

# Insights into the origins of beached plastic bottles in the Chagos Archipelago

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## Background

- Remote islands act as sinks to plastic pollution (Lavers and Bond, 2017).
- The Chagos Archipelago, a remote, uninhabited Marine Protected Area (MPA) has plastic debris on its beaches (Hoare et al., in review), and in its sediments (Readman et al., 2013).

## Objectives

- Understand the sources of plastic bottle pollution in the Chagos Archipelago;
- Quantify the proportion of plastic bottles originating from shipping/fishing activities and arriving on the Archipelago beaches.

## Hypothesis

Plastic bottles found on the Chagos Archipelago beaches come from the Maldives (the closest neighbour and touristic destination), Indonesia (the largest plastic polluter in the region) and shipping lanes/fishing activities around the MPA.

## Methods

Two expeditions and 38 transects of 100m in the Chagos Archipelago.



Egmont atoll survey locations. From left to right: Ile des Rats, Lubine, Sudest North and Sudest South



Diego Garcia survey locations

(Hays et al., 2020)

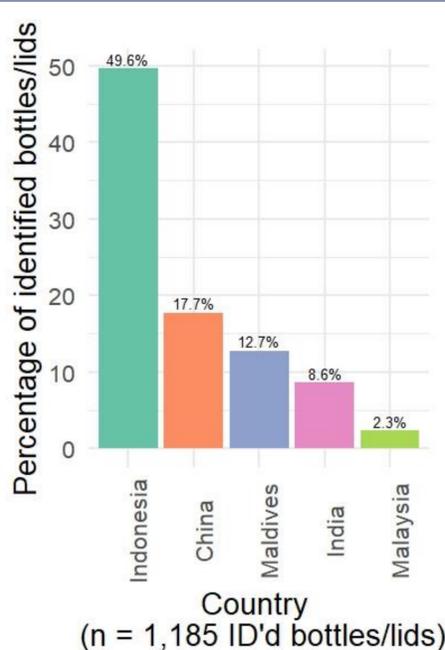


Manufacture date on lid

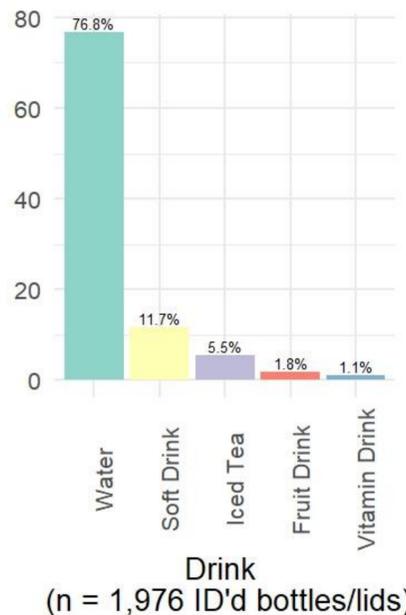
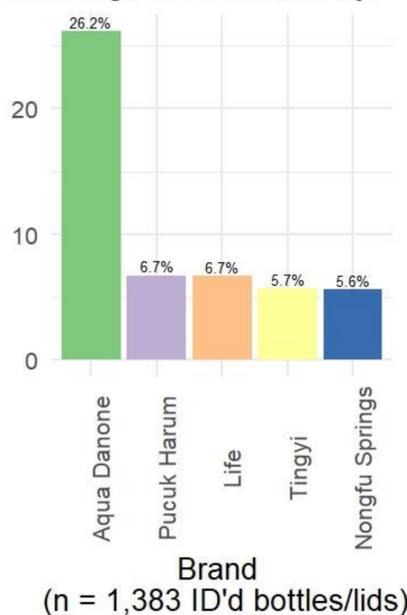
Brand and drink information

Country and product code on barcode

## Results and Discussion



Percentage of bottles/lids by:



## Bottle Ages

### Oldest Bottle



Drink: Water  
Brand: Taza  
Country: Maldives  
Manufacture date: 23/11/2016  
Age: 5 years 7 months

There could be even older bottles but with the date weathered off.

### Newest Bottle



Drink: Water  
Brand: Cold  
Country: Sri Lanka  
Manufacture date: 26/03/2022  
Age: 3 months

This could suggest it arrived from a ship passing by the archipelago.

- Ships have previously been shown to be major input routes of beached plastic bottles in New South Wales, Australia (Smith et al., 2018), on Inaccessible Island (South Atlantic) (Ryan et al., 2019), and on the coast of Kenya (Ryan, 2020).
- Next steps:
  - Investigate the ages of the bottles in relation to their country of origin to infer the proportion coming from ships.

## Bottles Distribution

- Numbers of bottles/lids were not significantly different between islands (Ile des Rats, Lubine, Sudest and Diego Garcia) and by side of island (ocean, lagoon, spit sides) (Kruskal-Wallis test,  $p > 0.05$  for all combinations).
- Previously however, most debris in the Chagos Archipelago has been found on the oceanside (Hoare et al., 2022 in publ.).
- Next steps:
  - Investigate the proportion of bottles with and without lids (they will have different buoyancies).
  - Look at the smaller scale oceanographic processes using models and satellite bottle tags.

## Brands and Origins

- Brands and countries of origin were significantly different between islands and between side of island (Chi-Squared test,  $p < 0.05$  for each combination).
- Models have shown Indonesia to be the main source of plastic bottles and caps in the Chagos Archipelago (Vogt-Vincent et al., in prep.). Indonesia is also the main source for South Africa (Ryan et al., 2021) and Inaccessible Island (Ryan et al., 2019).
- Next steps:
  - Explore the geographical distribution of the brands.
  - Use the results to inform policy conversations.