

Transcripts from the film: A look at Marine Plastics with Emily Penn

Learning Level All
Run Time 22.27 minutes

Emily Penn to camera: I'm pleased to be working with Macduff Marine Aquarium to help raise awareness around plastic pollution in our oceans.

For me, my journey as an ocean advocate began rather surprisingly.

I actually decided that I wanted to train as an architect when I was at school and I went off to university to do just that. It wasn't until I finished my degree and lined up my first job as an architect in Australia, but I decided I wanted to get there from England without taking an aeroplane. So, I ended up looking at that map, England to Australia, 14000 nautical miles, and I thought, how am I going to get there? And decided to try and hitchhike on a boat.

That's when I came across a project called Earthrace, a boat that runs on 100 percent biofuel. It had broken the round the world speed record but was now about to go around the world a second time to visit one hundred and twenty cities to talk to schools, politicians and media about renewable energy. So, I wrote to the skipper and I said, "How do I get a job on board this boat? And he said, come to Brighton, in South England and we'll see how you get on".

I showed up in Brighton with enough stuff to last me for a weekend and I didn't end up going home for another nine hundred and twenty-three days!

I got on board this amazing looking rocket ship style boat and off we went across the Atlantic Ocean, through the Panama Canal and then into the Pacific and we got welcomed into amazing remote communities. But there were so many things that I was never expecting to see on this trip around the world.

One was actually being woken in the night by the sound of something hitting the hull of our boat and when I came up on deck, it turned out that we were surrounded by pieces of plastic!

Now, at the time, we were eight hundred miles from nearest land, so the closest people to us were actually in the space station in orbit above our heads. And yet there was this evidence of human life and waste in the most remote part of the Pacific.

We stopped at remote islands and we found that the locals were struggling to catch fish because the commercial vessels had emptied their waters of the fish they knew how to catch. They were struggling to grow food in the ground because the rising sea levels had caused their soil to become so salty that their crops wouldn't grow. The knock-on effect of this was a new reliance on importing packaged food and drink that all came wrapped up in this new strange material: plastic!

With nowhere for that plastic to go, it ended up getting dumped on beaches, thrown in the ocean and sometimes burned, and it was this really toxic burning smell that kept getting up my nose on all of these islands. I wanted to know more about what it was and I then learnt about these chemicals that are released when you burn plastic

in this way and how they can impact our bodies, our health, they can lead to cancer. These were chemicals that we and the kids living on this island in the South Pacific really didn't want inside our bodies.

In between each of these islands we had days, weeks, and months of this open ocean and we would sit on the roof of Earthrace looking out at the curvature of the earth on the horizon. It was out here for me that things started to change; because one of the things I love about being at sea is how you constantly have to react to the changes around you. The wind changes direction or the waves start getting bigger and you have to adjust your sails, you shift your course, and sometimes your life depends on the response that you take. And it made me start thinking about my own course, my career, and I suddenly realised that I didn't want to go and be an architect and build buildings.

I actually wanted to tackle this issue of plastic that I was seeing everywhere I went. So, I went back to this little island in Tonga and started to work on the ground on a waste management system. I got to know the locals, to find out what they thought about all this plastic on their beaches. I quickly discovered that they didn't even have a word in their language for rubbish or bin, the idea of throwing something away into a controlled system didn't exist because a banana peel, a coconut husk, could be thrown on the ground with no consequence so it had never been thought of before.

So, it wasn't only infrastructure that these islands needed, but a whole new way of thinking about this new inorganic material. After six months of working with the schools, we culminated in an enormous clean up event and we had 3000 people, which was three quarters of the population, come together and we picked up fifty six tons of plastic in just five hours! Now, that's probably enough to fill up a school gym. It's so much rubbish, and it absolutely staggered me! I just couldn't believe it and it was not only the domestic waste from the local people who were relying on this imported food. It was also every morning when I walked along the beach, I was seeing plastic washing up and when I picked up these pieces of plastic, I realised that the writing on the labels was in languages that I didn't even recognize. This got me asking more questions: Where was that plastic coming from and how is it ending up all the way on this little beach in the South Pacific?

So, I started to learn more about the way that we use plastic and really the sheer volume of how much is produced and thrown away every day. Now, this counter here (counter on screen with numbers scrolling past 1.5 trillion) shows the number of plastic bags that we're using in the world right now. That's how quickly it's going up! And those bags, they get used once, maybe twice, probably three times at best, and then they're thrown away. That's the thing about plastic; it's an amazing material because it lasts forever, but we go and make things like plastic bags and water bottles that are designed to be used just once and then thrown away.

It's that mismatch of material science and product design that puts us in this situation of having huge amounts of waste material that no longer have any use or any value. So, then I thought, couldn't we just recycle all of that plastic? Can we turn it back into new things? But it turns out only nine percent of the plastic that we use actually gets recycled. That number is so low because plastic is a word that we give as a name to hundreds of different materials. They all have different properties; some of them are stretchy, some are hard. They might be clear or coloured, but to give them all of those different properties, they need to have different chemical structures.

When you recycle plastic, you can only take one type at a time to get a good quality product at the other end. So, all this plastic, it needs to be cleaned and sorted and then you come across something like a toothbrush that's got three or four different types of plastic stuck together into one object, which makes it completely impossible to recycle!

So, the end result is all this waste, with nowhere to go!

Lots of it goes to landfill, but a surprising amount of it escapes and it finds its way down streams, drains, rivers that ultimately run downhill to the ocean. When they get to the ocean, they then follow these ocean currents and end up in these hot spots around the world. We have five of these spots in our oceans and we call them Gyres. These are accumulation zones, where because of the ocean currents all of the plastic eventually ends up in the middle of the gyre.

Now, I was becoming increasingly intrigued with where this plastic was going and how it was moving around the planet, so after that project in Toga, in the Pacific, I decided to set off back to sea to try and find some answers to all of these unanswered questions.

So, we set off to sail to the Southern Atlantic Accumulation Zone. We left Brazil heading towards Africa and we got out to the middle of this gyre. The place that we expected to find all of this plastic that we knew was leaving the land but what was surprising us when we got there was actually it was beautiful and blue. We saw a piece of plastic there and a piece here and we got our nets out and started to collect this plastic and by the end of the day we had about thirty pieces of plastic piled on the boat. But it didn't make any sense because we know 8 million tons of plastic are going into our ocean every year and we could only find these thirty pieces!

Where was the rest of the plastic going?

Now, it turned out the plastic was there; we just couldn't see it! It was too small!

We built a manta trawl, a big piece of metal with wings like a manta ray and net, a very fine mesh net off the back. And when we pulled that along the surface of the ocean and brought it back on board and turned it inside out, we found 100s of tiny fragments of plastic. What we call microplastics, they are smaller than your little fingernail and they make up the majority of the plastic in the ocean.

They are not biodegrading, and they are not going back into the natural circle of life. When they get smaller from the UV rays of the sun and the wind and the waves, they are simply getting into smaller pieces that are much harder to see and much, much harder to clean up!

When we bring the samples on board, we then analyse them and we try and work out what's plastic and what's plankton, the fish food that's floating on the surface of the ocean as well. And it turns out in this slide (image of microscopic sample with some items highlighted) that these two pieces are actually plastic, and they look almost identical to the plankton. So, then we started catching fish and we found things, like this rainbow runner (image of small fish cut open with plastic in gut) that actually had 17 fragments of plastic inside its stomach; plastic that it had mistaken for food.

At this point, we started asking more questions about how has that plastic got into the food chain? And if we're at the top of that food chain, then what might it mean for the health of us as well?

There's very little evidence that connects the bottom to the top of this food chain, but I thought I'd skip right to the end and actually find out which of these chemicals that we're finding in plastic and the ocean also might be inside my body. So, I had a blood test, we looked for thirty-five chemicals that are banned by the United Nations and of those thirty-five chemicals, we found twenty-nine of them inside my body! Now, this I found really shocking, I think, mostly because when we're talking about environmental problems, we're usually talking about something that's happening somewhere else; that we're watching on TV, that's maybe happening somewhere far away, that's going to affect us, maybe, in the future.

But this test made me realise that, actually already we have a chemical footprint, something that we will never get rid of and at the moment, the levels of chemicals aren't alarmingly high, that we need to be worried about our health; but, it's a scary indicator of the direction that things are heading.

So, this sparked a whole new series of voyages for me called Exxpedition, an all women sailing mission to look at plastic and toxic pollution in our ocean and also our bodies. At the moment we are sailing around the world to understand really what plastic is out there in our ocean and where it is coming from, so that we can stop it getting there in the first place.

I want to share with you some clips of our sailing expedition across the North Pacific Gyre, which is better known as the Great Pacific Garbage Patch. We set sail with 14 women from Hawaii to sail to Vancouver right through the heart of the gyre. Here's a little of what we found when we got to Hawaii (*clip from the exxpedition showing the women doing a beach clean and posing as a group*).

'Today we are on the East coast of Oahu and we are looking at what plastic is washing in. Oahu, one of the Hawaiian islands, really sits on the edge of the North Pacific gyre that we are going to be sailing to next week. The plastic on this beach literally could have come from anywhere along the Pacific: America, Canada, Asia.

A lot of it is single use plastic, a lot of containers, here we have a toothbrush, we got a couple of pieces here that are interesting, you can actually see along here that there are some teeth marks.

Today has been brilliant as it's the first day that our Exxpedition North Pacific crew have all come together. The crew is made up from amazing women from all over the world. We have six different nationalities but most importantly, a really diverse skill set; we have got journalists, artist, scientist, a teacher, a film maker, policy makers and product designers. So, people who can both look at the challenge, share that message, and also think about solving it'.

Clip ends.

Emily Penn to camera:

So we set off along the southern shore of Oahu and we were in the shelter from the island, and then came the point when we turned the corner to feel the full brunt of the trade winds rushing across the Pacific and the team on board were incredible. They came from all different skills and backgrounds, but not many of them were sailors.

So, the first week was a real challenge for everybody on board and you can see how they were getting on forty-eight hours in.

Clip from expedition with the women giving short descriptions of their experience so far to camera:

'In the last forty-eight hours we have had wind, waves, rocking and a rolling, the food has been delicious.

Eaten a lot, slept a lot and heaved a lot!

Last night was very wavy!

Gusts up to forty knots and a squall in the night.

Full moon and stars!

I have never been so afraid of drinking water.

Not being be sick, being sick, threw up in the wrong direction and got sick on forehead.

The challenges of trying to cook noodles at a forty-five-degree angle.

Trying to use the loo at a forty-five-degree angle.

I think I saw a turtle!

I managed to cook some lunch in my underwear.

Singing Fleetwood Mac at the top of our lungs.

I really enjoy everyone here and their company helps to relieve the sea sickness.

It's been wonderful and we are almost heading in the right direction for the gyre!

Clip ends.

Emily Penn to camera:

So, living life at a forty-five-degree angle was a huge challenge, but as you can see, the team dealt with it well, with a lot of humour on board, but then on day six, the sun came up and we could see over the side of the boat and the mood on board really changed.

Clip from expedition with the women giving short descriptions of what they have found to camera:

'We have been sailing though the north pacific gyre for 7 days and we can't believe what we have seen.

Plastic bottles, toothbrushes, plastic bags, buckets and barrels, a lot of rope, more pieces of rope, nylon rope.

The constant stream of small bits of plastic, a cigarette lighter, fishing crates, mirco, micro, micro plastics, a huge fishing net!

Seeing these beautiful dolphins and then floating plastic right next to them.

It's the sheer amount of pieces!

It's literally a plastic soup.

Large plastic lids for container, a washing basket, half a toilet seat, a chair with all four legs.

All these items once belong to someone and they definitely don't belong in the ocean'.

Clip ends.

Emily Penn to camera:

This is that large net that you could see in that video, (picture of large net floating) and it always amazes me how the marine life then comes and congregates around it and the algae come and attaches to the ropes and the other bits of plastic and then the little fish come to feed on that. And that attracts the bigger fish and then the even bigger fish, which is why Anna jumped in behind me on shark watch to check that nothing was lurking down there as we attached a satellite tracker to this big piece of net.

But as I mentioned earlier the biggest problem is actually the smaller pieces. So, here is a little bit of the work we do around the microplastics:

Clip from expedition of the women collecting and analysing samples:

'We are in the middle of the North Pacific gyre and when we look out to sea it looks like a beautiful blue ocean. It's only when we put this trawl through the water with a very fine mesh net do we realise that actually most of what we are looking at right now is covered in tiny fragments.

We deploy the trawl for 30 min at a time and we are taking a tiny slice just a half a metre wide for a mile which just makes you wonder how many are out here in this vast ocean.

The samples we are taking on board will be used for a number of things, some will go back to Hawaii Pacific University to be analysed for the toxic chemicals that are adhering to surface of the plastic. The rest of the samples are analysed right here on board the Sea Dragon. We are looking at pellets, fragments, film, line and foam. Once we work out what these plastics are, we can better understand where they are coming from and how to stop them getting into the ocean'.

Clip ends

Emily Penn to camera:

We now know that over five trillion fragments of plastic are floating on the surface of our ocean and many times that have sunk to the depths, in a place so deep that we can't even measure what's going on down there.

It makes us realise that trying to clean up this plastic mess is the most impossible challenge.

Right now our opportunity is to turn off the tap, to start at the source and stop any more plastic from getting out there in the first place and so now all of our efforts are now focusing on land, working with individuals, on changing mind sets, working with governments, on changing policies and working with companies, on developing new solutions and innovations that eliminate single use plastic out of our supply chain.

Thank you so much for listening to some of my adventures around the world. I hope that you have all be inspired to take action on plastic pollution and think about how you can use the power that you have to be part of solving this problem. The more I have worked on this issue the more I realise that there is not one solution to all of this but, the great news is that there are hundreds and we need to be doing all of them! Just one or two of them each, to be minimizing the single use plastic that we all use every day and to maybe going beyond that to see how we can influence others and their plastic usage as well