Man-made fibres and plastic found in the deepest living organisms

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Credit: Newcastle University

A study, led by Newcastle University's Dr Alan Jamieson, has uncovered evidence that not only have plastics now reached the deepest chasms of our oceans but they are being ingested by the animals that live there.

Revealing their findings today as part of Sky Ocean Rescue - a campaign

to raise awareness of how plastics and pollution are affecting our seas - the team tested samples of crustaceans found in the ultra-deep trenches that span the entire Pacific Ocean - the Mariana, Japan, Izu-Bonin, Peru-Chile, New Hebrides and Kermadec trenches.

These range from seven to over 10 kilometres deep, including the deepest point, Challenger Deep in the Mariana Trench, at a staggering 10,890 metres deep.

Using state-of-the-art facilities at Newcastle University and Shimadzu UK Ltd in Milton Keynes, the team examined 90 individual animals and found ingestion of plastic ranged from 50% in the New Hebrides Trench to 100% at the bottom of the Mariana Trench.

The fragments identified include semi-synthetic cellulosic fibres, such as Rayon, Lyocell and Ramie, which are all microfibres used in products such as textiles, to Nylon, polyethylene, polyamide, or unidentified polyvinyls closely resembling polyvinyl alcohol or polyvinylchloride - PVA and PVC.

Research lead Dr Jamieson, said:

"We published a study earlier this year showing high levels of organic pollutants in the very deepest seas and lots of people asked us about the presence of plastics, so we decided to have a look.

"The results were both immediate and startling. This type of work requires a great deal of contamination control but there were instances where the fibres could actually be seen in the stomach contents as they were being removed.

"We felt we had to do this study given the unique access we have to some of the most remote places on earth, and we are using these samples

to make a poignant statement about mankind's legacy.

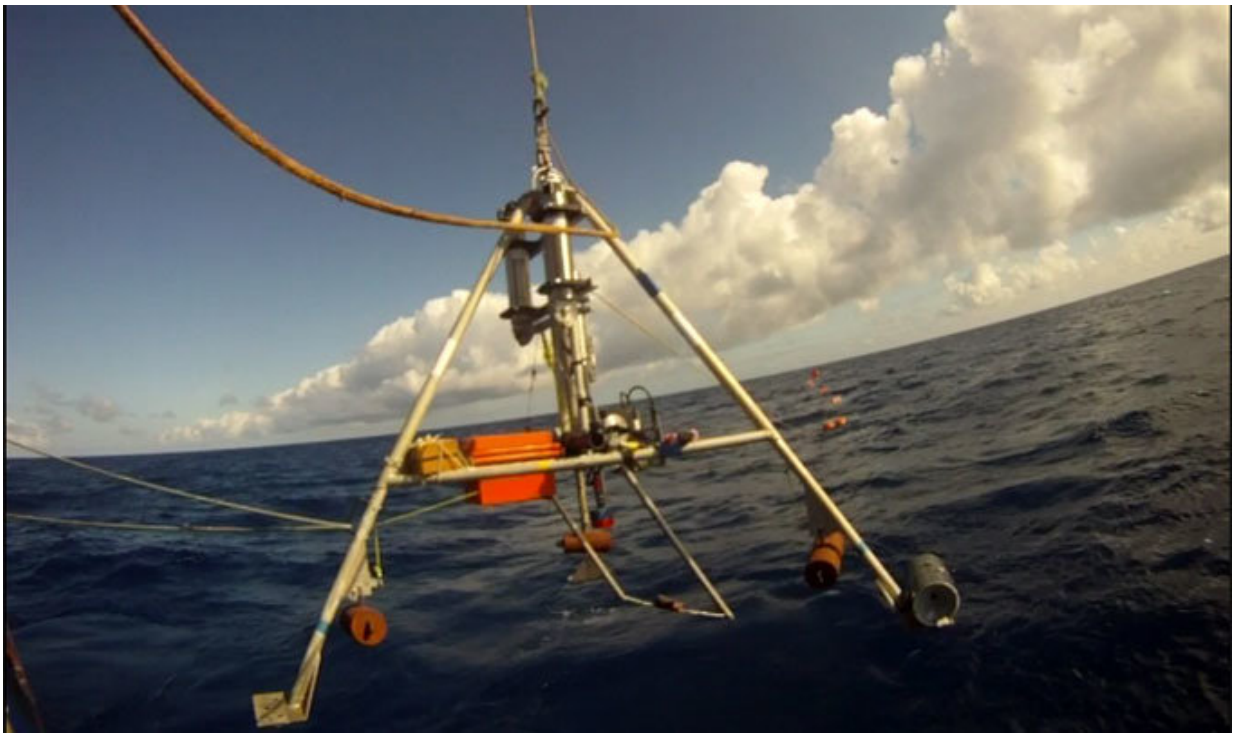
Surface to seafloor

Using deep-sea 'landers' developed by Dr Jamieson, the technology free-falls to the ocean floor and carries out a variety of monitoring and sampling tasks. The technology has been used at locations around the globe and the team's deepest landers have been dropped over 200 times around the Pacific Trenches.

There is now an established appreciation of plastic pollution in our oceans and the detrimental effects this has on marine organisms. An estimated 300 million tonnes of plastic now litters the oceans, with more than 5 trillion plastic pieces weighing over 250,000 tons currently floating on the surface.

Although the majority of marine litter can be observed floating on the surface, the degradation and fragmentation of plastics will ultimately result in sinking to the underlying deep-sea habitats, where opportunities for dispersal become ever more limited.

"Deep-sea organisms are dependent on food raining down from the surface," explains Dr Jamieson, "which in turn brings any adverse components, such as plastic and pollutants with it.



A 'Lander' developed by Dr Jamieson. Credit: Newcastle University

"The deep sea is not only the ultimate sink for any material that descends from the surface, but it is also inhabited by organisms well adapted to a low food environment and these will often eat just about anything.

"This study has shown that manmade microfibres are culminating and accumulating in an ecosystem inhabited by species we poorly understand, cannot observe experimentally and have failed to obtain baseline data for prior to contamination.

"These observations are the deepest possible record of microplastic occurrence and ingestion, indicating it is highly likely there are no marine ecosystems left that are not impacted by anthropogenic debris."

Deep-sea rubbish bin

Dr Jamieson adds: "Litter discarded into the oceans will ultimately end up washed back ashore or sinking to the deep-sea, there are no other options.

"Once these plastics reach the deep-seafloor there is simply nowhere else for them to go, therefore it is assumed they will simply accumulate in greater quantities.

"This is a very worrying find. Isolating plastic fibres from inside animals from nearly 11 kilometres deep (7miles) just shows the extent of the problem.

"Also, the number of areas we found this in, and the thousands of kilometre distances involved shows it is not just an isolated case, this is global."

Provided by Newcastle University

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