

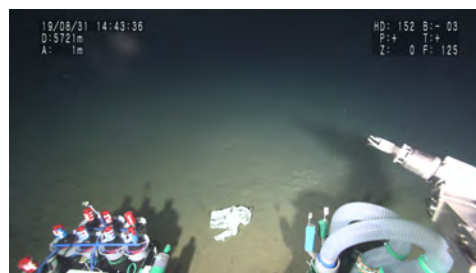


Cruise Report
R/V Yokosuka & Shinkai 6500
YK19-11

Understanding the actual condition of marine pollutants and their impact on
marine ecosystems

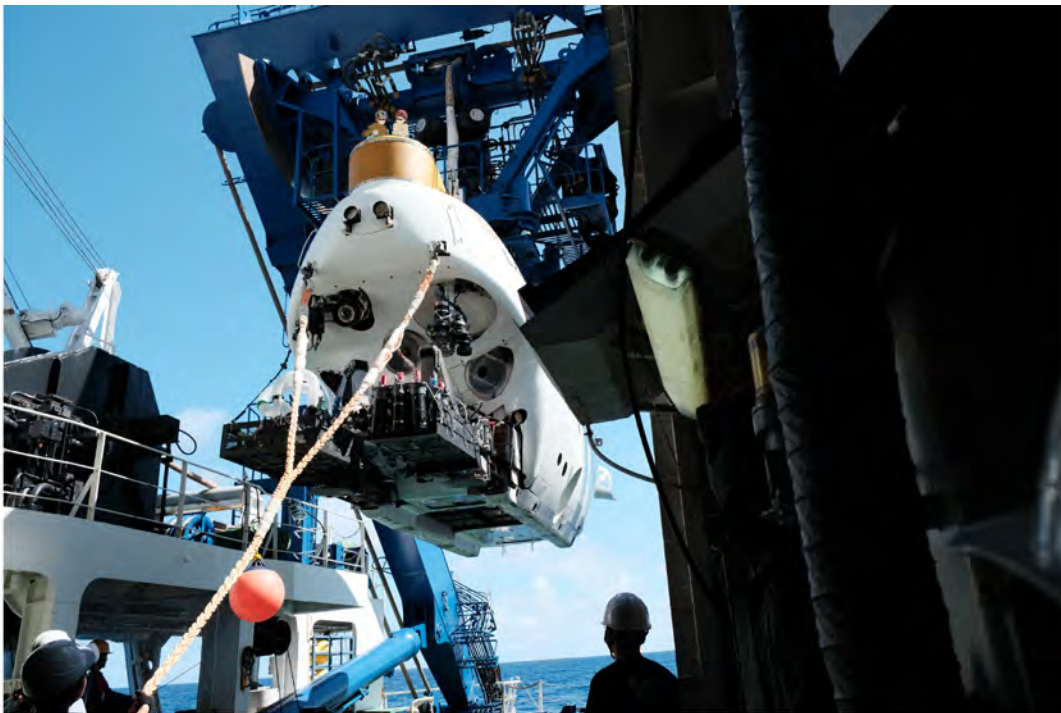
Sagami-Bay, Nankai Trough, east off Hachijo-jima Island
Aug. 28, 2019-Sep. 14, 2019

Japan Agency for Marine-Earth Science and Technology (JAMSTEC)



Acknowledgements

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ううん、、、航海探採の通知をもらった時、ドキドキしたんだ。きっと素敵なことが始まったんだって。

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Cruise information

Cruise ID: YK19-11

Vessel: YOKOSUKA

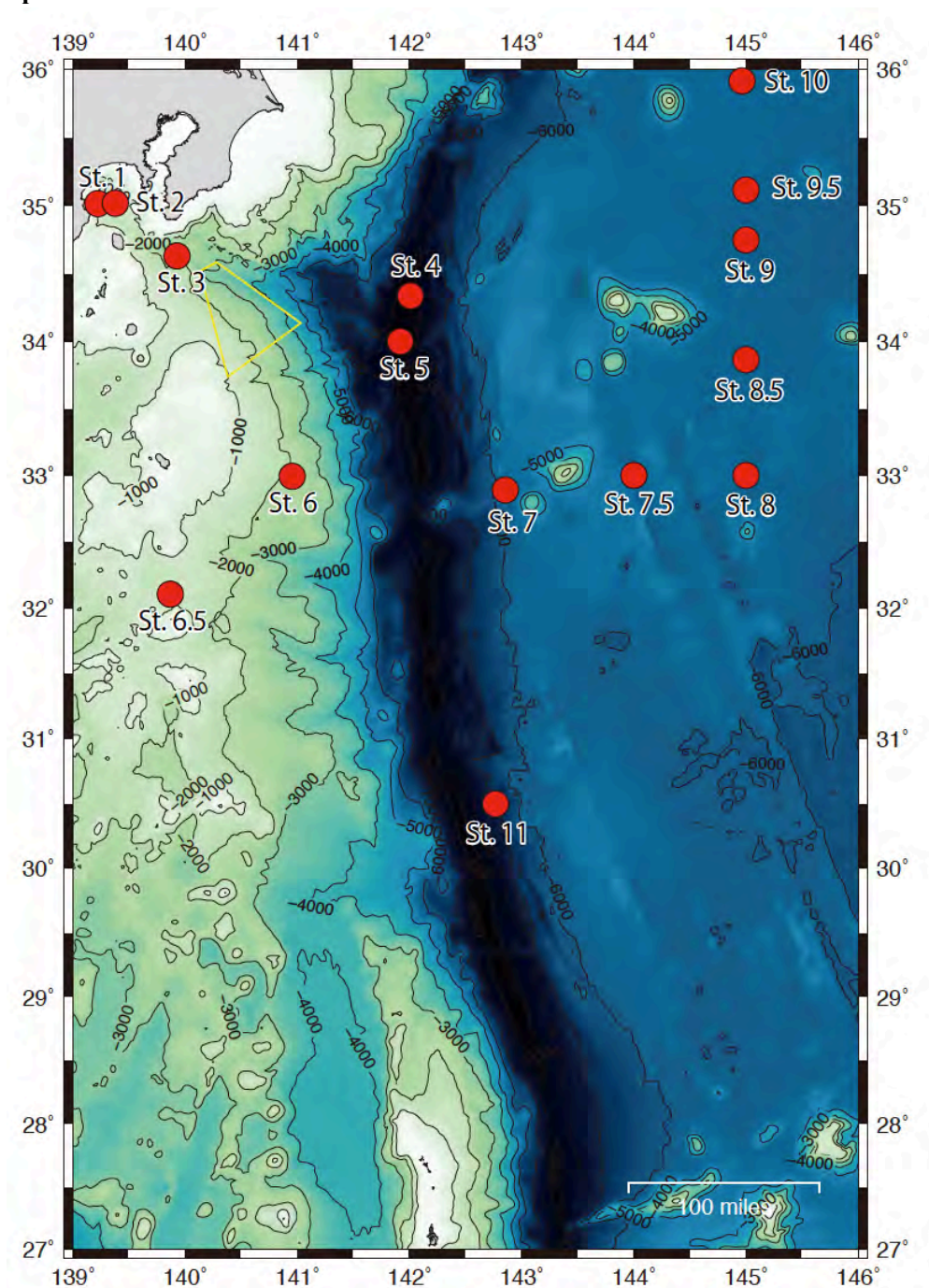
Title of the cruise: Understanding the actual condition of marine pollutants and their impact on marine ecosystems

Cruise period: August 28 – September 14, 2019/10/01

Ports of call: Futami (Ogasawara, Tokyo, Japan) – Yokosuka (Yokosuka, Kanagawa, Japan)

Research Area: Sagami-Bay, Nankai Trough, east off Hachijo-jima Island

Research map:



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Introduction and objectives of the cruise

Plastics that are very useful material have been utilized in human society in quite various ways. The commercial and industrial activities associated with 'plastics' are huge and our modern lives are greatly integrated with 'plastics'. However, such nice, useful and even cheap materials also cause serious environmental problems. Plastics have been unhesitatingly discarded by some or many people in some or many regions. Discarded plastics themselves cause many environmental and commercial problems, such as declines in ecosystem services and flooding disaster caused by the manholes closed by plastics. In addition to them, 'microplastics', which are caused by the results of chemical and physical degradation too, also cause serious environmental problems (e.g., accidental ingestion of microplastic and bioconcentration of toxic chemicals eluted from plastics).

The distribution, mass and ecological impacts of plastic debris (both macro and micro plastics) have not yet been well-investigated in the ocean. The abundance of plastic floating on the ocean surface represents less than 1% of the plastics that are surmised to have ended up in the ocean. The remaining 99% of plastics seem to have disappeared from the surface waters, which these are referred to as "the missing plastics". Some of the plastics is obviously transported into the deep ocean, since significant numbers of microplastic fragments and fibers have been found in multiple deep-sea sediment samples from various locations. However, we have not yet reached a consensus about how much plastic is accumulating ocean sediments, how these plastics were transported into the deep ocean, and their impact on marine organisms and ecosystems as whole.

The plastic debris are sunken to the bottom solely or together with some biological materials, such as 'house' of tunicates and wood tips, and then accumulated with and on the sediments at the bottom. It is also important to understand not only how and where the floating plastic debris end up in the ocean, but also whether sunken debris are degraded or not. Great Pacific garbage patch (GPGP) off the coast of California in the North Pacific Ocean, where plastic debris are gathered by the biggest gyre, is one of the model sites and the information about the marine pollutants has been increasing from studying focusing on GPGP. However, although other garbage patches are also considered to exist even around Japan, the study to identify their actual locations has not been tackled well. Western Pacific garbage patch (WPGP), far off Inu-bo-saki Japan, is one of those possible, but non-well-studied patches. Its existence was estimated based on the water-current model of Kuroshio extension recirculation gyre and it is also suggested that massive plastic waste from Asian countries (e.g., China and Indonesia) may gather there. The actual state of plastic pollution in marine environments around Japan including WPGP, should be understood properly and such a study should be tackled by JAMSTEC, one of the leading marine research institutes. Further, it is also important to propose some alternative materials that can be replaced with undegradable plastics causing marine pollution. The continuous development of the monitoring tools to understand the actual state of the deep-sea bottom is also essential subject for the studies regarding the marine pollutants.

Hence, we conducted the ship expedition with R/V Yokosuka accompanying HOV Shinkai 6500 for the following main research subjects: 1) identification of WPGP and understanding of its actual state of marine pollutants

(e.g., mass and variety of plastic debris there) at surface, 2) understanding of the distribution of sunken plastics (both macro and micro) at the deep-sea bottom and their effects on deep-sea animals (e.g., star fishes and bivalves), 3) understanding of the accumulating and degrading process of (micro)plastics together with other sunken materials such as cellulose found in ‘house’ of tunicates at the bottom and sedimentological information, 4) acquiring basic biological data (e.g., diversity of fungi and protists and survival strategies of rare deep-sea animals, such as *Calyplogena* and *Bathymodiolus* species) and scenery information at the bottom as the reference data, and 5) test and establishment for new monitoring tool to grasp the high-quality pictures from hadal zone on time. The expedition itself started from 28th August 2019 at Futami, Ogasawara, Tokyo and ended on 14th September 2019 at Yokosuka, Kanagawa (18 days in total) and the scientific party was composed of 14 persons.

Survey items

Shinkai 6500 (for Sts. 1, 2, 6.5, 8, 9 and 10)

*Each dive was conducted with the selective combination of the following research stuffs. The actual payload for each dive is introduced in the dive reports in appendix.

- Push corer
- Niskin water sampler
- Slurp gun
- Sample box
- 4K Camera
- Chamber of plastic degradation test
- METS Sensors

Free Fall Camera System (for Sts. 4 and 5)

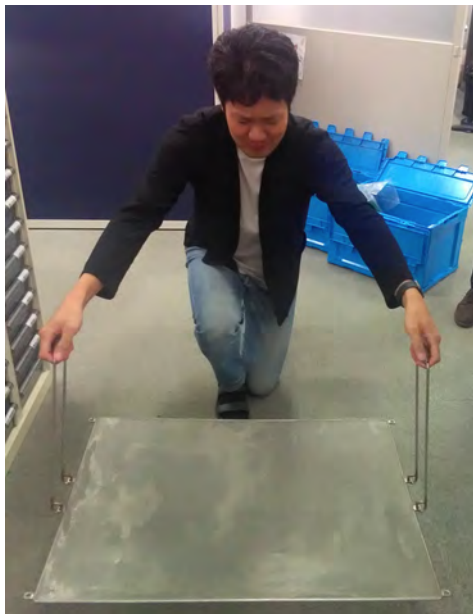
*Each dive was conducted with the combination of the following research stuffs. The actual payload for each dive is introduced in the dive reports in appendix.

- Aandera
- Camera system
- Hiroshima-type corer
- Multiple coreer
- Bait trap
- Niskin water sampler

Neuston net (for Sts. 2, 4, 7.5, 8.5, 9.5 and 11)



Micro-layer sampler (for Sts. 6.5, 7.5, 8, 10 and 11)



Pump (for Sts. 6.5, 7.5, 8, 10 and 11)



Summary and the cruise results

Identification of WPGP and understanding of its actual state of marine pollutants (e.g., mass and variety of plastic debris there) at surface.

Neuston net sampling and sub-surface water sampling.

In the cruise:

Floating microplastics were collected with a neuston net (mouth size: 1 m wide and 0.75 m height, mesh opening: 330 μm) for 20 min with a towing speed of 1-2 knots. The procedures were repeated three times at each site. Sea-surface microlayer (SML) samples were collected either from a small boat or the starboard of the ship. SML samples were taken with a metal mesh sampler that can collect roughly the upper 250 μm water layer. Triplicate samples (1 L) of SML were collected and filtered through a stainless-steel mesh screen with 32 μm mesh opening. The particles retained on the mesh screen was transferred to a glass jar by rinsing off with MilliQ water (Millipore) and fixed with 1% formalin. The glass jar was rinsed three times with MilliQ water prior to use. Sub-surface water at 0.5-1 m below the surface was collected with a pump for 10 min with a flow rate of ca. 68 liters per minute. The procedures were repeated three times. The pump intake was positioned at the upstream of the ship drainage so that the collected water is not contaminated with domestic wastewater. The pumped seawater was filtered through a stainless-steel mesh screen with 32 μm mesh opening. The particles retained on the mesh screen was transferred to a glass jar by rinsing off with MilliQ water (Millipore) and fixed with 1% formalin for further analysis. Generally, the floating microplastic abundance collected by neuston net was higher in the Kuroshio current and showed the highest abundance at the WPGP region or the Kuroshio extension re-circulation gyre (Stations 7.5 and 8.5).

Future plan:

The microplastics collected by the neuston net, surface microlayer, and pump will be counted and identified using a FT-IR analyzer. The volume of microplastics will be examined by image analysis and converted to weight using polymer specific density, which will be used to estimate the mass of microplastics (e.g. kg/km²) floating in the ocean.

Understanding of the distribution of plastic debris at the deep-sea bottom and their effects on deep-sea animals.

Distribution of plastic debris.

In the cruise:

Macroplastics or relatively larger plastic debris such as plastic bags and packages on the sea-floor (depths ca. 5700-5800m) were investigated using Shinkai 6500 (Dives #1553 to 1558). Plastic debris on the sea-floor were recorded during the dives by a down-facing 4K camera system and No.1 HDTV camera system equipped with Shinkai 6500 (NME-ME20FSH). We collected 5-6 debris items at each dive in the WPGP region including plastic bags, packages, clothes, fishing gears, cans and natural debris (i.e. woods). Relatively higher number of macroplastics were found

on the sea-floor in the WPGP region (Stations 8, 9 and 10) while no plastic debris were found at Myojin ridge (Station 6.5) except for the experimental debris generated in the previous dives (such as markers). Some of the debris found in the WPGP region were old, dating back to 1980s, which was indicated in the production number on the package.

Future plan:

The distribution and density of debris will be obtained by analyzing the video footages. The collected plastic debris will be weighted to estimate their mass (e.g. kg/km²). Pollutants associated with the collected debris including plastic additives will be analyzed at the University of Kumamoto (Nakata). Microbes associated with the debris will be examined at JAMSTEC (Nagano).

Effects of the marine pollutants on the deep-sea animals.

In the cruise:

Many deep-sea invertebrates and fishes were collected using a Shinkai 6500 suction sampler, manipulator or scoop sampler. Many amphipods were collected by a bait trap in the free-fall lander system. All samples were washed by filtered seawater, wrapped in aluminum-foil or put in aluminum tins, and then stored at -80°C.

Future studies:

Content of microplastics in the samples will be analyzed: quantities of persistent organic pollutants (POPs) will be analyzed. Mechanisms of uptaking microplastics into the animal bodies will be also investigated.

Understanding of the accumulating and degrading process of (micro)plastics together with other sunken materials such as cellulose found in ‘house’ of tunicates at the bottom and sedimentological information.

Microplastics in the sediments.

In the cruise:

Sediment samples were collected by using a push corer (H-type corer, covering 52.8 cm² seafloor surface area), which was operated by the manipulator of the manned submersible Shinkai 6500 at Sts. 1, 2, 8, 9, and 10. We used two types of the core, namely, polycarbonate-made and aluminum-made core tubes. Originally, core tube is made from polycarbonate, but aluminum-made tubes were used in this study for microplastic analysis to prevent plastic contamination. At Sts. 4 and 5, sediment samples were collected with Free Fall Camera System (FFCS).

Three sediment samples collected with aluminum-made core tube at Sts. 1, 2, 8, 9, and 10 and two sediment samples collected with polycarbonate-made core tubes at Sts. 4 and 5 were used for microplastic analysis. On board, sediment samples were sliced every 1 cm down to 10 cm or 20 cm below surface. Sediment samples will be treated according to the procedure described by Nakajima et al. (2019) and extracted microplastics will be counted under a fluorescence microscope. In addition, for one sediment sample collected with aluminum-made core tube at Sts. 1, 2, 8, 9, and 10, pollutants including plastic additives will be analyzed.

One sediment sample collected with polycarbonate-made core tube at Sts. 1, 2, 8, 9, and 10 were used for meiofaunal analysis. On board, sediment samples were sliced into 6 layers (0–0.5, 0.5–1, 1–2, 2–3, 3–4, 4–5 cm) and fixed with formalin.

Future plan:

Sediment samples will be treated according to the procedure described by Danovaro (2010) and meiofauna specimens will be counted and identified under a binocular stereoscopic microscope and a compound microscope equipped with differential interference optics.

Cellulose in the sediments.

In the cruise:

The deep-sea sediments were collected by using the push corer during the Shinkai 6500 dives (dive number: #1553, #1554, #1555, #1556, #1557, #1558). Each core sediments were divided into 8 fractions (0~1 cm, 1~2 cm, 2~3 cm, 4~5 cm, 5~6 cm, 6~11 cm, 11~16 cm, 16~21 cm).

Results & findings in this cruise:

The core samples were successfully divided and stored under the suitable conditions.

Future plan:

The collected deep-sea sediments will be subjected to a newly-developed cellulose extraction technique based on the cellulose dissolution.

Sedimentological study.

In the cruise:

We collected one push core sample (core number P2) for one dive. And then, we recovered totally three multi core samples for one free fall camera system (hereafter FFC) operation, and we collected one multi core sample (core number P1) for one operation. We described those sediment core samples as follows.

We collected totally five core samples using a H-type core sampler (core sample name; 6K#1553 P2, 6K#1554 P2, 6K#1555 P2, 6K#1557P3, 6K#1558 P2) and two core sample by the FFC (core sample name; FFC#006 P1, FFC#007P1) for sedimentological study. We observed all the core samples briefly by naked eyes from the outside of the core barrel and smear slides by a polarized microscope as below.

6K#1553 P2 was collected at the landing point in St. 8, where was the center region of the west Pacific garbage pool. The sampling site was located at 436.11 and 1136.96 in XY coordinate and at 33°0.2359'N and 145°0.7300'E. The water depth was 5719 m as shown in the event list of this dive (file name 1553event.TXT). The core sample was 26 cm long. The sediments were characterized by brownish-colored deep-sea clay, which was composed of clay particles, volcanic glass, radiolarians, sponge spicules, silicoflagellates as siliceous particles. Darker layers were observed at 4–5 cm and 24–26 cm in core depth.

6K#1554 P2 was collected at the landing point in St. 9, where was the inside region of the west Pacific garbage pool. The sampling site was located at 73.34 and -452.92 in XY coordinate, and at 34°45.2560'N and 144°59.7032'E. The water depth was 5813 m as shown in the event list of this dive (file name 1554event.TXT). The core sample was 23 cm long. The sediments were mostly same as 6K#1553 P2, but the color changed vertically dark brown at 0–3 cm, light brown at 3–9 cm, dark brown at 9–15 cm and light brown at 15–23 cm deep.

6K#1555 P2 was collected at the landing point in St. 10, where was a corner region of the west Pacific garbage pool. The sampling site was located at 473.07 and 585.99 in XY coordinate and at 35°55.7558'N and 144°58.3896'E. The water depth was 5707 m as shown in the event list of this dive (file name 1555event.TXT). The core sample was 25 cm long. The sediments were characterized by mostly same as 6K#1553 P2, but grayish olive clay was observed at 18–25 cm deep. A spherical brown hull of 1.2 cm in diameter was observed at 17.5 cm deep in P4 (Nagano core).

6K#1556 was dived at the Myojin Knoll and hydrothermal site of St. 6, but there were no flat muddy surface. We did not collect any core samples. The surface of the core sample was tilting, so that the length of the core sample was 19-21 cm long. The sediments were characterized by brownish clay at 0-5 cm and grayish olive clay at 5-25 cm deep. Sandy layer and black patches were seen at about 5 cm.

6K#1557 was collected at the landward slope of the Hatsushima Site of St. 1. The sampling site was located at 99.85 and -114.09, XY coordinate, and at 35°0.9540'N and 139°13.3250'E. The water depth was 855 m as shown in the event list of this dive (file name 1557event.TXT).

6K#1558 was collected at the Sagami trough floor of St. 2. The sampling site was located at -280.31 and -62.06 in XY coordinate, and at 35°1.1484'N and 139-22.6592'E. The water depth was 1387 m as shown in the event list of this dive (file name 1558event.TXT). The core sample was 28 cm long. The sediments were characterized by olive gray silty clay, but we could observe a very soft olive to brown silty clay layer at 0-6 cm, and a dark gray sand layer at 6-8 cm. This silty clay to sand layer in the upper horizon would be a very recent event deposit, which was deposited during and/or after the typhoon no. 15. The typhoon was coming to Kanto area on 8th Sep. and this dive was conducted on 11th Sep. This event deposit layer could be deposited within three days after the typhoon.

FFC#006 P1 was collected at the Bando Basin in the trench-trench-trench type Boso triple junction, St. 4. The sampling site was located at 34°20.4296'N and 142°00.6006'E. The water depth was 9218 m as described in the file of YK19-11_20190904_FFC.TXT. The core sample was 38 cm long. The sediments were characterized by grayish turbidite layers and olive gray hemipelagic sediment layers.

FFC#007P1 was collected at a bottleneck-like narrow strait between the Bando Basin and South Basin in the Boso triple junction, St. 5. The sampling site was located at 33°46.4374'N and 141°56.1556'E. The water depth was 9232.17m as described in the file of YK19-11_20190911_FFC.TXT. The core sample was 25 cm long. The sediments were characterized by turbidite layers, which are composed of a dark gray sand and a gray silt layers.

Future plan:

We collected totally ten core samples in surface sediment layers from the west Pacific regions related to

microplastic pollution. In general, there are bottom currents in different directions in these areas, but the main stream of the bottom current directions is thought to be south to north along Izu-Bonin, Japan and Kuril trenches. The microplastics (and also macroplastics) should be transported by this bottom current system. We are eager to disclose the bottom current system in the study area using sedimentary structures in the surface sediment samples. We will conduct smear slide descriptions, X-CT analysis, grain size measurements, ITRAX analysis, magnetic properties measurements to decipher the sediment source and transport processes using these data. Also Shinkai dive images and bathymetric data will be used for this study.

Degradation experiments.

In the cruise:

More than 200 types of novel bio-degradable materials (6K#1557-B1~3) and conventional plastics as references (6K#1557-N1~3) were stored in the sample chamber (Fig. 1a). The chambers were deposited on the deep-sea floor off Hatsushima, Sagami-bay (Fig. 1b) by Shinkai 6500 (dive number: #1557).

Future plan:

The sample specimen will be recovered 6 months, 1 year, and 2 years later. The recovered samples will be scrutinized to find out a clue for the deep-sea degradable materials. In addition, the microorganisms attaching on the plastics surface will be analyzed.



Fig. 1. (a) sample chamber and (b) deposited sample chamber on the deep-sea floor.

Acquiring basic biological data and scenery information at the bottom as the reference data.

eDNA analysis.

In the cruise:

Deep-sea water was collected at each Shinkai dive using Niskin water samplers. Ca. 1L of collected waters were subjected to measure the chemical parameters using Rinko-profiler and 20 L of each water sample was filtered through a sterivex (pore size, 45 nm) using a perista pump. The filtered sample (i.e., sterivex) was filled with RNA-later and then stored at -80°C after overnight incubation at 4°C.

Future plan:

The eDNA will be extracted from each sample and the subjected to the NGS amplicon analyses. Several taxa of fishes, fungi and protists will be the targets for the analyses. We are supposed to discuss the structures of animal, fungi and protists community and store the basic information to trace the changes of community structures.

Structural and material biology with deep-sea amphipods .

In the cruise

Hirondellea gigas was captured at St. 4 (depth: 9218 m) by the bait trap, which was attached to the Free Fall Camera System (FFCS). Liquid nitrogen is evacuated in a desiccator to obtain slush nitrogen, whose temperature being around -210°C , the melting point. The head of *H. gigas* (ca. 10 mm of length, three individuals) was picked by a tweezer and plunged into the slush nitrogen to rapidly freeze the exoskeleton including aluminum-containing gels. The amphipod was kept in a slush nitrogen for more than a minute to ensure complete freezing. The frozen amphipod is then transferred to a tube pre-cooled in a liquid nitrogen and stored in a fridge kept at -80°C .

Future plan:

The amphipods are to be trimmed under liquid nitrogen and imaged by a cryo-FIB-SEM equipped with EDS for the detailed morphological and mineralogical analyses of the surface gels.

Amphipod molecular biology and taxonomy.

In the cruise:

Amphipods were collected using baited traps attached to a Free Fall Camera System (FFCS) at two separate sampling sites (i.e., sts. 4 and 5). The FFCS was deployed to the sea floor and amphipods were recorded on video entering and exiting the bait traps. Upon recovery of the FFCS the amphipods captured in the bait traps were emptied into buckets containing ice cold water. Amphipods were then sorted into putative species and stored in either ethanol, formalin, RNAlater or frozen at -80°C for downstream analysis. Specimens from st. 4 were dominated by a small bodied species and several potential predatory amphipods were also recovered. In total between 200 and 500 specimens were collected. Specimens recovered from st. 5 were dominated by a large bodied species most likely to be *Hirondellea gigas*. In total between 200 and 250 specimens were collected and preserved.

Future plan:

Amphipods will be formally identified using appropriate taxonomic keys to accurately determine the population assemblages of the two sample sites. Morphological identification will also be confirmed by sequencing representative individuals at DNA barcoding loci and comparing these sequences against the NCBI Genbank database. Any novel species will be taxonomically described. Once species identification has been confirmed then the relative number of amphipods belonging to each species can be counted. These data will inform the population community structure of the two sample sites, and these can also be compared. Appropriate specimens can also be used for further molecular analyses.

Gut symbionts of sea cucumbers.

In the cruise:

A total of five sea cucumbers retrieved from Shinkai6500 operations were initially photographed for downstream species identification. The intestinal tract of each specimen was then dissected out. First, gut contents were excised from the intestines and frozen at -80°C . Second, the gut was split into foregut, midgut and hindgut sections and

dissected across the sagittal plane. One half of each section was placed in RNAlater and frozen at -80°C, while the other was fixed in formalin and stored in ethanol. A small piece of muscle tissue was also stored in RNAlater and frozen at -80°C.

Future plan:

Future analysis of these specimens will involve species identification, stomach contents analysis and DNA/RNA sequencing and in situ hybridisation of the gut wall tissue.

The symbiotic interaction between deep-sea bivalves and their symbiont.

In the cruise:

Bathymodiolus mussels were collected at approximately 900 m depth site in Off Hatsushima. *Calyptogena* clams were collected at approximately 850 m depth site in Off Hatsushima. After the dive, these bivalves were immediately dissected. For in situ hybridization, gills and other tissues were fixed with 4 % paraformaldehyde in PBS at 4 °C for approximately 16-24 hours followed by substitution with ethanol series. For microscopic analyses, tissues were fixed with 4 % paraformaldehyde in filtered sea water or 2.5% glutaraldehyde in sea water, and stored at 4°C. Tissues were also fixed with RNAlater, and stored at -80 °C for RNA analysis. For rearing experiment, *Bathymodiolus japonicus* were reared in tanks with seawater with or without rapamycin.

Future plan:

Expressions of genes and metabolites in bivalves will be analyzed. The gills, and mantles in *B. japonicus* for the 0th, 7th, 14th, and 28th days of rearing will be analyzed.

DNA barcoding of deep-sea animals.

For more reliable eDNA analyses, the referential data should be richer ideally. To contribute it, where possible sub-samples were taken from any animal specimens collected during Shinkai6500 dives, excised tissue was then preserved in RNAlater and frozen at -80°C for downstream analysis.

Future plan:

DNA will be extracted from each of the samples and sequenced at DNA barcoding loci. These sequences will be deposited onto the Genbank repository along with associated metadata for future use.

Mycology and protistology.

In the cruise:

Six sediment core samples were collected from several different locations and depths during 6K#1553-1558 dives. Each sediment core samples were cut into layers at different depths from the surface of the sea floor (0-1, 1-2, 2-3, 3-4, 4-5, 5-7.5, 7.5-10, 10-12.5, 12.5-15, ...cm). Each core sediment layers were stored at 4°C and -80°C. Three sunken woods and seventeen marine wastes at seafloor (mainly plastics) were also collected during 6K dives. Small portion of water samples collected in each 6K dive was subjected to the incubation for protist isolation.

During the cruise, fungal-like colonies were observed on one of the sunken woods retrieved during 6K#1555 dive. No protists could not be identified in the cruise.

Future plan:

Collected samples will be investigated for fungal diversity. Useful second metabolites produced by fungal isolates from the samples will be investigated as well. Microbial community related to the retrieved plastic wastes will be investigated, mainly focused on fungi. Fungi that can degrade plastics will be searched as well. Fungal-like colonies observed on the sunken wood will be investigated. The incubated samples for protists will be inoculated to new medium and observed carefully for the isolation and culture establishment of novel protists.

Test and establishment for new monitoring tool to grasp the high-quality pictures from hadal zone on time and collect the deep-sea sediments, water and animals.

Additional explanation on FFC11K (i.e., a new monitoring tool for hadal zone research):

FFC11K has been developed by MARITEC since FY2018 and is designed to be able to conduct operation in full ocean depth such as environmental monitoring and sampling for marine research on seafloor. A releasable anchor weight system is adopted to deploy with Free-fall and recover with Self-floating, which greatly decreases the cost for the recovery equipment like ropes and their handling system. Technical specifications of FFC11K are shown by table 1. One of key feature is to be mounted Video transmission system with acoustic communication. The system decodes pictures that captured video files from main HD camera of FFC11K to analogue signals and then transmits as acoustic signals by applying the amplified signal voltage to transmitter. It is designed to can receive the analogue signals of the pictures on YOKOSUKA at 2.5 sec interval. The designed maximum operating depth is 11,000m.

In the cruise:

FFC11K was used twice for observation conducted to obtain cores, water and biology samples on ultra-deep seafloor over 9000m depth at St.4 and St.5 in West Pacific Triple Junction. The operating performance, especially of Video transmission system with acoustic communication, in ultra-deep seawater was also confirmed as the observation was first operation in over 6,180m depth for FFC11K.

First deployment was conducted at St.4 from 4th September to 6th September 2019. According to positioning of deployed FFC11K with YOKOSUKA Acoustic Navigation System, the depth is 9,218m. Optional payloads included three undisturbed sediment core samplers (RIGO Corporation, JAPAN), one Hiroshima-type corer, a 12L Niskin water samplers, a dissolved oxygen (DO) sensor (Hadal Optode 5331, Xyrem), two bait-trap for biology samples and a HD camera for the bait-trap. These arrangements are shown by Fig. 2. FFC11K was recovered in 6th September and result in successful sampling the cores, water, amphipods and video files of the HD camera for bait-trap. However, FFC11K failed to obtain data of standard sensors and the main camera and transmit acoustic signals of pictures because of a software trouble of the control CPU. A motorized core sampler did not work and the core could not be obtained.

In 11th September, FFC11K has been deployed to seafloor at St.5 for about three hours. The deployment provided successful expected operation. Three undisturbed sediment core samples and so many amphipods (by two bait-traps) were successfully collected, although the motorized core sampler did not work again and the core could not be obtained. Analogue signals of video files from Video transmission system with acoustic communication have been decoded on YOKOSUKA at 2.5sec interval. We have been able to see videos from about 9200m depth seafloor after a delay of about nine seconds. A capture of the video files is shown by Fig.3.

Table.1 TECHNICAL SPECIFICATION

Size	1.6m×1.7m×2.2m(include Anchor weight)
Weight in air (Standard)	1.9 ton (with Anchor wight), 1.6 ton (without Anchor wight)
Weight in surface seawater (Standard)	160kg (with Anchor wight), -145kg (without Anchor wight)
Max. operating Depth	11,000m
POWER SUPPLY	Lithium ion battery pack 7kWh
Standard sensors and devices	Stand-alone Releaser (Teledyne Benthos R12K and 865A)
	SBE49 CTD sensor
	HD camera (Sony FCB-ES8230)
	200W LED light ×2
	Iridium beacon
	Flasher
Buoyancy module	Torelleborg TG-11500
Communication	Video Transmission System with Acoustic Communication
	Acoustic modem (~3000m)

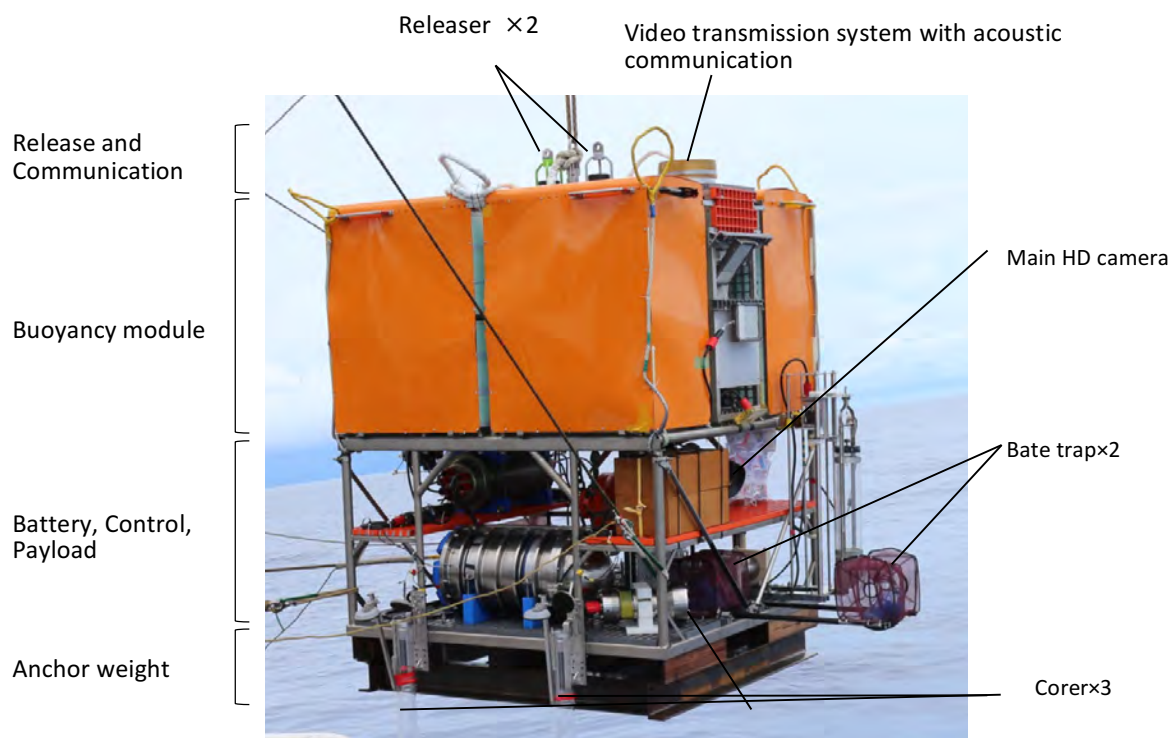


Fig. 2 Picture of FFC11K just before 4th Sep. deployment

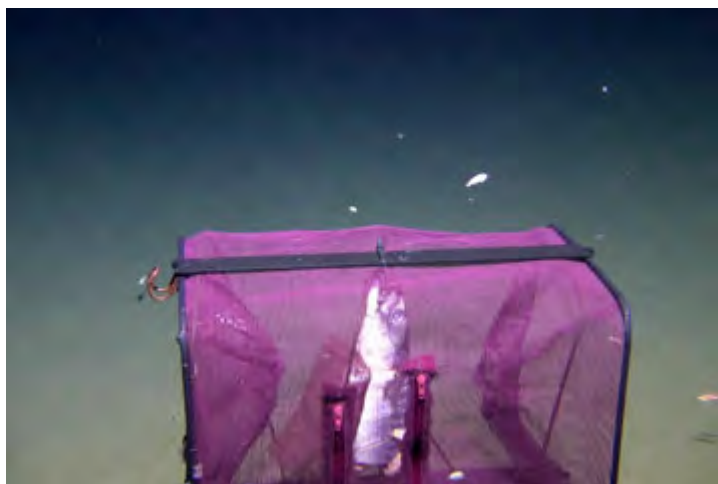


Fig. 3 A capture of video files on YOKOSUKA from Video transmission system with acoustic communication of FFC11k when was deployed at St.5.

Notice on using

Notice on using: Insert the following notice to users regarding the data and samples obtained.

This cruise report is a preliminary documentation as of the end of the cruise.

This report may not be corrected even if changes on contents (i.e. taxonomic classifications) may be found after its publication. This report may also be changed without notice. Data on this cruise report may be raw or unprocessed. If you are going to use or refer to the data written on this report, please ask the Chief Scientist for latest information.

Users of data or results on this cruise report are requested to submit their results to the Data Management Group of JAMSTEC.

Appendix: Cruise log (with the map)

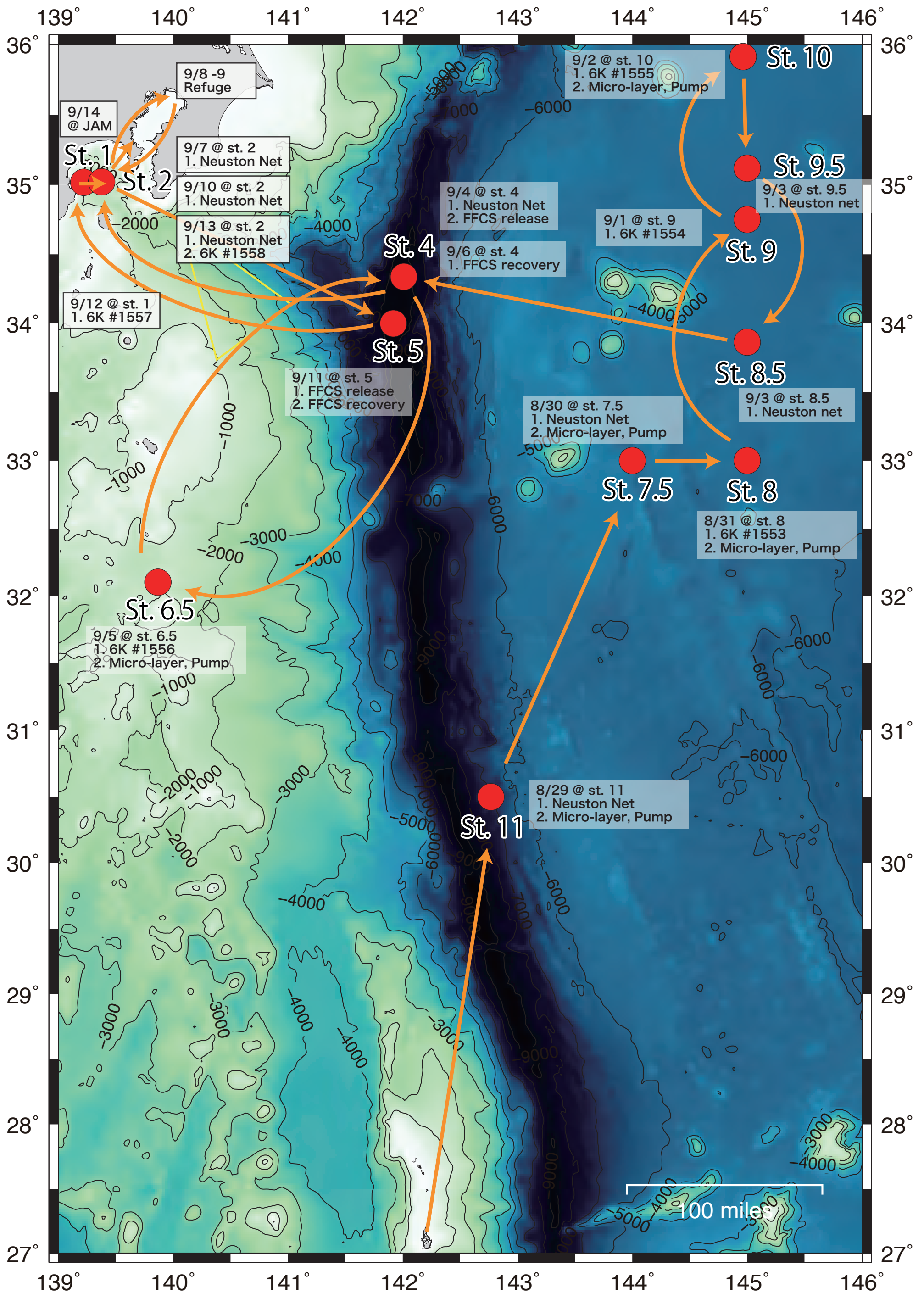
Date / Time	Descriptions	Weather, Wind and Sea condition
2019/08/28 Wed.	Noon Position: 27-26.0N, 142-05.0E (North Titishima Island)	bc / SE-4 / 3
9:00 - 9:15	All scientist aboard by tug boart	
9:45	Let go all shore lines and left FUTAMI for research area	
10:30 - 11:15	Carried out education and training for scientists	
13:00 - 14:00	Research meeting (Crew, Shinkai6500 operation team and scientist)	
14:15 - 16:15	Research meeting (Shinkai6500 operation team and scientist)	
18:00 - 18:15	Research meeting (scientist only)	
2019/08/29 Thu.	Noon Position: 30-30.0N, 142-46.0E (Off east of Aogashima Island)	bc / SW-4 / 3
7:00	Arrived at research area (St.11)	
8:33 - 8:53	Carried out towing Neuston net #01	
9:03 - 9:23	Carried out towing Neuston net #02	
9:32 - 9:53	Carried out towing Neuston net #03	
10:00 - 10:45	Carried out Micro-layer Sampling (5skims × 3times)	
11:50 - 11:25	Carried out Pump sea water sampling (10min. × 3times)	
13:00 - 13:35	Carried out Micro-layer Sampling (5skims × 3times)	
13:45	Commenced proceeding to research area (St.7.5)	
18:00 - 18:15	Research meeting	
2019/08/30 Fri.	Noon Position: 33-00.0N, 144-00.0E (Off east of Hachizyoushima Island)	bc / WSW-5 / 3
7:00	Arrived at research area (St.7.5)	
8:07 - 8:27	Carried out towing Neuston net #04	
8:34 - 8:54	Carried out towing Neuston net #05	
9:36 - 9:56	Carried out towing Neuston net #06	
10:02 - 10:20	Carried out towing Neuston net #07	
10:26 - 10:46	Carried out towing Neuston net #08	
11:08 - 11:44	Carried out Micro-layer Sampling (5skims+2skims × 3times)	
11:17 - 11:54	Carried out Pump sea water sampling (10min. × 3times)	
12:15	Commenced proceeding to research area (St.8)	
16:00	Arrived at research area (St.8) then released XBT at 32-56.9721N, 144-59.0036E	
16:31 - 17:35	Carried out MBES pre survey	
18:00 - 18:30	Research meeting	
18:15	Stopped engine and commenced drifting	
2019/08/31 Sat.	Noon Position: 33-00.0N, 145-01.0E (Off east of Hachizyoushima Island)	bc / West-4 / 3
9:14	Hoisted up SHINKAI6500	
9:22	Launched	
9:30	SHINKAI 6500 dove and started her operation #1553	
10:12 - 10:43	Carried out Pump sea water sampling (10min. × 3times)	
10:14 - 10:42	Carried out Micro-layer Sampling (5skims × 3times)	
12:10	Landed on the sea floor (D=5718m)	
14:59	Left the sea bottom (D=5721m)	
16:53	Refloated	
17:11	Hoisted up SHINKAI6500	
17:25	Recovered SHINKAI 6500	
18:00	Commenced proceeding to research area (St.9)	
19:00 - 19:30	Research meeting	

Date / Time	Descriptions	Weather, Wind and Sea condition
2019/09/01 Sun.	Noon Position: 34-45.0N, 145-00.0E (Off east of the Bousou Peninsula)	bc / SW-5 / 3
3:00	Arrived at research area (St.9)	
4:57	Released XBT at 34-42.2728N, 145-00.0073E	
5:39 - 6:20	Carried out MBES pre survey	
8:52	Hoisted up SHINKAI6500	
8:59	Launched	
9:07	SHINKAI 6500 dove and started her operation #1554	
9:09	Landed on the sea floor (D=5813m)	
11:55	Left the sea bottom (D=5813m)	
17:00	Refloated	
17:22	Hoisted up SHINKAI6500	
17:30	Recovered SHINKAI 6500	
18:00 - 18:15	Research meeting	
18:15	Commenced proceeding to research area (St.10)	
2019/09/02 Mon.	Noon Position: 35-56.0N, 144-58.0E (Off east of the Bousou Peninsula)	bc / ESE-1 / 1
1:30	Arrived at research area (St.10)	
4:57	Released XBT at 35-54.3881N, 144-58.8633E	
5:28 - 6:09	Carried out MBES pre survey	
8:53	Hoisted up SHINKAI6500	
9:00	Launched	
9:08	SHINKAI 6500 dove and started her operation #1555	
10:06 - 10:37	Carried out Pump sea water sampling (10min. × 3times)	
10:06 - 10:33	Carried out Micro-layer Sampling (5skims × 3times)	
11:39	Landed on the sea floor (D=5707m)	
15:01	Left the sea bottom (D=5704m)	
16:59	Refloated	
17:18	Hoisted up SHINKAI6500	
17:26	Recovered SHINKAI 6500	
18:00	Commenced proceeding to research area (St.9.5)	
18:30 - 18:45	Research meeting	
2019/09/03 Tue.	Noon Position: 34-30.0N, 144-58.0E (Off east of the Bousou Peninsula)	bc / WNW-3 / 3
7:08 - 7:28	Carried out towing Neuston net #09	
7:34 - 7:54	Carried out towing Neuston net #10	
7:59 - 8:19	Carried out towing Neuston net #11	
9:10	Commenced proceeding to research area (St.8.5)	
15:15	Arrived at research area (St.8.5)	
15:23 - 15:43	Carried out towing Neuston net #12	
15:50 - 16:10	Carried out towing Neuston net #13	
16:15 - 16:35	Carried out towing Neuston net #14	
16:45	Commenced proceeding to research area (St.4)	
18:00 - 18:15	Research meeting	

Date / Time	Descriptions	Weather, Wind and Sea condition
2019/09/04 Wed.	Noon Position: 34-20.0N, 142-01.0E (Triple junction)	bc / NW-2 / 1
	4:45 Arrived at research area (St.4)	
	6:32 Released XBT at 34-20.2915N, 142-02.8768E	
	6:55 - 7:25 Carried out MBES pre survey	
	8:43 - 8:51 Carried out checking the attitude of Free Fall Camera System	
	9:27 - 9:47 Carried out towing Neuston net #15	
	9:51 - 10:12 Carried out towing Neuston net #16	
	10:16 - 10:36 Carried out towing Neuston net #17	
	11:08 Launched Free Fall Camera System	
	15:05 - 15:10 Carried out fixing the position of Free Fall Camera System	
	15:20 Commenced proceeding to research area (St.6.5)	
	18:00 - 18:15 Research meeting	
2019/09/05 Thu.	Noon Position: 32-06.0N, 139-52.0E (Myozin sea hill)	bc / East-4 / 3
	5:45 Arrived at research area (St.6.5)	
	5:55 Released XBT at 32-06.1173N, 139-52.3122E	
	6:22 - 6:38 Carried out MBES pre survey	
	9:45 Hoisted up SHINKAI6500	
	9:54 Launched	
	10:02 SHINKAI 6500 dove and started her operation #1556	
	10:22 - 10:54 Carried out Pump sea water sampling (10min. × 3times)	
	10:53 Landed on the sea floor (D=1364m)	
	16:23 Left the sea bottom (D=1360m)	
	16:52 Refloated	
	17:11 Hoisted up SHINKAI6500	
	17:20 Recovered SHINKAI 6500	
	18:00 Commenced proceeding to research area (St.4)	
	18:15 - 18:30 Research meeting	
2019/09/06 Fri.	Noon Position: 34-20.0N, 142-00.0E (Triple junction)	bc / East-3 / 2
	7:00 Arrived at research area (St.4)	
	9:01 Launched down transducer to check Free Fall Camera System's signal	
	9:07 Recovered transducer	
	9:24 - 9:50 Carried out Micro-layer Sampling (5skims × 3times)	
	9:25 - 9:56 Carried out Pump sea water sampling (10min. × 3times)	
	12:02 Refloated Free Fall Camera System	
	12:36 Recovered Free Fall Camera System	
	13:20 Commenced proceeding to research area (St.2)	
	18:15 - 18:30 Research meeting	
2019/09/07 Sat.	Noon Position: 35-36.0N, 140-00.6E (Off Chiba port)	bc / WNW-2 / 1
	2:30 Arrived at research area (St.2)	
	6:00 - 6:20 Carried out towing Neuston net #18	
	6:25 - 6:45 Carried out towing Neuston net #19	
	6:50 - 7:10 Carried out towing Neuston net #20	
	7:20 Commenced proceeding to off Chiba port for anchoring	

Date / Time	Descriptions	Weather, Wind and Sea condition
2019/09/08 Sun.	Noon Position: 35-36.0N, 140-00.6E (Off Chiba port)	c / East-4 / 2
	Anchored for typhoon	
2019/09/09 Mon.	Noon Position: 35-36.0N, 140-00.6E (Off Chiba port)	c / SSW-4 / 3
	Anchored for typhoon	
2019/09/10 Tue.	Noon Position: 35-06.0N, 139-44.0E (East of Kensaki)	bc / SSW-2 / 1
	9:00 Hove up port anchor and commenced proceeding to research area (St.2)	
	13:50 Arrived at research area (St.2)	
	13:59 - 14:59 Carried out towing Neuston net #21	
	14:35 - 14:55 Carried out towing Neuston net #22	
	15:10 - 15:30 Carried out towing Neuston net #23	
	15:40 Commenced proceeding to research area (St.5)	
	18:00 - 18:15 Research meeting	
2019/09/11 Wed.	Noon Position: 33-46.0N, 141-56.0E (Triple junction)	bc / West-2 / 1
	3:30 Arrived at research area (St.5)	
	4:54 Released XBT at 33-46.7265N, 141-56.4553E	
	5:33 - 5:53 Carried out MBES pre survey	
	6:54 Launched Free Fall Camera System	
	9:59 - 10:06 Carried out fixing the position of Free Fall Camera System	
	11:52 Launched down transducer to check Free Fall Camera System's signal	
	11:58 Recovered transducer	
	12:46 Launched down transducer to check Free Fall Camera System's signal	
	13:05 Recovered transducer	
	15:43 Refloated Free Fall Camera System	
	16:14 Recovered Free Fall Camera System	
	16:30 Commenced proceeding to research area (St.1)	
	18:00 - 18:15 Research meeting	
2019/09/12 Thu.	Noon Position: 35-01.0N, 139-13.0E (Sagami Bay Off Hatushima Island)	c / East-3 / 2
	6:50 Arrived at research area (St.1)	
	6:54 Released XBT at 35-00.0789N, 139-13.5071E	
	7:23 - 7:39 Carried out MBES pre survey	
	9:45 Hoisted up SHINKAI6500	
	9:53 Launched	
	10:03 SHINKAI 6500 dove and started her operation #1557	
	10:45 Landed on the sea floor (D=926m)	
	16:41 Left the sea bottom (D=1034m)	
	17:06 Refloated	
	17:26 Hoisted up SHINKAI6500	
	17:34 Recovered SHINKAI 6500	
	18:00 Commenced proceeding to research area (St.2)	
	18:00 - 18:15 Research meeting	
	18:45 Arrived at research area (St.2)	
	18:46 - 19:06 Carried out MBES pre survey	

Date / Time	Descriptions	Weather, Wind and Sea condition
2019/09/12 Thu.	Noon Position: 35-01.0N, 139-13.0E (Sagami Bay Off Hatushima Island)	c / East-3 / 2
7:28 - 7:38	Carried out towing Neuston net #24	
7:42 - 7:52	Carried out towing Neuston net #25	
7:56 - 8:06	Carried out towing Neuston net #26	
8:58	Hoisted up SHINKAI6500	
9:02	Launched	
9:12	SHINKAI 6500 dove and started her operation #1558	
9:30	Landed on the sea floor (D=1400m)	
10:38	Left the sea bottom (D=1387m)	
14:56	Refloated	
15:24	Hoisted up SHINKAI6500	
15:50	Recovered SHINKAI 6500	
16:00	Commenced proceeding to Off YOKOSUKA port	
17:30 - 17:45	Research meeting	
19:10	Anchored YKOSUKA port 4 ward	
2019/09/14 Sat.		
9:15	Sent out 1st shore line, arrived at JAMSTEC, then completed voy. No. YK19-11	



Appendix: 6K dive reports (#1553 - 1558)

6K#1553 Dive Report

Date: 2019/8/31

Survey site: West Pacific Ocean, St. 8 (Center of the West Pacific Garbage Patch)

Landing Point: 33°0.2339'N, 145°0.7326'E, 5718 m

Leaving Point: 33°0.1111'N, 145°0.6642'E, 5721 m

Pilot: Keigo Suzuki

Co-pilot: Naoto Minamino

Observer: Tomo Kitahashi (JAMSTEC)

Objectives:

The objectives of this dive are to investigate the distribution of marine debris on the seafloor and microplastics in the sediment at deep sea of the West Pacific Garbage Patch, and the effects of (plastic) debris on deep-sea organisms and ecosystems.

Understanding of plastic pollutions at deep sea of the West Pacific Garbage Patch

Payload:

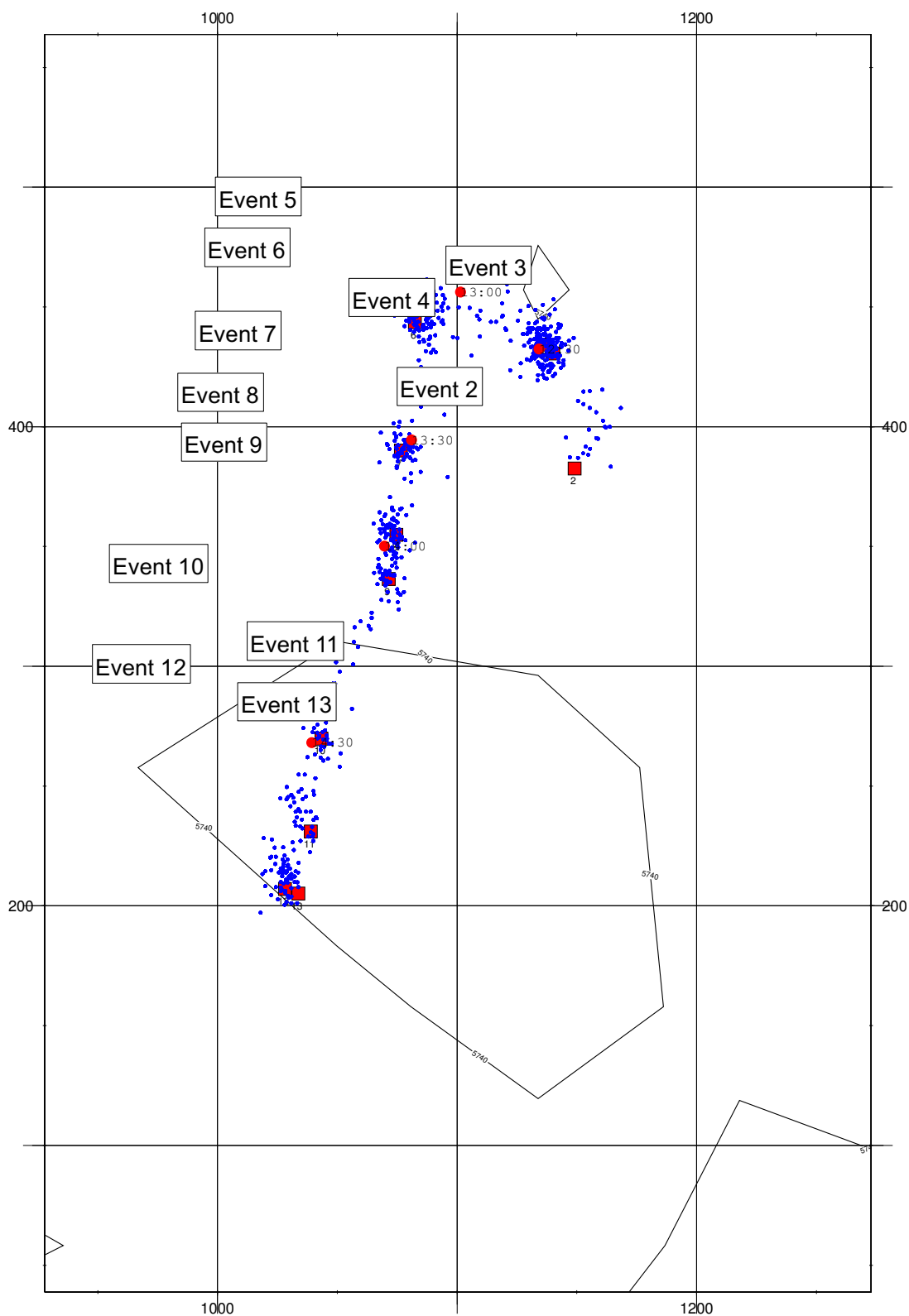
- 1) Niskin bottles (5L)×2
- 2) Niskin bottles (12L) ×2
- 3) Aluminum-made push corers (H-type) ×4
- 4) Polycarbonate-made push corers (H-type) ×4
- 5) Suction sampler with single canister
- 6) Suction sampler with 7 canisters
- 7) Sample box

Dive Log:

Dive 1553 route map is shown below. Before landing, deep seawater was sampled by Niskin bottles at a depth of 5,705 m (Event 2), and landed on the sea floor at a depth of 5,718 m (Event 3). The seafloor was covered with brown sediments. We collected eight sediment samples with Aluminium- and Polycarbonate-made push corers and cable tie with a manipulator (Event 4). After moving a while, we found Otohimenohanagasa (*Branchiocerianthus imperator* Allman, 1885) and collected by a suction sampler (Canister No.1, Event 5). After that, three sea cucumbers were collected by a suction sampler (Canister No.2, 3, and 4; Event 6 and 7). We found a piece of wood by the sea cucumber and put that into Sample box with a manipulator (Event 8). And then, we found plastic debris and retrieved with a manipulator (Event 9). We started investigating again, found a sea cucumber, and collected that with a suction sampler (Canister No.5; Event 10). And then, we found a cloth debris with fishing net and retrieved with manipulator into Sample box (Event 11). And then, plastic debris were collected with a suction sampler (single canister; Event 12) and left the seafloor at a depth of 5,721 m (Event 13).

#1553DIVE
North side of WPGP

(1 / 1500)



XY Origin Lat 33-00.00000N Lon 145-00.00000E
Center Lat 33-00.16300N Lon 145-00.70700E
Grid_File:1553_100.grd ContourInt:10m

(UR) Lat 33-00.30552N Lon 145-00.81834E
(LL) Lat 33-00.02148N Lon 145-00.59666E
(2019-08-31)

Datum WGS-84 Proj.LTM

Sample list:

Otohimenohanagasa (*Branchiocerianthus imperator* Allman, 1885) (Figure 2)

Four holothurians (Figures 3, 4, 5, and 8)

Piece of wood (Figure 6)

Two Plastic debris (Figures 7 and 10)

Cloth debris with fishing net (Figure 9)

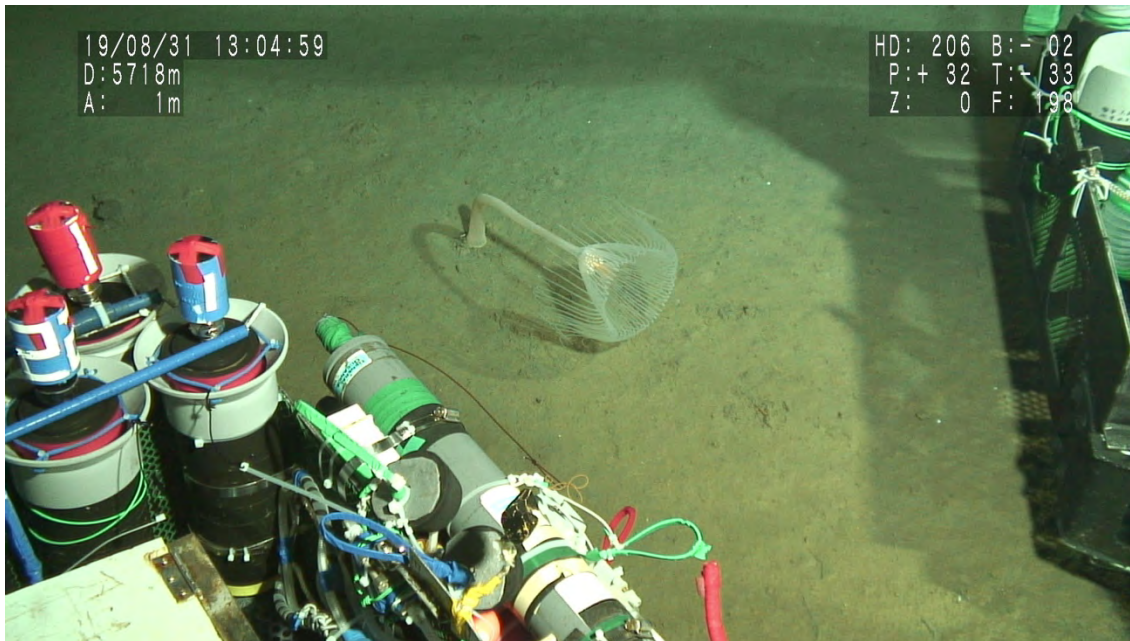


Fig. 2. *Branchiocerianthus imperator* (Allman, 1885) (Canister No.1)



Fig. 3. *Psychropotes longicauda* (Théel, 1882) (Canister No.2)

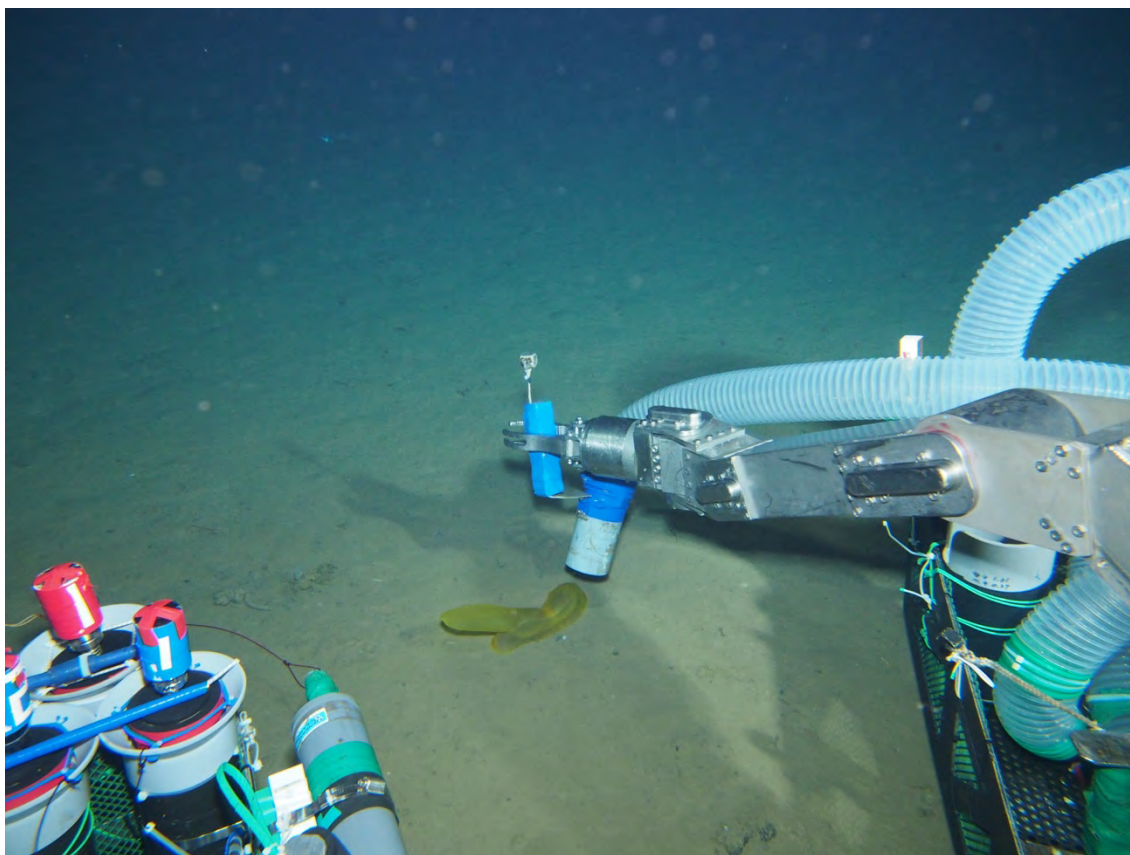


Fig. 4. *Psychropotes longicauda* (Théel, 1882) (Canister No.3)

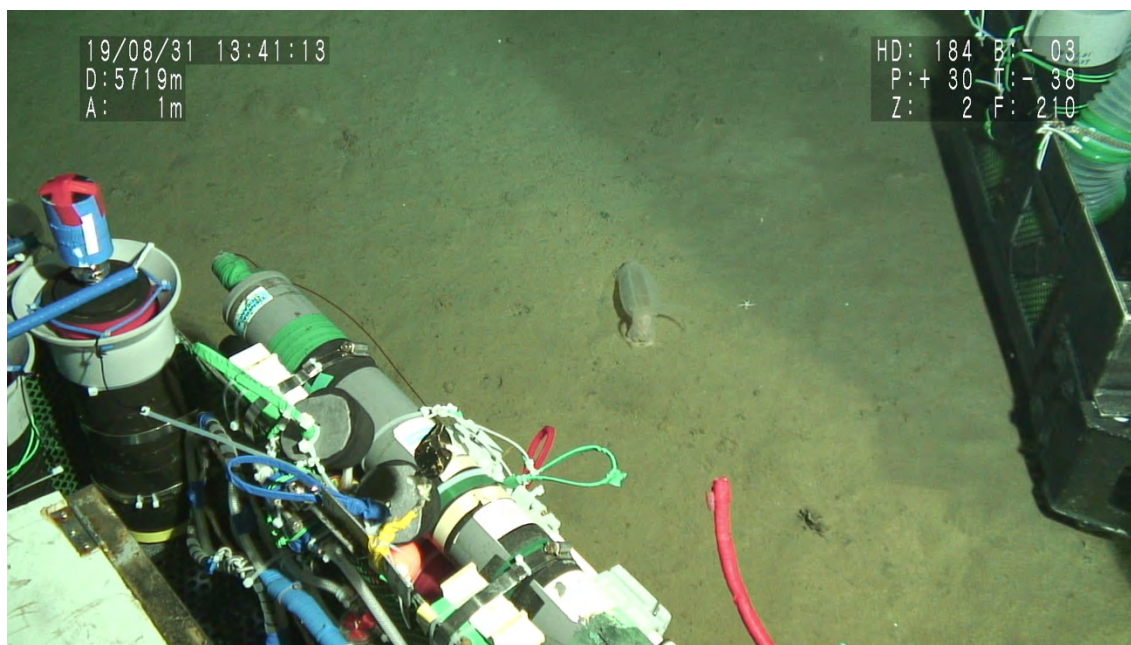


Fig. 5. Sea cucumber (white type, Canister No.4)



Fig. 6. Piece of wood (Sample Box)



Fig. 7. Plastic debris (Sample Box)

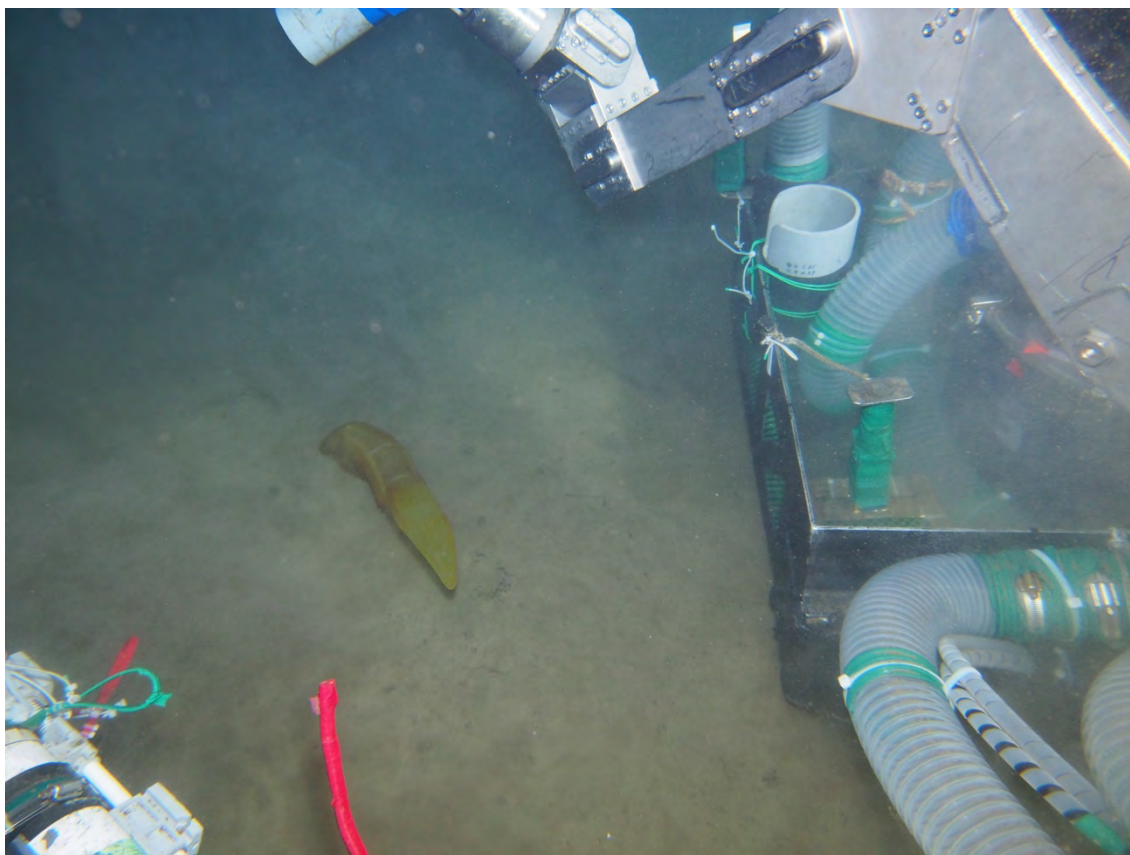


Fig. 8. *Psychropotes longicauda* (Théel, 1882) (Canister No.5)



Fig. 9. Cloth debris with fishing net (Sample Box)

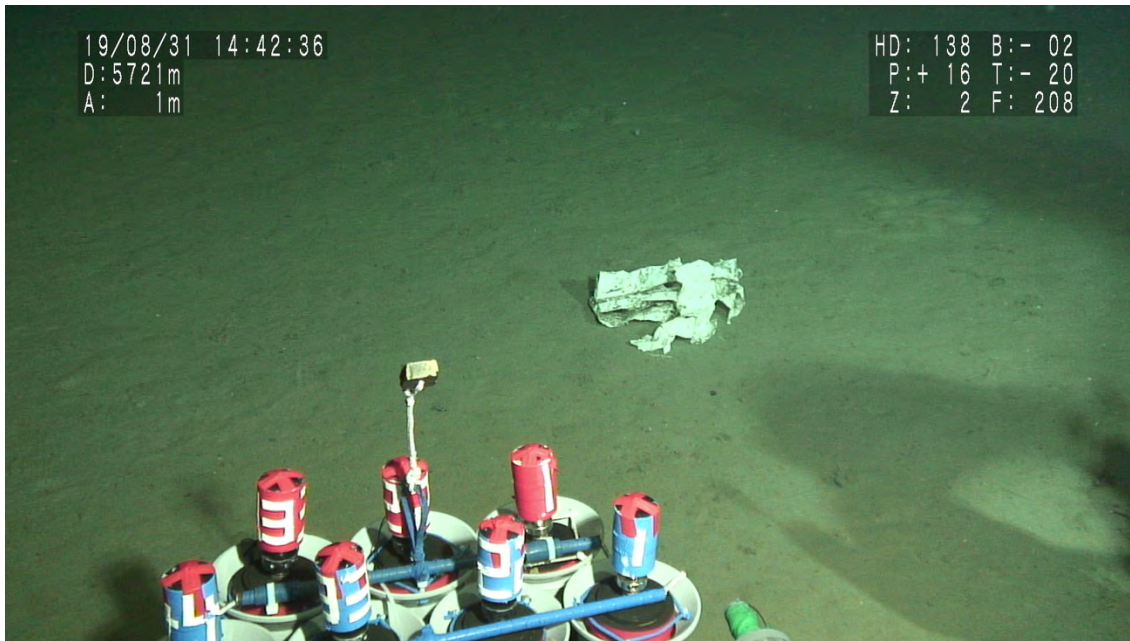


Fig. 10. Plastic debris (Single Canister)

6K#1554 Dive Report

Date: 2019/9/1

Survey site: West Pacific Ocean, St.9

Landing Point: 34°45.2635'N, 144°59.6974'E, D=5813m

Leaving Point: 34°45.9064'N, 144°59.5321'E, D=5816m

Pilot: Hirofumi Ueki

Co-pilot: Ryo Saigo

Observer: Yuriko Nagano (JAMSTEC)

Objectives:

The objectives of this dive are to investigate the distribution of plastic debris, including microplastics (MP) at the bottom of deep sea, and the effects of plastic on deep-sea organisms and ecosystems.

Dive summary:

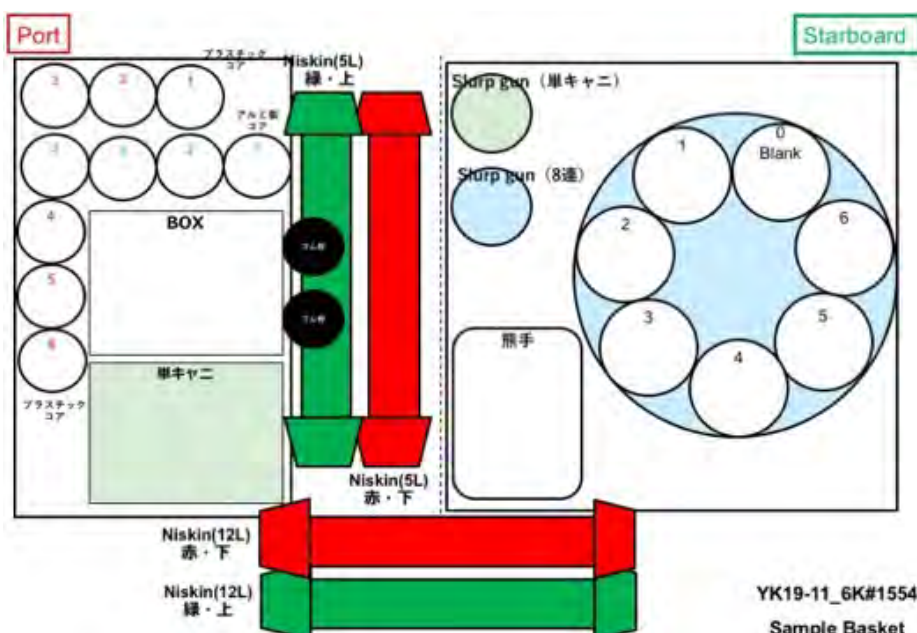
Before landing, deep seawater was sampled by Niskin sampler at a depth of 5803m. However, both (Green and red) of the 12L Niskin sampler's lids were already closed before sampling.

We landed on the sandy seafloor at a depth of 5813m. Then, 10 core samples were taken there by H-type corer. We also collected a waste (Can) from the seafloor by manipulator.

After moving a while, sea cucumber was collected. A waste (T-shirt) at seafloor was also collected. We kept searching for plastic waste on seafloor and collected 5 plastic waste (one was lost during operation) and 4 more sea cucumbers during the dive. We also retrieved two big pieces of wood from seafloor. However, these were lost during lifting 6K operation as the samples were too big to put in sample box and left in the sample basket. Then, we left the bottom as scheduled.

Payload:

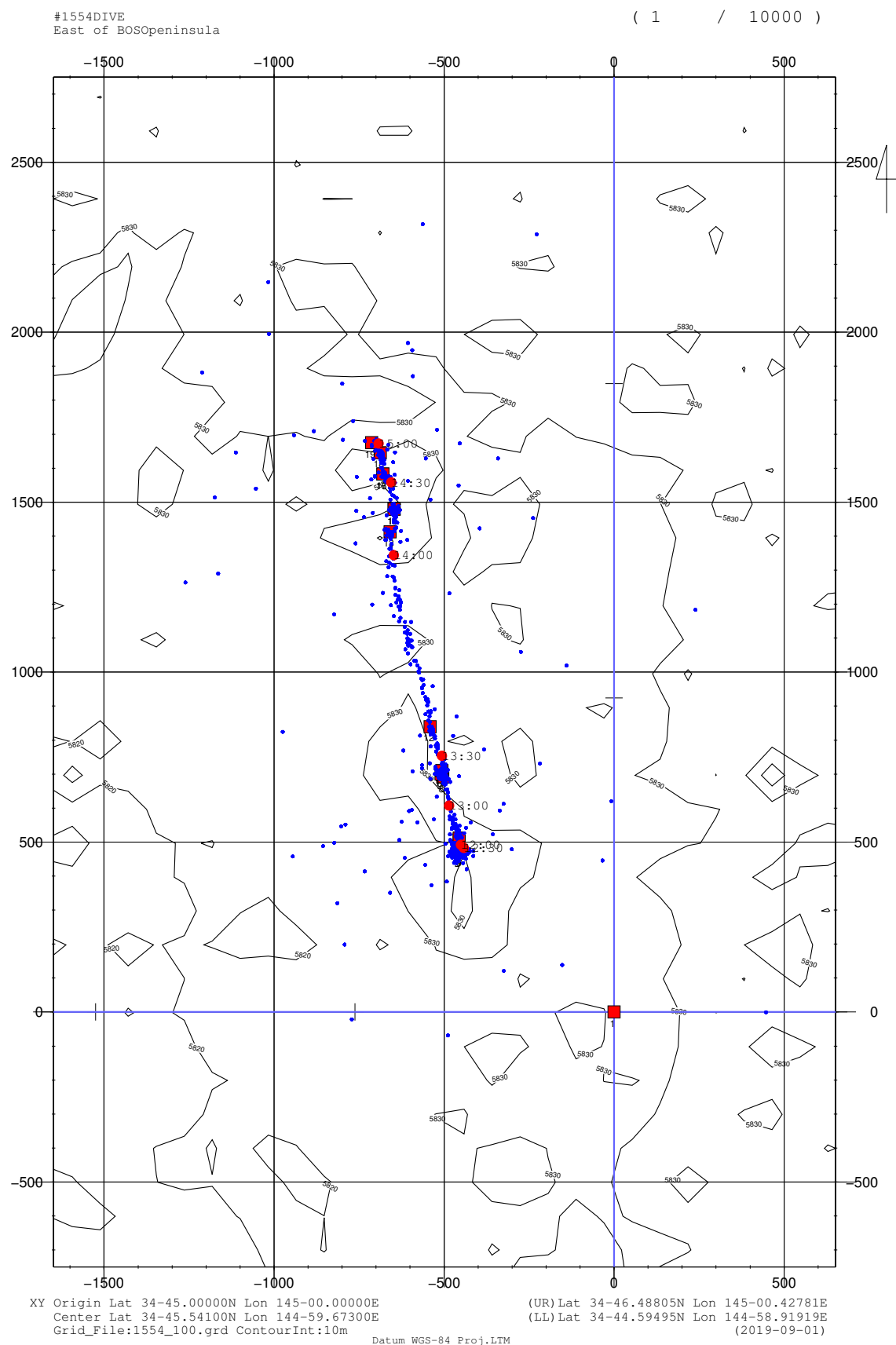
- 1) Niskin bottles(5L)×2
- 2) Niskin bottles (12L)×2
- 3) Push cores×10 (Plastic×6、Aluminum×4)
- 4) Sample box
- 5) Suction sampler with single canister
- 6) Suction sampler with 7 canisters

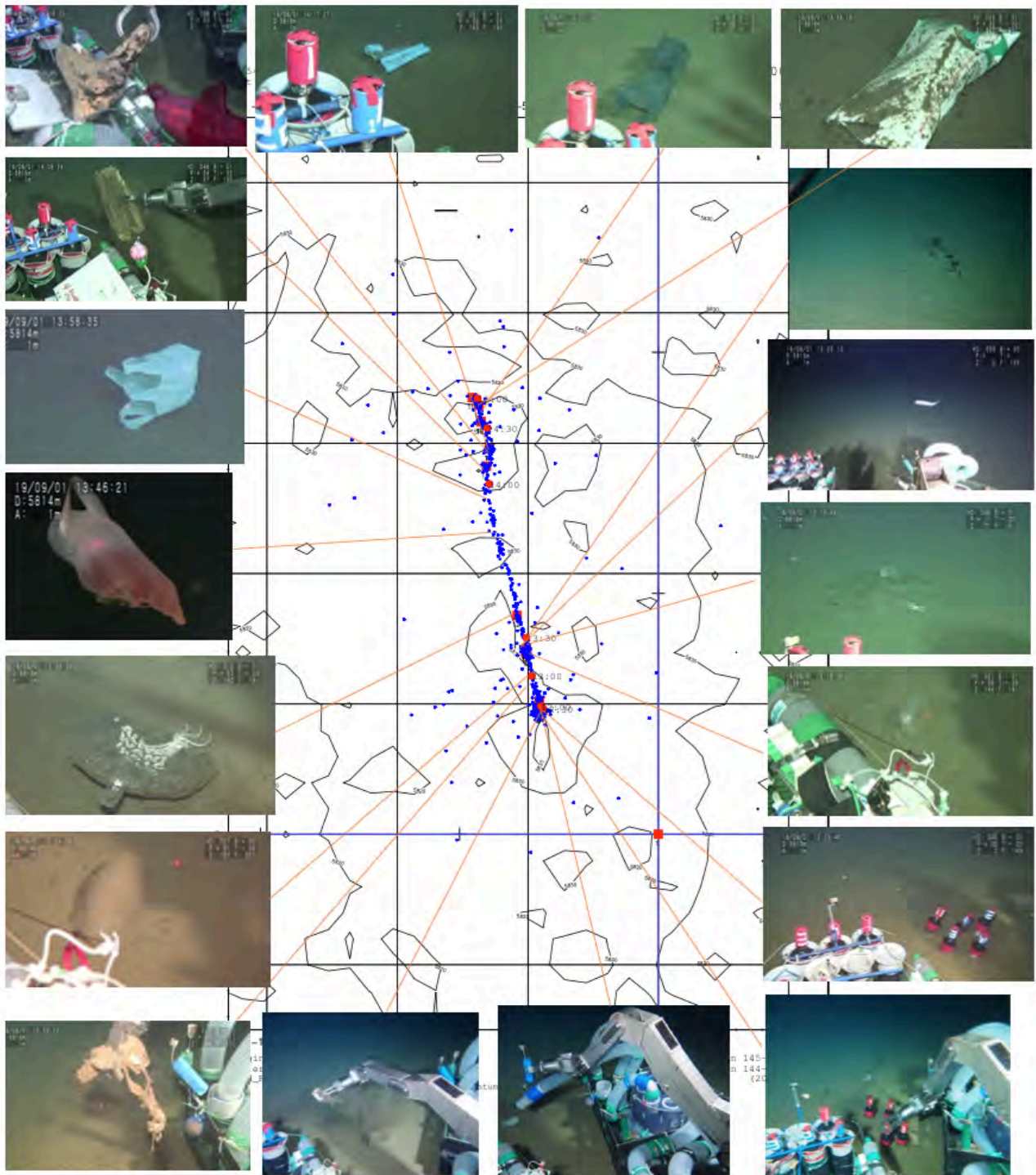


Sample list:

11:44	34°45.2557'N, 144°59.7007'E,	5803m	"Sampling Niskin(4)"
12:20	34°45.2560'N, 144°59.7032'E,	5813m	"Sampling Core (red1-5), Can"
12:35	34°45.2560'N, 144°59.7032'E,	5813m	"Sampling Core (blue1-4), (red6)"
12:47	34°45.2740'N, 144°59.7013'E,	5813m	"Sampling Animal (Sea cucumber)"
12:50	34°45.2777'N, 144°59.7013'E,	5813m	"Retrieve trash (T-shirt)"
13:08	34°45.3740'N, 144°59.6693'E,	5813m	"Sampling Sea cucumber"
13:13	34°45.3793'N, 144°59.6661'E,	5813m	"Sampling Sea cucumber"
13:18	34°45.3840'N, 144°59.6677'E,	5813m	"Sampling Sea cucumber"
13:24	34°45.3840'N, 144°59.6677'E,	5813m	"Retrieve plastic"
13:36	34°45.4543'N, 144°59.6449'E,	5814m	"Retrieve plastic"(Lost)
14:09	34°45.7642'N, 144°59.5681'E,	5815m	"Retrieve piece of wood"(Lost)
14:19	34°45.8002'N, 144°59.5757'E,	5815m	"Retrieve piece of wood"(Lost)
14:22	34°45.8002'N, 144°59.5757'E,	5815m	"Retrieve trash"
14:41	34°45.8561'N, 144°59.5538'E,	5816m	"Retrieve trash"
14:43	34°45.8561'N, 144°59.5538'E,	5816m	"Sampling Sea cucumber"
14:50	34°45.8908'N, 144°59.5488'E,	5816m	"Retrieve trash"

Track Line:





6K#1555 Dive Report

Date: 2019/9/2

Survey site: West Pacific Ocean, St.10

Landing Point: 35°55.7535'N, 144°58.3922'E, D=5707m

Leaving Point: 35°55.4046'N, 144°57.4662'E, D=5704m

Pilot: Takuma Ohnishi

Co-pilot: Satsuki Iijima

Observer: Ryota Nakajima (JAMSTEC)

Objectives:

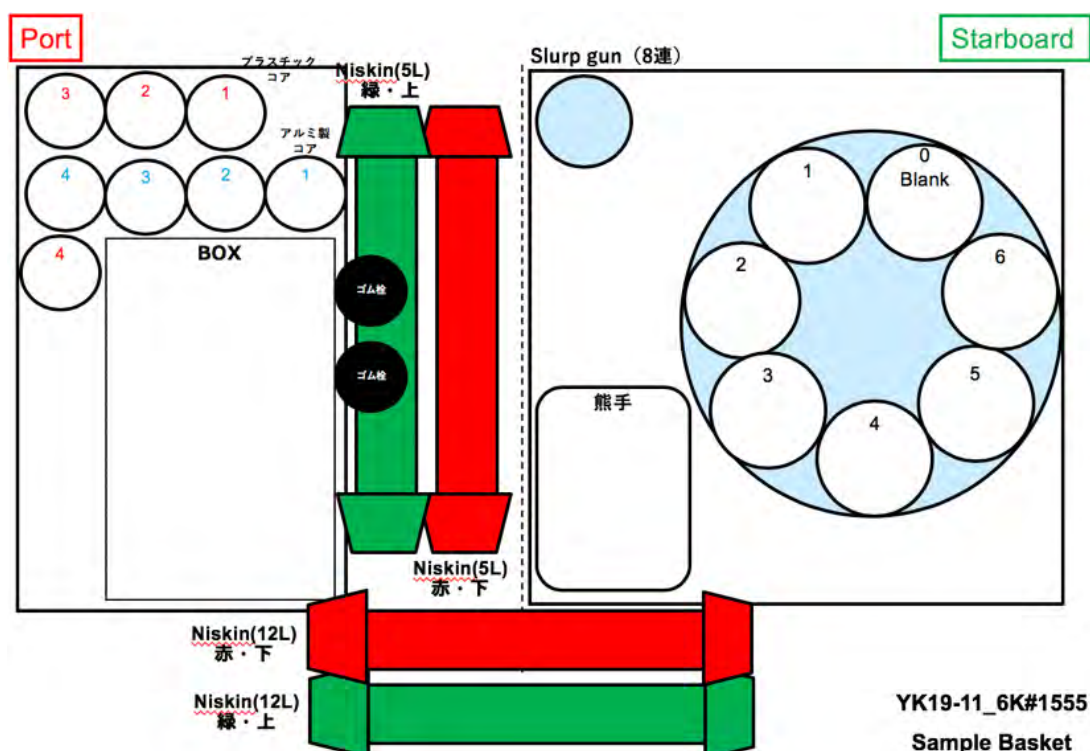
The objectives of this dive were to investigate the distribution and mass of plastic debris on the seafloor, including micro- and macroplastics and the effects of plastic pollution to the deep-sea organisms and ecosystems.

Dive summary:

Seawater samples were collected by four Niskin samplers before landing at a depth of 5,694m at 11:34 a.m.. We landed on the muddy sediment sea-bottom at a depth of 5,707m at 11:39 a.m. and collected 10 sediment core samples and 2 starfishes by the manipulator at 12:18 p.m.. We collected 5 sea cucumbers by manipulator at 12:42 p.m. In total 6 plastic debris including bags, packages, and a toothpaste tube were collected between 01:07 p.m. and 02:18 p.m. Sunken woods were collected at 01:44 p.m. and 02:22 p.m., of which latter was entangled by some brittle stars and associated with fungi. Sea bottom observation was carried out for ca. 40 min before leaving the bottom.

Payloads:

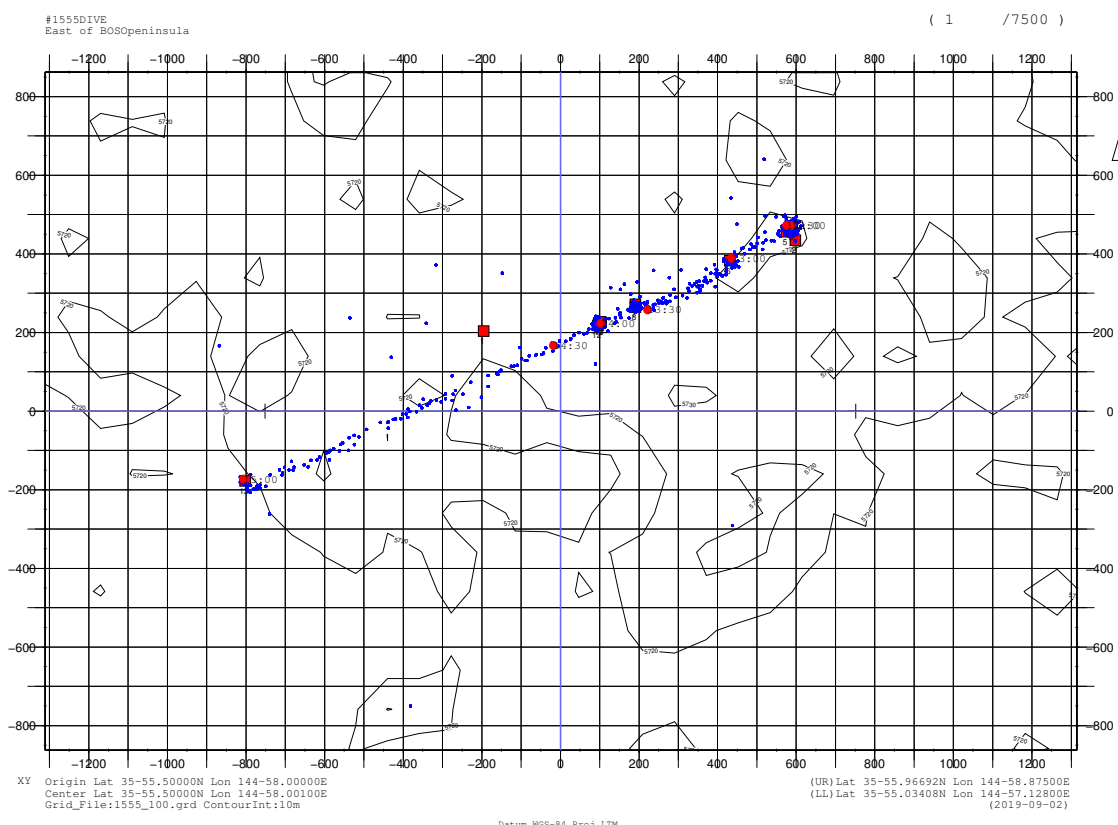
- 1) Niskin bottles(5L)×2
- 2) Niskin bottles (12L)×2
- 3) Push cores×8 (Plastic×4、Aluminum×4)
- 4) Sample box
- 5) Suction sampler with 7 canisters
- 6) rake



Sample list:

11:34	35°55.7357'N, 144°58.3977'E,	5694m	"Sampling Niskin (4)"
12:18	35°55.7558'N, 144°58.3896'E,	5707m	"Sampling Cores (8), Starfish (2)"
12:42	35°55.7471'N, 144°58.3828'E,	5707m	"Sampling sea cucumber (5)"
13:07	35°55.7075'N, 144°58.2869'E,	5707m	"Retrieve trash"
13:35	35°55.6471'N, 144°58.1268'E,	5707m	"Retrieve trash (plastic bag)"
13:44	35°55.6438'N, 144°58.1268'E,	5707m	"Sampling Branch (2)"
14:09	35°55.6222'N, 144°58.0692'E,	5707m	"Retrieve trash with a brittle star"
14:15	35°55.6233'N, 144°58.0675'E,	5707m	"Retrieve trash (plastic package and toothpaste tube)"
14:18	35°55.6233'N, 144°58.0675'E,	5707m	"Retrieve trash (plastic bag)"
14:22	35°55.6186'N, 144°58.0634'E,	5707m	"Sampling wood branch with brittle stars"

Track Line:





13:07 Retrieved trash



13:35 Retrieved trash (plastic bag)



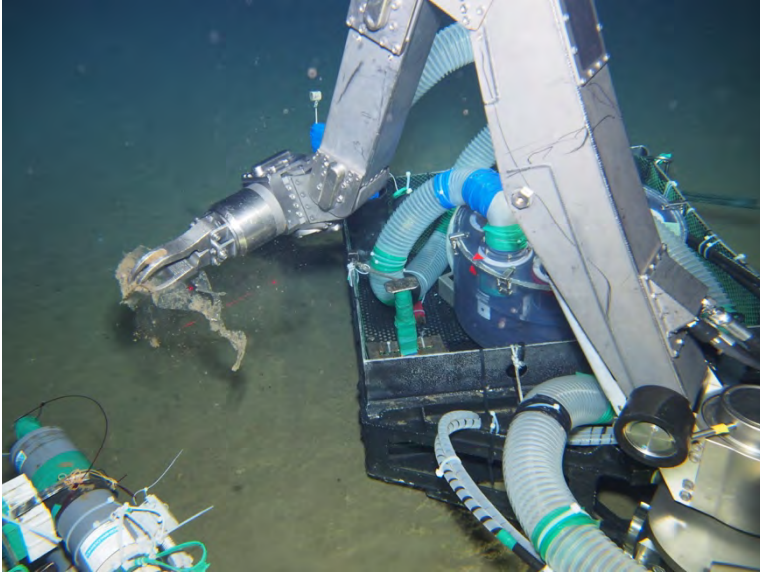
13:44 Sampled Branch. This was halved when collected.



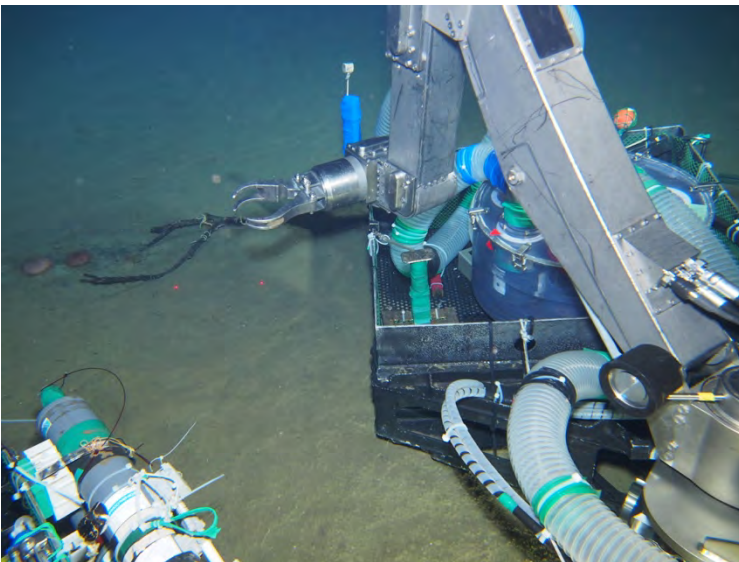
14:09 Retrieved trash with a brittle star



14:15 Retrieve trashes. Plastic package (upper) and toothpaste tube (lower).



14:18 Retrieved trash (plastic bag)



14:22 Collected wood branch with brittle stars

Dive log 6K #1555:

Time (UTC)	Time (Local)	Dep. (m)	Pos. Lat (dd-mm.mm N/S)	Pos. Lon (ddd-mm.mm E/W)	latitude	longitude	Head (deg)	Alt. (m)	Pos. X	Pos. Y	Description
2:34:16	11:34:16	5699	35 - 55.7352 N	144 - 58.3985 E							ニスキン採取、蓋がきちんと閉まっていることを確認
2:39:58	11:39:58	5710	35 - 55.7593 N	144 - 58.3905 E		144.9732	296	0	473	581	着底 【視程 10m , 温度 1.6, 流向・流速 80° 】, 着底した場所に白いセトデ、海底ゴミ確認
2:44:36	11:44:36	5710	35 - 55.7521 N	144 - 58.3997 E	35.9292	144.9733	302	0	469	586	白いセトデ発見
2:50:19	11:50:19	5710	35 - 55.7517 N	144 - 58.3917 E	35.9292	144.9732					ヒトデ2匹をボックスに回収
2:51:46	11:51:46	5711	35 - 55.7533 N	144 - 58.3831 E		144.9731	310	0	467	591	コア赤1を海底に挿入、堆積物の色は赤茶色～白に見える
2:53:54	11:53:54	5711	35 - 55.7552 N	144 - 58.3932 E	35.92925	144.9732	315	0	473	585	コア赤1を鞘に回収
2:54:50	11:54:50	5710	35 - 55.7524 N	144 - 58.3945 E	35.92921	144.9732	315	0	492	595	コア赤2を海底に挿入、堆積物の色は赤茶色～白に見える(下に行くにつれて白っぽくなっていく)
2:55:23	11:55:23	5710	35 - 55.7554 N	144 - 58.3892 E	35.92926	144.9732					コア赤2を鞘に回収
2:56:29	11:56:29	5711	35 - 55.746 N	144 - 58.3962 E	35.9291	144.9733					コア赤3を海底に挿入、堆積物の色は赤茶色～白に見える(下に行くにつれて白っぽくなっていく)
2:57:15	11:57:15	5710	35 - 55.754 N	144 - 58.3939 E	35.92923	144.9732					コア赤3を鞘に回収
2:58:30	11:58:30	5710	35 - 55.7524 N	144 - 58.3946 E	35.92921	144.9732					コア赤4を海底に挿入
2:59:13	11:59:13	5710	35 - 55.7517 N	144 - 58.3984 E	35.9292	144.9733					コア赤4を鞘に回収
3:03:33	12:03:33	5710	35 - 55.7617 N	144 - 58.3885 E	35.92936	144.9731					コア青1を海底に挿入
3:04:25	12:04:25	5711	35 - 55.7542 N	144 - 58.3986 E	35.92924	144.9733					魚発見
3:04:29	12:04:29	5711	35 - 55.7578 N	144 - 58.3858 E	35.9293	144.9731					コア青1を鞘に回収
3:07:04	12:07:04	5711	35 - 55.7528 N	144 - 58.3895 E	35.92921	144.9732					コア青2を海底に挿入
3:09:27	12:09:27	5710	35 - 55.7547 N	144 - 58.3931 E	35.92925	144.9732					コア青3をコア青2の手前の海底に挿入
3:12:38	12:12:38	5710	35 - 55.761 N	144 - 58.392 E	35.92935	144.9732					再び同種の魚発見
3:13:24	12:13:24	5710	35 - 55.7617 N	144 - 58.4041 E	35.92936	144.9734					コア青4をコア青3の左の海底に挿入
3:14:13	12:14:13	5710	35 - 55.7534 N	144 - 58.3885 E	35.92922	144.9731					コア青4を鞘に回収
3:16:03	12:16:03	5711	35 - 55.7516 N	144 - 58.3867 E	35.92919	144.9731					コア青3を鞘に回収
3:17:30	12:17:30	5710	35 - 55.7532 N	144 - 58.3954 E	35.92922	144.9733					コア青2を鞘に回収
3:19:18	12:19:18	5711	35 - 55.7552 N	144 - 58.3896 E	35.92925	144.9732			473	596	移動開始
3:21:05	12:21:05	5710	35 - 55.7534 N	144 - 58.3932 E	35.92922	144.9732					ウニ発見
3:21:59	12:21:59	5710	35 - 55.7575 N	144 - 58.3892 E	35.92929	144.9732					ナマコ発見
3:23:32	12:23:32	5710	35 - 55.7507 N	144 - 58.3876 E	35.92918	144.9731					ナマコ回収開始
3:25:26	12:25:26	5710	35 - 55.7696 N	144 - 58.3472 E	35.92949	144.9725			465	576	多連1番にナマコ回収
3:25:54	12:25:54	5710	35 - 55.7513 N	144 - 58.3838 E	35.92919	144.9731					ナマコ発見
3:27:57	12:27:57	5710	35 - 55.7559 N	144 - 58.3778 E	35.92927	144.973					ナマコ回収開始
3:28:44	12:28:44	5711	35 - 55.75 N	144 - 58.3853 E	35.92917	144.9731					多連2番にナマコ回収
3:30:07	12:30:07	5711	35 - 55.7522 N	144 - 58.3833 E	35.9292	144.9731					移動開始
3:30:31	12:30:31	5711	35 - 55.7502 N	144 - 58.3816 E	35.92917	144.973					ナマコ発見
3:31:29	12:31:29	5710	35 - 55.7455 N	144 - 58.3838 E	35.92909	144.9731					ナマコ回収開始
3:33:08	12:33:08	5711	35 - 55.7493 N	144 - 58.3838 E	35.92916	144.9731	120	0	458	573	多連3番にナマコ回収
3:37:37	12:37:37	5710	35 - 55.7509 N	144 - 58.3773 E	35.92918	144.973	75.5	0	460	579	多連4番にナマコ回収
3:41:07	12:41:07	5711	35 - 55.7554 N	144 - 58.3779 E	35.92926	144.973	54.4	1	459	578	多連5番にナマコ回収
3:43:51	12:43:51	5711	35 - 55.7449 N	144 - 58.3923 E	35.92908	144.9732	45	1	459	574	魚のような生き物が画面右側を横切る
	12:46:00										魚の死骸のようなもの、見つめる(時間は大体の値)
3:48:34	12:48:34	5711	35 - 55.7475 N	144 - 58.3845 E	35.92913	144.9731					細長い魚類が画面右側を横切る
3:53:24	12:53:24	5711	35 - 55.7475 N	144 - 58.347 E	35.92913	144.9725					クワガに似た生物横切る
3:54:27	12:54:27	5708	35 - 55.7268 N	144 - 58.3298 E	35.92878	144.9722					赤い透明の生き物？が横切る、カメラにドアップで映り込む
3:56:45	12:56:45	5711	35 - 55.7148 N	144 - 58.2948 E	35.92858	144.9716					白い細長い魚類が画面左下を通り過ぎる
4:00:42	13:00:42	5711	35 - 55.7066 N	144 - 58.2873 E	35.92844	144.9715	191	0	360	423	プラスチックゴミ発見
4:05:43	13:05:43	5711	35 - 55.7025 N	144 - 58.2975 E	35.92838	144.9716	195	1	383	425	左BOX1にプラスチックゴミ回収
4:09:23	13:09:23	5711	35 - 55.7068 N	144 - 58.2923 E	35.92845	144.9715					白いセトデ横切る
4:10:07	13:10:07	5711	35 - 55.707 N	144 - 58.2904 E	35.92845	144.9715					再び白いセトデ発見
4:11:06	13:11:06	5710	35 - 55.7078 N	144 - 58.2931 E	35.92846	144.9716					ナマコ横切る
4:20:41	13:20:41	5711	35 - 55.652 N	144 - 58.1705 E	35.92753	144.9695					魚類横切る
4:31:33	13:31:33	5711	35 - 55.6479 N	144 - 58.134 E	35.92747	144.9689	237	0	271	200	白いゴミ発見
4:34:57	13:34:57	5711	35 - 55.6502 N	144 - 58.1268 E	35.9275	144.9688	240	1	267	200	左BOX1にニールゴミ回収
4:36:30	13:36:30	5711	35 - 55.6436 N	144 - 58.1263 E	35.92739	144.9688	219	1	266	183	細長い木の枝を発見
4:44:17	13:44:17	5712	35 - 55.6452 N	144 - 58.1306 E	35.92742	144.9688	212	1	262	178	左BOX1に木の枝を、大きいので2つに割って回収
4:46:24	13:46:24	5711	35 - 55.6464 N	144 - 58.1244 E	35.92744	144.9687					白い紡錘型の物体が画面に映る
4:48:55	13:48:55	5710	35 - 55.6419 N	144 - 58.0973 E	35.92737	144.9683					地面に何か白いものが残った
4:50:50	13:50:50	5712	35 - 55.6241 N	144 - 58.095 E	35.92707	144.9683					生き物が徘徊したような痕跡が見受けられる
4:51:25	13:51:25	5711	35 - 55.6215 N	144 - 58.0754 E	35.92703	144.9679					ヒトデがいた
4:53:12	13:53:12	5711	35 - 55.6211 N	144 - 58.0728 E	35.92702	144.9679					
5:02:00	14:02:00	5711	35 - 55.6225 N	144 - 58.0682 E	35.92704	144.9678	279	0	221	98	何か筒のようなゴミ発見、ヒトデが上に乗っていた！
5:02:52	14:02:52	5712	35 - 55.6236 N	144 - 58.0646 E	35.92706	144.9677					
5:07:02	14:07:02	5711	35 - 55.6228 N	144 - 58.0702 E			279	0	237	100	左BOX1にクモヒトデ付きゴミを回収
5:09:14	14:09:14	5711	35 - 55.6238 N	144 - 58.0657 E	35.92706	144.9678	227	1	243	90	ゴミを2つ見つける。内1つは黄色いお菓子の袋のよう
5:12:03	14:12:03	5711	35 - 55.6185 N	144 - 58.0689 E	35.92698	144.9678					左BOX1に黄色い袋回収
5:14:24	14:14:24	5712	35 - 55.621 N	144 - 58.0677 E	35.92702	144.9678					左BOX1にもう一つのゴミも回収
5:17:26	14:17:26	5712	35 - 55.6256 N	144 - 58.0686 E	35.92709	144.9678	221	0	222	104	さらに隠れていたビニールゴミを左BOX1に回収
5:19:42	14:19:42	5711	35 - 55.6216 N	144 - 58.0702 E	35.92703	144.9678	232	0	224	105	クモヒトデ付き木の枝と白い黄色のインゲンチャク発見
	14:21:00										クモヒトデ付き木の枝を左BOX1に回収(長いボタン押しを、時間は大体の値)
5:27:01	14:27:01	5708	35 - 55.6089 N	144 - 58.0459 E	35.92682	144.9674					ヒトデがいた
5:29:37	14:29:37	5710	35 - 55.5956 N	144 - 57.9866 E	35.92659	144.9664					何かが海底に生えていた
5:32:01	14:32:01	5712	35 - 55.5706 N	144 - 57.9435 E	35.92618	144.9657					エビミミのような生き物が残った、体色は赤い
5:32:50	14:32:50	5711	35 - 55.5642 N	144 - 57.9278 E	35.92607	144.9655					ナマコ発見
	14:35:00										ヒトデいた？
5:36:31	14:36:31	5710	35 - 55.5203 N	144 - 57.8668 E	35.92534	144.9644					白いセトデ、続いてナマコがいた
5:41:05	14:41:05	5711	35 - 55.5175 N	144 - 57.7681 E	35.92529	144.9628	243	2	0.57	-365	アナウンズ:この周辺でもゴミがたくさん見られる
5:51:30	14:51:30	5708	35 - 55.4196 N	144 - 57.5481 E	35.92366	144.9591			-150	-690	アナウンズ:この周辺でビニールゴミの切れ端がたくさん見られる
5:59:00	14:59:00	5707	35 - 55.4016 N	144 - 57.4638 E	35.92336	144.9577	331	3	-187	-799	崖底準備開始
6:01:32	15:01:32	5705	35 - 55.4064 N	144 - 57.466 E	35.92344	144.9578		13	-173	-803	崖底

6K#1556 Dive Report

Date: 2019/9/5

Survey site: Myojin Knol

Landing Point: 32° 6.3442N, 139° 52.0829E, D=1360 m

Leaving Point: 32° 6.1902N, 139° 52.1130E, D=1176m

Pilot: Kazuhiro Chiba

Co-pilot: Akihisa Ishikawa

Observer: Tetsuro Ikuta (JAMSTEC)

Objectives:

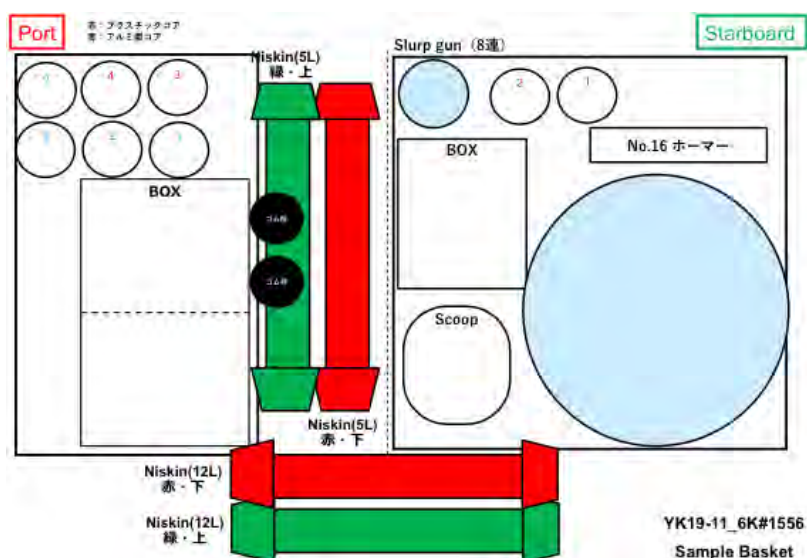
The objectives of this dive are to investigate the distribution of plastic debris, including microplastics (MP) at the bottom of deep sea, and to collect experimental animals for understanding physiological effects of plastic on deep-sea organisms and ecosystems.

Dive summary:

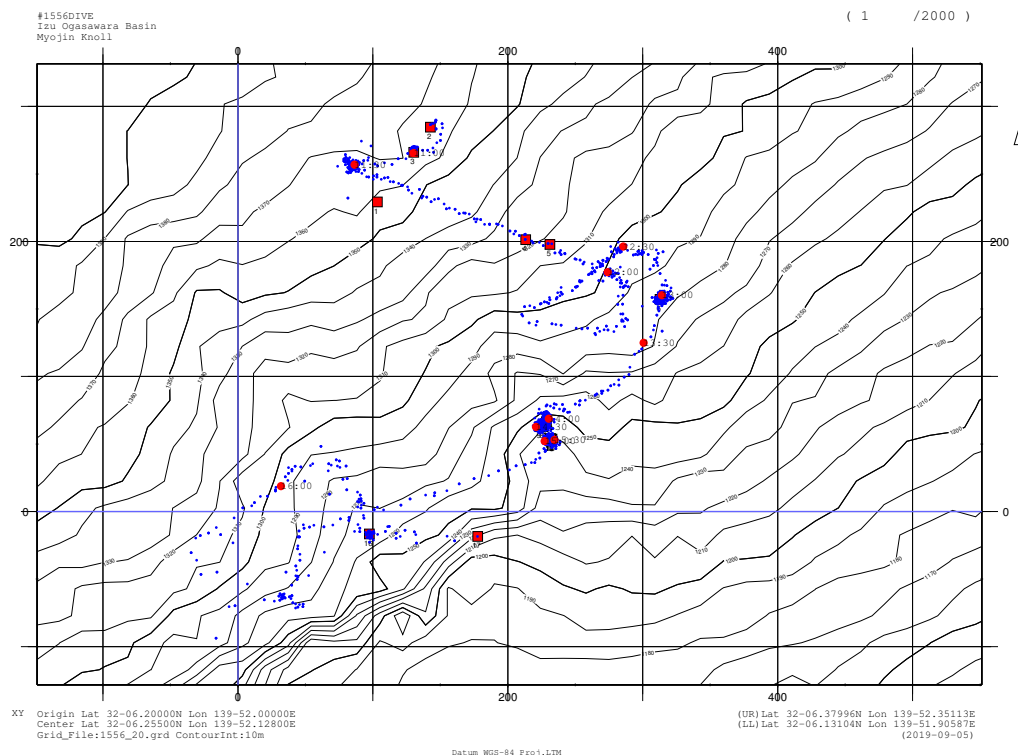
Before landing, deep seawater was sampled with four Niskin samplers at a depth of 1358 m. We landed on the rocky and sandy seafloor at a depth of 1360 m. We tried to take core sample, but sandy sediment fell out from the push core sampler. Therefore, we gave up to collect the core samples in this dive. We collected Bathymodiolus mussels, bythograeid crabs by suction sampler, and some asteroids by manipulator. Additionally, chemical condition on a colony of Bathymodiolus mussel was measured using the chemical sensors. During the dive, no plastic debris could be observed visually, except for the experimental plastic materials laid in the previous dives (such as markers). Then, we left the bottom as scheduled.

Payload:

- 1) Niskin bottles(5L)×2
- 2) Niskin bottles (12L)×2
- 3) Push cores×8 (plastic×4、aluminum×4)
- 4) Sample box×2
- 5) Suction sampler with 7 canisters (no canister was set to use a single canister)
- 6) Scoop sampler
- 7) ROV homer
- 8) Chemical sensor system



Track Line:



10:46, 32-6.3545N,139-52.0907E, 1358 m, "Sampling Niskin(4) Alt=10m"
 10:53, 32-6.3442N,139-52.0829E, 1360 m, "Landing"
 11:50, 32-6.3091N,139-52.1357E, 1311 m, "Finding mussels, simmering"
 11:51, 32-6.3078N,139-52.1471E, 1306 m, "Finding Grating"
 13:22, 32-6.2851N,139-52.1990E, 1274 m, "Measurement sensor, sampling mussels, bythograeid crab"
 13:59, 32-6.2364N,139-52.1455E,1237 m, "Sampling chimney, mussels"
 14:08, 32-6.2343N,139-52.1439E,1233 m, "Finding mussels"
 14:30, 32-6.2348N,139-52.1424E,1232 m, "Sampling mussels, bythograeid crabs"
 14:50, 32-6.2293N,139-52.1481E,1223 m, "Sampling starfish"
 14:53, 32-6.2290N,139-52.1474E,1222 m, "Finding flowerpot marker"
 15:00, 32-6.2290N,139-52.1474E,1222 m, "Set marker, measurement sensor"
 15:17, 32-6.2290N,139-52.1474E,1222 m, "Set ROV Homer"
 15:24, 32-6.2290N,139-52.1474E,1222 m, "Measurement DO"
 15:30, 32-6.2290N,139-52.1474E,1222 m, "Sampling starfish"
 16:15, 32-6.1918N,139-52.0620E,1247 m, "Sampling chimney, mussels, starfish"
 16:23, 32-6.1902N,139-52.1130E,1176 m, "Left Bottom Alt=43m"

6K#1557 Dive Report

Date: 2019/9/12

Survey site: Off Hatsushima, Sagami Bay, St.1

Landing Point: 35°0.9159'N, 139°13.3840'E, D=926m

Leaving Point: 35°0.7851'N, 139°13.4104'E, D=1034m

Pilot: Keita Matsumoto

Co-pilot: Ryo Saigo

Observer: Takao Yoshida (JAMSTEC)

Objectives:

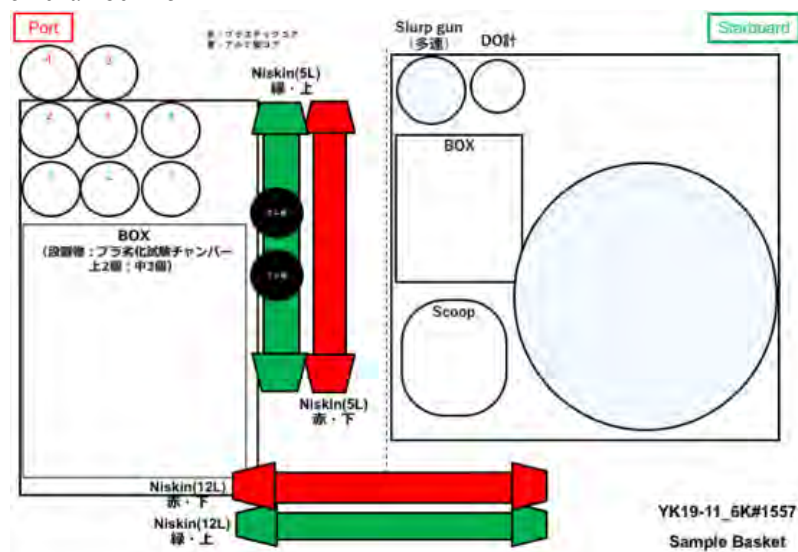
Objectives of this dive are investigation of the distribution of plastic debris, including microplastics (MP) at the bottom of deep sea, and the effects of plastic on deep-sea organisms and ecosystems.

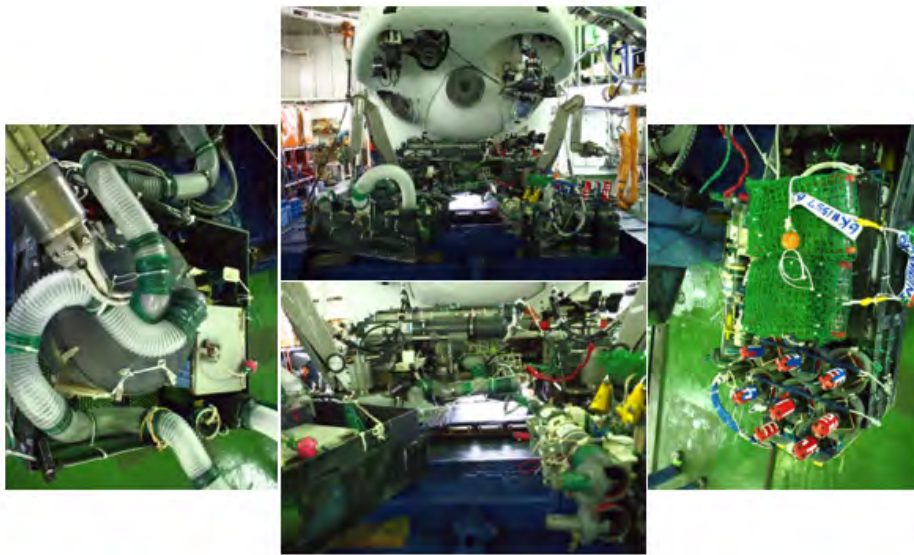
Dive summary:

Before landing, deep seawater was corrected by Niskin sampler at a depth of 927m. We landed on the seafloor at a depth of 926m. We moved to the *Calymene* clam colony at 853m. We landed on the *Calymene* clam colony. Eight core samples were collected by push corers (plastic and aluminum corers). After core sampling, six plastic degradation chambers were deployed at outside of *Calymene* clam colony. Then, environmental conditions in *Calymene* clam colony were measured by multiple sensors including temperature, DO, H₂, H₂S, and methane. After that, *Calymene* clams were collected. We moved to the *Bathymodiolus* mussels colony at 900m. We also measured the environmental conditions in mussels colony. *Bathymodiolus* mussels were collected by suction and scup samplers. We were searching for the plastic debris at a depth of 1000m, but no debris were found during this dive. We also collected the sea cucumber and starfish. Then, we left the bottom as scheduled.

Payload:

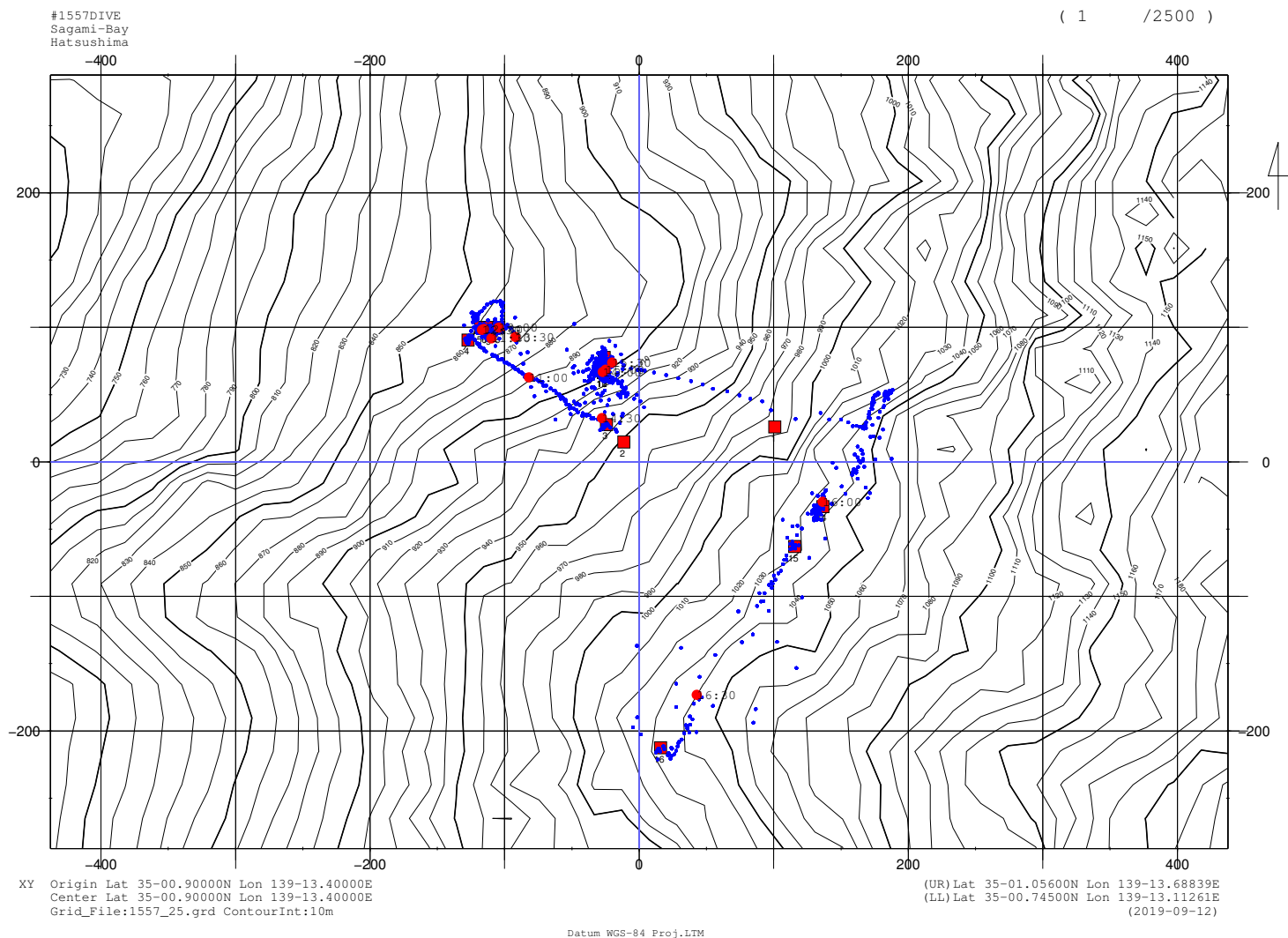
- 1) Niskin bottles(5L) X2
- 2) Niskin bottles (12L) X2
- 3) Push cores X8 (Plastic X4, Aluminum X4)
- 4) Sample box X2
- 5) Scup sampler
- 6) Suction sampler with single canister
- 7) Multi sensor system (temperature, H₂S, H₂, and methane)
- 8) DO sensor
- 9) Plastic degradation chamber X5





Sample list:

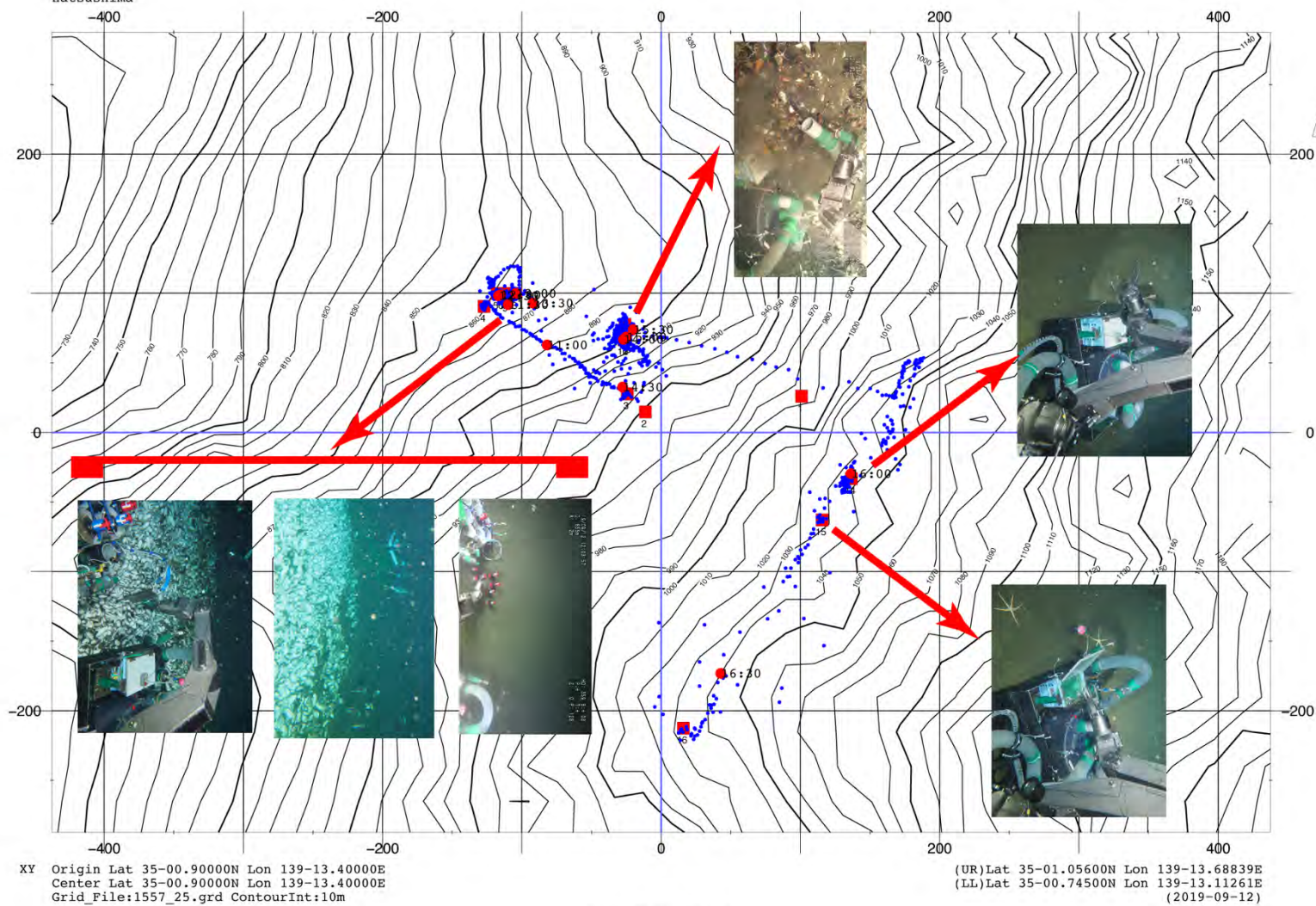
10:43	35°0.9085'N, 139°13.3924'E,	927m	"Sampling Niskin(4)"
10:45	35°0.9159'N, 139°13.3840'E,	926m	"Landing"
12:13	35°0.9540'N, 139°13.3250'E,	855m	"Sampling core(8)"
12:26	35°0.9541'N, 139°13.3256'E,	855 m	"deploy plastic degradation chamber"
13:24	35°0.9531'N, 139°13.3269'E,	855 m	"Sampling Calyptogena"
15:04	35°0.9364'N, 139°13.3825'E,	906m	"Sampling Bathymodiolus"
15:25	35°0.9428'N, 139°13.3828'E,	905m	"Sampling Bathymodiolus "
16:09	35°0.8823'N, 139°13.4899'E,	1031m	"Sampling Sea cucumber"
16:19	35°0.8666'N, 139°13.4761'E,	1024 m	"Sampling Starfish"
16:41	35°0.7851'N, 139°13.4104'E,	1034 m	"Left Bottom"



Track Line:

#1557DIVE
Sagami-Bay
Hatsushima

(1 /2500)



Dive log of 6K#1557:

Time (UTC)	Time (Local)	Dep. (m)	Pos. Lat (dd-mm.mmm N/S)	Pos. Lon (ddd-mm.mmm E/W)	latitude	longitude	Head (deg)	Alt. (m)	Pos. X	Pos. Y	Description	Remarks
1:37:45	10:37:45	944	35 - 0.9017 N	139 - 13.3915 E	35.01503	139.2232	327	7	4.93	-12.6	画像では海底視認	
1:41:03	10:41:03	930	35 - 0.9072 N	139 - 13.3907 E	35.01512	139.2232	335	0	13.06	-11.7	赤ヌシキン採取したっぽい	
1:43:04	10:43:04	929	35 - 0.9128 N	139 - 13.3895 E	35.01521	139.2232	328	8	26.6	-22	ヌシキン4本採取	
1:45:10	10:45:10	929	35 - 0.9151 N	139 - 13.383 E	35.01525	139.2231	328	5	30	-30	着底した	
1:49:00	10:49:00	924	35 - 0.9157 N	139 - 13.3835 E	35.01526	139.2231	299	6	33.99	-33.5	イベントマーク3へ向けて航走中	
1:59:43	10:59:43	885	35 - 0.9346 N	139 - 13.3476 E	35.01558	139.2225	298	8	64.1	-82.5	崖を上っている。シロウリガイ死骸多い	
2:09:38	11:09:38	849	35 - 0.9499 N	139 - 13.3178 E	35.01583	139.222	227	8	91.92	-126	マーカー？	
2:12:05	11:12:05	850	35 - 0.95 N	139 - 13.3164 E	35.01583	139.2219	280	6	92	-127	6K1009マーカー視認	
2:18:05	11:18:05	848	35 - 0.9589 N	139 - 13.3213 E	35.01598	139.222	311	5	110	-119	位置知らせ	
2:23:26	11:23:26	851	35 - 0.9648 N	139 - 13.3328 E	35.01608	139.2222	204	0	118	-101	シロウリガイ巨大コロニー到着？	
2:37:54	11:37:54	853	35 - 0.954 N	139 - 13.3228 E	35.0159	139.222					found Fujikura-box	
2:43:48	11:43:48	853	35 - 0.9535 N	139 - 13.3225 E	35.01589	139.222					trying to land near fujikura-box for round observation	
2:50:19	11:50:19	855	35 - 0.9536 N	139 - 13.3259 E	35.01589	139.2221					starting core samplings	
2:52:48	11:52:48	853	35 - 0.9514 N	139 - 13.3298 E	35.01586	139.2222					took pictures of core red 1	
2:53:15	11:53:15	854	35 - 0.953 N	139 - 13.3275 E	35.01588	139.2221					put core red 1 onto the bottom	
2:53:51	11:53:51	854	35 - 0.9532 N	139 - 13.3259 E	35.01589	139.2221					successfully got core red 1 and took picture of core red 1 filled with the sediments	
2:56:37	11:56:37	855	35 - 0.9542 N	139 - 13.3254 E	35.0159	139.2221					赤コア2番 海底に挿入 一番左	
2:58:34	11:58:34	855	35 - 0.9532 N	139 - 13.3254 E	35.01589	139.2221					赤コア3番 海底に挿入 赤2番の右隣	
2:59:13	11:59:13	855	35 - 0.9537 N	139 - 13.3254 E	35.0159	139.2221					赤コア4番 海底に挿入 赤3番の右隣	
3:01:10	12:01:10	855	35 - 0.9544 N	139 - 13.3247 E	35.01591	139.2221					青コア1番 海底に挿入 赤4番の手前	
3:01:28	12:01:28	855	35 - 0.9539 N	139 - 13.325 E	35.0159	139.2221					青コア2番 海底に挿入 赤4番の右隣	
3:01:49	12:01:49	855	35 - 0.9541 N	139 - 13.3252 E	35.0159	139.2221					青コア3番 海底に挿入 青2番の右隣	
3:02:44	12:02:44	855	35 - 0.9538 N	139 - 13.3247 E	35.0159	139.2221					青コア4番 海底に挿入 青1番の右隣	
3:04:36	12:04:36	855	35 - 0.9535 N	139 - 13.3252 E	35.01589	139.2221					青コア1番 回収	
3:06:03	12:06:03	855	35 - 0.9541 N	139 - 13.3252 E	35.0159	139.2221					青コア2番 回収	
3:07:03	12:07:03	855	35 - 0.9541 N	139 - 13.3246 E	35.0159	139.2221					青コア3番 回収	
3:08:21	12:08:21	855	35 - 0.954 N	139 - 13.3248 E	35.0159	139.2221					青コア4番 回収	
3:10:15	12:10:15	855	35 - 0.9542 N	139 - 13.3248 E	35.0159	139.2221					赤コア2番 回収時にベロロード上で落としてしまう	
3:11:03	12:11:03	854	35 - 0.9533 N	139 - 13.3268 E	35.01589	139.2221					赤コア2番 回収	
3:11:50	12:11:50	855	35 - 0.9541 N	139 - 13.3253 E	35.0159	139.2221					赤コア4番 回収	
3:13:20	12:13:20	855	35 - 0.9538 N	139 - 13.3258 E	35.0159	139.2221					赤コア3番 回収	
3:15:05	12:15:05	855	35 - 0.954 N	139 - 13.3253 E	35.0159	139.2221					プラスチック汚化装置設置開始	
3:15:41	12:15:41	855	35 - 0.9541 N	139 - 13.3254 E	35.0159	139.2221					プラスチック汚化装置N1設置 緑スーパーボール	
3:17:53	12:17:53	855	35 - 0.9535 N	139 - 13.3256 E	35.01589	139.2221					プラスチック汚化装置N2設置 赤	
3:20:05	12:20:05	855	35 - 0.9539 N	139 - 13.3257 E	35.0159	139.2221					プラスチック汚化装置N3設置 半透明スーパーボール	
3:21:16	12:21:16	855	35 - 0.954 N	139 - 13.3261 E	35.0159	139.2221					プラスチック汚化装置B2設置 オレンジ	
3:24:37	12:24:37	856	35 - 0.9544 N	139 - 13.3252 E	35.01591	139.2221					プラスチック汚化装置設置 ピンク	
3:24:41	12:24:41	856	35 - 0.9544 N	139 - 13.3252 E	35.01591	139.2221					プラスチック汚化装置B1設置 オレンジ	
3:31:35	12:31:35	855	35 - 0.9561 N	139 - 13.3246 E	35.01594	139.2221	340	5	101	-110	シロウリガイ多数発見	
3:38:03	12:38:03	856	35 - 0.9525 N	139 - 13.3295 E	35.01588	139.2222	308	1	98.44	-104	DO計測開始	
3:46:55	12:46:55	856	35 - 0.955 N	139 - 13.3317 E	35.01592	139.2222					DO計測終了	
3:47:19	12:47:19	856	35 - 0.9567 N	139 - 13.331 E	35.01595	139.2222					化学センサー計測開始	
4:11:55	13:11:55	856	35 - 0.9546 N	139 - 13.3311 E	35.01591	139.2222					化学センサー計測終了	
4:14:02	13:14:02	856	35 - 0.9534 N	139 - 13.3306 E	35.01589	139.2222					シロウリガイをボックスに採集開始	
4:24:08	13:24:08	857	35 - 0.9528 N	139 - 13.3267 E	35.01588	139.2221					シロウリガイ採集終了	
4:26:29	13:26:29	856	35 - 0.9536 N	139 - 13.3271 E	35.01589	139.2221	45	2	98	-110	イベントマーク2番へ移動開始	
4:30:11	13:30:11	851	35 - 0.9487 N	139 - 13.3405 E	35.01581	139.2223	161	42	74	-85	イベントマーク2番へ南から侵入予定	
4:41:38	13:41:38	924	35 - 0.9284 N	139 - 13.3931 E	35.01547	139.2232	340	8	55	-10	1290マーカー視認	
4:48:58	13:48:58	907	35 - 0.9341 N	139 - 13.3817 E	35.01557	139.223					ヒバリガイ視認	
4:49:16	13:49:16	907	35 - 0.9343 N	139 - 13.3821 E	35.01557	139.223	310	6	65	-26	着底して周囲の観察	
4:54:05	13:54:05	908	35 - 0.9371 N	139 - 13.3826 E	35.01562	139.223					ヒバリガイ直上でDO計測	
4:55:47	13:55:47	907	35 - 0.9421 N	139 - 13.3866 E	35.0157	139.2231					化学センサー計測開始	
5:17:01	14:17:01	907	35 - 0.9346 N	139 - 13.3846 E	35.01558	139.2231					タサゴ視認	
5:26:29	14:26:29	907	35 - 0.9385 N	139 - 13.3862 E	35.01564	139.2231					DO計測終了。化学センサーは引き続き行う	
5:27:20	14:27:20	907	35 - 0.9302 N	139 - 13.3788 E	35.0155	139.223					スラップガンによる生物の採集開始	
6:04:54	15:04:54	901	35 - 0.938 N	139 - 13.3824 E			301	7	72.62	-28.3	生物のサンプリング終了	
6:05:47	15:05:47	901	35 - 0.9393 N	139 - 13.3823 E							化学センサー計測終了	
6:10:42	15:10:42	901	35 - 0.9394 N	139 - 13.3818 E			288	7	73.76	-26.1	左サンプルBoxに生物のサンプリングを試みる	
6:19:06	15:19:06	903	35 - 0.9444 N	139 - 13.3829 E	35.01574	139.223					マリンスノーが底だし	
6:25:18	15:25:18	905	35 - 0.9419 N	139 - 13.3843 E	35.0157	139.2231	234	1	80.39	-24.1	左サンプルBoxにシシカイヒバリガイを採取した	
6:27:52	15:27:52	905	35 - 0.9417 N	139 - 13.3838 E	35.0157	139.2231	236	1	76.8	-23.8	化学センサー計測開始	
											高度を上げ、航走開始	
6:34:30	15:34:30	917	35 - 0.9179 N	139 - 13.477 E			107	104	50	100	しんかもの位置確認、海底の見えるところまで高度を下げる	
6:43:04	15:43:04	1024	35 - 0.9276 N	139 - 13.516 E	35.01546	139.2253	123				魚類(ハコフグ)っぽい！！！！	
6:45:25	15:45:25	1043	35 - 0.9288 N	139 - 13.5226 E	35.01548	139.2254	205	2	53.7	186.8	着底確認	
6:54:54	15:54:54	1043	35 - 0.8966 N	139 - 13.5049 E	35.01494	139.2251	235	6	-6	163	スネイルフィッシュ？ー全身が白い魚類	
6:59:28	15:59:28	1036	35 - 0.887 N	139 - 13.4901 E	35.01478	139.2248	230		-24	137	謎の大地の高まり	
7:00:21	16:00:21	1033	35 - 0.884 N	139 - 13.4887 E	35.01473	139.2248			-29	134	イベントマーカー1からこの付近までゴミは確認されず	
											生物のサンプリングを試みる(色:透明)でピンク、ヨコエビのように顔がある	
7:02:27	16:02:27	1032	35 - 0.8816 N	139 - 13.4872 E	35.01469	139.2248	259	5	-39	132	右BOXにナマコを採取	
7:10:01	16:10:01	1032	35 - 0.882 N	139 - 13.4892 E	35.0147	139.2248					高度を上げ、航走開始	
7:11:40	16:11:40	1031	35 - 0.8806 N	139 - 13.488 E	35.01468	139.2248			-34	133	白くて腕の細いヒトデ2匹確認、サンプリングを試みる	
7:14:53	16:14:53	1026	35 - 0.8712 N	139 - 13.4776 E	35.01452	139.2246	236	3	-53	118	右BOXにヒトデを回収した	
7:19:21	16:19:21	1027	35 - 0.867 N	139 - 13.4756 E	35.01445	139.2246	244	3	-61	116	再び航走開始	
7:19:52	16:19:52	1027	35 - 0.8666 N	139 - 13.4766 E	35.01444	139.2246					ピンク色で腕の太い、ヒトデを画面右下に確認	
7:23:43	16:23:43	1029	35 - 0.8516 N	139 - 13.4657 E	35.01419	139.2244	210		-89	99	5秒前くらいに画面右下にゴミが通り過ぎる。その後ゴミのようなものが確認された	
7:28:55	16:28:55	1046	35 - 0.8229 N	139 - 13.4377 E	35.01372	139.224					海底に何か細長くて、白いもの確認	
7:33:08	16:33:08	1043	35 - 0.7945 N	139 - 13.4242 E	35.01324	139.2237					海底に何か細長くて、白いもの確認(↑上のものと似ている。ここでは足がっばいあるのが確認された)	
7:39:55	16:39:55	1043	35 - 0.7914 N	139 - 13.4225 E	35.01319	139.2237					オレンジ色のヒトデが確認	
7:35:00	16:35:00	1039	35 - 0.7861 N	139 - 13.4193 E	35.0131	139.2237	214		-213	28	オレンジ色のヒトデ2匹と、ナマコを確認、海底準備開始	
7:35:45	16:35:45	1037	35 - 0.7825 N	139 - 13.4164 E	35.01304	139.2236	36.7	4	-217	22	海底	
7:40:10	16:40:10	1038	35 - 0.7851 N	139 - 13.4099 E	35.01309	139.2235			-214	13		

6K#1558 Dive Report

Date: 2019/9/13

Survey site: Sagami bay central area, St.2

Landing Point: 35°1.2500'N, 139°22.6500'E, D=1400 m

Leaving Point: 35°1.4066N, 139°22.6258'E, D=1387 m

Pilot: Keisuke Suzuki

Co-pilot: Naoto Minamino

Observer: Noriyuki Isobe (JAMSTEC)

Objectives:

The objectives of this dive are to investigate the distribution of plastic debris, including microplastics (MP) at the bottom of deep sea, and the effects of plastic on deep-sea organisms and ecosystems.

Dive summary:

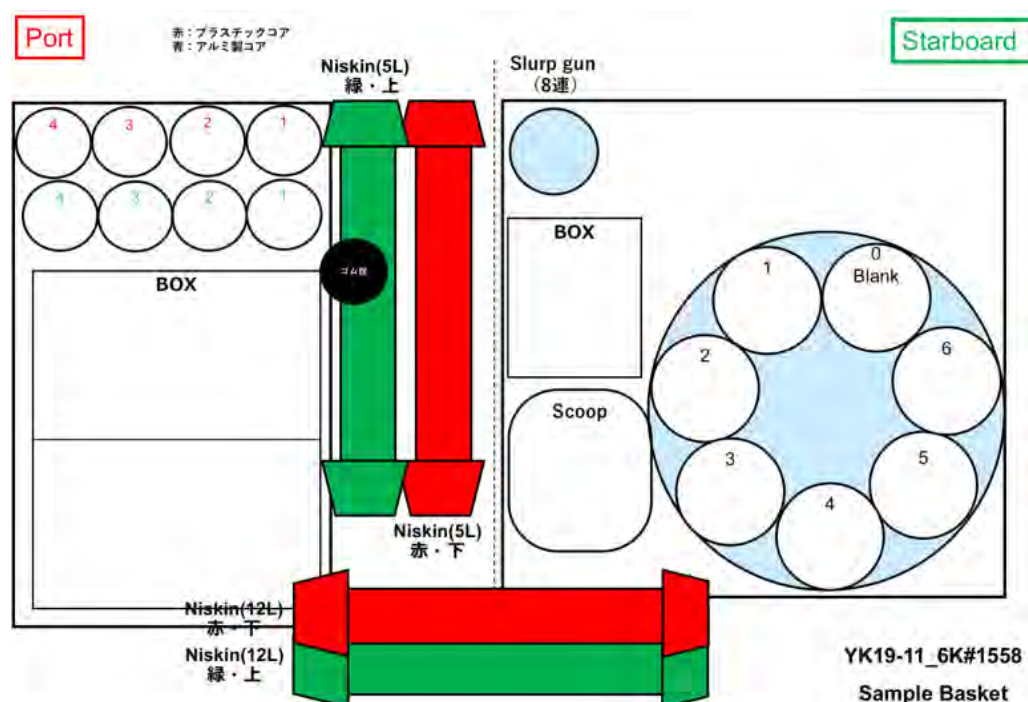
Before landing, deep seawater was sampled by Niskin sampler at a depth of 1375 m.

We landed on the sandy seafloor at a depth of 1400 m. Then, 8 core samples were taken there by H-type corer. We also collected 2 sea cucumbers and a waste (Can) from the seafloor by manipulator.

After moving a while, 2 sea cucumbers and a sea weed were collected. We kept searching for plastic waste on seafloor but collected aluminum foil, instant noodle package, and another can. After collecting 5th sea cucumber, we left the bottom as scheduled.

Payload:

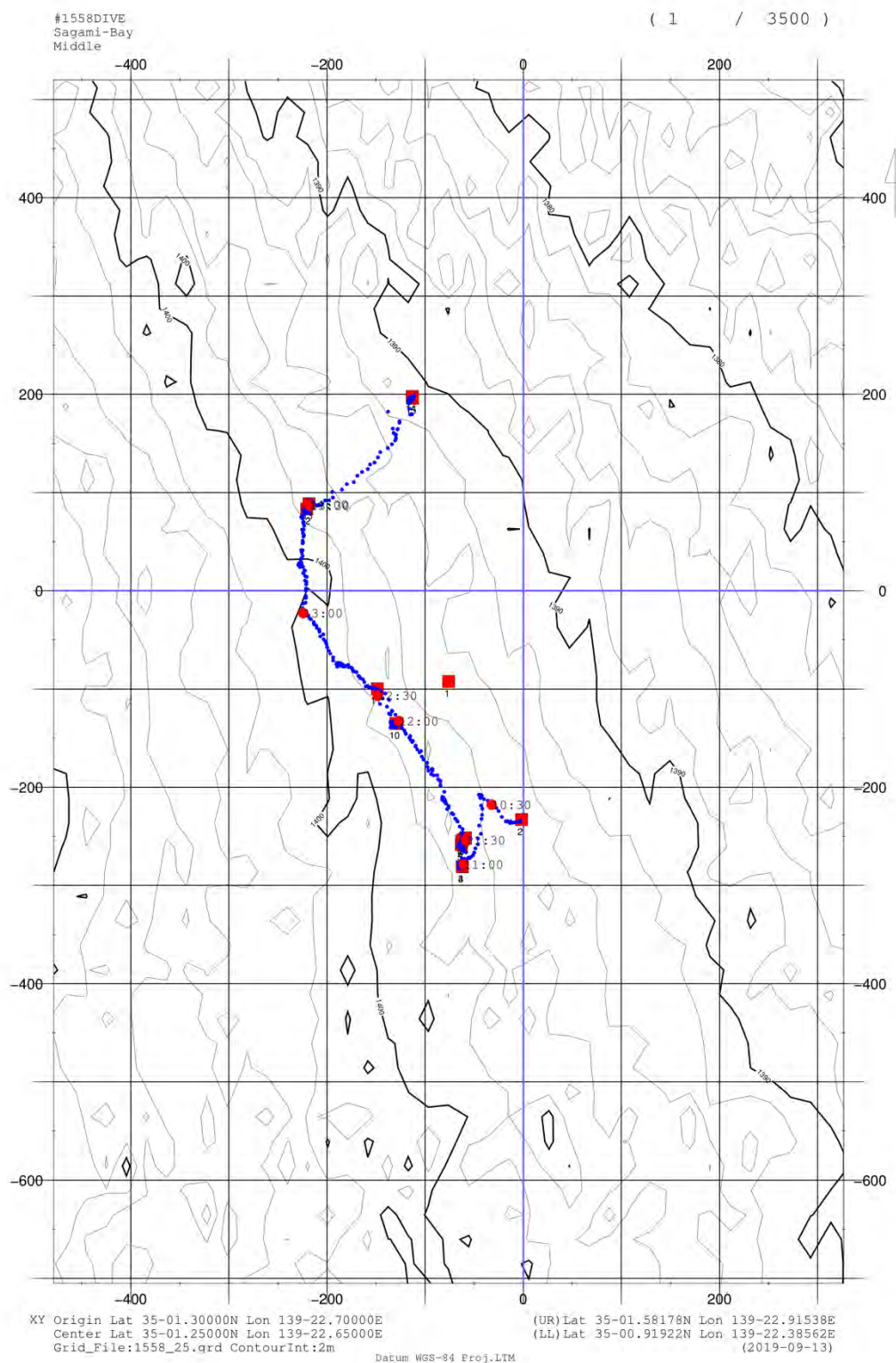
- 1) Niskin bottles(5L)×2
- 2) Niskin bottles (12L)×2
- 3) Push cores×8 (Plastic×4、Aluminum×4)
- 4) Sample box (large)
- 5) Sample boc (small)
- 6) Suction sampler with 7 canisters
- 7) Scoop

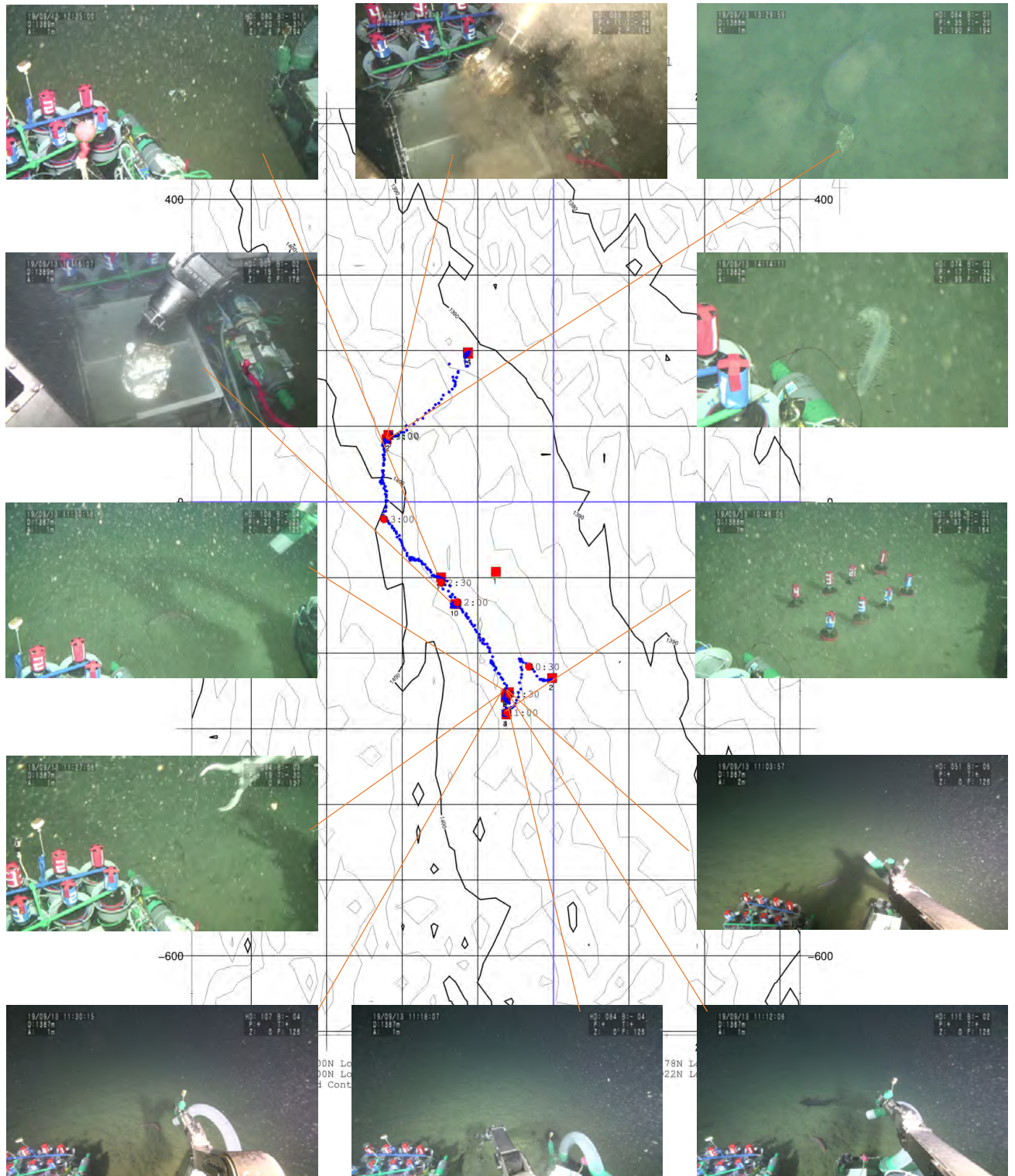


Sample list:

10:26	35°1.1748'N, 139°22.6988'E,	1375m	"Sampling NISKIN(4)"
10:57	35°1.1484'N, 139°22.6592'E,	1387m	"Sampling core(8)"
11:10	35°1.1601'N, 139°22.6586'E,	1387m	"Sampling Sea cucumber"
11:14	35°1.1621'N, 139°22.6588'E,	1387m	"Sampling Sea cucumber"
11:19	35°1.1621'N, 139°22.6588'E,	1387m	"Retrieve Trash"
11:29	35°1.1637'N, 139°22.6598'E,	1387m	"Sampling Sea cucumber, Sea-weed"
11:31	35°1.1640'N, 139°22.6613'E,	1387m	"Sampling Sea cucumber"
12:16	35°1.2272'N, 139°22.6147'E,	1389m	"Retrieve Trash"
12:38	35°1.2460'N, 139°22.6021'E,	1389m	"Retrieve Trash"
13:24	35°1.3450'N, 139°22.5547'E,	1389m	"Retrieve Trash"
14:02	35°1.3484'N, 139°22.5563'E,	1388m	"Retrieve Trash"
14:18	35°1.4079'N, 139°22.6256'E,	1382m	"Sampling Sea cucumber"

Track Line:





Time (UTC)	Time (Local)	Dep. (m)	Pos. Lat (dd-mm.mm N/S)		Pos. Lon (ddd-mm.mm E/W)		latitude	longitude	Head (deg)	Alt. (m)	Pos. X	Pos. Y	Description	Remarks	
1:15:06	10:15:06	1320	35	-	1.1804	N	139	- 22.7134	E	113	66	-221	20	これより海底に降りる	
1:27:05	10:27:05	1376	35	-	1.1731	N	139	- 22.6948	E	338	11	-234	-10	ニスキン採取終了、これより海底に降りる	マリンスノーで結構視界が悪い
1:39:18	10:39:18	1388	35	-	1.1489	N	139	- 22.661	E	83.9	1	-27.9	-61	着底【視程 5m、温度 2.4、流向・流速 170° 方向】、土の性質:泥、コア試料のサンプリングを試みる	ずっと海底の水が濁っている
1:40:56	10:40:56	1388	35	-	1.1481	N	139	- 22.6595	E	87.8				コア赤1を海底に挿入	
1:42:03	10:42:03	1388	35	-	1.1484	N	139	- 22.6583	E					コア赤2を海底に挿入	
1:42:34	10:42:34	1389	35	-	1.1487	N	139	- 22.6583	E					コア赤3を海底に挿入	
1:43:20	10:43:20	1388	35	-	1.149	N	139	- 22.6593	E					コア赤4を海底に挿入	右から左にかけて1, 2, 3, 4の順
1:44:13	10:44:13	1389	35	-	1.1497	N	139	- 22.6584	E					コア青1を赤1の手前の海底に挿入	
1:44:48	10:44:48	1389	35	-	1.1494	N	139	- 22.6592	E					コア青2を赤2の手前の海底に挿入	
1:45:22	10:45:22	1389	35	-	1.149	N	139	- 22.6585	E					コア青3を赤3の手前の海底に挿入	
1:45:52	10:45:52	1389	35	-	1.1481	N	139	- 22.6584	E					コア青4を赤4の手前の海底に挿入	
1:48:33	10:48:33	1388	35	-	1.1487	N	139	- 22.6596	E					コア青1を鞘に収納	
1:49:42	10:49:42	1388	35	-	1.1485	N	139	- 22.6582	E					コア赤1を鞘に収納	
1:50:34	10:50:34	1388	35	-	1.1509	N	139	- 22.6567	E					コア青2を鞘に収納	
1:50:56	10:50:56	1388	35	-	1.1491	N	139	- 22.6586	E					コア赤2を鞘に収納	
1:51:36	10:51:36	1388	35	-	1.1494	N	139	- 22.6598	E					コア青3を鞘に収納	
1:52:30	10:52:30	1388	35	-	1.148	N	139	- 22.6587	E					コア赤3を鞘に収納	
1:53:10	10:53:10	1388	35	-	1.1488	N	139	- 22.6589	E					コア青4を鞘に収納	
1:54:48	10:54:48	1387	35	-	1.1485	N	139	- 22.6593	E					コア赤4を鞘に収納	
1:57:44	10:57:44	1388	35	-	1.1487	N	139	- 22.6616	E	103	1	-280	-60	位置の確認	
1:59:48	10:59:48	1388	35	-	1.1496	N	139	- 22.6597	E	105	1			going to North	
2:05:02	11:05:02	1388	35	-	1.1591	N	139	- 22.6581	E					landed and trying to get a cucumber	
2:08:23	11:08:23	1388	35	-	1.1612	N	139	- 22.6581	E					collected a sea-cucumber in canister 1	
2:14:24														collected a sea-cucumber like a millionpod in chamber 2	
2:17:56	11:17:56	1388	35	-	1.1612	N	139	- 22.6582	E					found a can	
2:18:57	11:18:57	1387	35	-	1.1616	N	139	- 22.6595	E					collected a beer-can in the sample box (left rear)	
2:21:48	11:21:48	1388	35	-	1.1628	N	139	- 22.6607	E					collected a pink & long sea-cucumber in chamber 3	
2:29:11	11:29:11	1388	35	-	1.1636	N	139	- 22.6615	E					collected a sea-weed like something in the sample box (left rear)	
2:31:14	11:31:14	1388	35	-	1.1636	N	139	- 22.6603	E					collected a pink & long sea-cucumber in chamber 4	
2:49:22	11:49:22	1388	35	-	1.1936	N	139	- 22.6449	E					going to North to find something	
3:04:05	12:04:05	1389	35	-	1.2281	N	139	- 22.614	E	39.7	2	-134	-131	landed	
3:16:27	12:16:27	1389	35	-	1.2271	N	139	- 22.6145	E					collected a aluminium debris in sample box (left flont)	
3:32:04	12:32:04	1390	35	-	1.2449	N	139	- 22.6043	E					found a debris	
3:34:14	12:34:14	1389	35	-	1.2444	N	139	- 22.6047	E					start collecting a debris	
3:38:28	12:38:28	1390	35	-	1.2449	N	139	- 22.6032	E	80.2	1	-99	-149	collected a debris in sample box (left flont)	
4:18:34	13:18:34	1389	35	-	1.3457	N	139	- 22.5552	E	82	1	83	-220	landed and trying to get a debris	
4:23:57	13:23:57	1389	35	-	1.3452	N	139	- 22.5547	E					collected a debris in sample box (left rear)	
4:31:00	13:31:00	1389	35	-	1.3482	N	139	- 22.5572	E					found blue color belt ?	
5:01:56	14:01:56	1389	35	-	1.3481	N	139	- 22.5562	E					collected a blue string in the left sample box	half part of the string is out from the sample box
5:14:35	14:14:35	1383	35	-	1.4054	N	139	- 22.625	E					found sea cucumber	
5:18:40	14:18:40	1383	35	-	1.4077	N	139	- 22.6257	E					collected sea cucumber in chamber 5	
5:19:02	14:19:02	1383	35	-	1.4071	N	139	- 22.625	E					start preparing to leave	
5:25:20	14:25:20	1383	35	-	1.407	N	139	- 22.6266	E					left bottom	

Dive log of 6K#1558: