



Microbial Oceanography Laboratory

Citizen Science Toolkit for Quantifying Macroplastics in the Marine Environment



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Introduction

Plastics are synthetic hydrocarbon polymers used by humans for its durability and wide range of applications (Thompson et al. 2009). We continually produce plastics because of our dependence on the material, but as synthetic polymers with chemical additives, these take hundreds of years to decompose, accumulating in landfills or in natural environments (Geyer et al. 2017). In 2010, Jambeck et al. (2015) estimated that 4.8 to 12.7 million metric tons of plastics was released into the ocean. Plastic wastes remain afloat at sea or sink down the seafloor. However, majority of these wastes were estimated to accumulate in coastal regions (Lebreton et al. 2019), leaving coastal areas and sediments at risk to plastic pollution (Barnes et al. 2009; Pinnell and Turner 2019). Thus, it is important to quantify plastic debris in coastal areas to measure the extent of pollution.

This document outlines methods for macroplastic assessment in coastal areas. The supplied methods will determine the debris density (# of plastic pieces/unit area) and the type of debris materials.

References

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Site Selection

The beach sites for macroplastics survey should be selected according to the following criteria:



San Rafael III, Noveleta, Cavite

- **Sandy or pebble shoreline**
- **A minimum length of 100 m parallel to the water**
- **Low to moderate slope (15 to 45 degrees)**
- **Clear access to the sea (no breakwater or jetties)**
- **Accessible to survey teams year round**
- **Must not be part of a clean-up program (if possible)**

Materials

- 1 Transect tapes, at least 30 m (x 3)
- 2 Rope, 4 m
- 3 Digital camera
- 4 Phone (with apps for GPS and wind compass)
- 5 Flag markers
- 6 Clipboard for each surveyor
- 7 Data sheets
- 8 Pencils for data recording
- 9 First aid kit



Field Survey

Adapted from "Microbial transformation of plastics in SE Asian seas: a hazard and a solution" (MicroSEAP)



1. For beach sites, lay three 30 m transects at the strandline. The strandline is the part of the beach where debris accumulate.

2. The transects are laid parallel to the shoreline (Fig. 1). The minimum distance between two consecutive transects should be at least 2 m apart or wider. For larger study sites, the distance between two consecutive transects can be larger.

a. For smaller sites that cannot fit 3 x 30 m transects, shorter transect length (e.g., 15 or 20 m) may also be adopted, but the number of transects at each tidal zone should still be three.

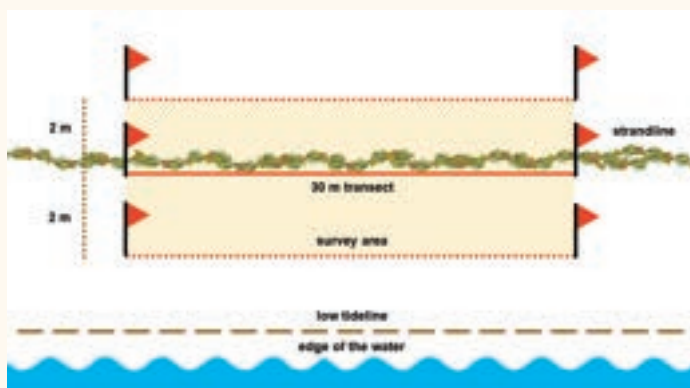


Figure 1. Survey area (30m x 4m) along beach strandline

Field Survey

Adapted from "Microbial transformation of plastics in SE Asian seas: a hazard and a solution" (MicroSEAP)

3. To mark the survey area, use the 4 m rope to measure 2 m to the left and right of the strandline.

4. Place flaglets to mark the edges of the survey area.

5. For sampling macro-litter (> 25 mm in size, bigger than a bottle cap), record the following information for each litter item found within 2 m to the left and 2 m to the right of the transects (i.e., 4 m total width x 30 m total length belt transect).

6. Record debris counts while walking across the survey area in a pattern (Fig. 2).

6. If you find litter items that are not in the list of debris types in the datasheets, take a photo for documentation.

7. Fill-out datasheet for other information on site characteristics after the field survey.

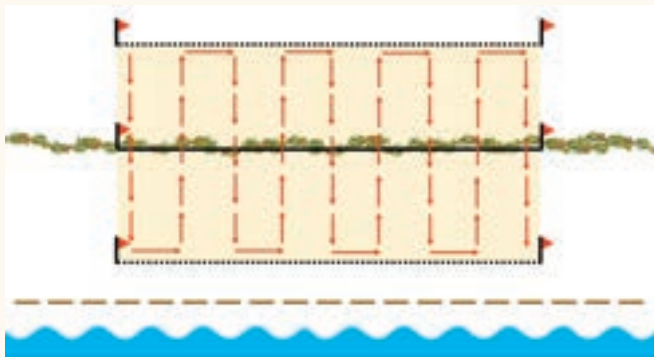


Figure 2. Field survey walking pattern



Field Survey

Adapted from "Microbial transformation of plastics in SE Asian seas: a hazard and a solution" (MicroSEAP)



The macrodebris item concentration (number of debris items/m²) per transect is calculated as follows:

$$C = \frac{n}{wl}$$

Where

C = concentration of debris items (# of debris items/square meter)

n = # of macro-debris items observed

w = width (m) of shoreline section (i.e. transect width)

l = length (m) of the shoreline sampled = 30

For a given sampling event, take the mean concentration at each transect to calculate an overall site concentration (\pm standard deviation) for that date.

Field Survey (Schematic Guide)



Lay 30 m transects at the strandline. **1**



Mark survey area using a 4 m rope. **2**



Place flaglets at the edges of the survey area. **3**



Record macroplastic found within area. **4**



Record debris counts in the datasheet. **5**



Fill out information on site characteristics. **6**

Appendix A: **Data Sheets**



MACROPLASTICS SURVEY DATASHEET – SITE CHARACTERISTICS

This should be filled out per site.

Surveyor name:	Survey date:
Site name:	Country:
GPS start:	GPS end:
SHORELINE CHARACTERISTICS	
Habitat type: beach mangrove seagrass coral reef	
Backshore type: cliff seawall urban building forest/tree shrub mangrove other:	
Shore exposure: cove/bay straight headland	
Tidal distance (m):	
LAND-USE CHARACTERISTICS	
Access: vehicular trail isolated	
Major site usage: tourism fishing protected isolated other:	
Nearest town distance (km):	Nearest river distance (km):
River input: yes no	Pipe/drain input: yes no
Evidence of dumping: none construction household other:	
Evidence of recent activities: none clean-up/rubbish removal apparent spilled trash storm/flood strong winds public event other:	
Notes (include descriptions on landmarks, coastal hydrography, etc):	

Notes:

GPS start: GPS coordinates of the start of the first transect

GPS end: GPS coordinates of the end of the third transect

Tidal distance: the maximum horizontal distance between the low- and high-tide line

Access: vehicular (you can drive to the site), trail (you must walk), isolated (you need a boat/plane)

Nearest town distance: nearest distance to villages / residences / towns / human populations

Main category	Specific litter category	Count	Notes
Glass	Bottles / jars		
	Light bulbs / tubes / globes		
	Fragments		
	Other:		
Wood	Cigarette packs		
	Lighters / matches		
	Paper / newspaper / pieces of papers		
	Crates / boxes / cardboards		
	Fishing traps / pots		
	Ice cream sticks / chopsticks / toothpicks		
	Fragments		
	Other:		
Cloth	Clothes / towels / rags		
	Sacking / gunny sacks / canvas		
	Diapers / sanitary pads		
	Fabric pieces		
	Other:		
Rubber	Slippers / flip-flops / shoes / gloves		
	Tires		
	Balloons, balls		
	Rubber bands		
	Other:		
Metal	Aluminium / tin / aerosol cans		
	Bottle caps		
	Buckets / drums		
	Nails / irons		
	Fishing related (lures, hooks, sinkers)		
	Other:		
Other	Batteries		
	Appliances, electronics		
	Furniture		
	Contraception / condoms		
	Masks / gloves / face shields		
	Syringes		

Appendix B: **Data Submission**



Data Submission

1. To submit your datasheet, encode it onto a spreadsheet (offline or online)
2. Go to the submission portal via <https://plasticount.ph> and click on the submit data button on the header



or go directly to: <https://forms.gle/Ecgtqq8eaFt7r7k79>

3. Accomplish the contributor's information section and then choose to upload field/monitoring sheet option.
4. Upload a copy of your datasheet or you may also share it via a link.

The image is a screenshot of a web form. It has two main sections. The first section is titled 'Datasheet Upload' and contains a button with a plus sign and the text 'Add file'. The second section is titled 'Datasheet Sharing (via Link)' and contains a text input field with the placeholder text 'Your answer'.

5. Fill out the field details of the collection and accomplish the rest of the form to submit your data.

Note: Your data will take time to process. You may receive updates via email.



Notes

Notes

About the Projects



PlasMics

This project investigates the fate of plastics in select bays and seas in the Philippines through (A) a standardized data gathering and survey of prevalence and abundance of micro- and macroplastics in Manila Bay and the West Philippine Sea; (B) employment of various -omics tools to look at plastics-associated microbial community and biodegradation potential of microbes; (C) conduct monitoring of select aquaculture species for prevalence of microplastic ingestion; and (D) bring awareness of the impacts of plastic pollution to the Filipino people, scientific community, and government agencies.



PlastiCount Pilipinas

PlastiCount Pilipinas aims to increase local capacity for monitoring plastics pollution in the coastal and marine environments by adopting technologies implemented in Japan and United Kingdom and making the data available to the public for use in policy, advocacy, and education. Through this project, PlastiCount Pilipinas aims to make the public aware of the extent of plastics, especially in marine environments, and what we can do to help through a whole-of-nation approach.



MicroSEAP

The objective of the project is to reduce the impact of marine plastic pollution in Southeast Asia through understanding the role of microorganisms living on the plastic surface on the pollution threat and investigate the potential of these microorganisms in creating a solution to this problem. MicroSEAP aims to determine the loading of plastics in three marine environments: beach, mangroves and coral reefs. The project seeks to quantify ecosystem plastic loads to establish baseline information on the occurrence of plastic debris, identify types of plastic polymers, and estimate annual proportions of polymers based on historical data obtained from collaborators.



