



Present and future research on micro-plastics in Japan

Keiichi UCHIDA

Tokyo *University of Marine Science and Technology*
(TUMSAT)

Present research

Offshore research have been conducted since 2014.

*Before 2014, the research have been conducted
coastal line, coastal areas, and bay areas.*

*Even though they investigated and removed the debris,
it came back after a while.*

Where did the debris come from?

Because, there was no means for investigating offshore.

TUMSAT has 4 training and research vessels.



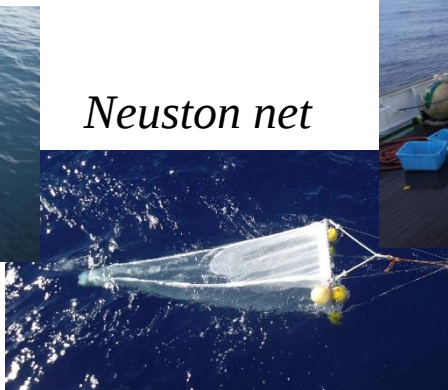
Umitaka-maru



Shinyo-maru



Visual survey

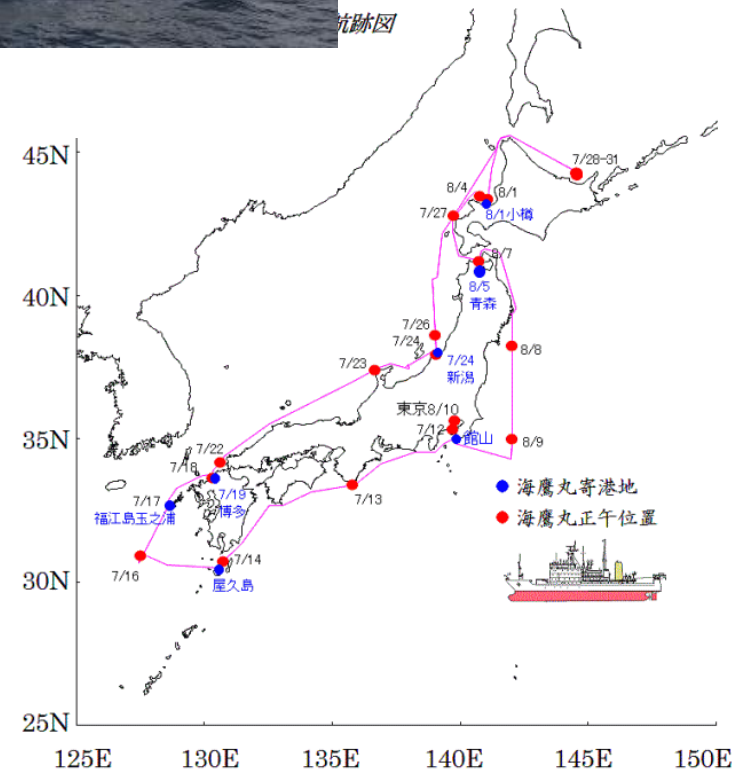


Neuston net



Bottom trawl

TUMSAT can conduct synthetic survey for Marine debris.



Research group

Our group consists of

Tokyo University of Marine science and Technology

sampling micro-plastics, visual survey, seabed litter survey

Kyushu University

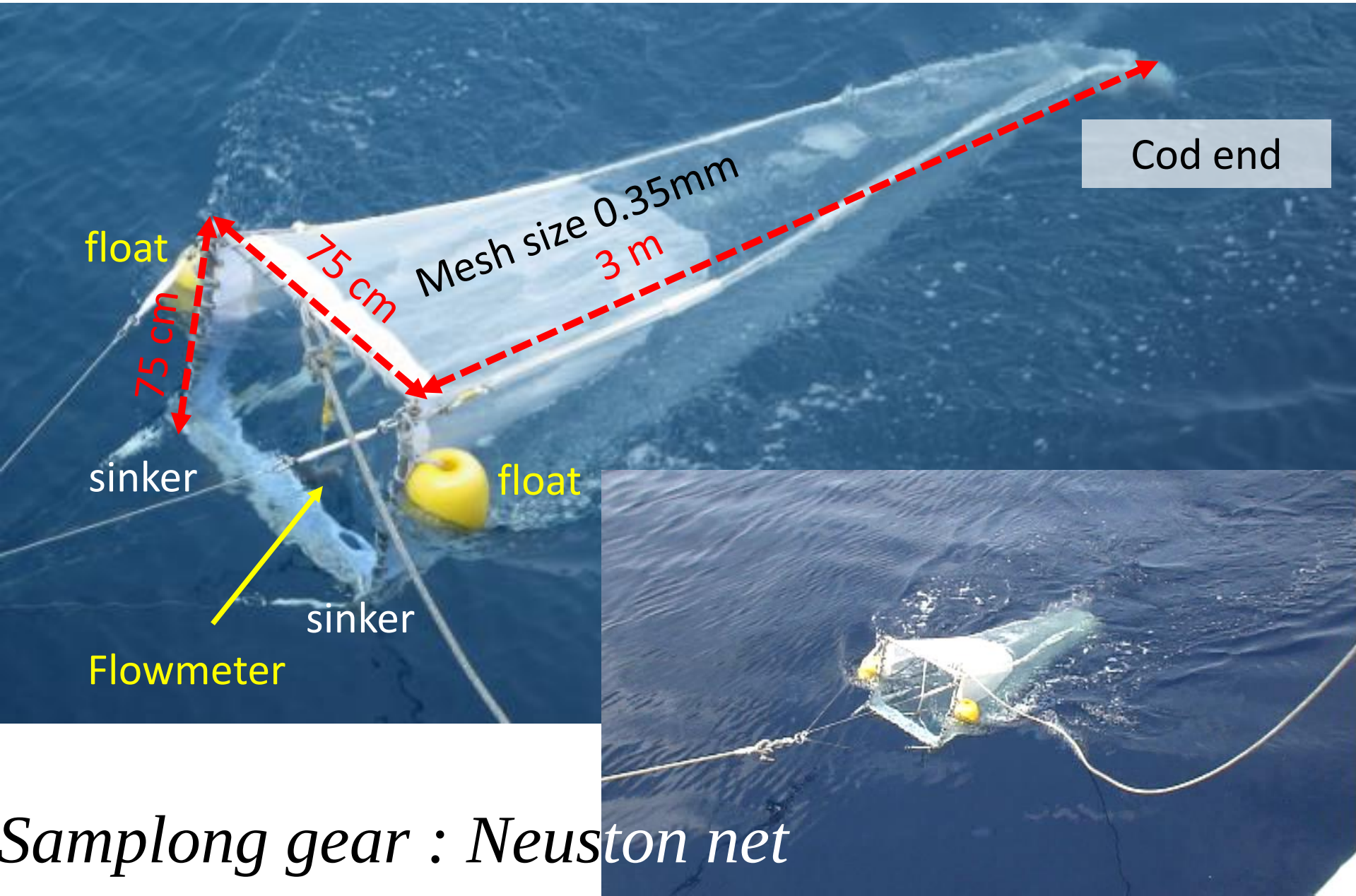
analyzing micro-plastics from oceanography

Tokyo University of Agriculture and Technology

analyzing micro-plastics from chemistry

Our project Supported by Ministry of the Environment.

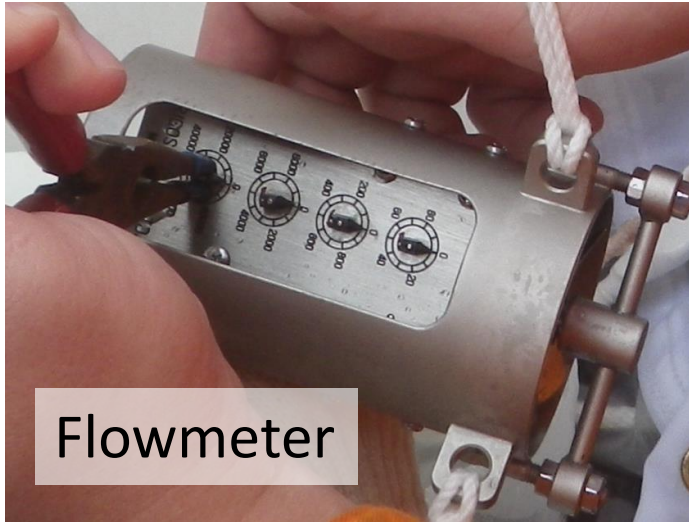
Sampling method for micro-plastics



Samplong gear : Neuston net

How to Sampling and analyzing Micro-plastics

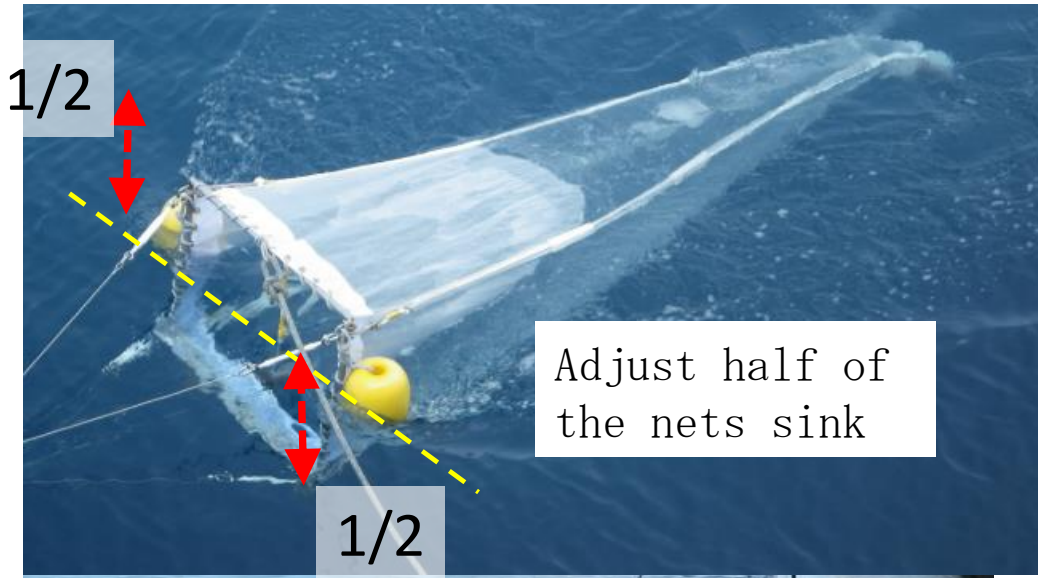
How to operate Neuston net.



Flowmeter

The flow-meter measures the quantity of water filtered through the net

20 minutes to 40 minutes with 2 knots



How to handling samples after tow.



Prepare the
filtrated seawater
for preventing
contamination



Wash away sticking
sample to codend



Remove large debris after
wash away small litters

How to gather samples



Gather in a filter net
and put it in a bottle



Prevent spoilage of organisms with 2-5 %
formalin



Recorded data.

Date, time,

Location(start-finish :lat. long.)

Ship speed, coerce,

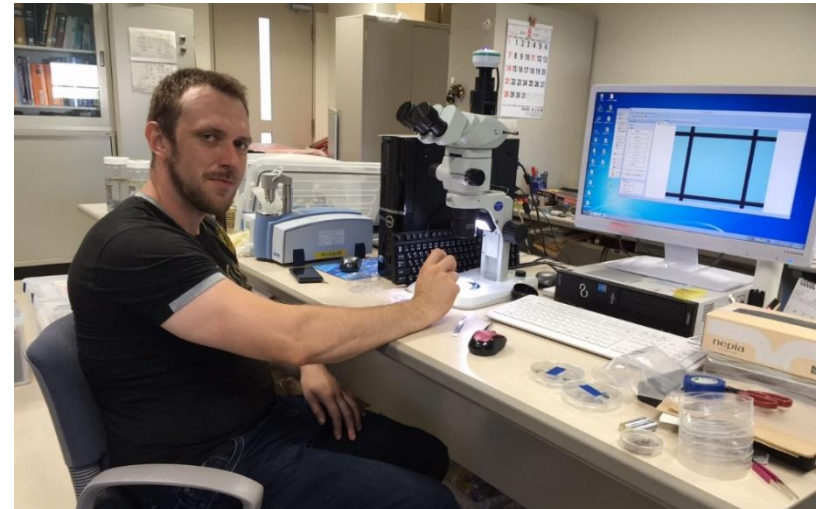
Wind speed, direction

Wave height

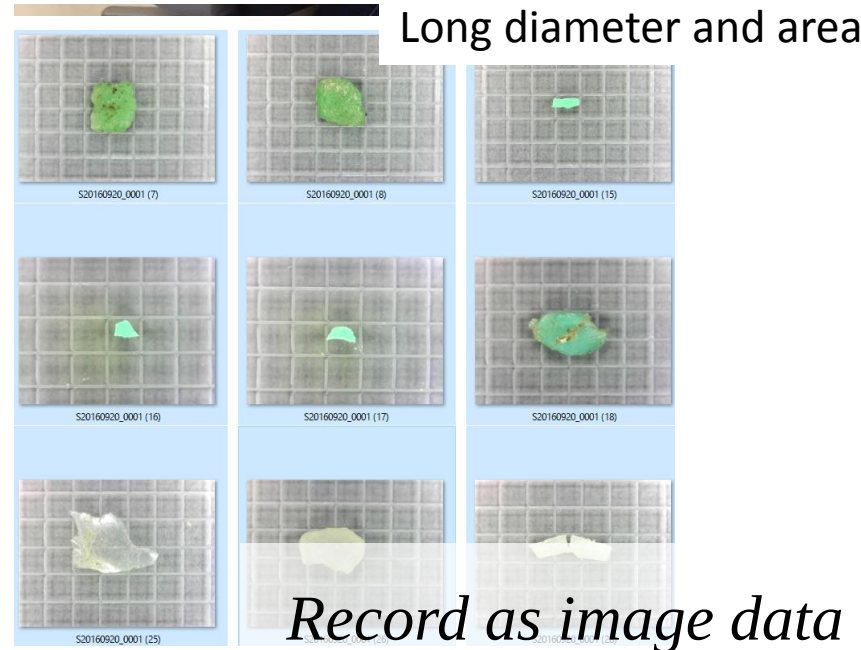
Water temperature and salinity

Number of Flowmeter

Measurement of samples



Long diameter and area



Estimated concentrations

$$\text{Density} = \text{pieces} / \text{m}^3$$

$$= \text{pieces} / \text{km}^2$$

The concentration (pieces m^3) of micro-plastics was integrated vertically (pieces km^2).

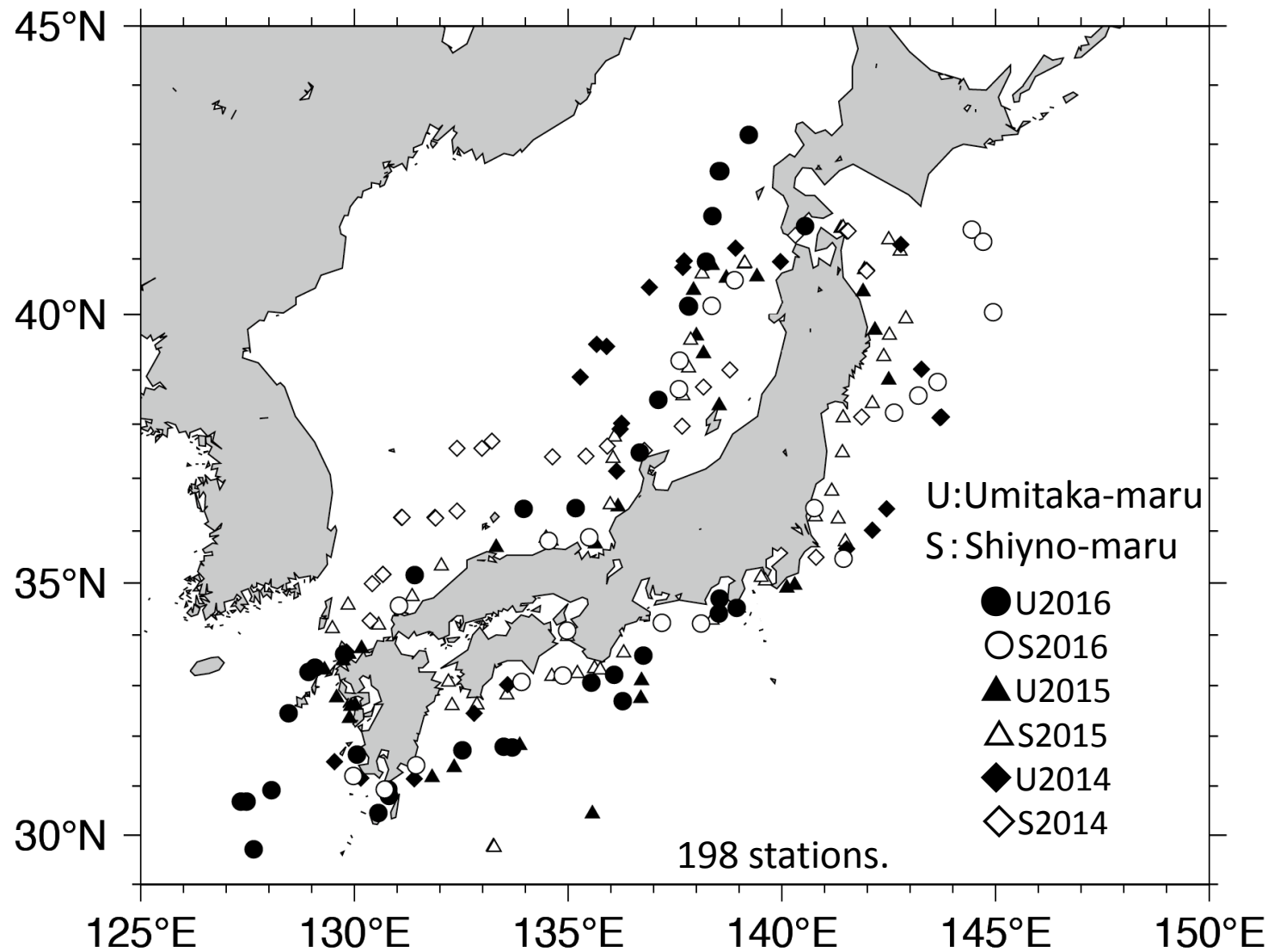
micro-plastics is from 0.3 to 5 mm

The intervals of size ranges are

*0.1 mm for 1 mm for mesoplastics < 10 mm,
10 mm for mesoplastics > 10 mm.*

Divide by type; fragment, expansion polystyrene, fiver.

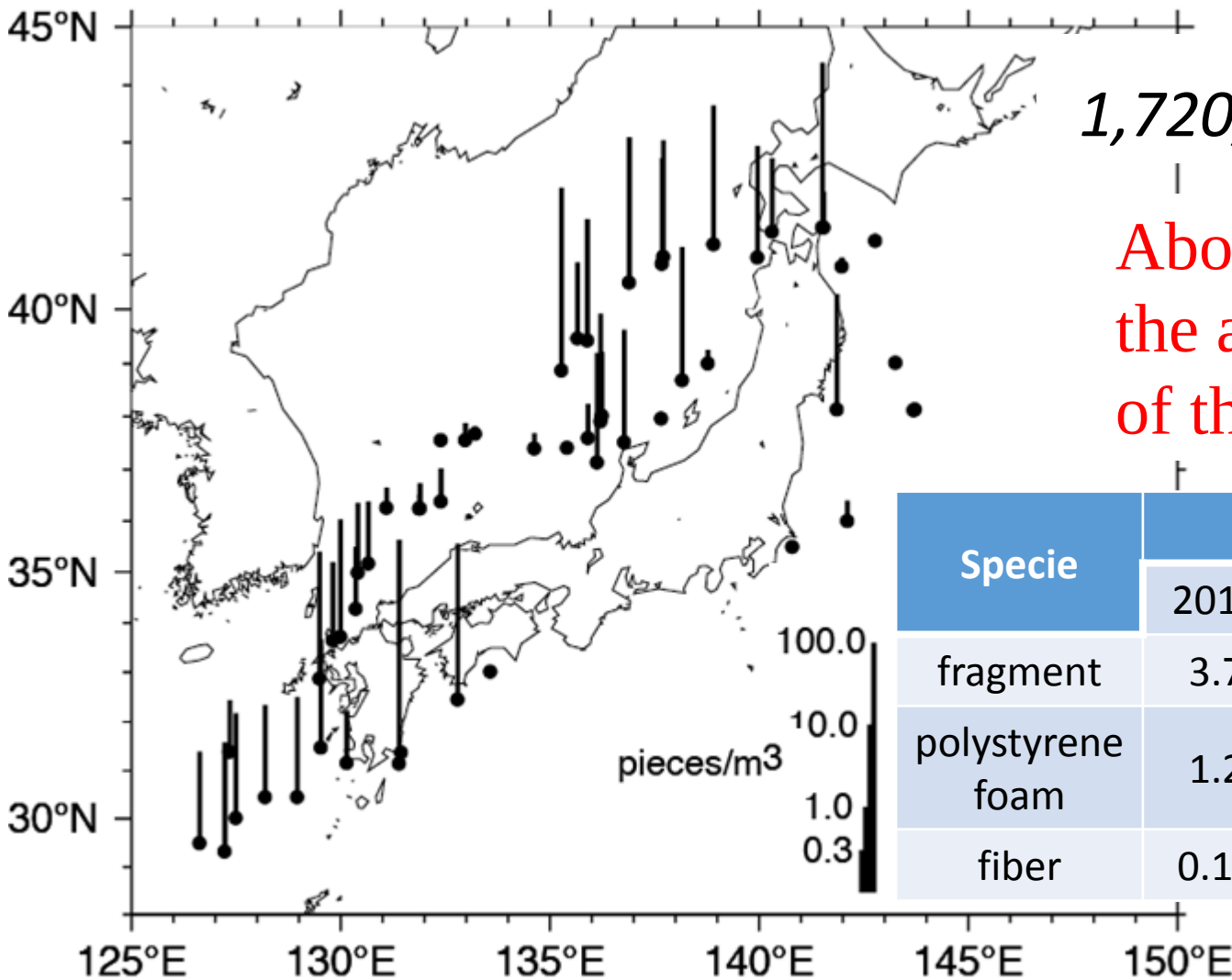
Present research



East Asian seas: A hot spot of pelagic micro-plastics

Atsuhiko Isobe, Keiichi Uchida, Tadashi Tokai, Shinsuke Iwasakia.

Marine Pollution Bulletin, 2015, 101, 618–623. doi:10.1016/j.marpolbul.2015.10.042



1,720,000 (pieces / km²)

About 27 times
the average amount
of the world's oceans

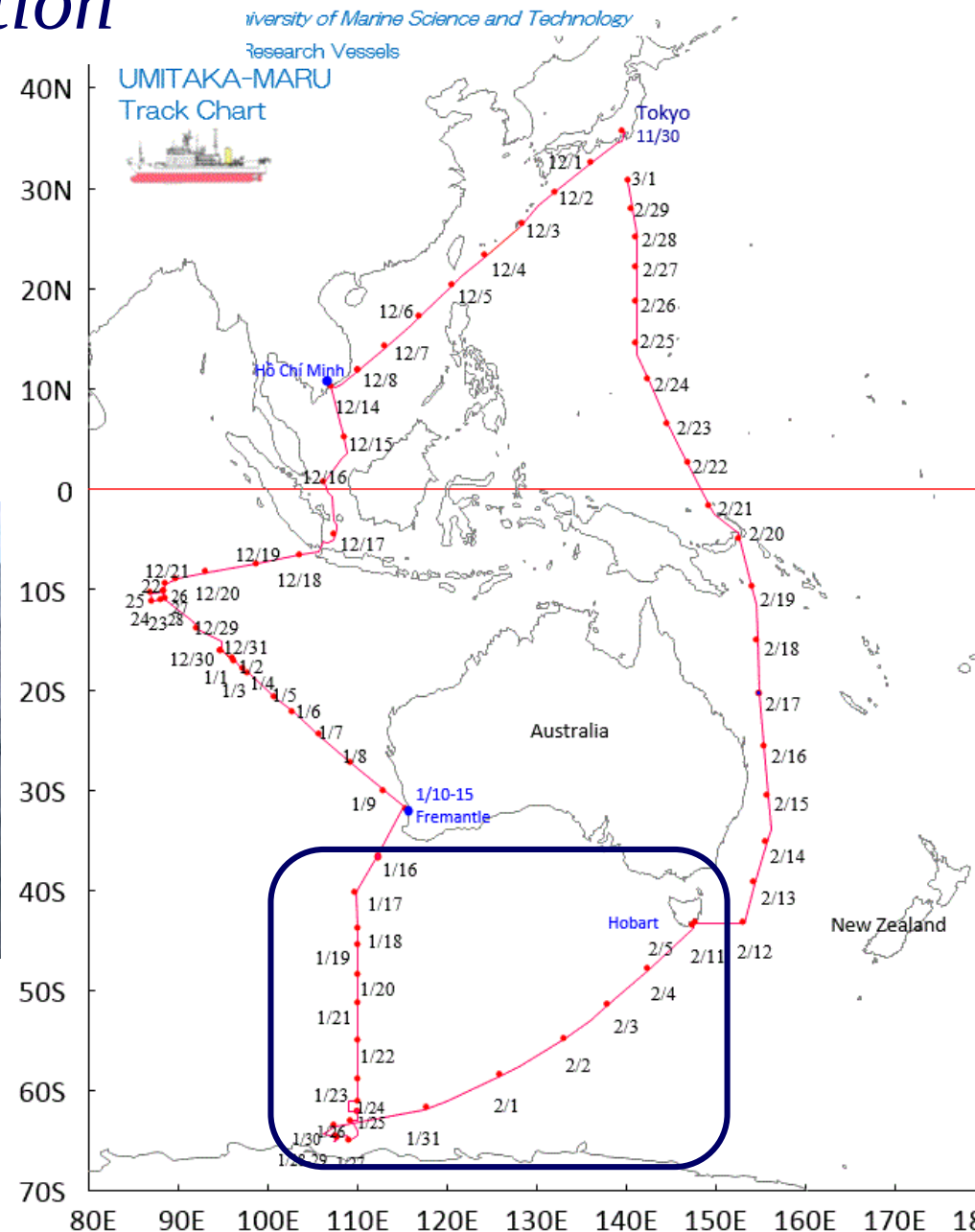
Specie	year			Average
	2014	2015	2016	
fragment	3.7	2.4	2.1	2.7
polystyrene foam	1.2	0.20	0.32	0.57
fiber	0.13	0.06	0.09	0.09

Antarctic Ocean Observation

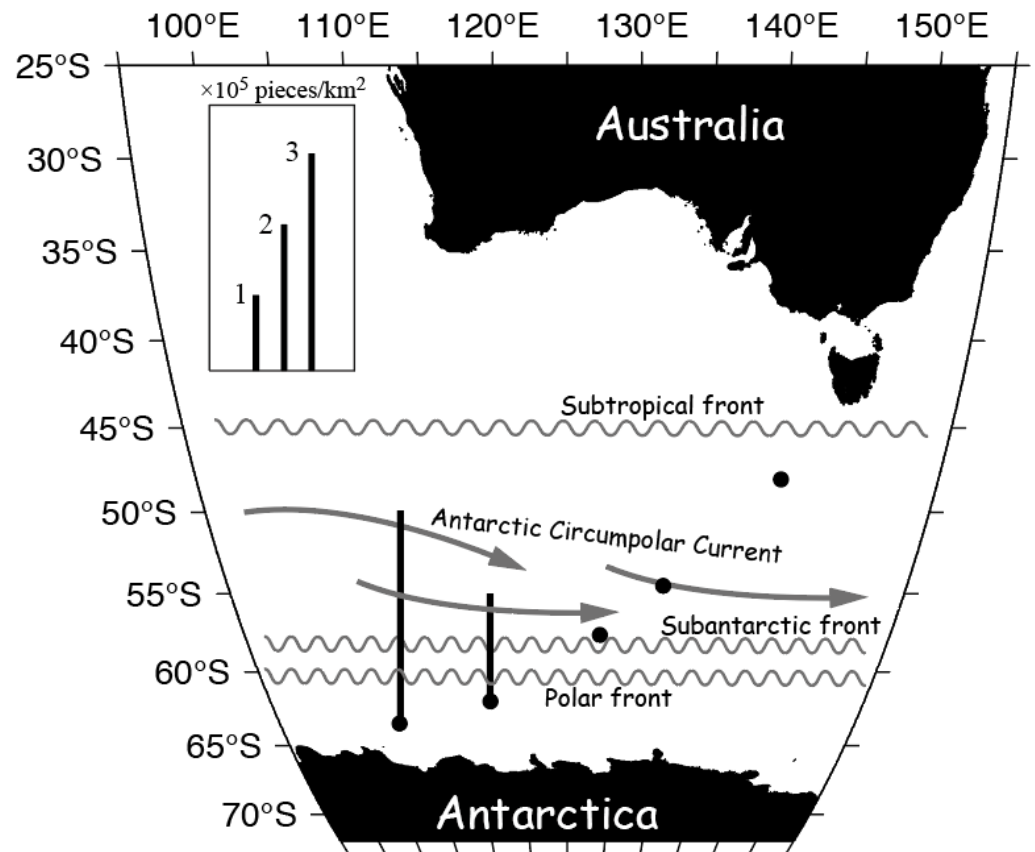
January 2016 Sampling in the Antarctic Ocean



19th Antarctic Ocean Observation
by Umitaka-maru,
30 Nov 2015 – 4 March 2016



Result of Antarctic Ocean Observation



Sta.	Date	Particle count	Seawater volume	Concentration
		(pieces)	(m ³)	(pieces m ⁻³)
1	Jan. 30, 2013	20	202	9.9×10^{-2}
2	Jan. 30, 2014	18	392	4.6×10^{-2}
3	Feb. 1, 2015	2	566	3.5×10^{-3}
4	Feb. 2, 2016	2	502	4.0×10^{-3}
5	Feb. 4, 2016	2	417	4.8×10^{-3}

Compared with the ocean of the world

ocean	Total particle count (pieces/km ²)
East Asian sea ¹	1,720,000
N. Pacific ²	105,100
World's ocean	63,320
Seto Inland Sea ³	76,000
Antarctic sea ⁴	286,000

1: Isobe et al (2015), 2 Eriksen et al(2014),

3: Isobe et al (2014), 4: Isobe et al (2016)

There is no ocean without microplastic.

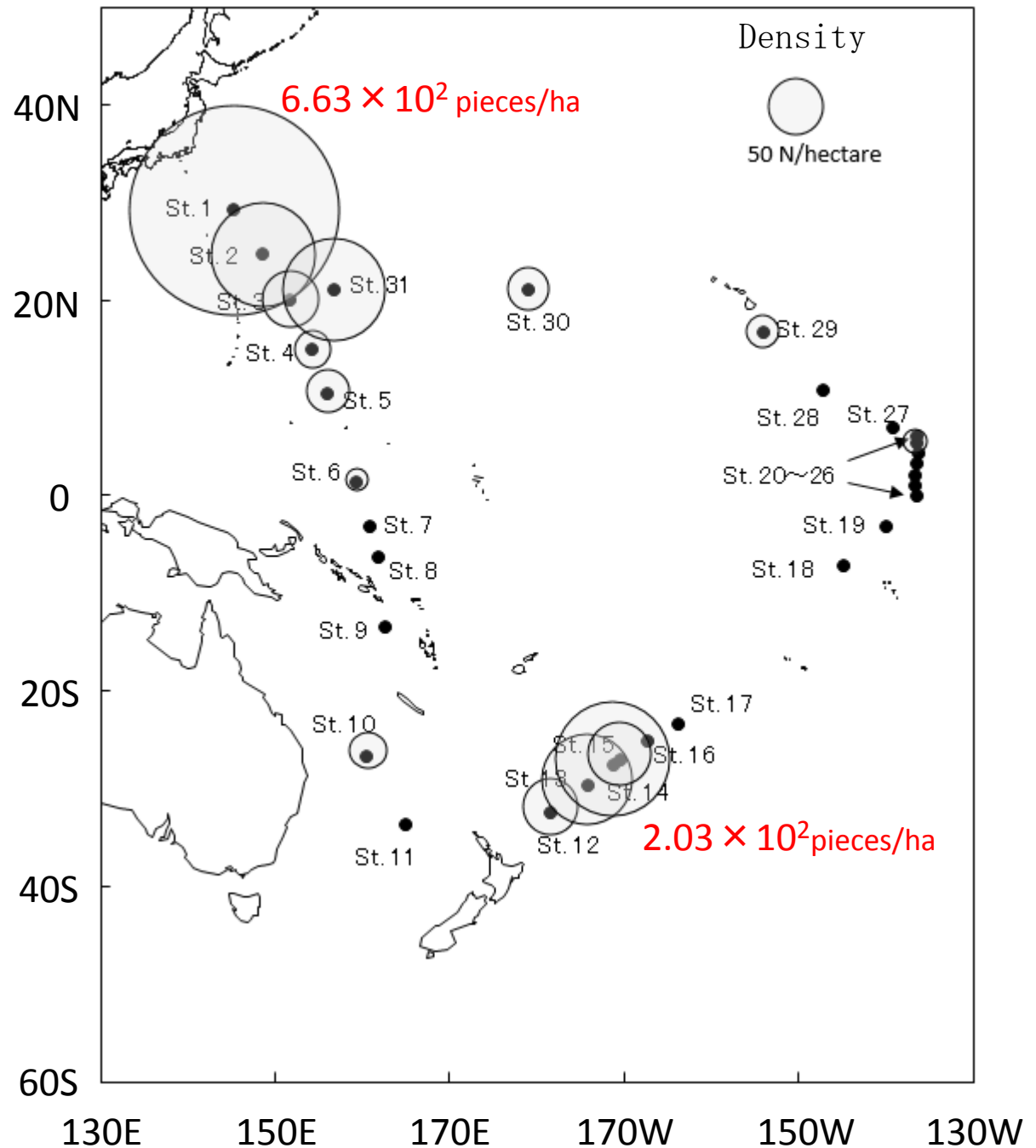
Is microplastic still being increased?

Umitaka- maru conducted Neuston net sampling in 2000

Mesh size is larger than
present research

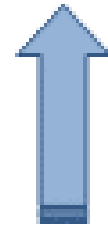
$1.00 \times 1.64 \text{ mm} > 0.35 \text{ mm}$
2000 2014

Sampling locations and
distribution density of
small floating plastic
fragments at each
station (pieces / ha)

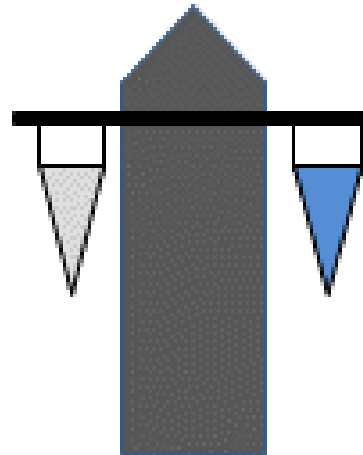


Parallel towing of the two Neuston nets

mesh size: and 0.35mm vs 1.00 × 1.64mm

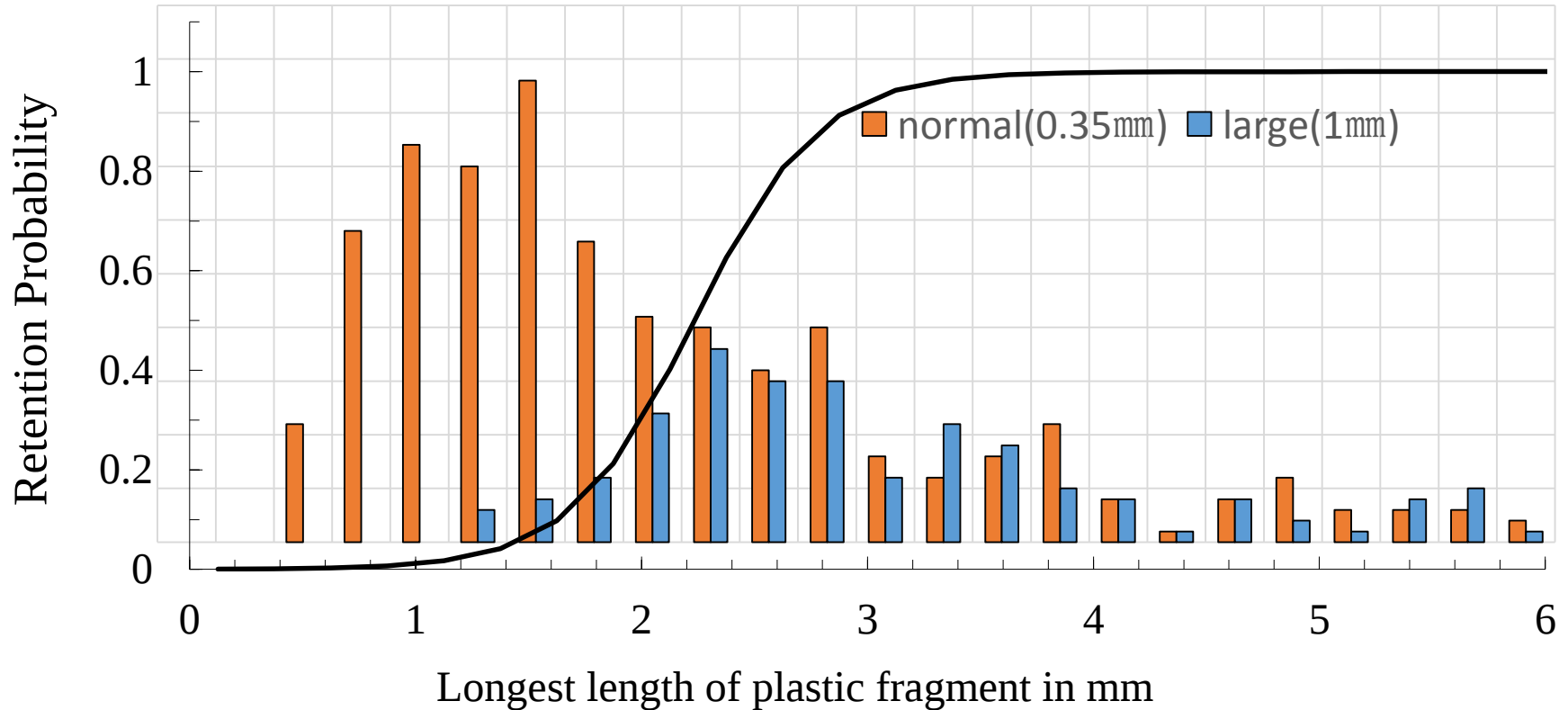


0.35mm vs 1.00 × 1.64mm



Result of Parallel towing

Size selection of 1.0×1.6 mm meshsize
Comparison in size distribution of plastics except string-like
between 0.35mm and 1.0mm mesh sizes



*With this method, it is possible to compare with
previous research.*

Standardization Harmonization

Sampling efficiency

Compare survey methods

Clarify the difference in sampling efficiency due to the difference in method

It is possible to compare the results of each survey.

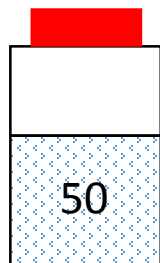
Compare the Neuston net and Manta net in this year.

Standardization Harmonization

Ability of analyzing

*Estimate variances among laboratories by
common use of a **standard sample**.*

*How many millimeters can you measure?
Is it possible to distinguish the material?
Which diameter do you measure?*



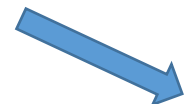
A laboratory.

50 ©



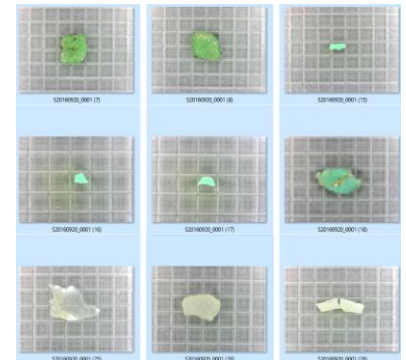
B laboratory.

48 ○



C laboratory.

30 ×



Standardization Harmonization

Joint survey

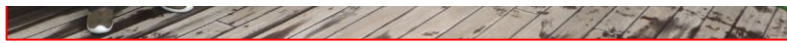
Exchange information about sampling and analysis methods at the investigation site.

In 2016, 2 countries from east Asia.

*In 2017, 3 countries from east Asia
and South east Asia.*



***It is important that East Asian and
Southeast Asian countries collaborate on
research for marine debris.***



Standardization Harmonization

Promotion activities of
micro-plastics survey

- Invitation of overseas researchers
- Making explanatory video for marine debris survey
- Dissemination visual observation data recording software



Next project

4 University Training and Research Vessel

Variety season

Cooperative Research Team

Expand research area

