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PLASTICS

Study: Polyester fibers widespread in the Arctic

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Icebreaker ships help scientists sample microplastics at the North Pole. Fisheries and Oceans Canada

A study touted as the "most comprehensive" look at microplastics in the Arctic shines new light on their prevalence and underscores clothing's environmental footprint.

The **study**, published today in the journal *Nature Communications*, found that synthetic fibers make up about 92% of microplastic pollution in near-surface seawater. Of that, around 73% is polyester — a fiber commonly used in textiles, pointing to clothing, laundry and wastewater discharge as major culprits in polluting the world's oceans with microplastics.

"The dimensions of the fibers we're finding and the identification of most of them as polyester is striking, because the diameter of the polyester fibers in the Arctic are basically the same as the ID of a lot of the polyester textiles produced for clothing," said lead author Peter Ross, vice president of research at Ocean Wise in Vancouver, British Columbia.

Ross and his colleagues also observed almost three times more microplastics in the eastern Arctic compared with the west. Infrared spectrometer analysis of the fibers' unique signatures pointed to older materials as researchers moved west.

"So the conclusion there is that the eastern Arctic is at the receiving end of polyester fibers from the Atlantic Ocean and the western Arctic is subject to older, more weathered and more broken-down polyester fibers," Ross said.

He cautioned that scientists are still determining how microplastics travel from point sources and that atmospheric delivery methods are likely also at play. But North Atlantic waters entering the eastern Arctic are a "well-understood conveyor belt."

The team used research vessels to collect water samples between 3 and 8 meters below the water at 71 stations across the European and North American Arctic, including the North Pole, during 2016.

"What we're really doing is targeting the water column, and that is where the food web lives," Ross said.

Previous microplastics work has focused on the surface, where plastic foam such as Styrofoam tends to dominate, leaving the potential for other important insights into materials that don't float to be missed. The researchers also analyzed samples as deep as 1,015 meters at six sites in the Beaufort Sea. They used lab filtering and smaller mesh sieves to drill down on pieces of plastic as small as 8 microns. Ross said the

combination of different sample techniques, geographic range, and precision focus in lab counts and identification makes the new work "the most comprehensive study of microplastics in the Arctic environment."

"The preeminent value in what we did is that it's spatially comprehensive," Ross said. "It gives us a really comprehensive view of what's going on."

Sam Athey, a doctoral candidate at the University of Toronto, studies sources, pathways and solutions for human-made microfibers. She found the findings of Ross' paper, while mostly unsurprising, to be important.

"They go to show that what we wear and the materials in our closet really do undergo these long0range transport processes," Athey said. "They're being deposited in these remote and previously thought of as pristine environments that are the ultimate sink for these fibers."

A **study** her lab did last year, published in *Environmental Science & Technology Letters*, found cellulose from denim in Arctic sediment samples, illustrating clothing's widespread environmental footprint.

"It became a really personal example," Athey said. "I wear blue jeans all the time; everyone wears blue jeans. You can see it, then: These are coming from your clothing."

Scientists are seeking solutions for the fibers ending up in the ocean and its food chain. Another recent **study** Ross was involved with found microplastics in beluga whales in the Beaufort Sea, evidence that they are being ingested in the food web, likely through fish.

"We don't know how big of an issue it is in terms of food security," Ross said. "It's an important question that remains to be better answered."

Possible solutions include using aftermarket lint screens in washers, buying used clothes, avoiding "fast fashion" textiles that break down more quickly, trying new **wastewater treatment techniques** and — for manufacturers — considering different textiles.

Ross and other colleagues at Canada's Ocean Wise lab are **working with** outdoor apparel brands like REI, Patagonia and Arc'teryx to understand the ways different materials and designs shed fibers through the laundry system and into wastewater.

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