cleaning house

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The Fitz has been working on the problem of plastic pollution since the 1980s, when we conducted some of the first experiments to assess the impacts of plastic ingestion on seabirds. Since then we have documented plastic entanglement and ingestion among marine organisms ranging from sea anemones to sharks. It is clear that we need urgent action to reduce the amount of waste plastic entering the environment (see pp. 32–41 in the September/October 2018 issue of *African Birdlife*).

The long-term solution is to change the way we treat solid waste. In addition to stopping littering, we need to replace mixed-waste dumping in landfills with sorting all rubbish at source, composting organic waste and recycling other materials. By coupling these measures with improved product design to aid re-use and recycling, the goal of zero waste to landfill can be achieved. Recent legislation promoting extended producer responsibility, which requires manufacturers to take responsibility for the fate of their products beyond the point of sale, will help in this regard. But this is not going to happen overnight. In the interim, how best should we focus our efforts to reduce plastic pollution?

above *Recent studies indicate that most litter washing down rivers comes ashore close to river mouths. Cleaning beaches greatly reduces the amount of plastic entering the sea from land-based sources.*

It is widely assumed that most plastic entering the sea does so from land-based sources, mainly by way of storm-water drains and rivers. An estimated 1–2 million tonnes of plastic enters the sea from rivers each year, yet we have surprisingly little information about what happens to that plastic. Oceanographic models provide a good understanding of the dispersal of floating plastic at sea, but the complex interactions of waves and tides make it much harder to predict what happens to plastic close to the coast. Some gets carried out to sea and some washes ashore, but we don't know which pathway is more important.

To assess the dispersal of floating litter in coastal waters, Vonica Perold and I monitored litter arriving along 2.4 kilometres of Cape Town's False Bay coastline during the Covid-19 lockdown. Because the beach was closed to beachgoers, all litter deposited on the beach had washed ashore. In early May, when the Zandvlei estuary was closed, litter was distributed more or less evenly along the coast. However, when Zandvlei was opened to the sea for the first winter storm, litter was concentrated within a few hundred metres of the estuary mouth (Ryan et al. 2021. *Estuarine, Coastal and Shelf Science* 251: 107186).

To get an idea of the proportion of litter from the vlei washing ashore, we deployed marked plastic and wood blocks where the river entered the sea. Most of the blocks were recovered from the beach close to the river mouth or in the estuary. When the blocks were released on a rising tide, some travelled up to 1.2 kilometres inland. Further trials by honours student Kyle Maclean at other rivers in Cape Town and Durban confirmed that more than 80 per cent of floating blocks released into the sea at river mouths wash ashore on nearby beaches. This is encouraging, because it means that by cleaning beaches, particularly close to river mouths, we can prevent a large proportion of urban litter from getting into the sea.

These studies build on findings that superficial, large litter items – the kinds of things that can easily be collected during beach clean-ups – account for more than 90 per cent of the mass of plastic on beaches (Ryan et al. 2020. *Frontiers in Marine Science* 7: 575395). Microplastics, and especially microfibres, are superabundant on beaches, but they contribute little to the mass of plastic. By cleaning large plastic items from beaches, we prevent them breaking up into microplastics, which are much harder to deal with.

Of course, it would be better to intercept plastics before they reach river mouths and this year Kyle will assess the efficacy of the various litter booms, nets and grids that have been installed to trap litter in storm-water drains and canals. Numerous sophisticated litter interceptors have been designed to clean waterways around the world, but the high rate of theft and vandalism in South Africa places extra constraints on the design of these devices. The project also aims to identify the sites where installing such devices will have the greatest benefit in terms of reducing plastic pollution.

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