists circumnavigating the British Isles on board the 72ft yacht *Sea Dragon*.

As part of a project called eXXpedition that was co-founded by sailor and activist Emily Penn, this boat is fully equipped for scientific research. A 14-strong all-female crew has been researching ocean pollution since 2014, crossing all the main gyres and using a manta trawl net to sample ocean plastics.

The eXXpedition team has just returned from its tenth voyage trawling for plastics and toxics, sailing round 2,000 miles of British coastline and bringing back a unique set of samples from UK waters, including sediment samples from seven ports. This will help identify microplastics found in different environments.

Plastic is already working its way up the food chain and Thompson's team recently found evidence of microplastics in one-third of UK-landed fish. "That really brings home the fact that plastics are present in the things we eat," he says. Human exposure to contamination from seafood is still very low, he believes, so it's not yet a human health concern. However, this evidence is alarming enough for scientists, policy makers, the plastics industry and the general public to want to make changes.

Toxic food

When marine animals and seabirds consume plastic items, they can starve to death. Microplastics also act like sponges, absorbing toxic chemicals and pesticides, and some plastics attract a layer of algae, making them smell like tasty morsels of food.

Microplastics come in many forms. Countless billions of lentil-sized plastic pellets known as nurdles or mermaid's tears are shipped around the world and used as the raw material to manufacture plastic products. Spillages pose a huge risk to the marine environment and these tiny nurdles are found in abundance washed up on seashores worldwide.

Nondegradable microfibres shed from synthetic fleece material during laundry cycles can also enter the water system. Tiny plastic balls called microbeads are washed away every time we rinse off certain cosmetics, toothpaste and household cleaning products.

Slowly, policy is changing: the UK government plans to ban the sale and manufacture of microbeads in cosmetics by the end of 2017. But a more extensive, integrated approach is possible.

Costa Rican government officials recently announced ambitious plans for a countrywide ban on all single-use plastics by 2021. Most countries in the world have a linear system whereby items are made, used and disposed of. But recovering products and reusing plastics before allowing them to impact our environment changes that to a more innovative, circular economy. For example, the Italian company Aquafil collects 'ghost' or spent fishing nets from around the world and regenerates the nylon to produce ECONYL® yarn used by companies such as Adidas, Finisferre and Davy J to manufacture swimwear.

If we rethink the future of plastics and the way we create 'stuff', products start to look more sustainable in the long-term.

Leading by example

The plastic problem seems almost too daunting to digest, but the tide is turning. There is now a collective change in our attitudes towards reusing and recycling plastic.



Erwin Zwart



Holly Wint

Preparing the manta trawl net for sampling during the eXXpedition project – and a typical catch

So where does – and can – sailing fit in to this? Whether it be with respect to technology, manufacturing processes, or innovation, most yachtsmen do look to the top end of our sport for trends that will ultimately trickle down. The same applies to sustainability. Top racing event organisers and pro sailors know that they can reach a big audience and many are now being proactive and leading by example in the fight to clean up our oceans.

"When you're at the elite level of the sport you are looked at through a microscope," says Dee Caffari, who is skippering the yacht *Turn the Tide on Plastic* in the current Volvo Ocean Race. "It's a big responsibility but then you realise how powerful your reach is when you're delivering a simple message."

Ellen MacArthur was one of the early sailing stars to realise the impact she could have. Her Ellen MacArthur Foundation includes a New Plastics Economy programme.



'THOMPSON'S TEAM RECENTLY FOUND EVIDENCE OF MICROPLASTICS IN ONE-THIRD OF UK-LANDED FISH'



Studio Swine

Above: one of The Ocean Cleanup's pilot barriers collects floating plastic

Left: plastic in the sea gets broken down by sunlight and wave action into multiple small pieces

The winners of its \$1m innovation prize were announced at the Our Ocean conference in Malta in October and ideas included a new method of delivering groceries without any single use packaging. Listed overleaf are some other key organisations championing change towards plastic in the sea.

At Land Rover BAR, Ben Ainslie's team is leading by example through its work with sustainability partners 11th Hour Racing. No plastic bottles are allowed in its Portsmouth building and nothing is sent to landfill. Rainwater catchers provide fresh water and solar panels line the roof to ensure all its electricity comes from renewable sources.

The Extreme Sailing Series organisers OC Sport have worked with Sailors for the Sea to set a benchmark for 'clean' regattas. And the America's Cup village in Bermuda in June was another example of what should already be the norm for any large event. Swedish water

LAND ROVER BAR

2050

The ocean is expected to contain 1 tonne of plastic for every 3 tonnes of fish by 2025, and by 2050, more plastics than fish (by weight).

#BringTheCupHome
landroverbar.com

LAND ROVER BAR'S TIPS TO REDUCE POLLUTION

- Use reusable water bottles
- Avoid cosmetics that contain microbeads
- Carry reusable bags for shopping
- Swap disposable coffee cups for refillable ones
- Pick up three pieces of plastic each time you are near the sea
- Place recycling bins at your club or regattas



Jen Edney/Volvo Ocean Race

EMILY PENN'S TIPS FOR CRUISERS:

- Buying in bulk means your products come with less, or no, packaging.
- Where possible buy reusable packaging.
- Remove packaging before you leave port and dispose of it at a proper waste management facility.
- Don't throw anything overboard (except for organics over 12 miles from land).
- Include all food scraps apart from cooking oil in your organics bin.
- Research what waste management/recycling system exists where you land. If inadequate facilities exist, keep waste on board.

purification company Bluewater provided water fountains, there were no plastic plates or bottles and members of the media were even issued with a free Klean Kanteen reusable aluminium bottle – the perfect sustainable souvenir.

A sustainable Volvo Ocean Race

With its 12 stopovers around the globe, the Volvo Ocean Race is the ideal billboard for promoting a cleaner future for our seas. “Our goal is to leave a legacy,” said CEO Mark Turner when he announced the VOR sustainability programme for the 2017-18 edition and beyond. Partnerships were signed with 11th Hour Racing, AkzoNobel and the United Nations Environment and a series of commitments that focus on ocean health were outlined.

“In each location we are able to impact, influence, change views, and get new commitments while we are there from governments and business,” says Turner.

Where once it was alcohol and cigarette firms, banks or mobile phone companies that sponsored the Whitbread and Volvo Ocean Race teams, the current edition is more in tune with our times. Three of the VOR teams, together with the organisers, are promoting a sustainability message this year.

Damian Foxall, who embarked on his tenth round the world race when he set off with *Vestas 11th Hour Racing*, says it was this focus on ocean health and sustainability that drew him back. “My personal goal for this year’s race is to have a positive plastic footprint... a personal plastic footprint that has refused, reduced, reused, recycled, and recovered more plastic than consumed.”

Dee Caffari explained to us how the race villages ban plastic water bottles, straws and cable ties, and will serve sustainably sourced food. Her campaign focuses on plastic pollution in particular. “We’re trying to raise people’s awareness of the issues and trying to change their behaviours.

“We’re also carrying a science project onboard that’s never been used before,” she says. The Turn the Tide on Plastic crew will take daily GPS-logged water samples to measure for quantities of microplastics.

“The actual data we will collect is real data that industry leaders and government cannot ignore.”

Surely there is a large element of hypocrisy here, though: multimillion pound yachts and their large support teams flying in and out of countries all round the globe? Caffari agrees: “We talk about harnessing the power of nature and purity of our sport – but we cook carbon boats, ship containers and fly people to these events. It’s important we acknowledge that, don’t shy away from it and talk about how we’re compensating for it.”

She says the VOR sustainability programme is all about



Beau Outteridge

“THE ACTUAL DATA WE WILL COLLECT IS REAL DATA THAT INDUSTRY LEADERS AND GOVERNMENT CANNOT IGNORE.”

Fresh water dispensers are becoming a common sight at race villages



Pedro Martinez/Volvo Ocean Race

leaving a legacy in each port they visit, both through infrastructure and education. “As a race we are investing in the research to make a difference. Unless we keep demanding the changes then the people at the top won’t make those changes. As part of the UN initiative that *Turn The Tide on Plastic* is attached to, we are trying to help reach that top echelon. As a sailing team we won’t get there, but as part of a bigger team we might.”

“You have to think how simple things can be done by everyday people,” says Caffari. “If everybody just changes their behaviour slightly it will have a knock-on effect. We’ve got fresh drinking water readily available, but we’re not using it. Let’s have fountains available and have everyone carrying a water bottle. Let’s get people carrying a thermal mug rather than cups that can’t be recycled.”

“Single use plastic is something we can all do better on,” agrees Emily Penn, who has spent the last decade combing

ORGANISATIONS CHAMPIONING THE FIGHT AGAINST OCEAN PLASTIC

Plastic Oceans

A not-for-profit organisation that launched ‘A Plastic Ocean’ this year – a documentary film, eight years in the making, made to show the real facts.

www.plasticoceans.uk

The Ocean Cleanup

This proactive scheme uses huge floating booms to trap ocean plastic. It estimates it can remove 50 per cent of the Great Pacific Garbage Patch in just five years.

www.theoceancleanup.com

11th Hour Racing

This Schmidt Family Foundation programme aims to find innovative solutions to the health of our marine environment and partners high end race events and teams.

www.11thhourracing.org

Sailors for the Sea

A programme that supports clean regattas like the Extreme Sailing Series, educates children, and has an ocean watch campaign and green boating guides.

www.sailorsforthesea.org



Ian Roman/Volvo Ocean Race



Jen Edrney/Volvo Ocean Race

the oceans, studying and campaigning against plastic and microplastics. Penn was the first woman to be awarded the international Yachtmaster of the Year and recently lectured the current Volvo crews about sustainability. "What's really surprised me is that plastic is not only dense in the gyres, it's literally covering our whole oceans – 70 per cent of the planet."

She agrees with Professor Richard Thompson's earlier comments that it is much more efficient to focus on prevention at source rather than clean up afterwards. Penn encourages all sailors to use the free Marine Debris Tracker app. She also has some useful tips for cruisers see tips, listed on page 39.

Sailors must play their part. There is no reason today to ship gallons of water aboard in plastic bottles, for example. The likelihood is that cruisers will be carrying those bottles to somewhere they won't be recycled.

Back in 2014, we surveyed 225 skippers taking part in the Atlantic Rally for Cruisers (ARC) specifically on the subject of water provision on board. The fleet shipped 30,000 litres of bottled water between them! That's an average of 145lt of bottled water per boat just for a two- to three-week crossing. In fact, we'd underestimated usage ourselves and the maximum amount they could enter in

Above: a Brazil beach clean during a Volvo Ocean Race stopover
Right: all Volvo crews support sustainability with simple messages like this by Dongfeng Race Team's Marie Riou

our survey form was '200lt plus', so the average was probably considerably higher.

Yet around 60 per cent of the fleet had watermakers to supplement an average fresh water tank capacity of 500lt.

For storing reserve water, collapsible containers and jerrycans are better than buying bottled water. Alternatively, reduce consumption of fresh water on board by fitting a saltwater tap or using manual pumps at sea rather than electric pumps.

By making small lifestyle changes, every person can immediately make a difference. The wider the message is spread, the more pressure will be placed on the authorities to make changes, such as introducing bans on single-use plastics.

Sailors are well placed to help and have the best motivation to do so. ■



Yachting World will support and highlight all areas of marine sustainability. In future issues we will be looking specifically at 'end of life boats' and the latest thinking on recyclable materials in boatbuilding. We will champion new products and initiatives or smart building methodology in our news, gear and yachts pages, highlighting any with this 'Clean Oceans' logo.

Seabin

These floating bins work like vacuum cleaners for marinas. The Palma based company is also doing valuable work in raising awareness of marine pollution.
www.seabinproject.com

5 Gyres

This company uses science, art, education and adventure to empower action against plastic pollution.
www.5gyres.org

eXXpedition

Scientific research into ocean plastic by all-female crews aboard the 72ft yacht *Sea Dragon*. The company was co-founded by tireless ocean health campaigner Emily Penn.
www.exxpedition.com

Marine Debris Tracker

Log plastics you see/collect at sea or on the beach using a simple app:
www.marinedebris.engr.uga.edu