Regional Microplastic Research Progress and Collaboration

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2018.11.19, a dead sperm whale at Indonesia Kapota Island, 6 kg of plastics in its stomach, 115 plastic cups, 25 plastic bags, 4 plastic bottles, 2 slippers and some plastic ropes.
**Definition of Microplastics**

**Definition:** Plastic fragments or particles (less than 5mm)

- Various shapes
- Component complexity
- Uneven size
Characteristics of microplastics in marine environment

◆ Large surface area, persistent, extensive, fluidity, hydrophobic

◆ Enrich pollutants (POPs, microorganism and Heavy metals, etc)

◆ Depositing into the deep sea
Sources of Marine Microplastics

**Primary source:** Plastic particles from daily chemical products.

**Secondary source:** Break down of large pieces of plastics coming from land, shipping, aquaculture, and tourism.
Lifetime of Plastic Products

Product lifetime distributions

Roland Geyer et al. 2017

- Packaging
- Consumer & institutional products
- Other and textiles
- Electrical & electronic
- Transportation
- Industrial machinery
- Building and construction

Plastic currents
A giant distribution system for marine plastics


Microplastic concentration
Kilograms per square kilometre

4  10
Surface current

North Pacific gyre
North Atlantic gyre
Indian Ocean gyre
South Pacific gyre

Sample points used in the model

Packaging 36%
Building & Construction 16%
Textiles 15%
Consumer Products 10%
Transportation 7%
Electrical 4%
Others 12%
The Great Pacific Garbage Patch (GPGP), predicted at least 79 (45–129) M tons of ocean plastic /1.6 million km², 4-6 times higher than reported. >3/4 GPGP mass was larger than 5 cm and at least 46% was fishing nets. Microplastics accounted for 8% of the total mass but 94% of the estimated 1.8 (1.1–3.6) trillion pieces floating in the area.

Lebreton, et al., 2018
Current Research Fields

- Establishment of standardized method for separation and analysis of microplastics;
- Temporal and spatial distribution of microplastics in various medium (offshore, lakes, rivers, sediments, organisms);
- Ecotoxic effects of microplastics;
- Marine microplastics pollution, Ecological risk Assessment system and Standards;
- Formulate policies and regulations to control and reduce pollution of microplastics, etc.
Microplastic Identification

Sampling

Sample Pre-treatment

Sample Analysis
Our Research Work

WORK LIST

Microplastics in surface seawater and water column

Microplastics in marine organisms

Microplastics database

Microplastics and other pollutants

International co-operation
Microplastics in Western Pacific
Sampling:

Water samples – hundreds

Horizontal: Sailing surface water and Trawling samples; vertical: CTD

Sediments – a few

Organic samples – a few
## Microplastics Database

### Information (7S-D)

<table>
<thead>
<tr>
<th>Samples-unique number</th>
<th>Sample type</th>
<th>Sampling time</th>
<th>Sampling method</th>
<th>Survey area (latitude and longitude)</th>
<th>Spectrogram (μFT-IR)</th>
<th>Sustainable upgrading Distribution</th>
</tr>
</thead>
</table>
Regional: Surface Water Microplastics Abundance (n/m³)
Regional: Beach and Sediment Study in China

2016
中国海洋环境状况公报

2017年
中国海洋环境状况公报

10 beaches
Regional: Marine Organisms Study in China

Zoolankton
Mussel as bioindicator

(Ding, et al., 2018, Anal. Methods)

(Li et al 2015. EP)
Other Regional Work

- Flux and Transportation Study
- Biotoxicity Study
- Modeling
- Policy
- Non-profit organizations
Recent China-Southeast Asian Marine Cooperation Forum

The “Platisphere”

Diverse organisms attached on the biofilm
Deo Florence L. Onda
MSI of Philippines

Plastic litter in the ocean in Semporna, Malaysia. Image: Rick Carey / Shutterstock

Research by the Ocean Conservancy showed that more than half the plastic coming from South and Southeast Asia goes into the ocean because of a lack of developed waste and recycling systems.

What’s being done?

Transboundary problem, need international collaboration

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Malaysians produce 4,000 metric tons of plastic waste each day. (https://cleanmalaysia.com/2017/09/04/plastic-bag-bannedPORT-K/)
International co-operation
Future Direction

- Strengthen international cooperation and exchange
- Establish standard methods and specifications for investigation of microplastics
- Improvement and Optimization of qualitative and quantitative methods for Microplastics
- Strengthening the investigation and Research of Open Ocean Microplastics
- Intensive study on the mechanism of migration, diffusion and ecological effect of microplastics
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Thank You!