

# Toward the “harmonized observations of microplastics” and “prediction of future”

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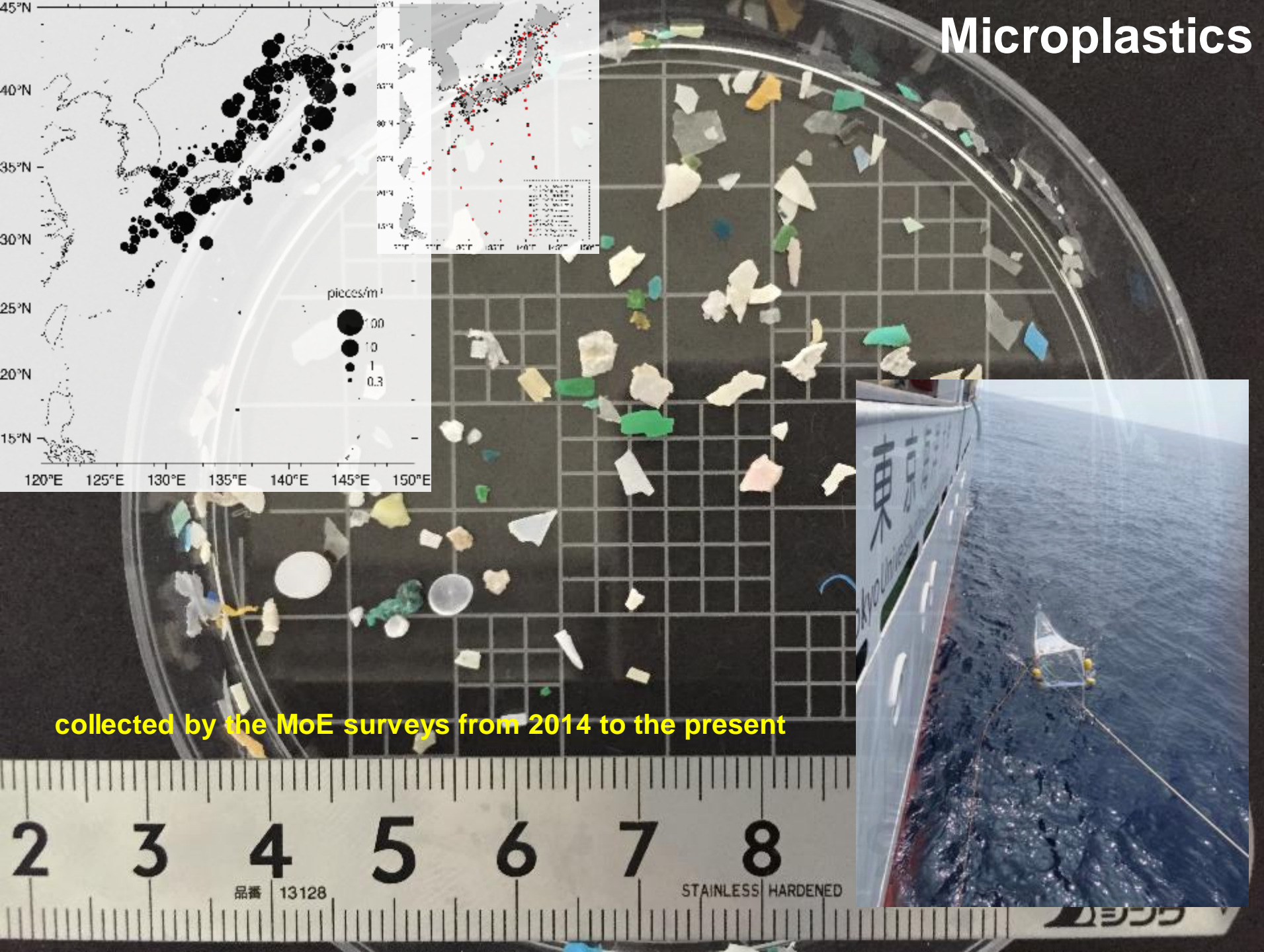
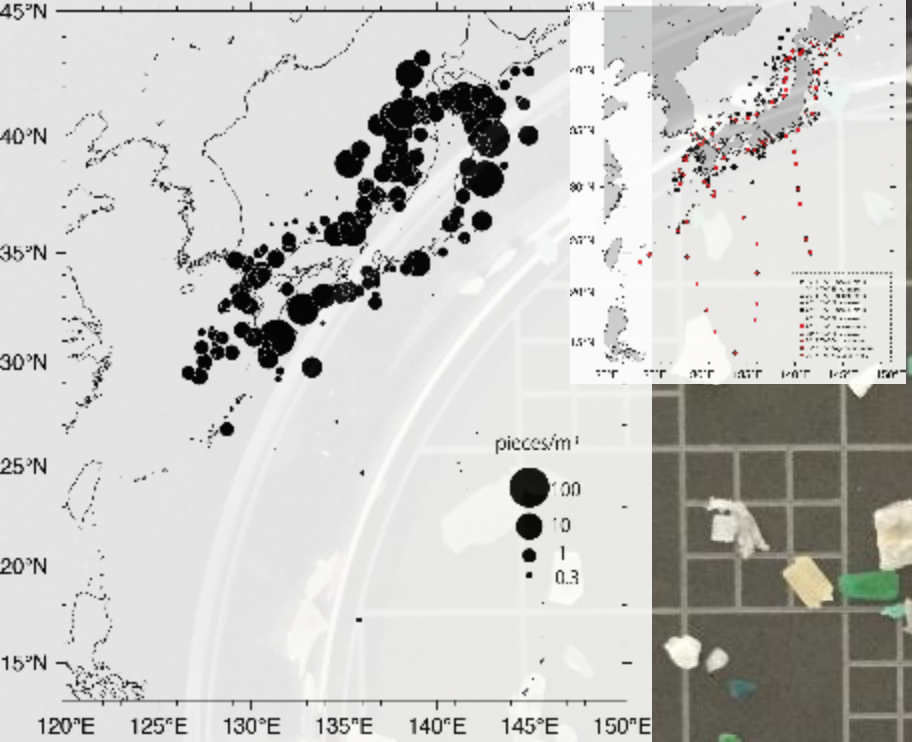
“Osaka Blue Ocean Vision”

We aim to reduce additional pollution by marine plastic litter to zero by 2050

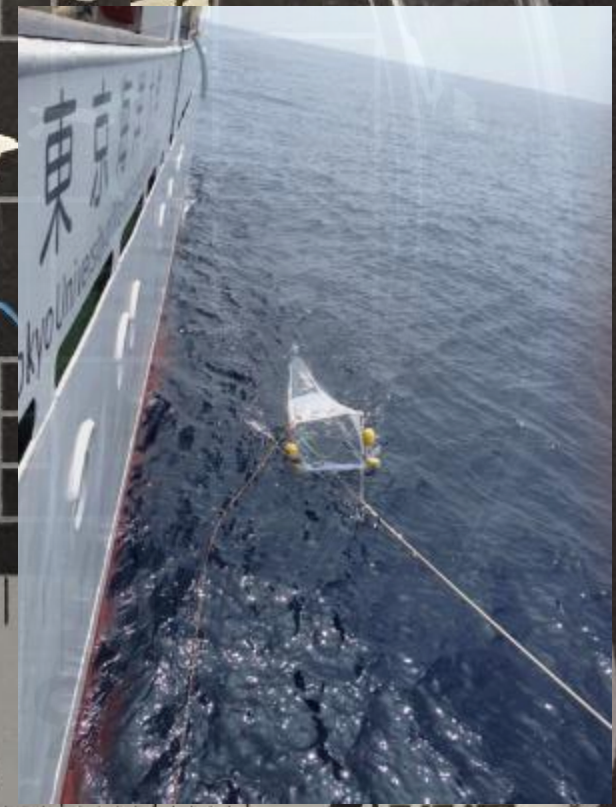
## To do

- ✓ We have to persistently **monitor the status of marine plastic litter** in the current oceans.
- ✓ We have to accurately **predict the status of marine plastic litter** in the future oceans.
- ✓ We have to **establish the action plan to reduce marine plastic litter** in line with scientific evidence based on monitoring and prediction.

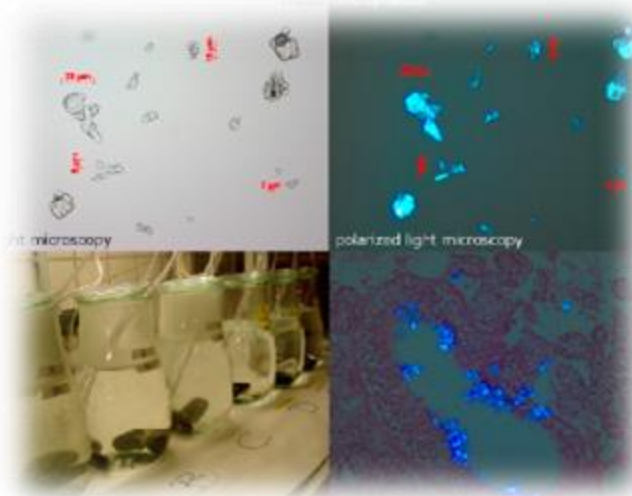
# Microplastics



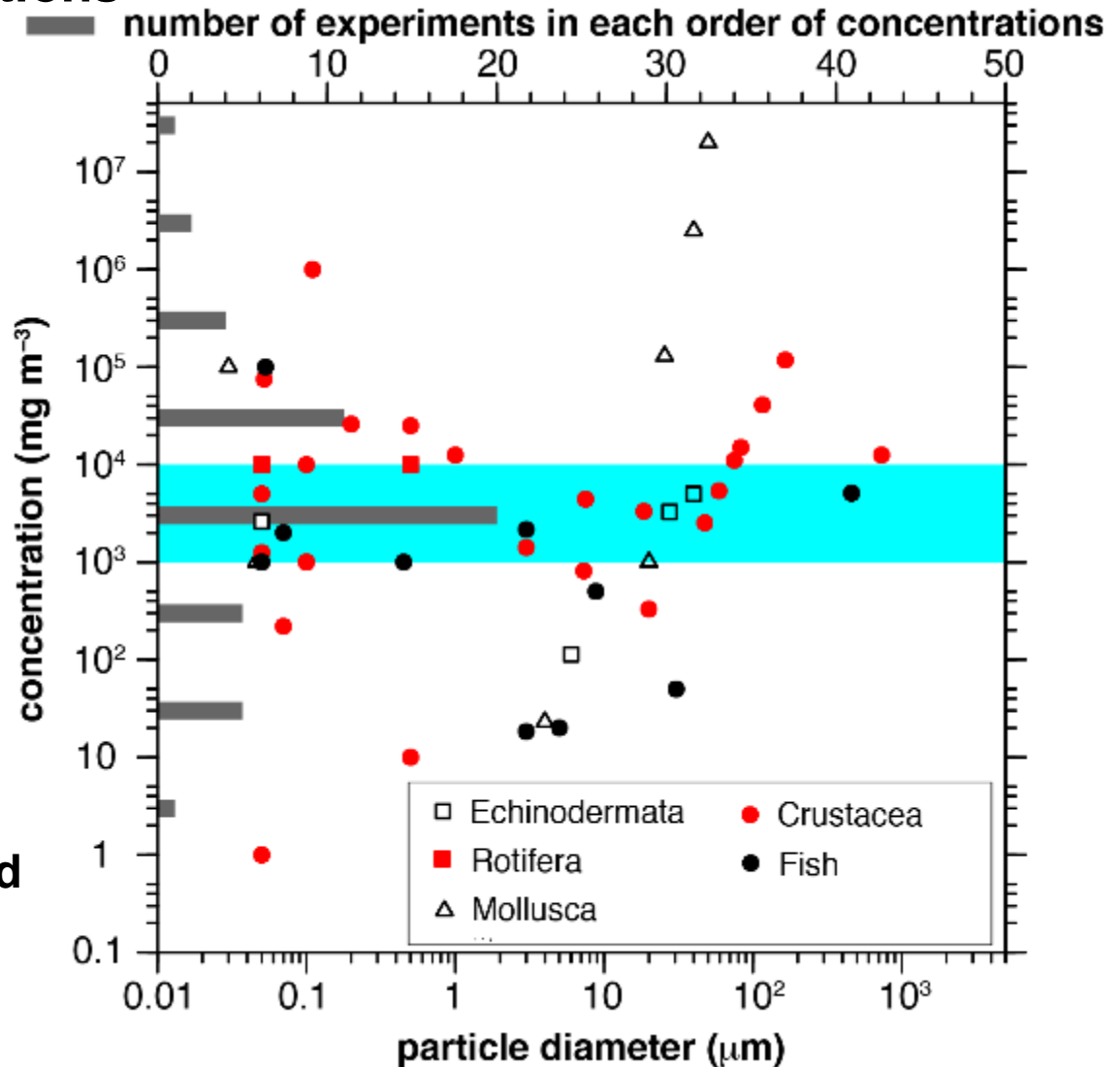
collected by the MoE surveys from 2014 to the present



# Laboratory-based studies to date have investigated biological damages on aqua biota exposed to small microplastics with different diameters and concentrations

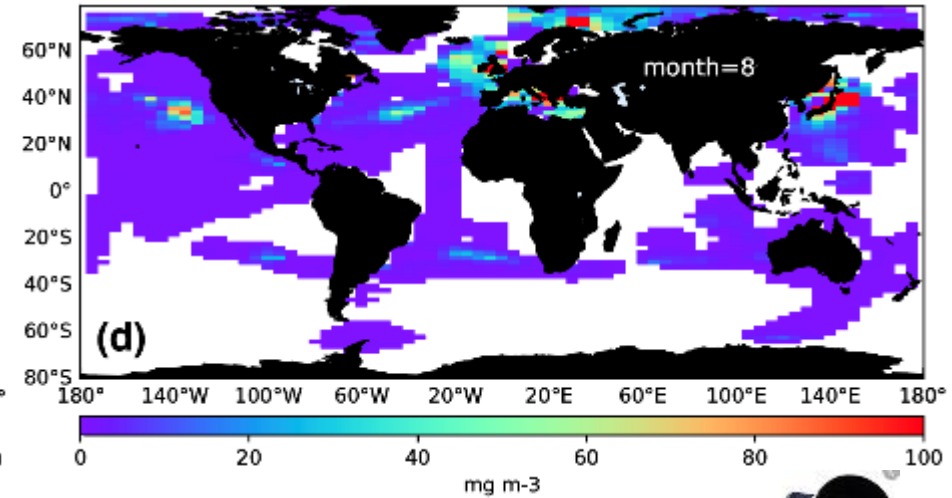
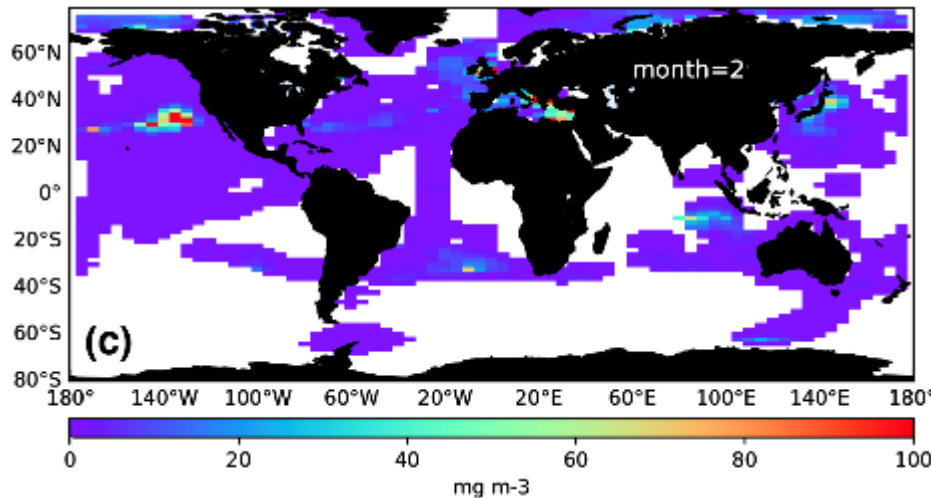
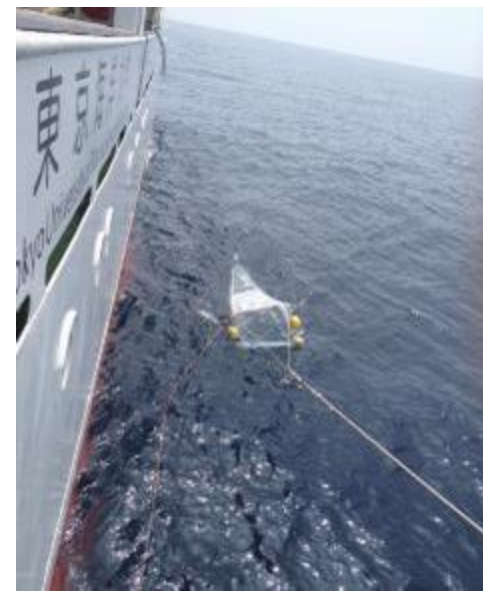
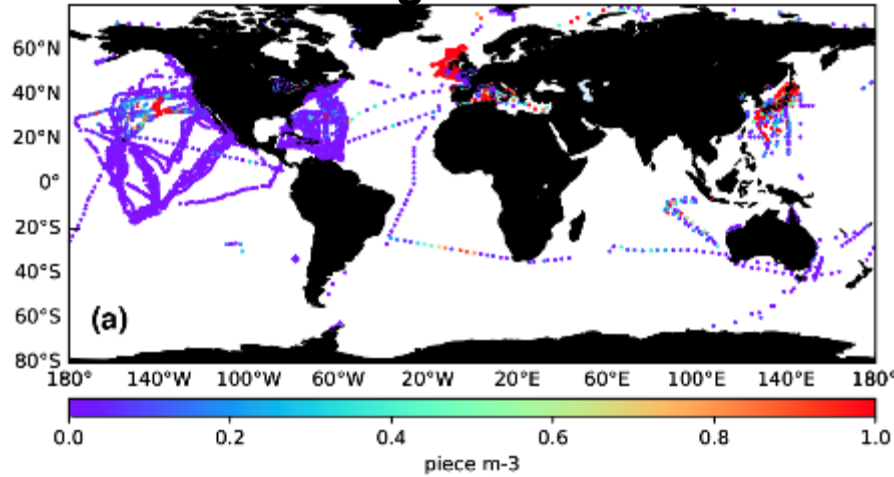


damages (feeding rate ↓, mortality ↑ etc...) were revealed  
**> 1000 mg/m<sup>3</sup>**



Isobe et al., (2019; Nature Communications)

**> 7000 data of microplastic abundance obtained by surface net towing from 2000 to 2019.**

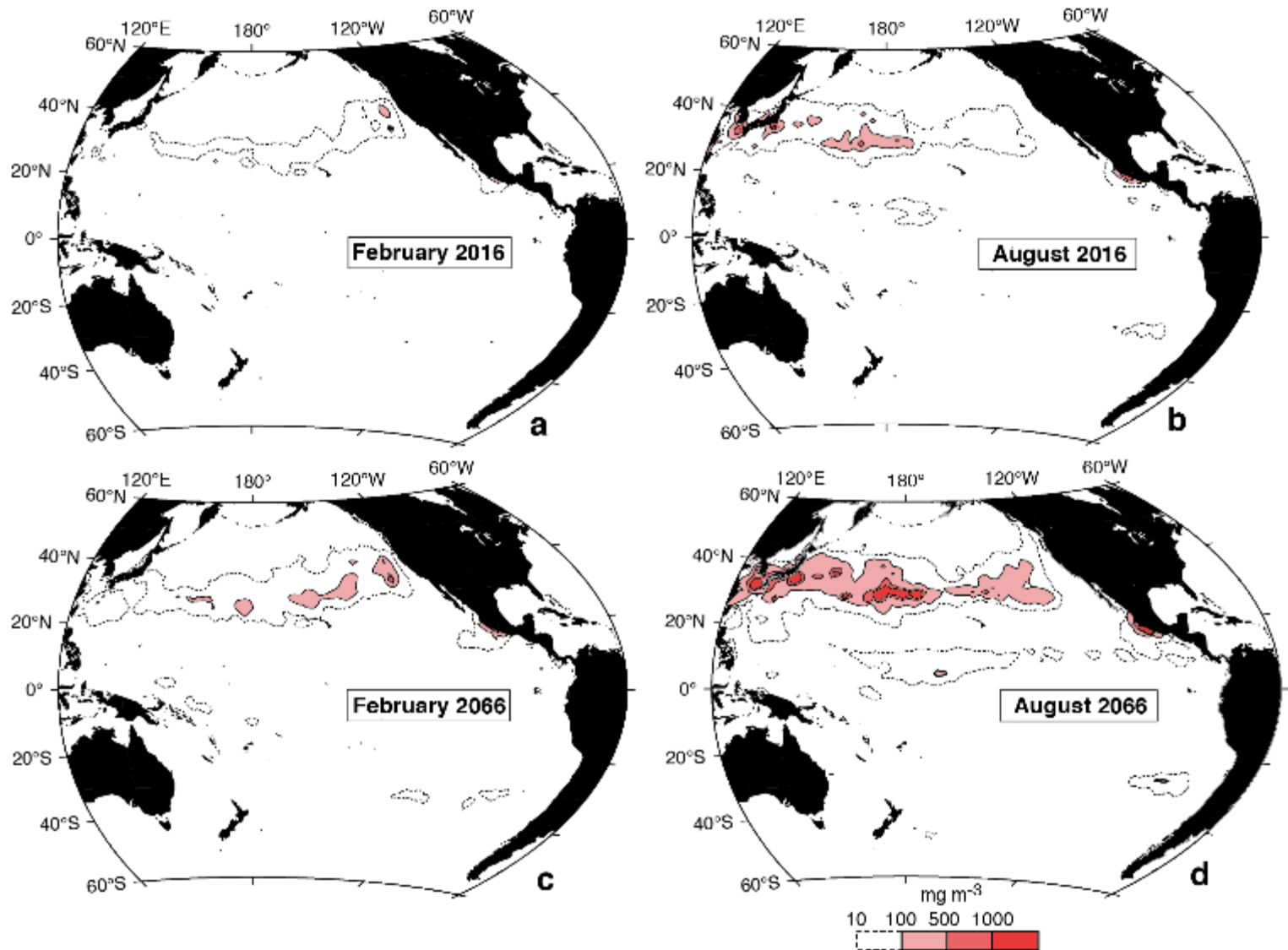


**Processed data of surface microplastic abundance ( $\text{mg}/\text{m}^3$ ) in February and August using satellite-derived winds and an optimum interpolation method**

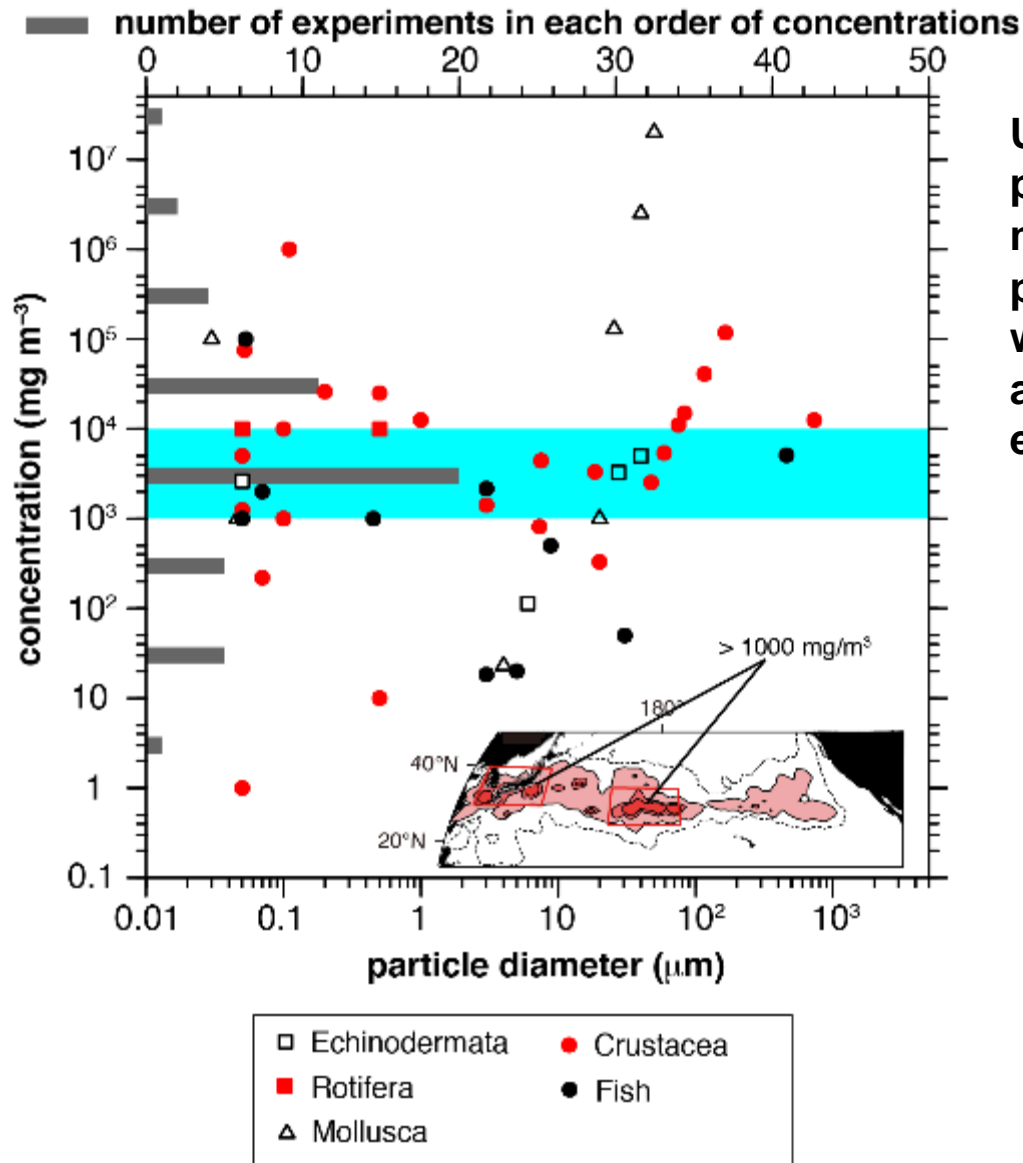
**Isobe et al. (in preparation)**



# Microplastic abundance after 50 years predicted by a numerical simulation



Isobe et al., (2019; Nature Communications)

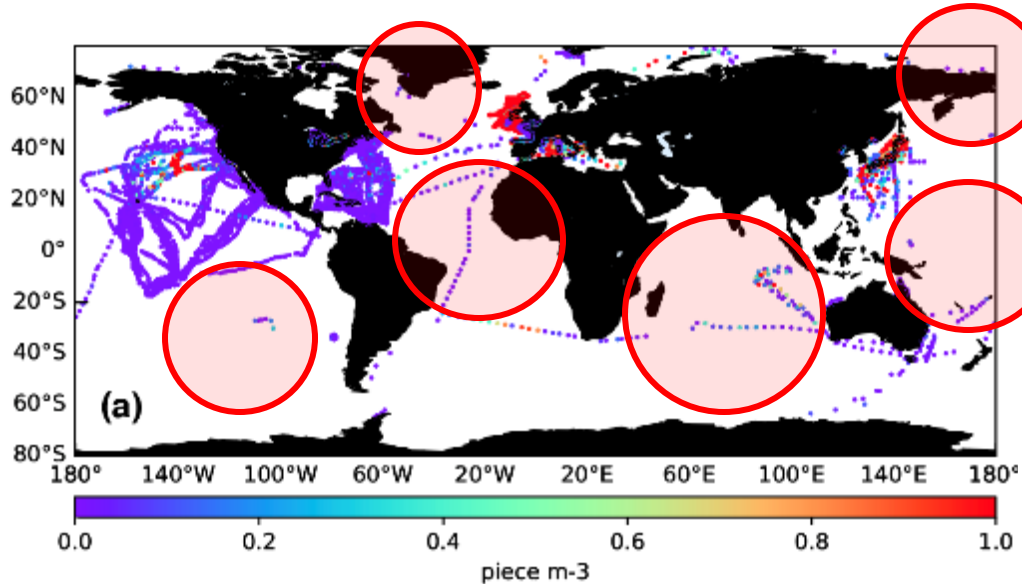


Unless the amount of mismanaged plastic waste is reduced substantially, marine plastic pollution is likely to proceed to a point of no return, beyond which marine organisms will be harmed, as has been shown in laboratory experiments.



Isobe et al., (2019; Nature Communications)

- ✓ We have to persistently **monitor the status of marine plastic litter** in the current oceans.

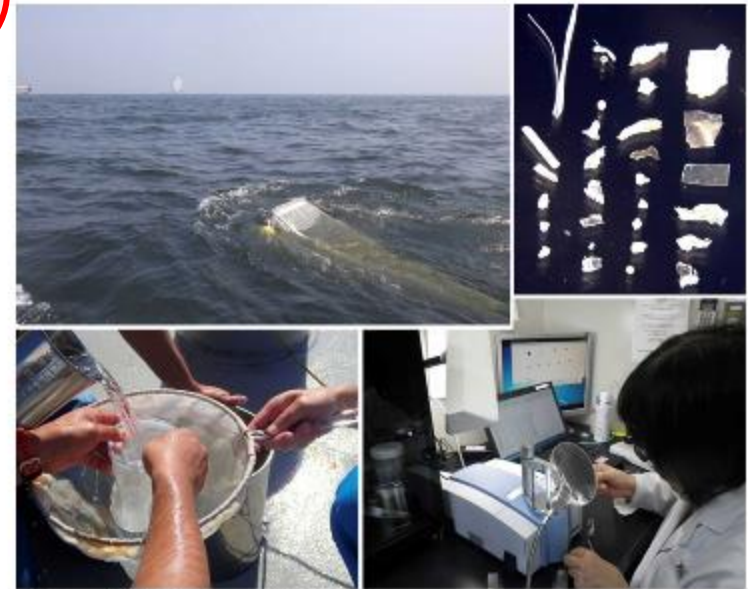


- ✓ **Observation network using a harmonized protocol** of microplastic survey is required among different countries
- ✓ A framework of **international data center for marine plastic litter** is required to synthesize the observed data

## Guidelines for Harmonizing Ocean Surface Microplastic

### Monitoring Methods

Version 1.0, May 2019



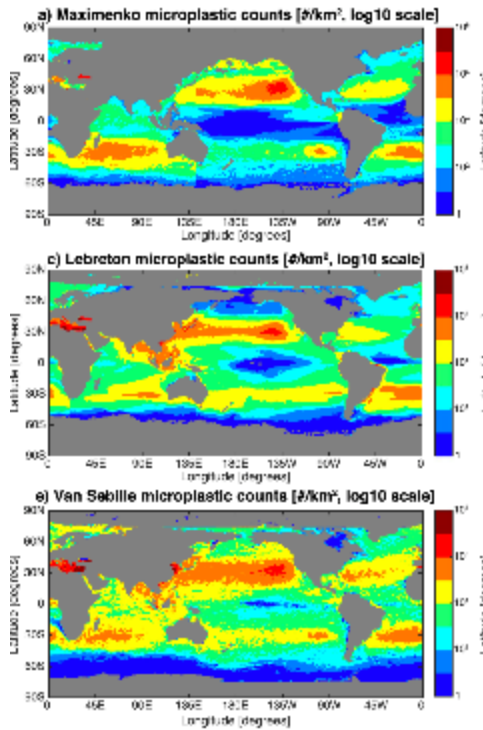
Ministry of the Environment, JAPAN  
May, 2019

Google

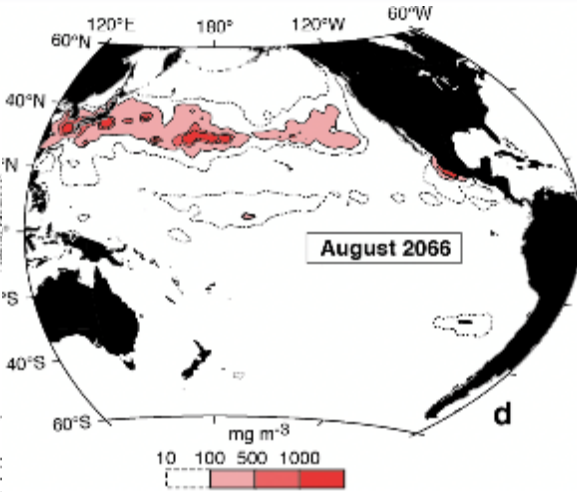
Guideline microplastic



✓ We have to accurately **predict the status of marine plastic litter** in the future oceans.

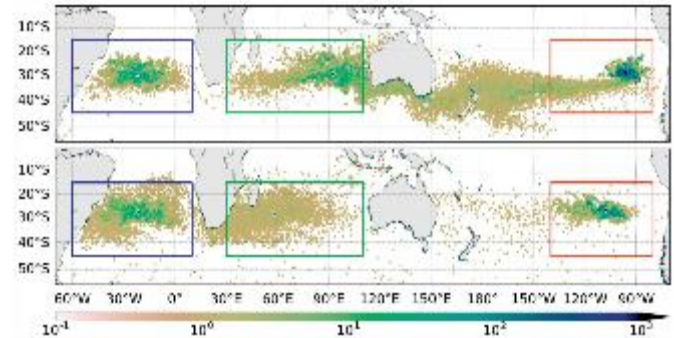


van Sebille et al. (2015; Environ. Res. Lett.)



Isobe et al. (2019; Nature Comm.)

Dobler et al. (2019, Mar. Pollut. Bull.)



An intergovernmental framework of scholars with different backgrounds is required to accurately predict the plastic pollution in different scenarios in the future. The framework may be similar to IPCC for climate change, e.g., **I**ntergovernmental **P**anel for **P**lastic **P**ollution (IP3).

- ✓ Prediction of future abundance of microplastics
- ✓ Prediction of biological damage
- ✓ Analysis of discarded plastic flow on land
- ✓ Estimate discarded plastic inventory.....



✓ We have to **establish the action plan to reduce marine plastic litter** in line with scientific evidence based on monitoring and prediction.



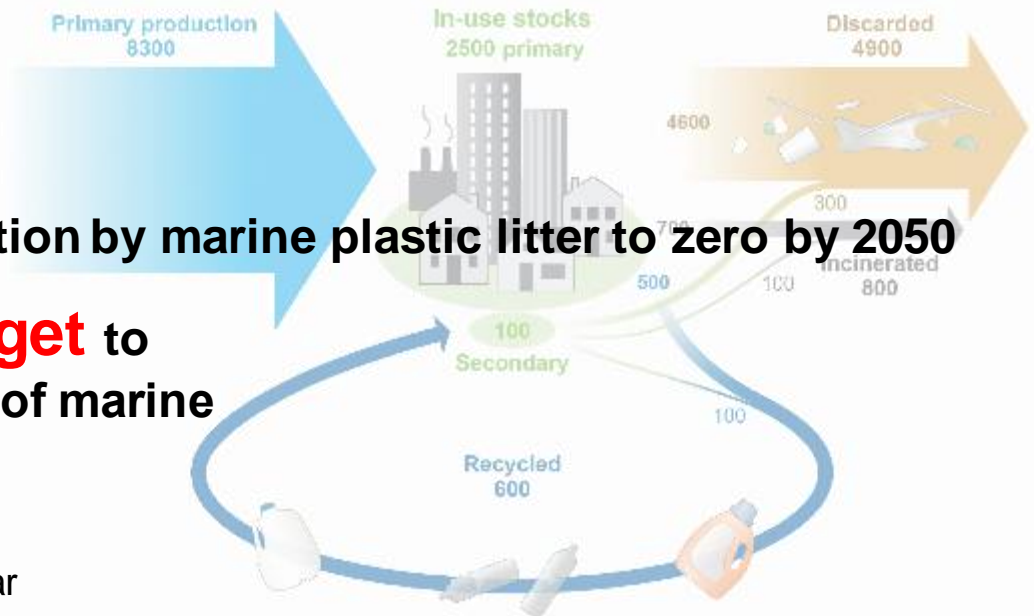
- ✓ The action plan to reduce marine plastic litter should be **based on scientific evidence** derived from appropriate monitoring and prediction.
- ✓ The action plan to reduce marine plastic litter may suggest reduction (ban) of single-use plastics in the world, but should not be overly rapid so as that **no one will be left behind**.

### “Osaka Blue Ocean Vision”

We aim to reduce additional pollution by marine plastic litter to zero by 2050

What will be the **numerical target** to quantitatively measure “reduction of marine plastic litter”?

- ✓ Abundance of marine plastic litter
- ✓ Weight of mismanaged plastics per year
- ✓ Weight of discarded plastics per year
- ✓ Weight of plastic production per year



Geyer et al. (2017; Sci. Adv.)

**SATREPS PROGRAM SPONCERED BY JST/JICA  
FY2019(build-up), 2020~2014**

**Formation of a center of excellence for marine plastic pollution studies  
in the Southeast Asian seas**

**PI: Prof. Atsuhiko Isobe, Research Institute for Applied Mechanics**  
**PI in Thailand : Prof. Voranop Viyakarn, Chulalongkorn Univ.**

| Research activities  | Build-up                 | Year 1  | Year 2  | Year 3   | Year 4  | Year 5  |
|--|--------------------------|---|---|--|---|---|
| 1 <sup>st</sup> Step<br>(Sattahip project)                 | Plann ing of field works | Analyses for generation & route of plastic wastes, monitoring on beaches, coral reefs, estuaries, marine organisms & POPs |   |  | Prototype of Action plan and improvement  | —   |
| 2 <sup>nd</sup> Step<br>(Development over Thailand)        | Plann ing of field works | Monitoring in Gulf of Thailand, numerical modeling  |   |  | Analyses for generation & route of plastic wastes, monitoring on beaches, coral reefs, estuaries, marine organisms & POPs | <ul style="list-style-type: none"> <li>● Action plan to combat marine plastic litter in Thailand</li> <li>● Establishment the Center of Excellence</li> </ul> |
| 3 <sup>rd</sup> Step<br>(Development over ASEAN countries) | —                        | —   | Exchange the knowledge among ASEAN researchers, support of monitoring design in ASEAN countries, training of monitoring |  | Symposium 'Marine plastic pollution in ASEAN regions' on T/V UMITAKA maru   |   |
| capacity development                                       | —                        | Training and PhD students in Japan, public awareness in Thailand  | Training and PhD students in Japan, public awareness in Thailand  | Training and PhD students in Japan, public awareness in Thailand | Training and PhD students in Japan, public awareness in Thailand  | Training and PhD students in Japan, public awareness in Thailand  |

