



ReefClean is funded by the Australian Government's Reef Trust



Australian Government

REEF TRUST



AUSTRALIAN
MARINE DEBRIS INITIATIVE



Australian Microplastic Assessment Project

ReefClean Review of Microplastics across GBR Catchments - 2019

Table of Contents

<u>MICROPLASTIC IDENTIFICATION IN GBR CATCHMENTS</u>	<u>3</u>
2019 MICROPLASTIC OVERVIEW	5
REGION # 1 – CAPE YORK	7
REGION # 2 – WET TROPICS	9
REGION # 3 – BURDEKIN DRY TROPICS.....	12
REGION # 4 – MACKAY WHITSUNDAY	14
REGION # 5 – FITZROY	15
REGION # 6 - BURNETT MARY	16
POTENTIAL SOURCES OF MICROPLASTICS.....	16
INTERIM CONCLUSIONS	17



ReefClean is funded by the Federal Government’s Reef Trust and delivered by Tangaroa Blue Foundation and AUSMAP.

We acknowledge the Traditional Custodians of the land on which we live, work & learn.

Microplastic Identification in GBR Catchments

The ReefClean project is designed to implement a cost-effective program of targeted and integrated marine debris activities to:

- reduce the volume of debris generated in or entering the Great Barrier Reef (GBR) that may impact listed threatened and migratory species, such as dugongs and turtles, and ecosystems of the GBR, and
- increase awareness in Reef catchment communities about the issue of marine debris and actions they can undertake to prevent litter from entering Reef waterways.

Microplastic surveys formed part of community clean-up activities at coastal sites around the GBR, to improve awareness of the impacts of microplastics on the environment and contribute to mapping the extent of microplastic accumulation around waterways and beaches.

The AUSMAP methodology was used to collect rigorous and scientifically reliable data on microplastic particles (1-5 mm). This method, developed by Dr Scott Wilson from Macquarie University in conjunction with partners from University of Newcastle and University of Tasmania, involved replicate sediment sampling along shorelines and sieving for microplastics by the community across the GBR catchments (Refer to Table 1). Samples collected were then verified by university researchers.



Table 1: Summary of Sampling Activities in Year 1 of ReefClean

Regions of Sampling	Sites	Groups Participating
Cape York NRM	Thursday Island, Friday Island, Goods Island, Quintell Beach, Rocky Islet Reef, North Shore Cooktown, Walker Bay Cooktown	Tangaroa Blue Foundation, Tagai State College
Wet Tropics	Cairns, Holloways Beach, Kurrimine, Michaelmas Cay	Tangaroa Blue Foundation, Holloways Beach Environmental Education Centre, Terrain NRM, Conservation Volunteers Australia
Burdekin Dry Tropics	Cape Pallarenda, Magnetic Island, Orpheus Island	Tangaroa Blue Foundation, Conservation Volunteers Australia, Reef Check Australia, Trinity Bay State High School
Mackay-Whitsunday	Cannonvale	Tangaroa Blue Foundation, Eco Barge Clean Seas, Conservation Volunteers Australia, Community
Fitzroy	Tannum Sands	Tangaroa Blue Foundation, Boyne Island Environmental Education Centre, North Keppel Environmental Education Centre, Fitzroy Basin Association, Conservation Volunteers Australia, Community
Burnett-Mary	Agnes Water, Miara, Bargara	Conservation Volunteers Australia

2019 Microplastic Overview

Microplastics were collected from 16 locations in the GBR catchments in 2019 (Figure 1). AUSMAP rates each location based on microplastic loads (particles/m²) which is then illustrated on a map with the different coloured points representing the relative loads as follows:

- | | | |
|----------|-----------|-------------|
| ▪ Green | Very Low | < 10 |
| ▪ Yellow | Low | 11 - 50 |
| ▪ Orange | Moderate | 51 - 250 |
| ▪ Red | High | 251 – 1,000 |
| ▪ Black | Very High | > 1,000 |



Figure 1: ReefClean sample locations and microplastic loads (Green = Very Low; Yellow = Low)

All sites sampled in 2019, had **very low to low** microplastic levels (0 - 27 particles/m², Figure 1). To give some perspective, some sites around major cities outside the GBR region are in the hundreds or thousands, with the highest recorded site in South Australia at > 9,500 microplastics/m².

Sites around the Dry Tropics and Fitzroy regions had higher levels than those in the other regions, with the Burnett Mary and Wet Tropics having the lowest values on average (Figure 2). Individual regional trends and more detailed analysis are discussed in the regional overviews below. Whilst most sites sampled were coastal beaches, the highest levels were reported from nearshore islands with hard plastic fragments commonly being the most frequent microplastic type. These plastics were more often white, blue or clear/opaque.

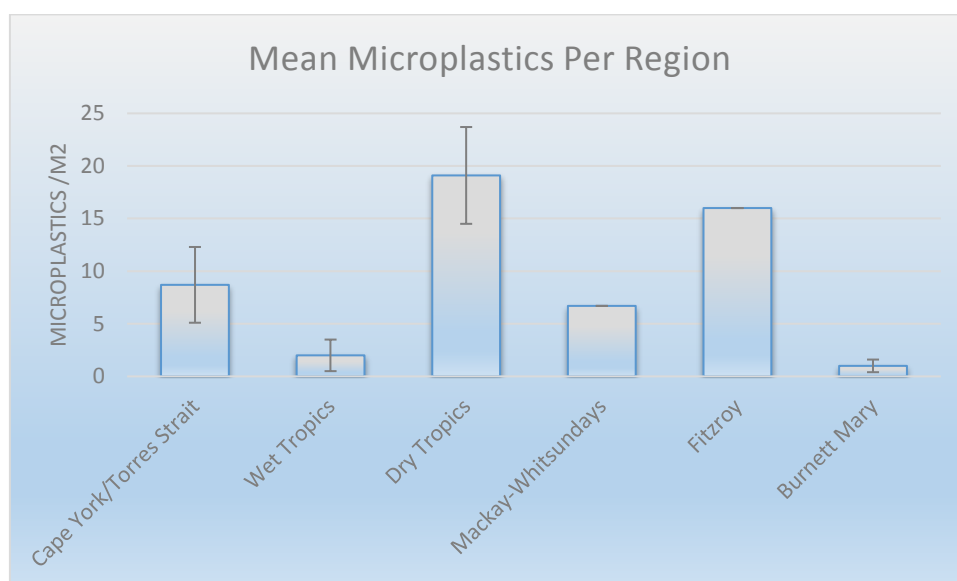


Figure 2: Average microplastic loads per region. Error bars = Standard Error of Mean.

Region # 1 – Cape York

A training day was conducted on Thursday Island hosted by Tagai State College. Seven samples were collected within the region (Figure 3), with both North Shore, Cooktown and Goods Island in the Torres Strait recording the highest levels of 23 and 21 microplastics per m², respectively. The locations of Thursday and Friday Islands and Walker Bay, south of Cooktown, had very low microplastic levels with 4, 5 and 7 particles per m², respectively. Quintell Beach near Lockhart River and Rocky Islet north of Cooktown recorded zero values.

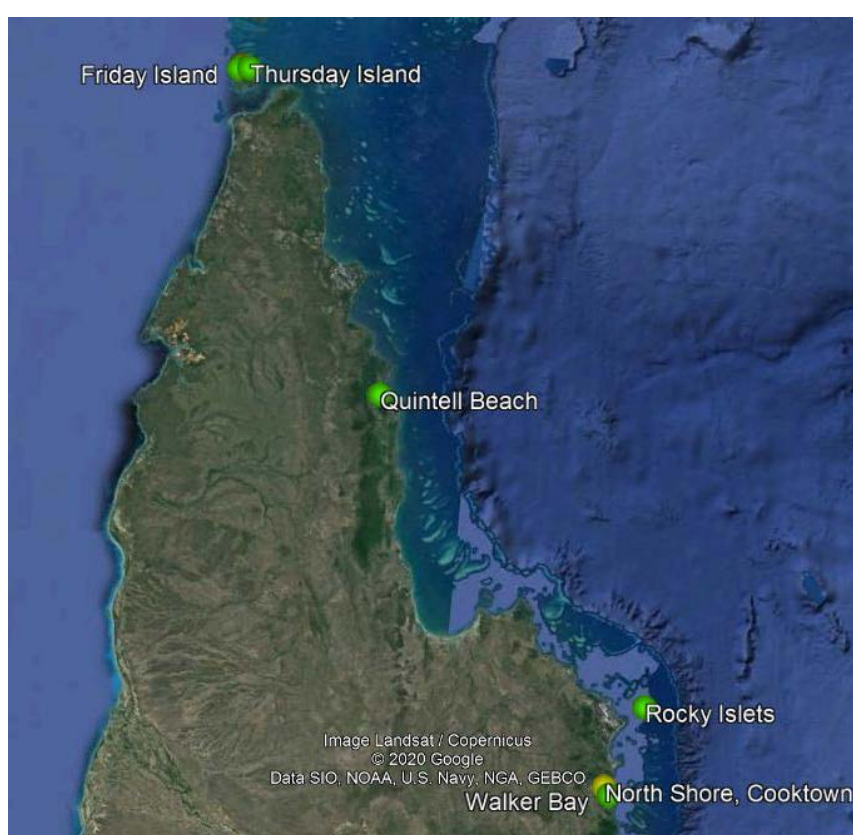


Figure 3: Cape York and Torres Strait sample locations and microplastic loads (Green = Very Low; Yellow = Low)

The analysis of the plastics found that the region was dominated by hard plastic fragments and foam although at the Friday Island location, fibres were also found (Figure 4). All microplastics at the two Cooktown locations were made up of hard fragments. Most of the plastics found were white, clear/opaque or blue (Figure 5) in line with what most plastic products colours are. The two Cooktown sites had similar plastic trends to each other

indicating similar sources. The microplastics found were a mixture of sizes but were predominantly in the larger size classes (Figure 6) and associated with the hard plastic fragments indicating more recent break up of products.

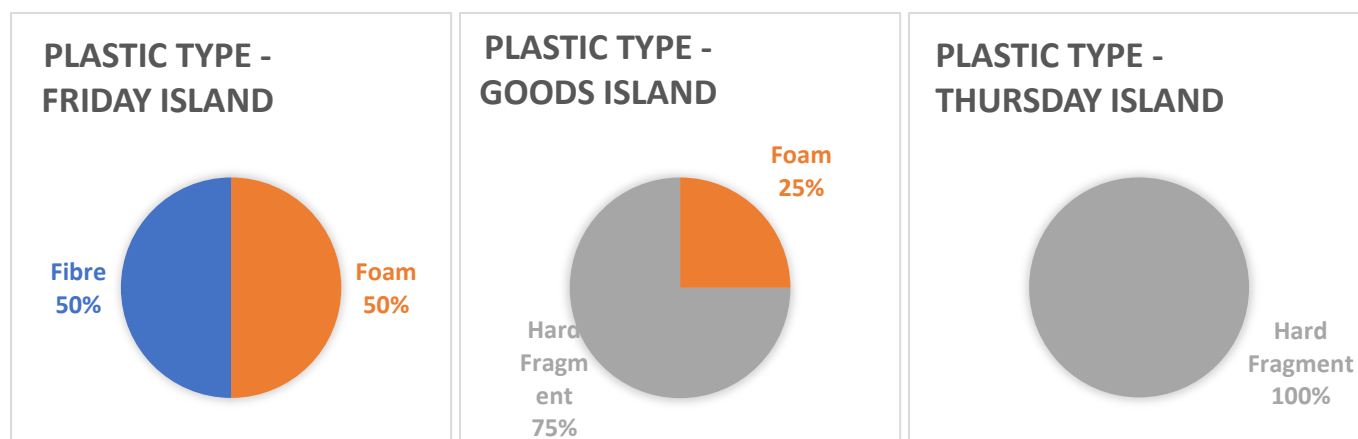


Figure 4: Plastic types recorded at Torres Strait sites

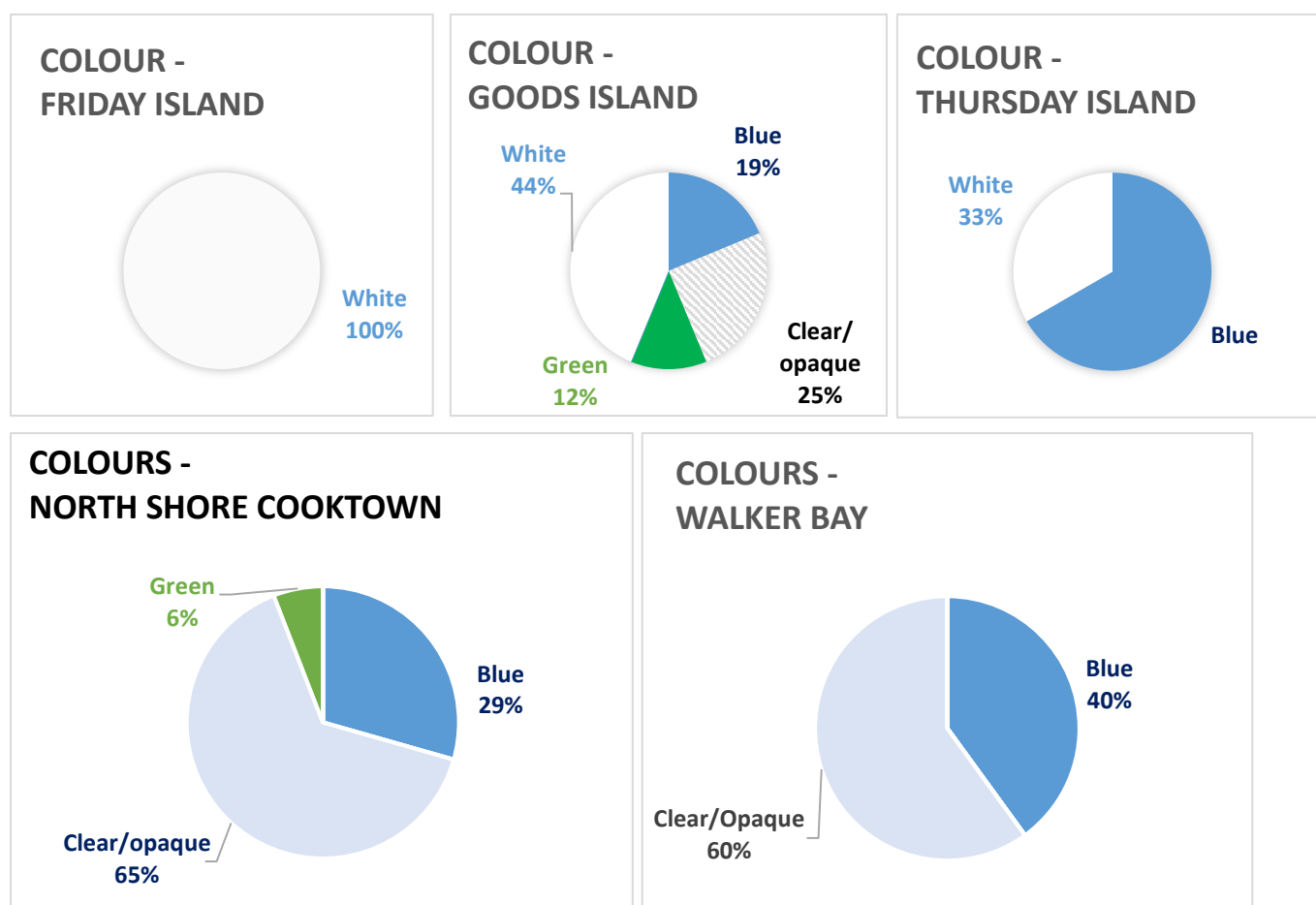


Figure 5: Plastic colours recorded at Cape York and Torres Strait sites

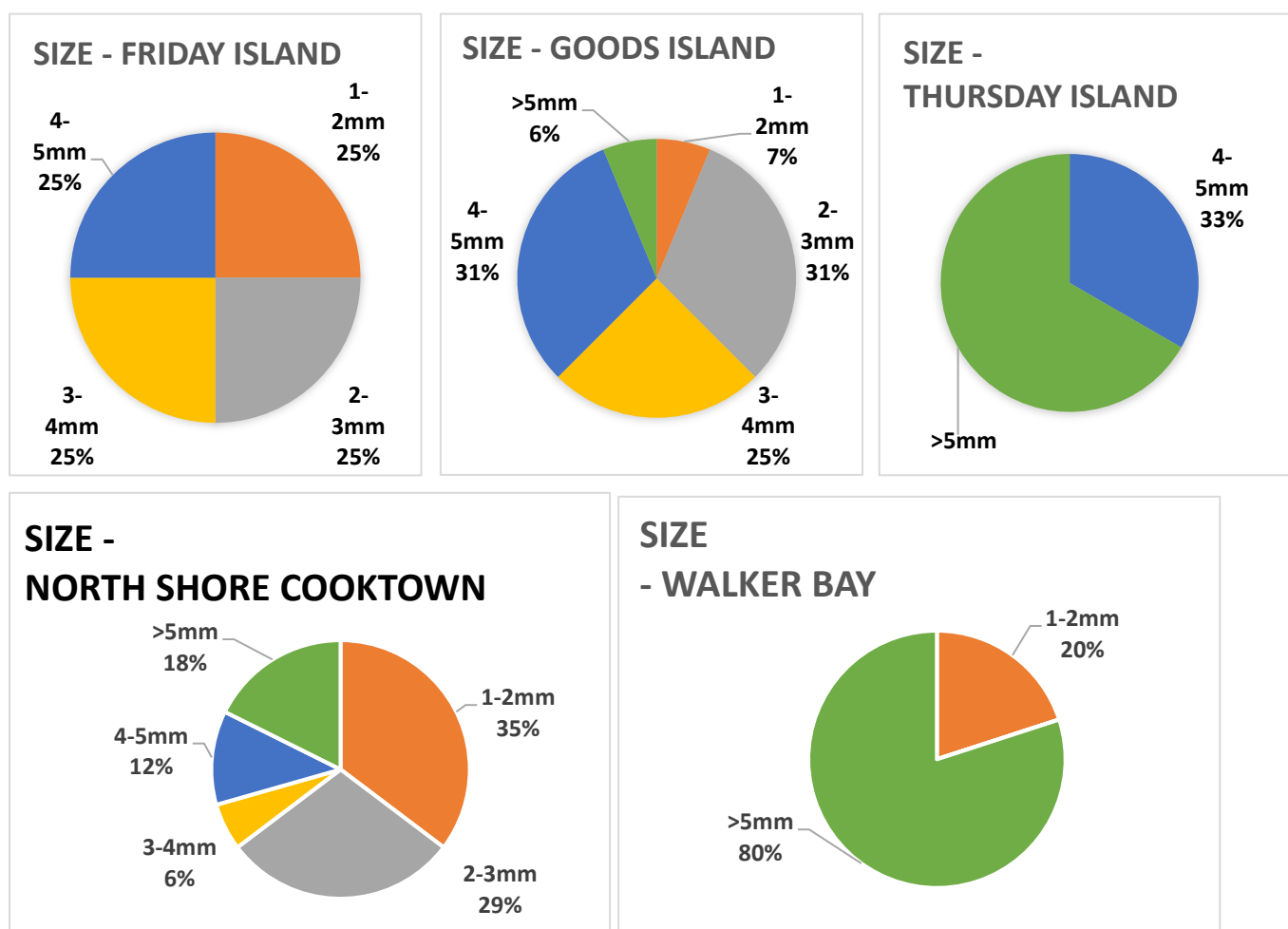


Figure 6: Plastic sizes recorded at Cape York and Torres Strait sites

Region # 2 – Wet Tropics

A training day was conducted on Holloways Beach, north of Cairns, hosted by Holloways Beach Environmental Education Centre in June 2019. Four locations and five samples were collected within the region (Figure 7) in 2019, with all recording very low levels of microplastics. Three locations, Cairns Esplanade, Kurrimine Beach and Michaelmas Cay, all recorded zero microplastics.

In June 2019, Holloways Beach recorded eight particles per m². A second sample in November 2019 at this same location only found two microplastics per m². The microplastics changed between the sample times; the June sample was dominated by

hard fragments that were predominantly white and from a mixture of size classes (Figures 8-10). The November sample only found film (soft wrapper fragments) that were yellow or opaque/clear between 1-3mm in size. The small number of plastics found is the likely reason for the large differences found.

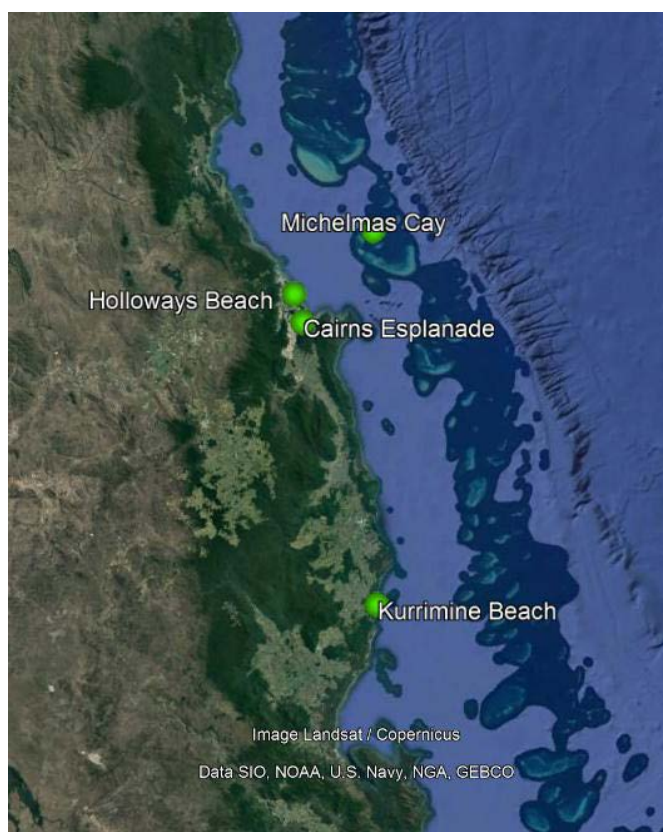


Figure 7: Wet Tropics sample locations and microplastic loads (Green = Very Low, Yellow = Low)

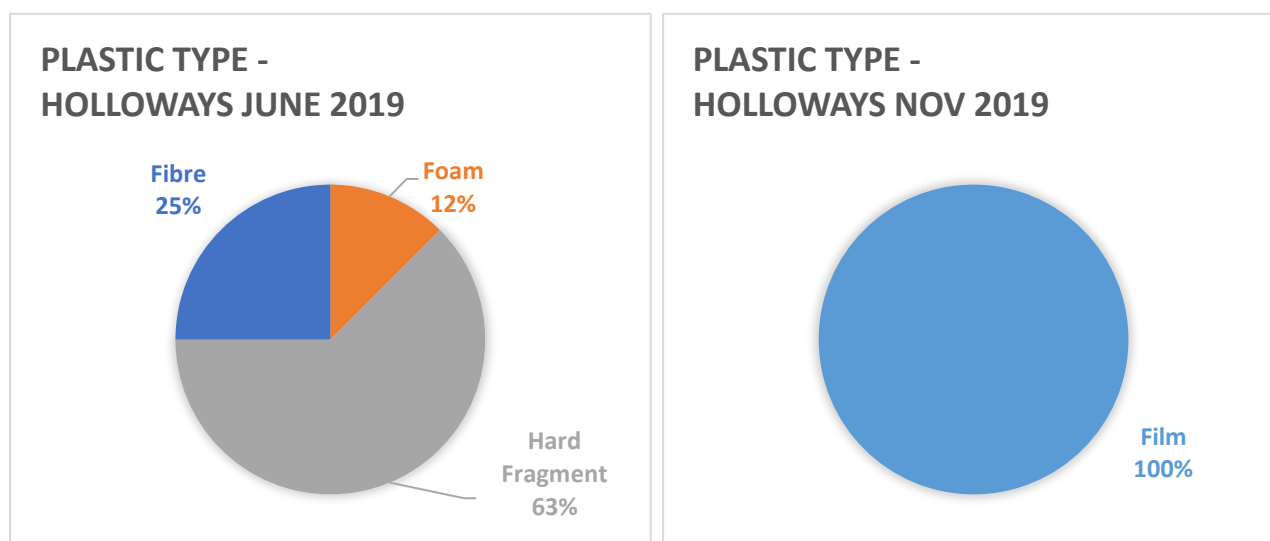


Figure 8: Plastic types recorded at Holloways Beach 2019

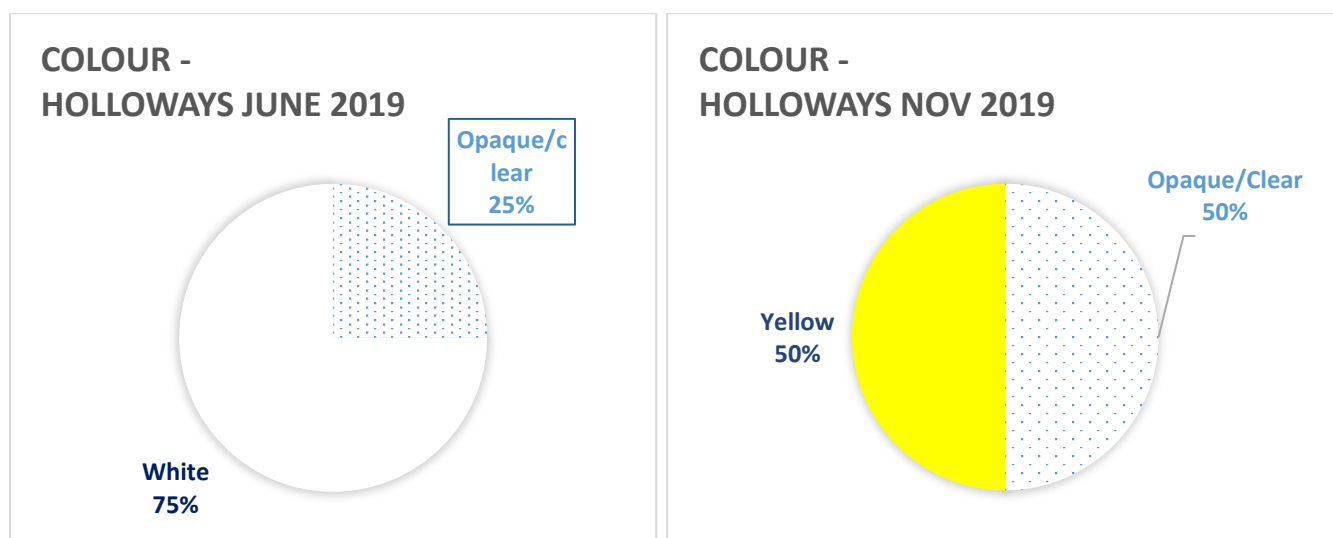


Figure 9: Plastic colours recorded at Holloways Beach 2019

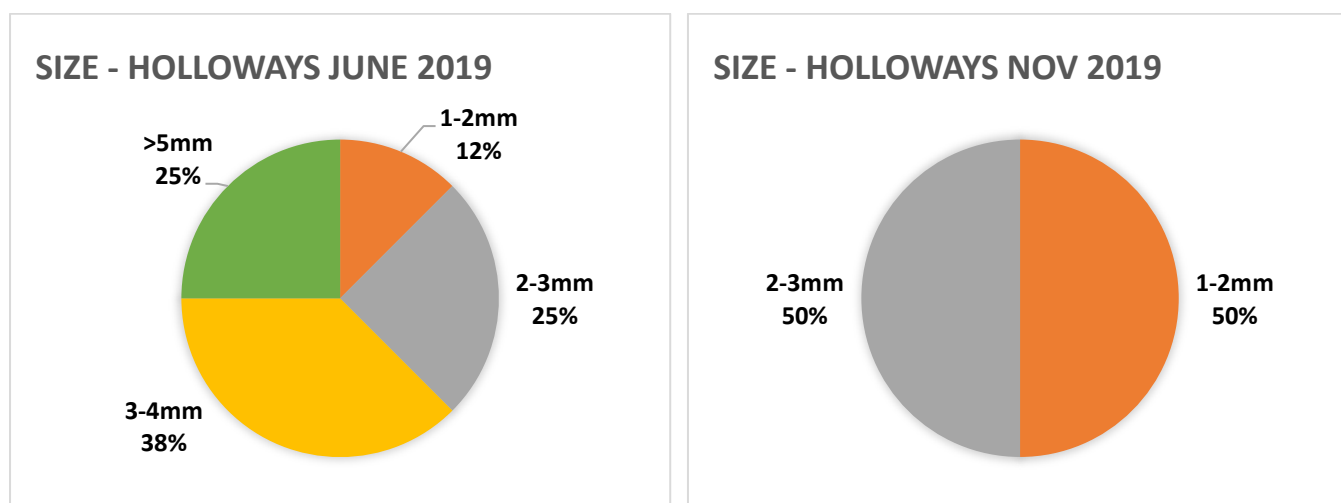


Figure 10: Plastic sizes recorded at Holloways Beach 2019

Region # 3 – Burdekin Dry Tropics

A training day was held in November 2019 at Cape Pallarenda, north of Townsville, hosted by Conservation Volunteers Australia. Three sites have been sampled within the region (Figure 11) with all recording low levels of microplastics. Alma Bay on Magnetic Island had the highest with 27 microplastics per m², Orpheus Island (ocean side) had 20 pieces, and Cape Pallarenda had 11 microplastics identified. Plastics were predominantly hard fragments at all locations (Figure 12), mostly blue, white or green in colour (Figure 13) and a mixture of size classes (Figure 14). Although plastics tended to be larger in size and included a resin pellet on Orpheus Island.



Figure 11: Burdekin Dry Tropics sample locations and microplastic loads (Yellow = Low)

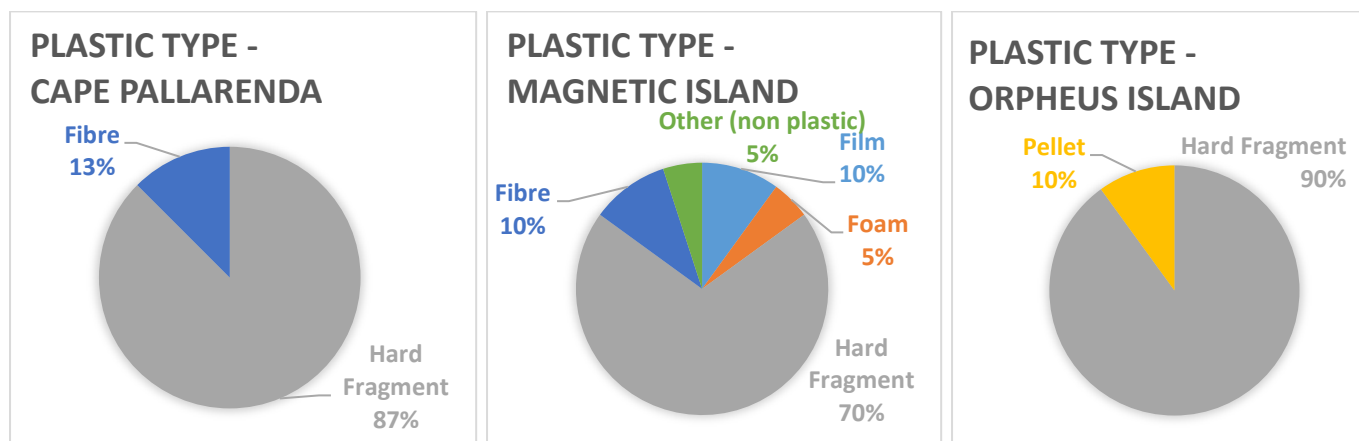


Figure 12: Plastic types recorded in Burdekin Dry Tropics region

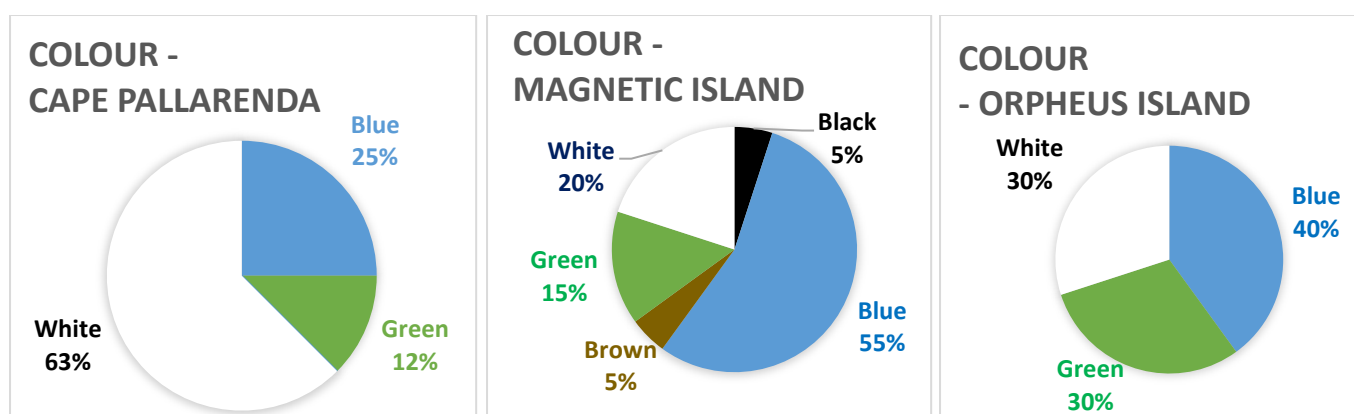


Figure 13: Plastic colours recorded in Burdekin Dry Tropics region

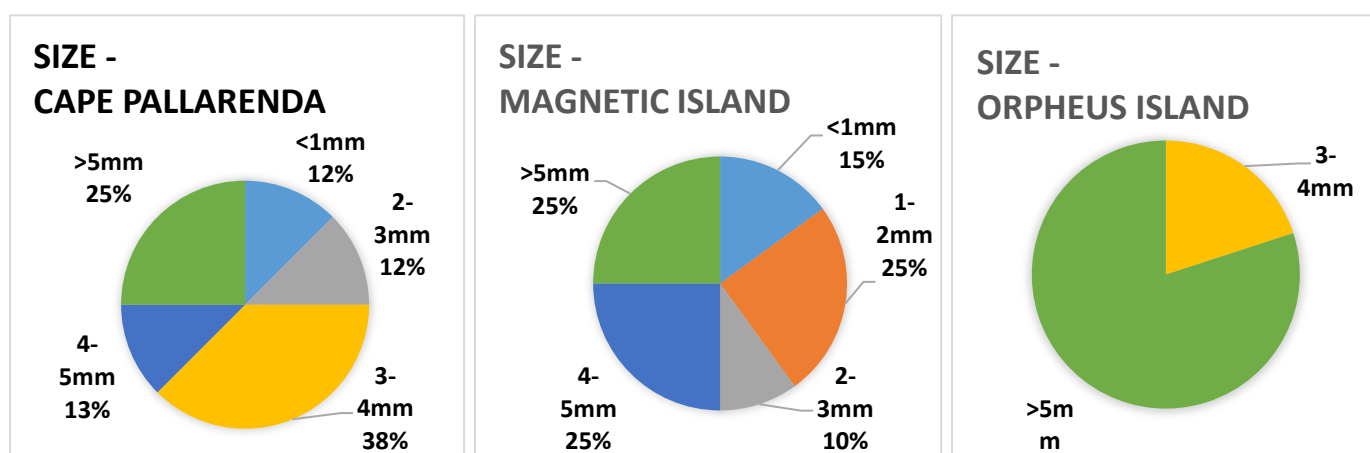


Figure 14: Plastic sizes recorded in Burdekin Dry Tropics region

Region # 4 – Mackay Whitsunday

A training day was held at Airlie Beach hosted by Eco Barge Clean Seas and Conservation Volunteers Australia. Only one sample, at Cannonvale Beach, has been collected from the region to date with levels of seven microplastics per m² giving the site a ranking of very low (Figure 15). Plastics were predominantly hard fragments with one fibre found. These plastics were a selection of colours and mostly in the smaller size classes (Figure 16).

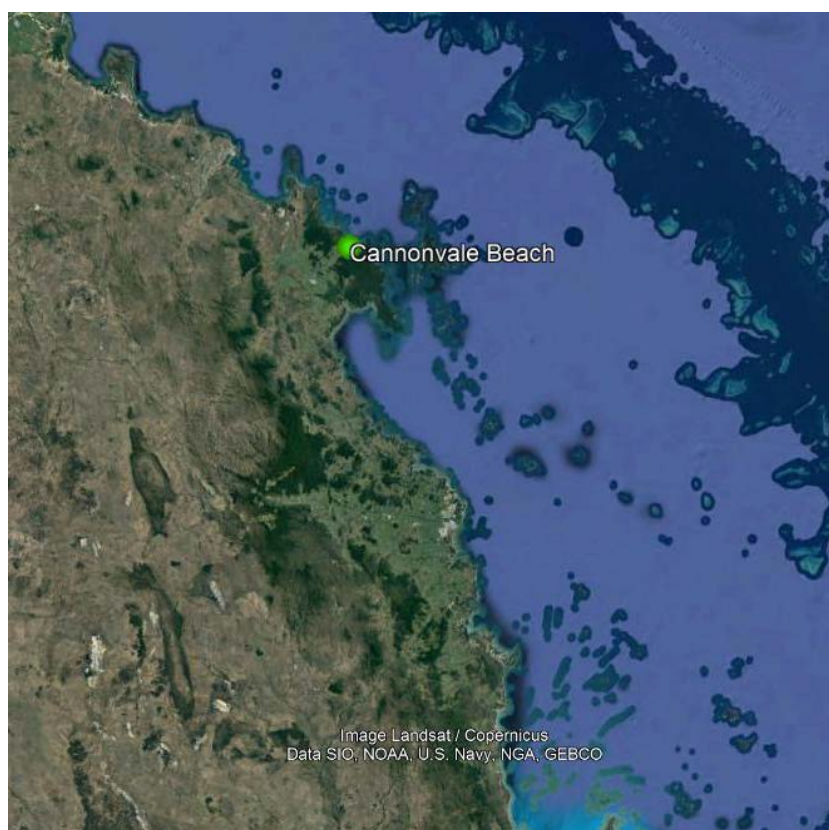


Figure 15: Mackay Whitsunday sample location and microplastic loads (Green = Very Low)

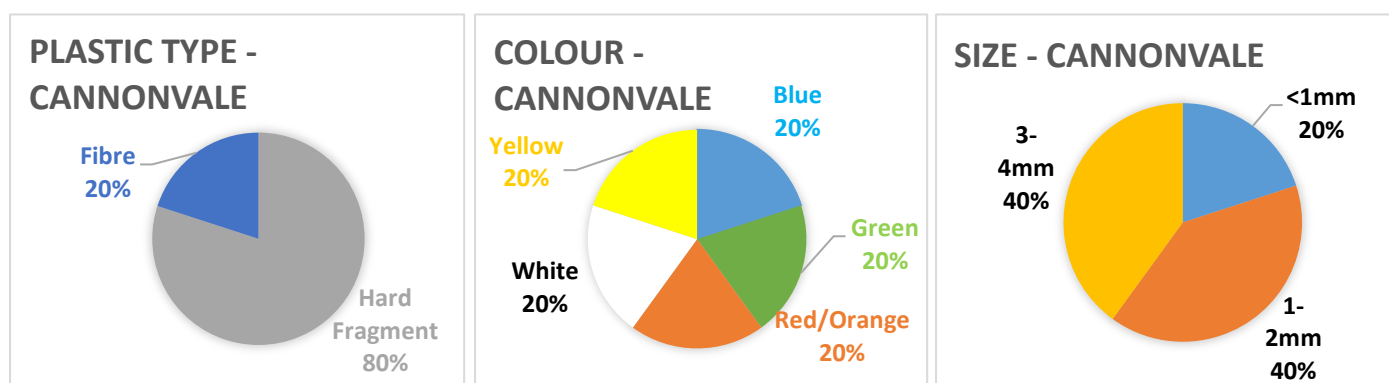


Figure 16: Microplastic type, colour and size for Mackay Whitsunday 2019

Region # 5 – Fitzroy

A training day was held at Boyne Island hosted by Boyne Island Environmental Education Centre. Only one sample, at Tannum Sands (Second Beach), has been collected from the region to date with levels of 16 microplastics per m² giving the site a ranking of low (Figure 17). The majority of the microplastic was hard fragments of the larger size classes and interestingly, red/orange in colour (Figure 18). These red fragments appeared to be from a bottle cap. Wax was also found, likely related to water sport related activities in the area.



Figure 17: Fitzroy sample location and microplastic loads (Yellow = Low)

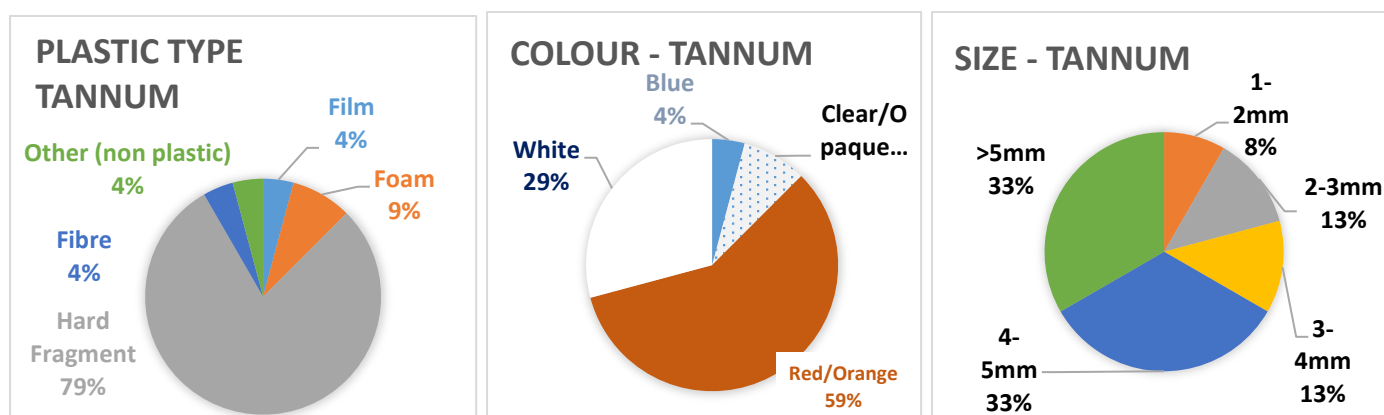


Figure 18: Microplastic type, colour and size for Tannum Sands 2019

Region # 6 - Burnett Mary

Three locations were sampled within the Burnett Mary region in 2019, with very low levels found at all sites (Figure 19) making this the region with the lowest values on average (1 piece/m²). The highest concentration of two pieces/m² was found at Agnes Water, while Bargara had one piece/m² and Miara had zero. Plastics found were all hard fragments or either green or white and more likely from oceanographic sources.

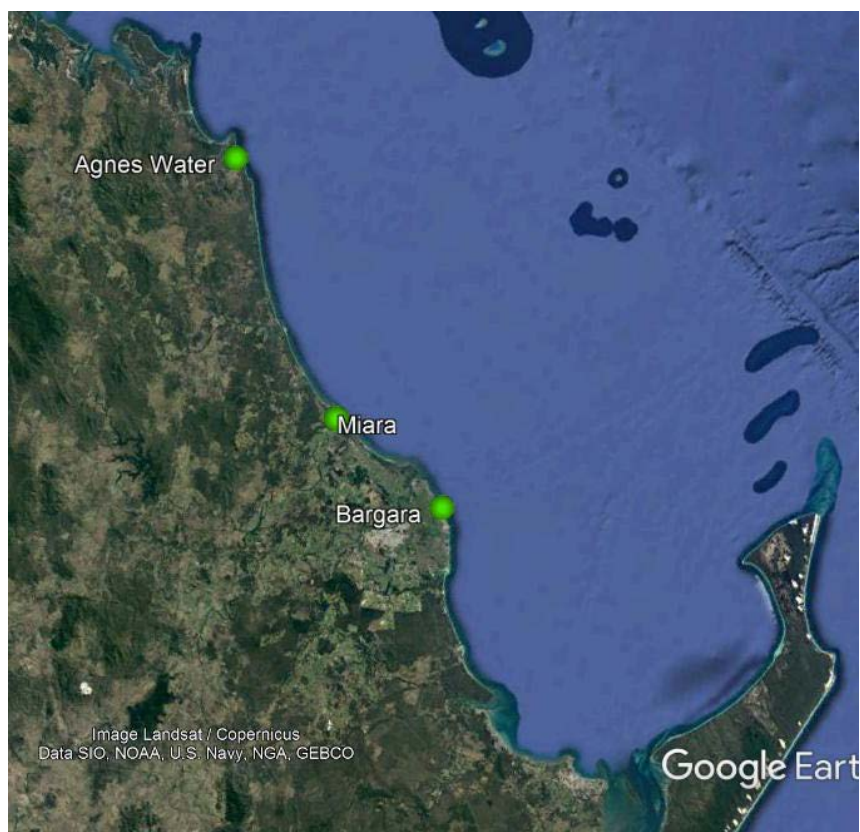


Figure 19: ReefClean sample locations and microplastic loads (Green = Very Low)

Potential Sources of Microplastics

Microplastics found during 2019 were predominantly hard fragments of selected colours (blue, white, clear/opaque). These hard fragments originate from whole products that break up due to UV degradation and wave action. Whilst it is often difficult to determine where these plastics originate, a few features, such as colour, shape, ageing, fouling or newness can give us a clue. For example, fragments of a bottle cap found at the Tannum Sands site, were considered from the local area due to the freshness of the pieces (i.e, the pieces had sharp edges and bright colouring). Conversely, most pieces from the Torres Strait sites were well worn, faded and some had fouling on their surface, indicating the

plastic had spent long periods in the environment and are likely to have originated from distance sources transported by ocean currents. Foam was the second most common item found within the GBR these occur more commonly from the fragmenting of packaging materials and are easily transported by wind and water. Very few primary microplastics were found (one pellet), and fibre and film was only present in some locations. Weather patterns and local activities prior to sampling can influence what plastics are found, hence more data over time is required to provide a better indication of the microplastic source trends.

Interim Conclusions

Year 1 of the ReefClean Microplastic project primarily targeted the training of the community to enable sampling to occur across the GBR catchment. As such there was a limited number of samples collected during this year and thus definitive conclusions are difficult to make at this time. What microplastics (1-5mm) that were found indicated that the GBR catchment had low to very low loads relative to major urban centres outside the reef catchments.

Following on from this, more extensive sampling both spatially and temporally within the GBR region is planned to cover gaps and re-survey those sites that had previously been sampled. A further training day in the Burnett-Mary region is also planned, to allow more data to be gathered in the southern GBR. A re-engagement of trained volunteers will occur to encourage more sampling within the targeted areas.

