

Research Report

Chikyu Add-on Program (CAP)

Nankai Trough

A microplastic monitoring using D/V CHIKYU



October 10 2018 – March 29 2019

Marine Biodiversity and Environmental Assessment Research Center

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1. Project Information

1-1. Project ID: CAP_002

1-2. Name of vessel: D/V CHIKYU

1-3. Cruise piggybacked: IODP Exp. 358

1-4. Project title: A microplastic monitoring using D/V CHIKYU

1-5. Project period: October 10 2018 – March 29 2019

1-6. Ports of call: Shimizu on October 10 2018 – Shimizu on March 29 2019

1-7. Research area: Nankai Trough

2. Investigations

2-1. Introduction

Global plastic production increases annually, with an estimated ca. 10 million tons of plastic entering the oceans each year. More than half of the plastic entering the ocean each year comes from the Asian continent with China way out ahead (one-fourth of the total). Japan is located in an area where a large amount of plastic is transported and accumulating from the massive waste producers via ocean currents such as the Kuroshio Current. Indeed, a recent study revealed that the sea around Japan is actually a hotspot of floating microplastics. Although there is now emerging data of microplastics in the coastal waters around Japan, we still lack data on plastic abundance on the Kuroshio current. In addition, little is known about the temporal variability of microplastic abundance on the Kuroshio current, which needs to be clarified. This project aimed to investigate the temporal variability of microplastic abundance in the surface water at Nankai Trough during the IODP Exp. 358.

2-2. Methods

A microplastic sampler used in this project consisted of a battery powered flowmeter, tube, and a sampling mesh-bag (Fig. 1). The mesh-opening of the bag was 330 μm . The tube end of the sampler was connected to the outlet of the vessel's on-board seawater pump, while the mesh-bag was attached to the other end of the tube (Fig. 2). Microplastics was collected in the bag by flushing the seawater continuously. The mesh-bag was retrieved and changed once a week, and the bag was stored in a bottle of ethanol (70%) at room temperature for further analysis. Flow speed was logged at each time of sampling.

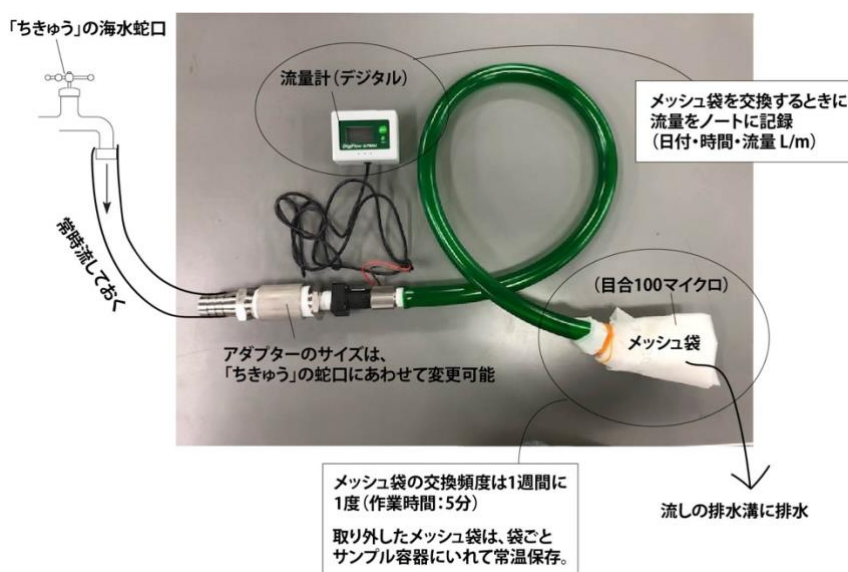


Fig. 1. Conceptual image of the microplastic sampler.



Fig. 2. The microplastic sampler installed to the outlet of the onboard seawater pump of D/V CHIKYU.

2-3. Sampling log

Day	Time	Flow speed (L/min)	Event log
10-Oct-18	10:00		Departure
	14:45		Flushing
11-Oct-18	6:15	9.16	The microplastic sampler was installed to the seawater pump outlet
13-Oct-18	Afternoon		Arrived at C0002
	18:30	9.52	Mesh-bag#1
20-Oct-18	19:05	9.52	Bag#1 was retrieved
	19:20	9.52	Mesh-bag#2
25-Oct-18	12:10		Pump stop
	17:45	7.01	Pump start
27-Oct-18	19:05	6.70	Bag#2 was retrieved

	19:10	6.81	Mesh-bag#3
02-Nov-18	0:50	6.70	Changed batteries
03-Nov-18	19:00	6.38	Bag#3 was retrieved
	19:11	6.66	Mesh-bag#4
10-Nov-18	19:00	7.18	Bag#4 was retrieved
	19:03	7.18	Mesh-bag#5
17-Nov-18	19:12	7.50	Bag#5 was retrieved
	19:15	7.50	Mesh-bag#6
24-Nov-18	19:00	8.21	Bag#6 was retrieved
	19:05	8.21	Mesh-bag#7
29-Nov-18	10:40		Changed batteries
01-Dec-18	19:00	8.75	Bag#7 was retrieved
	19:08	8.75	Mesh-bag#8
08-Dec-18	19:00	9.23	Bag#8 was retrieved
	19:05	9.23	Mesh-bag#9
15-Dec-18	19:00	9.75	Bag#9 was retrieved
	19:06	9.75	Mesh-bag#10
22-Dec-18	19:00	9.52	Bag#10 was retrieved
	19:03	9.60	Mesh-bag#11
24-Dec-18	21:25		Changed batteries
29-Dec-18	19:02	9.52	Bag#11 was retrieved
	19:08	9.52	Mesh-bag#12
05-Jan-19	19:00	9.60	Bag#12 was retrieved
	19:02		Pump stop
	20:50		Flushing
06-Jan-19	19:00		Pump start
	19:02	9.30	Mesh-bag#13
12-Jan-19	18:58	10.34	Bag#13 was retrieved
	19:05	10.43	Mesh-bag#14
18-Jan-19	17:30	10.90	Changed batteries
19-Jan-19	19:13	10.81	Bag#14 was retrieved
	19:18	10.91	Mesh-bag#15
26-Jan-19	19:00	11.53	Bag#15 was retrieved
	19:04	11.53	Mesh-bag#16
02-Feb-19	19:00	9.44	Bag#16 was retrieved

	19:04	9.44	Mesh-bag#17
09-Feb-19	19:00	9.91	Bag#17 was retrieved
	19:03	9.83	Mesh-bag#18
09-Feb-19	21:05		Changed batteries
16-Feb-19	19:00	11.21	Bag#18 was retrieved
	19:03	11.21	Mesh-bag#19
23-Feb-19	19:00	10.16	Bag#19 was retrieved
	19:05	10.25	Mesh-bag#20
02-Mar-19	19:00	10.71	Bag#20 was retrieved
	19:05	10.81	Mesh-bag#21
09-Mar-19	19:00	10.00	Bag#21 was retrieved
	19:04	10.00	Mesh-bag#22
16-Mar-19	20:40	11.53	Bag#22 was retrieved
	20:45	11.65	Mesh-bag#23
23-Mar-19	19:35	10.16	Bag#23 was retrieved
	19:39	10:16	Mesh-bag#24
29-Mar-19	19:00	10.08	Bag#24 was retrieved
	19:15	10.08	Flushing at Shimizu port
30-Mar-19	19:10		Flushing stop

3. Future plan

Microplastics in the sampling mesh-bags will be sorted out and analyzed with a FT-IR for identification of type, shape and abundance (items/m³). Data will be published in a scientific journal.

4. Acknowledgements

I thank an anonymous helper for collecting the microplastic samples during the IODP Exp. 358 and Dr. Kimoto for his help in installation and removal of the microplastic sampler.