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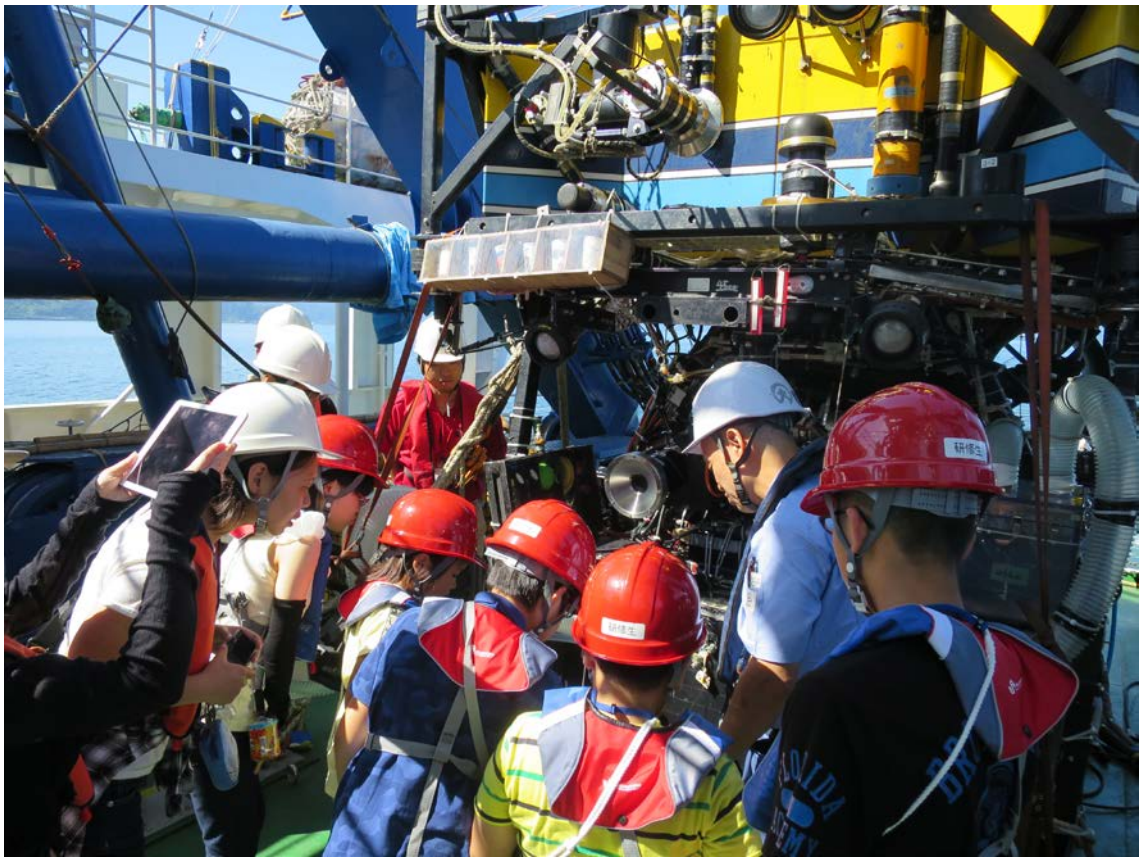
Natsushima Cruise Report

NT15-14

Prize Cruise for the Postcard Design Contest



Kagoshima Bay

August 8, 2015 – August 10, 2015

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

Contents

1. Cruise Information

1.1. Cruise ID: NT15-14

1.2. Name of vessel: Natsushima

1.3. Title of the cruise: Prize Cruise for the Postcard Design Contest

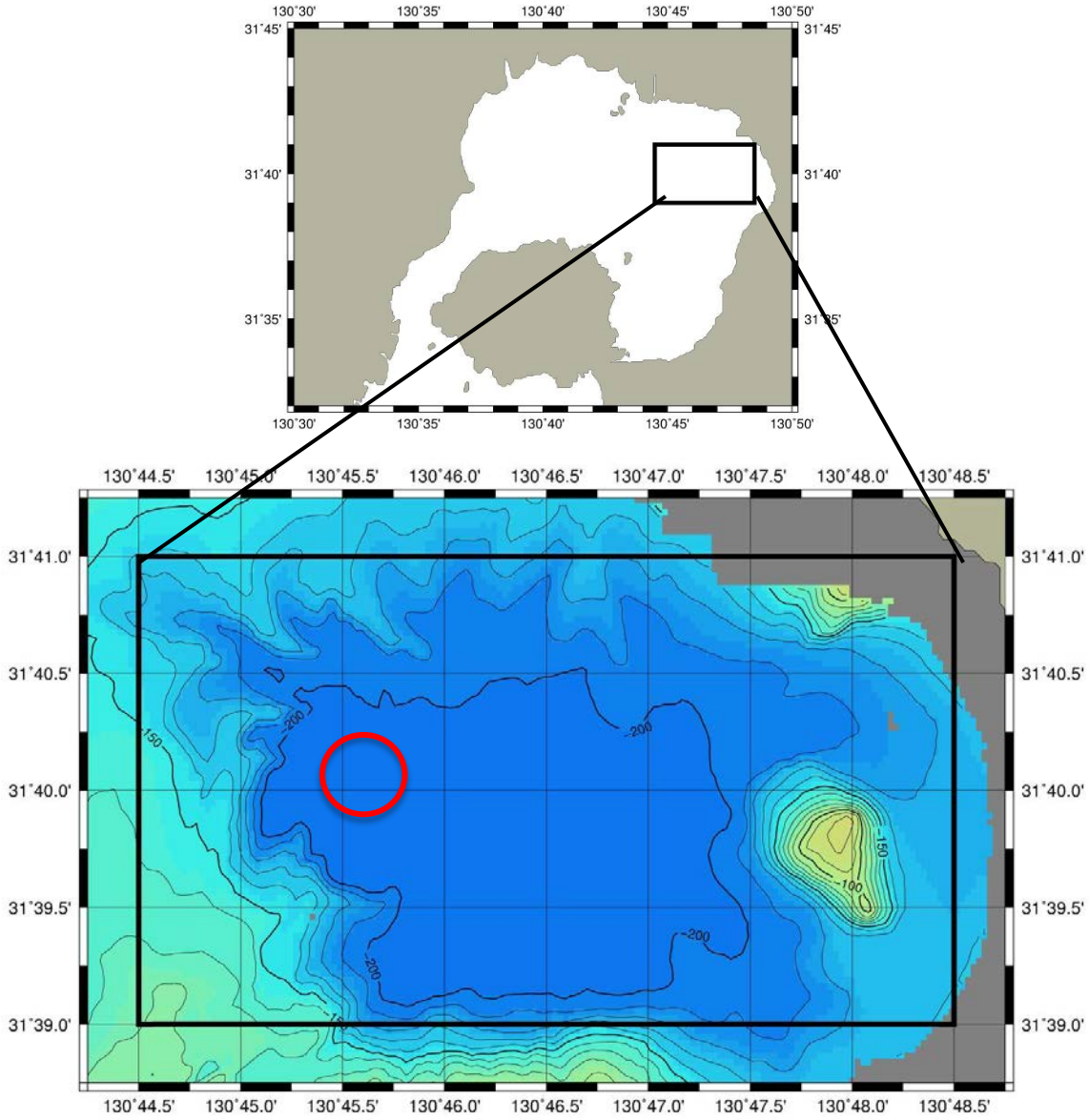
1.4. Title of proposal: Prize Cruise for the Postcard Design Contest

1.5. Cruise period: August 8, 2015 – August 10, 2015

1.6. Ports of call: Kagoshima – Kagoshima – Kagoshima – Kagoshima

1.7. Research area: Kagoshima Bay

1.8. Research Map



August 8, 9, and 10: 31°40.10'N, 130°45.70'E (Depth: 200 m)

2. List of Participants

2.1. Chief scientist: Shigeyuki Hirose [JAMSTEC, Public Relations Division (PRD)]

2.2. RePresentative of Scientice Party: Shigeyuki Hirose [JAMSTEC, Public Relations Division (PRD)]

2.3. Scientist: Katsunori Fujikura [JAMSTEC, Department of Marine Biodiversity Research (B-DIVE)]

Yabuki Akinori [JAMSTEC B-DIVE]
Gotoh Shinpei [JAMSTEC B-DIVE]
Katsura Shibata [JAMSTEC PRD]
Hajime Kawakami [JAMSTEC PRD]
Takanori Kanai [JAMSTEC PRD]
Yukiko Fujii [JAMSTEC PRD]
Kyoko Takeuchi [JAMSTEC PRD]
Mayumi Kodama [JAMSTEC PRD]
Ryousuke Komi [Tokyo Sea Life Park]
Suguru Nemoto [Enoshima Aquarium]
Yoshihiro Suzuki [Enoshima Aquarium]
Ayuta Yamaki [Kagoshima City Aquarium]
Tomoko Yamamoto [Kagoshima University]
Makoto Shirabe [NiGK Corporation]

2.4. Passengers: 15 persons

3. Observation

3.1. Cruise summary

Shigeyuki Hirose [JAMSTEC PRD]

JAMSTEC provided a single-day boarding experience on the R/V Natsushima to the children who won prizes in the 17th Postcard Design Contest and their parents, in order that they had a better understanding of and deeper interests in the oceans.

Boarding experiences on the R/V Natsushima were carried out in the three days including the underwater navigations of the remotely operated vehicle Hyper-Dolphin. During the underwater navigations of Hyper-Dolphin, organisms such as conger and rockfish, and submarine hot spring (30–100°C) were observed through the high-definition marine camera. We carried out the submarine experiments and performance tests of the apparatus for *in-situ* collection and fixation of microbes during the underwater navigations. Around the sea floor, the children and parents tried to operate the Hyper-Dolphin from the control room on the R/V Natsushima as well. On board, the children and parents observed and dissected the organisms sampled in this cruise.

3.2. Dive information

(1) Dive #1863

Date: August 8, 2015 (JST)

Site: Wakamiko Crater in Kagoshima Bay (31°40.08N, 130°45.69E); Depth: 200–201 m

Landing (Time, Depth): 10:57, 201 m

Leaving (Time, Depth): 13:30, 200 m

(2) Dive #1864

Date: August 9, 2015 (JST)

Site: Wakamiko Crater in Kagoshima Bay (31°40.06N, 130°45.69E); Depth: 197–201 m

Landing (Time, Depth): 10:43, 200 m

Leaving (Time, Depth): 14:00, 200 m

(3) Dive #1688

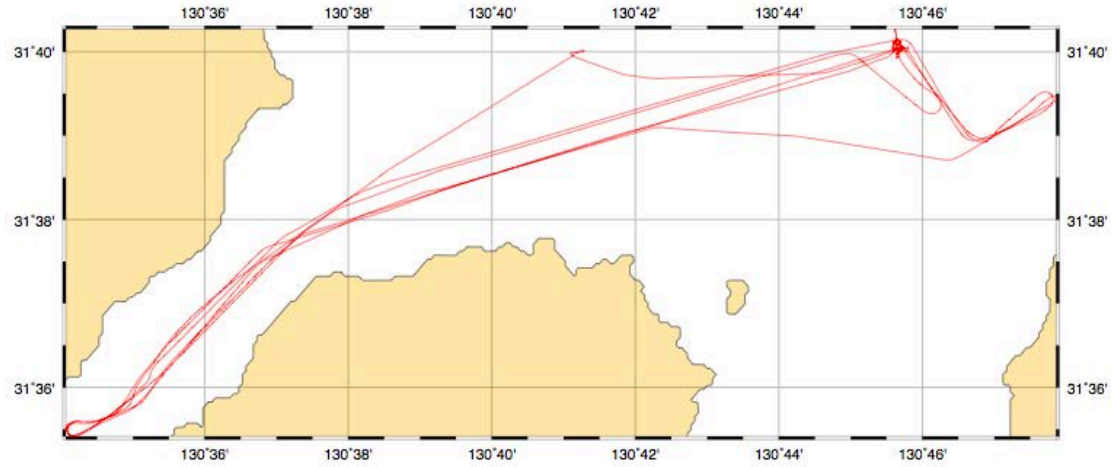
Date: August 10, 2015 (JST)

Site: Wakamiko Crater in Kagoshima Bay (31°40.05N, 130°45.67E); Depth: 198–201 m

Landing (Time, Depth): 10:49, 199 m

Leaving (Time, Depth): 14:00, 200 m

3.3. Cruise track



Cruise track of NT14-12

3.4. Submarine experiments

(1) Observations of items under high pressure

In submarine (under high pressure), we observed the items such as tomato, banana, plastic bottle (empty and full), balloon, and so on.

Fig. 3.4. A part of submarine experiments

3.5. Observed organisms and submarine hot spring

During the underwater navigations, we observed the organisms such as conger and rockfish, submarine hot spring, and microbial mat.

Fig. 3.5-1. Conger

Fig. 3.5-2. rockfish

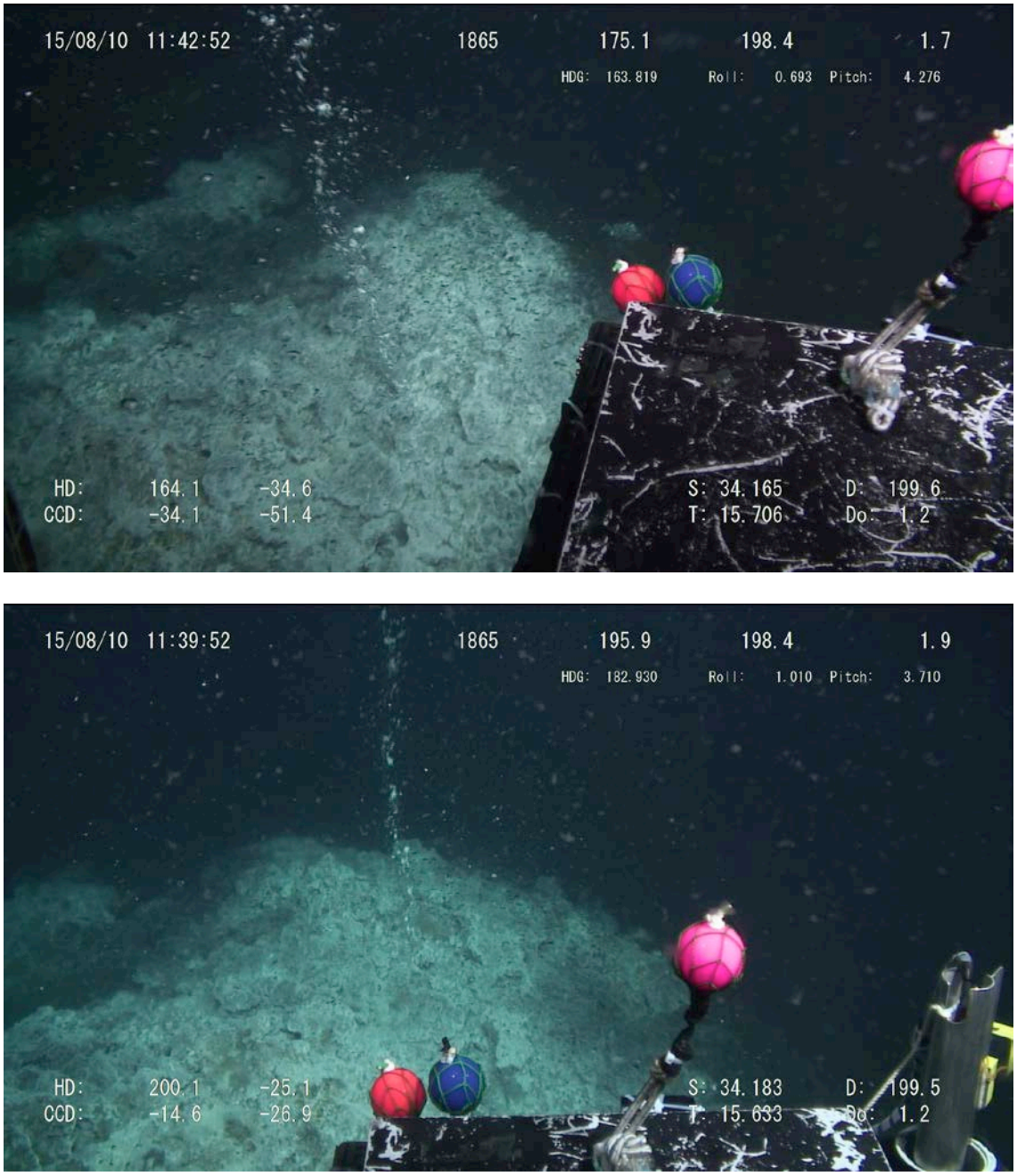


Fig. 3.5-3. Submarine hot spring and microbial mat

3.6. Performance test of the apparatus for *in-situ* collection and fixation of microbes (AICOF [temporal name])

Yabuki Akinori, Gotoh Shinpei, and Katsunori Fujikura [JAMSTEC B-DIVE]

Makoto Shirabe [NiGK Corporation]

3.6.1. Background

The diversity of eukaryotic microbes living in deep-sea has been studied well by molecular approaches and it was revealed that many of them might be new species. In spite of that information, those many “possible” new species still remain to be found or identified so far. Why cannot they be found? One of the reasons is that their cells may have been shrunk and/or broken easily due to the sampling artifact such as rapid changes of temperature and water pressure. Another possible reason is that their biomass is not so high in the deep-sea that we could not find them easily. To resolve these problems and to understand precise diversity of eukaryotic microbes, we invented an apparatus for *in-situ* collection and fixation of microbes (AICOF [temporal name]). In NT 15-14, performance tests of the AICOF were conducted. It should be note that the AICOF was invented in July 2015 and it had not been used so far until NT15-14.

3.6.2. Brief description of each performance test

(1) Dive #1863

The performance test of the AICOF was conducted at Stop1 from 11:15 to 11:41. The water on the bacterial mats growing on the large rock was slurped from the cock of the AICOF for 15 minutes. To avoid slurping sediments, the cock was distantly positioned by ca. 10 cm from rock surface. After the water slurping was finished, two valves for the circulation change were twisted and then the circulation of 5L of 2.5% glutaraldehyde solution was started. This circulation was performed for 10 minutes. Both water slurping and circulation of glutaraldehyde solution were confirmed by spinning of a wheel.

(2) Dive #1864

The same procedures conducted in #1863 were conducted again at Stop 1 from 11:16 to 11:40. In order to acquire denser sample than that collected in Dive #1863, the cock was closely positioned to rock surface in Dive #1864. Although water slurping for 15 minutes was originally planed as conducted in Dive #1863, it was found that the speed of spinning wheel became very slow after 13 min. passed and then the slurping procedure was quitted at that point.

(3) Dive #1865

The same procedures conducted in # 1863 and #1864 were also tried in Dive #1865 at Stop1 from 11:29. In this dive, we set sterilized seawater instead of glutaraldehyde solution in order to

acquire no-fixed dense organismal samples. The water just above the bacterial mat was aimed to be slurped as in #1864, however, the wheel was not spun in this time. Although the water slurping was stopped and restarted again, the wheel was not spun. We also checked the circulation of sterilized seawater, however, the wheel was not spun this this time either. Hence, we considered that the pumps for slurping and circulation could not work due to unknown trouble(s) and performance test of the AICOF in Dive 1865 was ended at this time.

After HPD was retrieved on R/V Natsushima, the condition of the AICOF was checked and then it was revealed that there was just a problem with the wheel. It seemed that the AICOF itself worked properly in this dive too, but the wheel was damaged and could not be spun.

3.6.3. On-board brief observation and future works

The samples collected in #1863 and 1864 were briefly observed on board. Several eukaryotic cells could be recognized. Diatom cells were most frequently found and those diatoms looked still intact. Since the performance tests were conducted at the points of ca. 200 m in depth, those diatoms that may have been sunken from the surface were still alive there. It seemed that there were more cells in he sample collected in #1864 than in #1863, which was probably caused by the different distance between the cock and bacterial mat. Other eukaryotic microbes were also observed in the samples. We will carefully observe them furthermore in the laboratory after the cruise.

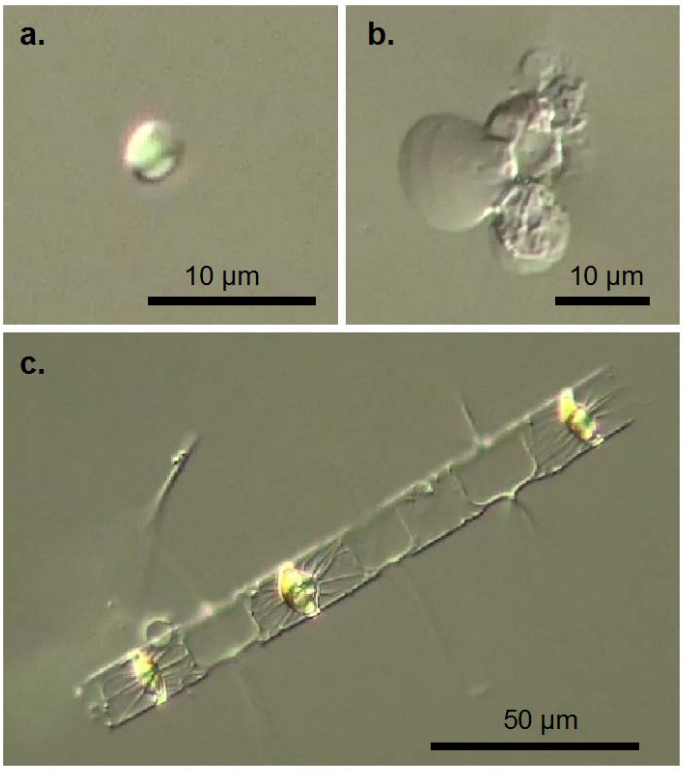


Plate 3.6. Eukaryotic microbes collected by the AICOF. **a.** unknown coccoid alga (Prasinophyceae sp.?). **b.** Amoebozoa sp. **c.** Bacillariophyceae sp. It should be noted here that many other microbes could be observed in the samples collected by the AICOF.

3.7. Sampling of sediment, rocks, and organisms

Katsunori Fujikura, Yabuki Akinori, and Gotoh Shinpei [JAMSTEC B-DIVE]

We have 3 dives at the hydrothermal vents (200 m vent site) in Kagoshima Bay. We collected some biological and geological samples including benthic animals, fishes, sediments and rocks. All samples used for presentation to the guests. After that, we fixed and preserved samples for biological and geological analyses. Sample list attach as metadata sheets.

3.8. Sampling of organisms

Ryousuke Komi [Tokyo Sea Life Park]

Suguru Nemoto and Yoshihiro Suzuki [Enoshima Aquarium]

Ayuta Yamaki [Kagoshima City Aquarium]

Fig. 3.8-1. *Periclimenes cf. thermohydrophilus*

This Periclimenesed shrimp has been reported only in a habitat of vestimentiferan tubeworm *Lamellibrachia satsuma* in the Kagoshima Bay (Hayashi & Ohtomi 2001). Because of the nature, Hayashi & Ohtomi (2001) said that this species is the potoniine shrimp in association with the vestimentiferan or polychaete tubeworms, though relationship between this shrimp and the host invertebrate has not been clearly established. Recently, a related species of *P. thermohydrophilus* has been found in a habitat of *L. satsuma* in the Nikko Sea mount, however, these shrimps has not been found outside of tubeworm colonies yet.

In this NT15-14 cruise, we observed a lot of the shrimps on the sea floor covered bacterial mat near hydrothermal vents. This is the first report of discovering the shrimp outside of tubeworm colonies. The area located in the Kagoshima Bay at 200 m depth has been known as a hydrothermal vents site without tubeworm colonies, although there is a *L. satsuma* habitat at 2-3 km away from the area.

This discovery suggests that this Periclimenesed shrimp depends on chemosynthetic organisms or reduction environment rather than vestimentiferan tubeworms, though identification of the shrimp is necessary. The haplotype network analysis of the species or other molecular-biological analysis would reveal their dispersal ecology and topical distribution of vestimentiferan tubeworm *L. satsuma* in Kagoshima Bay.

Fig. 3.8-2. *Philine argentata*

This Philined sea slug species lives in the sediments. The area of distribution of the species is from Hokkaido to Okinawa in Japan, Korean Peninsula and the coast of China (Nakano., 2004). According to Marine Biological Sample Database of JAMSTEC, several Philined sea slugs have been collected from the deep sea. This species has been found off Kamaishi and off Ryori (581 to 745 m depth).

In this cruise, we collected 7 specimens of the sea slug. Although the collection records of the species from deep sea are only a few, this is the first record of the species from hydrothermal vent site.

We collect 12 species with suction sampler altogether (Fig.3). The most was made fixed sample for hydrothermal vent biota survey. Palaemonesed shrimp and Philined sea slug were used for a breeding experiment. And we will reveal some of these behavioral ecology.

In submersible exploration, a large number of Myctophidid fish and Maurolicinae fish were observed from about 140m depth to the bottom. Those fish was also observed in the hydrothermal vent area neighborhood. There are few examples which observed many fish at hydrothermal vent area.

On board No. :
Cruise No. : NT15-14
和名 : タギリカクレエビ
Science name : *pericmenes thermohydrophilus*
Dive No. : #1863
Locality : Kagoshima Bay
31° 40.05′N
130° 45.693′E
Depth : 200m

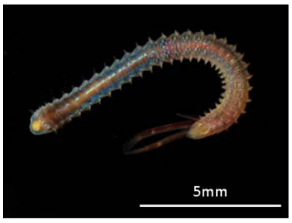
On board No.:
Cruise No. : NT15-14
和名 : 軟甲綱の一種
Science name: Malacostraca
Dive No. : #1864
Locality : Kagoshima Bay
31° 40.08′N
130° 45.704′E
Depth : 198m

On board No.:
Cruise No. : NT15-14
和名 : キヌタレガイ
Science name: *Solemya pusilla*
Dive No. : #1864
Locality : Kagoshima Bay
31° 40.08′N
130° 45.704′E
Depth : 198m

On board No.:
Cruise No. : NT15-14
和名 : 頭盾目の一種
Science name: Cephalaspidea
Dive No. : #1864
Locality : Kagoshima Bay
31° 40.08′N
130° 45.704′E
Depth : 198m

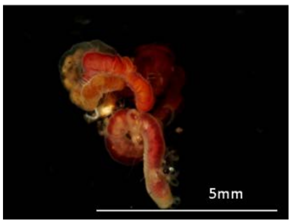
On board No. :
Cruise No. : NT15-14
和名 : タギリカクレエビ
Science name : *pericmenes thermohydrophilus*
Dive No. : #1864
Locality : Kagoshima Bay
31° 40.08′N
130° 45.704′E
Depth : 198m

On board No.:
Cruise No. : NT15-14
和名 : コノハエビ属の一種
Science name: *Nebalia* sp.
Dive No. : #1864
Locality : Kagoshima Bay
31° 40.08′N
130° 45.704′E
Depth : 198m

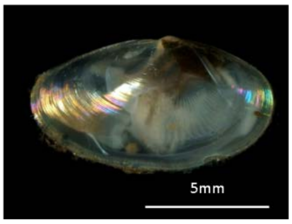


On board No.:
Cruise No. : NT15-14
和名 : 多毛綱の一種
Science name: Polychaeta
Dive No. : #1864
Locality : Kagoshima Bay
31° 40.05′N
130° 45.693′E
Depth : 199m

On board No.:
Cruise No. : NT15-14
和名 : 多毛綱の一種
Science name: Polychaeta
Dive No. : #1864
Locality : Kagoshima Bay
31° 40.05′N
130° 45.693′E
Depth : 199m



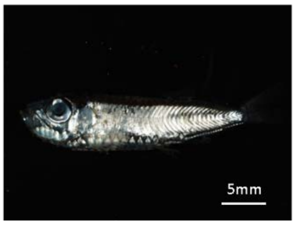
On board No.:
Cruise No. : NT15-14
和名 : 多毛綱の一種
Science name: Polychaeta
Dive No. : #1864
Locality : Kagoshima Bay
31° 40.05′N
130° 45.693′E
Depth : 199m



On board No. :
Cruise No. : NT15-14
和名 : シズクガイ？
Science name : *Theora fragilis* ?
Dive No. : #1864
Locality : Kagoshima Bay
31° 40.08′N
130° 45.704′E
Depth : 198m

On board No.:
Cruise No. : NT15-14
和名 : ヨウジエソ
Science name: *Pollichthys mauli*
Dive No. : #1864
Locality : Kagoshima Bay
31° 40.09′N
130° 45.687′E
Depth : 199m

On board No.:
Cruise No. : NT15-14
和名 : イワハダカ
Science name: *Benthosema fibulatum*
Dive No. : #1864
Locality : Kagoshima Bay
31° 40.09′N
130° 45.687′E
Depth : 199m



On board No.:
Cruise No. : NT15-14
和名 : キュウリイエソ
Science name: *Maurolicus japonicus*
Dive No. : #1864
Locality : Kagoshima Bay
31° 40.09′N
130° 45.687′E
Depth : 199m

Fig. 3.8-3. Collected biological sample in NT15-14 cruise

4. Notice on Using

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.