

Picking Plastics in Paradise:

Using Citizen Scientists to Characterize Marine-Borne Plastics in Indonesia

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Professional Background

- Consulting (25+): municipal compost program planning/implementation
- Operations/Materials Sourcing (5): anaerobic digestion, EBMUD
- Projects: 100+
- Key Clients: San Francisco, Portland/Metro, StopWaste, Berkeley, SBWMA
- Board Service : Upstream; NCRA; Alameda County Recycling Board; CORC; Berkeley ZW Commission; SLUG; Cooperative Center Federal Credit Union
- Earlier Work: Indonesia Ministry of Environment / UNDP

Entering the “Plasti-scene” Era



What could I do? Some choices:

- Consume “Responsibly”: Sip my latte in my *tres chic* re-usable mug in my favorite café. Come join me!
- Advocate: Work on policy with NCRA, CAW, Upstream, 5 Gyres, GAIA, Clean Water Action, Break Free from Plastics Coalition, etc. Come join us!
- Learn and Contribute: Citizen-based science—vacationing for the common good. Away we go!

Citizen Science Adventure



5 Gyres

- Mission: Empower action against the global health crisis of plastic pollution through science, education, and adventure
- Education: Raising awareness about ocean-borne plastics
- Science: Documenting plastics pollution in the 5 Gyres
- Advocacy: Writing Plastics BAN (Better Alternatives Now) List
- Website: <https://www.5gyres.org/>



5 GYRES
SCIENCE TO SOLUTIONS

Upstream

- Early and long-standing promoter: manufacturer responsibility for products and packaging in U.S.
- Catalyst: building coalitions around plastics policy
- Current focus: Making “throw-away” weird
- Upcoming conference, June 12-14, Scotts Valley: “Unwrapped: Health Risks of Plastics/Food Packaging Chemicals”
- Website: <https://www.upstreamsolutions.org/>



Indonesia: Fast Facts

- Population: 260 million
- Ethnic groups: > 300
- Islands: 18,000
- Coast: world's second longest
- Lizards: world's largest
- Major exports: fuels, palm oil, electronics, rubber, vehicles, machinery, gems, shoes, textiles, wood
- Active geology: volcanoes, earthquakes, tsunamis



Expedition Goals

- Collect near-shore micro-plastic data
- Collect macro-plastic data (sea, land)
- Work with local research entities, NGOs
- Train new 5 Gyres Ambassadors
- Educate and advocate

Citizen Science Adventure

SCHEDULE		August 7 th Padar/Rinca
05:30	- Sunrise Hike @ Padar	
08:00	- Depart from Padar	
12:00	- Lunch	Trash Analysis
13:00	- Mangrove/Beach Cleanup	
15:00	- Hike Rinca with Komodos (2 hour hike)	
19:00	- Dinner on top deck	Trash Analysis
20:00	- Evening Presentations (Haley/Marcus/Rachel)	
21:00	- Dance Party with DJ Charles	



Types of Waste Characterizations in Indonesia



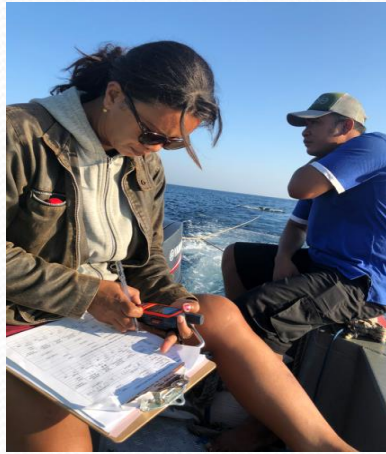
Manta Trawls

TRAWL SAMPLE IDENTIFICATION CHART

START DATA	Trawl#	TIME start	Latitude (N) start		Longitude (W) start		
STOP DATA	Date	TIME end	Latitude (N) end		Longitude (W) end		
SEA and BOAT CONDITIONS	Start Sea State / End Sea State	Start Speed / End Speed (knots)	Start Direction/ End Direction (ex: NW)	Average Boat Speed (knots)	Average Wind Direction (ex: NW)	Average Wind Speed (knots)	Flowmeter (optional)
							Start
							Stop



Manta Trawls



Beach Micro-Plastics

- Area: 1 square meter
- Micro = < 5 mm



Traditional Waste Characterization / Beach Clean-up Style

DATE	BEACH	TOTAL # PIECES ANALYZED	% FOOD PACKAGING	PERSONAL CARE	HOUSEHOLD	CIGARETTES	FLIP FLOPS	ROPE PIECES
7/25/18	BANTA ISLAND	92	70%	NA	NA	NA	NA	NA
7/25/18	SANGEANG ISLAND (BLACK SAND / BUBBLES)	273	36%	4.50%	9.50%	NA	18%	32%
8/1/18	GILLI ISLANDS	181	62%	2%	2%	34%	NA	NA
8/5/18	BANTA ISLAND	100	84%	7%	9%	NA	NA	NA

Traditional Waste Characterization / Beach Clean-up Style

BEACH SURVEYS

225 Kg of trash removed

8738 items collected

1777	misc. foam
1048	misc. fragment
939	water cups
816	shoes
799	water bottles
601	other plastic bottles
396	bottle cap
383	food wrappers
278	straws
256	rope

MANGROVE SURVEYS


39 Kg of trash removed

131 items collected

68	rope
15	misc. fragment
13	other plastic bags
11	rice bags
5	tarps
4	water bottles
4	textiles
4	food wrappers
2	nets



Brand Audit

Break Free From Plastic Brand Audit Form						
Organization:		Date of Audit:				
Name of Recorders:		Time of Audit (start):				
Name of Sorters:		Time of Audit (end):				
Total Volume (fill up only if waste audit was conducted):		Total Weight (fill up only if waste audit was conducted):				
Brand Name	Manufacturer	Local / International	Type of product	Type of packaging	Tally (indicate with tally marks)	Total number of pieces
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

TYPE OF PRODUCTS	
Household Products (HP)	detergents, cleansers, bleach, cleaning tools, cigarette butts, textiles, etc
Food Packaging (FP)	biscuits, cookies, junk food, candies, sweets, sauces, ready-to-eat meals, etc
Personal Care (PC)	soap, shampoo, toothpaste, gel, diapers, sanitary pads, medically-related products, etc

TYPE OF PACKAGING			
PS	polystyrene	SL	single layer
HP	hard plastics	ML	multi-layer, composites, laminates
PET	polyethylene	F	foil
O	others	ES	expanded polystyrene

18th Expedition Highlights



5 GYRES
SCIENCE TO SOLUTIONS

sailed over
700
nautical miles
in **16** days

visited **10** of
Indonesia's
approx. **17,500**
islands

1 beach
analysis showed
plastic pollution
levels of over
**350 pieces of
plastic/sq. m**
of sand

42
microplastic
samples in
surface waters
using the
manta trawl

16 beach
cleanups,
3 mangrove
cleanups

removed over
900 lbs of
plastic trash

1 manta trawl had
microplastic concentrations
of over **120,000**
**pieces/km² of surface
sea water**

Plastic Litter: Sectors Affected

- Tourism
- Fishing
- Marine life
- Birds
- Human health

Picking Plastics in a Remote Tropical Paradise: Range of Emotions and Sensations

- Joy: natural beauty, strong local cultures
- Sadness: so much plastic litter

- Solitude and Inter-Connection: ocean, land, sky
- Disconnection: could not escape from plastic trash

- Fear: Rapid growth in fossil-fuel plastics world-wide
- Hope: Less stuff → more fun, deeper meaning

