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Most plastic dumped at sea doesn't come from land-based sources, UCT study finds

New research led by the University of Cape Town (UCT) has cast doubt on the widely held assumption that most marine plastic comes from land-based sources, but rather that a significant proportion come from ships dumping their litter at sea in contravention of international law.

The researchers discovered that Inaccessible Island – a small and isolated island in the Southern Atlantic Ocean, which is thousands of kilometres from any continent – is full of plastic most of which does not come from land.

“Recent studies of litter in the North Pacific garbage patch and remote islands in the Pacific Ocean show that fishing gear and other shipping-related equipment account for much of the mass of plastic at sea,” says UCT Professor Peter Ryan, an expert on marine plastics who led the research. “The challenge comes in understanding the origin of ‘general’ litter – food packaging and domestic products – which could come from ships or land-based sources.”

Ironically, isolated oceanic islands – many thousands of kilometres from land – can become catch-alls for ocean waste when they are near a gyre. Their shores collect a disproportionate amount of plastic pollution, despite being far from the major plastic-waste sources. Despite being more than 2 500 kilometres from any mainland, Inaccessible Island’s shores are littered with plastic debris, of which about one-third is bottles, especially plastic water and soft drink bottles.

By acting as a sampling net for South Atlantic Ocean litter, this island and the litter it accumulates have helped scientists, led by UCT, piece together clues to the origins of the ‘general’ plastic in our oceans.

“Unlike much general household litter, bottles can be useful tracers because they often have marks that indicate where and when they were made, giving an estimate of the maximum time they could have been at sea. We could also use the presence of marine animals – such as goose barnacles – on the bottles as another indicator of how long they had been in the ocean,” says Ryan.

By combining models of oceanic currents with information on the origins and age of the bottles they collected, the research team could assess whether it was plausible that the bottles could have drifted from the country where they were made. "Because we started monitoring litter on Inaccessible Island in the 1980s, we've been able to chart long-term changes in the origins of bottles over the last three decades," says Ryan. "When we first visited the island, most litter drifted 3 000 kilometres from South America.

"By 2009, Asia just surpassed South America as the main source of bottles, and by 2018, 74% of bottles came from Asia." Of the bottles that arrived during the researchers' three-month stay on Inaccessible Island, 84% were from Asia, at least two-thirds of which came from China. Most of these bottles were made within one to two years of washing ashore, whereas it would take four to five years – at least – for bottles to drift from Asia via the Indian Ocean. Most litter from China would be more likely to end up in the North Pacific garbage patch than at Inaccessible Island.

Since the 1950s, the global production of plastics has grown by about 8% per year and now stands at more than 300 million tonnes per year. Understanding where litter comes from is essential to figuring out how to fix the problem. Since the dumping at sea of plastics – and other wastes that are slow to degrade – was banned in 1989, it has been widely assumed that some 80% of litter in the sea comes from on land. However, there is little hard evidence to confirm the importance of land-based sources for plastic in remote areas.

The last few decades have seen a rapid increase in merchant shipping between South America and Asia, with more than 2 400 ships now passing the archipelago of Tristan da Cunha, of which Inaccessible Island is a part, each year. The total number of bottles stranding at Inaccessible Island has grown during the past 30 years – two times faster than any other type of litter. Water bottles comprised at least 61% of the drink bottles the team found, and unless the way water is packaged is changed, that proportion can be expected to continue to grow.



Co-author of the study Dr Maëlle Connan with bottles washed ashore on the west

coast of Inaccessible Island.

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