

Banned chemicals from the '70s found in the deepest reaches of the ocean

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A Nature picture of a *Hirondellea gigas*, known to consume almost any organic material that descends from the surface waters, including any pollutants

A study, led by Newcastle University's Dr Alan Jamieson, has uncovered the first evidence that man-made pollutants have now reached the farthest corners of our earth.

Sampling amphipods from the Pacific Ocean's Mariana and Kermadec trenches—which are over 10 kilometres deep and 7,000 km apart—the team found extremely high levels of Persistent Organic Pollutants—or POPs—in the organism's fatty tissue. These include polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs) which are commonly used as electrical insulators and flame retardants.

Publishing their findings today in *Nature Ecology & Evolution*, the study team - from Newcastle University, UK, University of Aberdeen and the James Hutton Institute—say the next step is to understand the consequences of this contamination and what the knock-on effects might be for the wider ecosystem.

Lead author Dr Jamieson, said:

"We still think of the [deep ocean](#) as being this remote and pristine realm, safe from human impact, but our research shows that, sadly, this could not be further from the truth.

"In fact, the amphipods we sampled contained levels of contamination similar to that found in Suruga Bay, one of the most polluted industrial zones of the northwest Pacific.

"What we don't yet know is what this means for the wider ecosystem and understanding that will be the next major challenge."

A legacy of the past

From the 1930s to when PCBs were banned in the 1970s, the total global production of these chemicals was in the region of 1.3million tonnes.

Released into the environment through industrial accidents and discharges and leakage from landfills, these pollutants are invulnerable

to natural degradation and so persist in the environment for decades.

The research team used deep-sea landers - designed by Dr Jamieson - to plumb the depths of the Pacific Ocean in order to bring up samples of the organisms that live in the deepest levels of the trenches.

The authors suggest that the pollutants most likely found their way to the trenches through contaminated plastic debris and dead animals sinking to the bottom of the ocean, where they are then consumed by amphipods and other fauna, which in turn become food for larger fauna still.

"The fact that we found such extraordinary levels of these pollutants in one of the most remote and inaccessible habitats on earth really brings home the long term, devastating impact that mankind is having on the planet," says Dr Jamieson, who is based in the School of Marine Science and Technology at Newcastle University. "It's not a great legacy that we're leaving behind."

Sink for pollutants

Oceans comprise the largest biome on the planet, with the deep ocean operating as a potential sink for pollutants and litter that are discarded into the seas.

These pollutants then accumulate through the food chain so that by the time they reach the deep ocean, concentrations are many times higher than in surface waters.

"We're very good at taking an 'out of sight out of mind' approach when it comes to the deep ocean but we can't afford to be complacent.

"This research shows that far from being remote the deep ocean is highly connected to the surface waters and this means that what we dump at the

bottom of the sea will one day come back up in some form another."

More information: *Nature Ecology & Evolution*,
[nature.com/articles/doi:10.1038/s41559-016-0051](https://doi.org/10.1038/s41559-016-0051)

Provided by Newcastle University

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