

Plastic pollution in paradise

I'm a second year PhD student, looking at the impacts of plastic pollution on filter-feeding elasmobranchs, particularly reef manta rays (*Mobula alfredi*), which are listed as Vulnerable on the IUCN Red List. My work is funded by NERC, and is in collaboration with Royal Holloway University of London, the Institute of Zoology, and the Zoological Society of London (ZSL). I'm very grateful to have received the Royal Holloway Doctoral School Travel Grant to support my participation in a ZSL expedition to the Chagos Archipelago to collect field data for two of my PhD chapters.

The Chagos Archipelago is an isolated, near-pristine Marine Protected Area (MPA), which provides important ecosystem services to many protected marine species, including a resident population of reef manta rays. Despite its remote setting, it is a major sink for plastic pollution, the origins of which are unclear. First there are the evident offenders, visible on most beaches around the archipelago: flip-flops, plastic drink bottles, fragments of hard plastic and polystyrene. Less noticeable but still as present, are the smaller fragments of microplastic in the sand and the water, that filter-feeders such as reef manta rays could potentially ingest. The data collected during the expedition will help understand the sources and pathways of plastic pollution in the archipelago and recognise the risks to the reef manta ray population supported by the MPA.



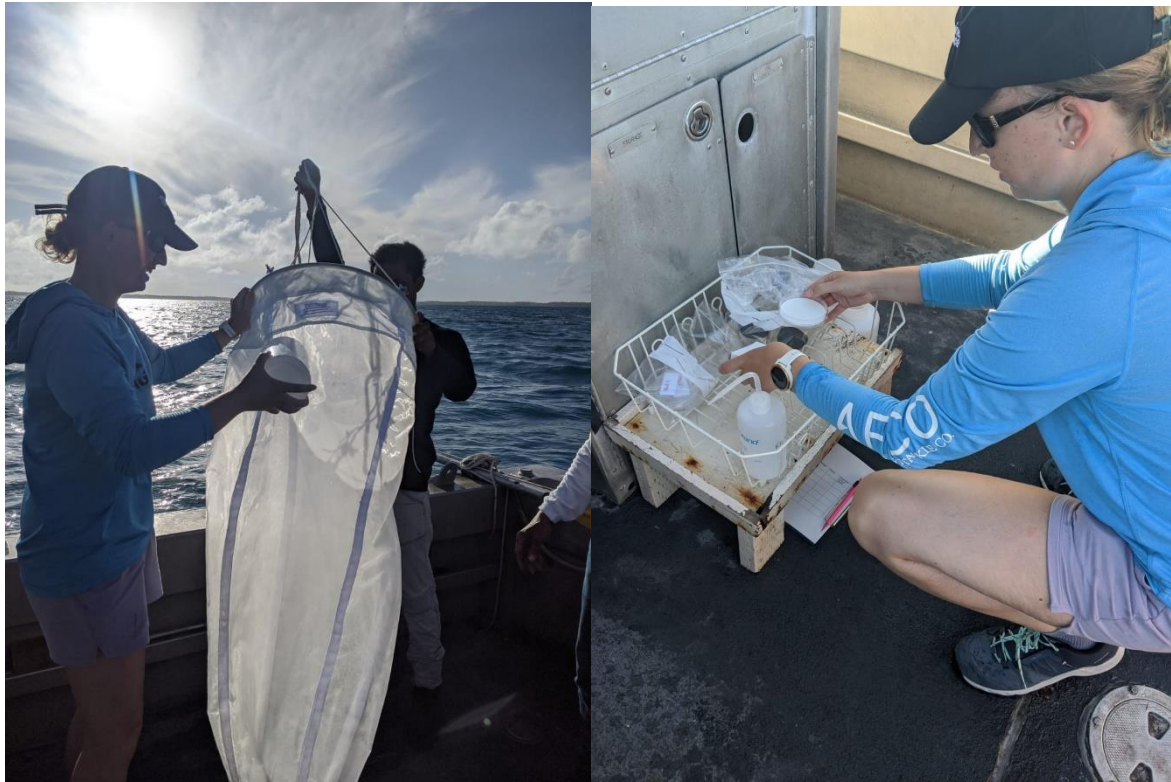
These two pictures highlight the difference in what can be seen looking out to sea and back to the vegetation.

The first aim of the trip was to continue work from last year's expedition and collect information about the origins of the plastic on the beaches. We looked at the brands and countries of origin of the water and drink bottles. We also ran Marine Debris Tracker transects (a citizen science app which allows to count and categorise plastic debris) around Diego Garcia, a US/UK Naval facility, the only inhabited island in the archipelago. Over the whole trip and 30 transects, we logged just under 14,000 items!

The second aim of the trip was to investigate the presence of microplastic in manta ray feeding grounds. To do this, I ran plankton trawls from a small boat in and out of the lagoon, using a mesh size of 200um, to represent the size of particles manta rays feed on. The net was weighed so that when trawled at 2 knots, it sat just under the surface, where manta rays feed, but also where most plastic accumulates. The boat crew were very ingenious and suggested using a paddle to ensure the net stayed out of the boat's wake as much as possible, to minimise mixing of the upper layer of the water.



Due to the omnipresence of microplastic particles in the air, I needed to be very careful with contamination of my samples. Between each trawl, we meticulously rinsed the net with a backwash of seawater, and I set out a dampened filter paper to capture any microplastic in the air. Back in the lab, I will count and categorise the plastic particles I find. I will also investigate the polymers in the samples, to link these back to the polymers found on the beaches and therefore potentially the origins of the particles.



Finally, we also helped the turtle team from Swansea University with their work on hawksbills and green turtles, including tagging, measuring and weighing the turtles, and collecting eDNA samples. This was a great opportunity to learn different methods from other scientists. Additionally, we had a chance to continue a campaign for the reduction of single-use plastic by personnel on Diego Garcia. This included follow up surveys to assess changes in behaviour and attitudes around the use of plastics, workshops exploring plastic waste management options, and outreach about our work with the wider population living on Diego Garcia. We held a Science and Cocktail night where each team gave a presentation about their work. We also talked on the radio about the importance of reducing single use plastic for the biodiversity the archipelago supports, alongside tips on how to do that in our everyday life.

Seeing the plastic pollution problem with my own eyes on this trip has given me a huge motivational boost, and I can't wait to start looking at the data and samples I've gathered, to see what story they tell.

Jessica Savage – PhD Biological Sciences