

KAIYO CRUISE REPORT

KY11-02 Leg.2

Larval dispersion and biodiversity of hydrothermal vent animals
Estimation of hydrothermal activity using growth line on bivalve shells

Okinawa Trough

Feb. 9, 2011 ~ Feb. 13, 2011

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

Contents

1. Cruise Information	1
2. Participants	2
3. Observation	4
3-1. Scientific Purposes and Results	4
3-2. List of Observation Instruments	12
3-3. Cruise Log	13
3-4. Dive Information	15
3-5. Sample List	23
4. Notice on Using	25
5. Appendix	26

1. Cruise Information

Cruise ID: KY11-02, Leg. 2

Name of Vessel: R/V Kaiyo / Hyper-Dolphin

Title of the Cruise:

Larval dispersion and biodiversity of hydrothermal vent animals.

and

Estimation of hydrothermal activity using growth line on bivalve shells.

Chief Scientist: Hiroshi Miyake (Kitasato University)

Cruise Period: 2011.2.9 ~ 2011.2.13

Port of Call: Naha, Okinawa

Research Area: Iheya Ridge

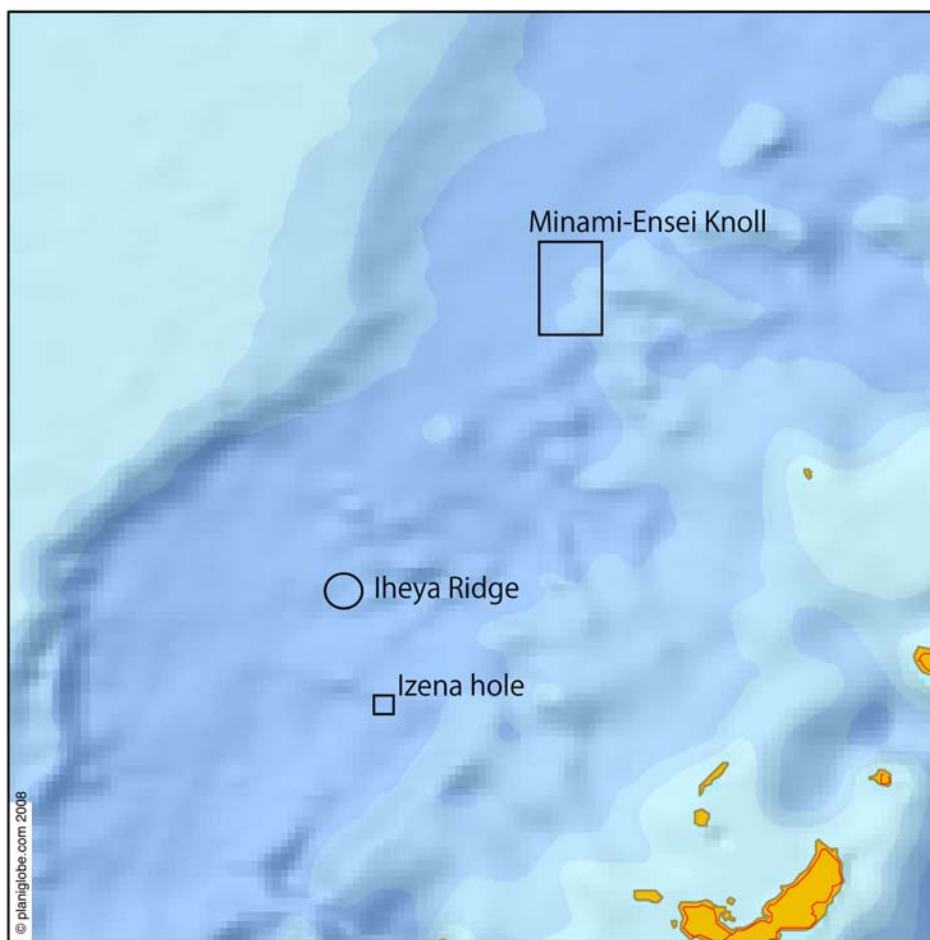


Fig. Localities of the investigation area of this cruise. Dives were conducted at Iheya Ridge

2. Participants

Scientist

Hiroshi Miyake, Kitasato University, Chief scientist

Hitoshi Ida, Kitasato University

Shinji Tsuchida, JAMSTEC

Masanori Kyo, JAMSTEC

Kiminori Shitashima, CRIEPI

Mitsugu Kitada, Enoshima Aquarium

Madoka Kitajima, Enoshima Aquarium

Hiromi Watanabe, JAMSTEC

Katsunori Fujikura, JAMSTEC

Yoshimi Takahashi, JAMSTEC

Fumihiko Sato, Okayama University of Science

Satoshi Mitarai, Okinawa institute of Science and Technology

Maiko Tamura, Okinawa institute of Science and Technology

Shusuke Machida, Nippon Marine Enterprises Co., Ltd.

Crew

Shinya Ryouno, Captain

Takafumi Aoki, Chief Officer

Shintaro Hashimoto, 2nd Officer

Hidehiko Konno, 3rd Officer

Hiroyoshi Kikkawa, Chief Engineer

Kazuhiko Kaneda, 1st Engineer

Kenzo Kato, 2nd Engineer

Takaatsu Imoto, 3rd Engineer

Satoshi Watase, Chief Radio Operator

Hidehiro Ito, 2nd Radio Operator

Yuka Moriwaki, 3rd Radio Operator

Yasuyoshi Kyuki, Boat Swain

Yoshiaki Kawamura, Able Seaman

Kuniharu Kadoguchi, Able Seaman

Hideo Isobe, Able Seaman
Saikan Hirai, Able Seaman
Jiro Hanazawa, Sailor
Shun Abe, Sailor
Kozo Miura, No.1 Oiler
Toshikazu Ikeda, Oiler
Takeshi Watanabe, Assistant Oiler
Daiki Igarashi, Assistant Oiler
Ryo Matsuuchi, Assistant Oiler
Yasunori Kawai, Assistant Oiler
Ryuei Takemura, Chief Steward
Yoshio Okada, Steward
Kana Yuasa, Steward
Shigeto Ariyama, Steward
Yoshie Hidaka, Steward

Hyperdolphin Operation Team

Yoshio Oono, Operation Manager
Kazuki Iijima, ROV Operator
Katsushi Chiba, ROV Operator
Yudai Sakakibara, ROV Operator
Shigeru Kikuya, ROV Operator
Atsushi Takenouchi, ROV Operator
Ryou Saigou, ROV Operator

3. Observation and Research

3-1. Scientific Purpose and Results

3-1-1. Larval dispersion and biodiversity of hydrothermal vent animals

Hiroshi Miyake

It is important for deep-sea hydrothermal vent animals to disperse their larvae to other hydrothermal vent. The genetic diversity of the population of vent species may depend on a recruitment of larvae to vent site. There are many types of hydrothermal vent, for example, knoll, ridge, and hole, in Okinawa Trough. There are two types of hydrothermal vent plume, one remain in caldera other disperse out of vent area. Genetic diversity may low in the hydrothermal vent area where is closed by outer rim of caldera, however, it may high in open vent area where is not closed by outer rim of caldera.

In this study, to clear the relationships between genetic diversity and hydrothermal plume type, sampling of vent larvae were conducted in the two types of plume using slurp-gun with plankton net and sampling adult and juvenile individuals around vent site.

However, sea condition was not good, so we had only one day to dive. We tried to get good sample, but there are little larvae samples. I would like to try to submit application of this theme to JAMSTEC again.

3-1-2. Estimation of hydrothermal and methane seep activity using growth line on bivalve shells

Hiromi WATANABE, Katsunori FUJIKURA, Eriko SEO, Yoshimi TAKAHASHI (JAMSTEC)

Satoshi MITARAI, Maiko TAMURA (OIST)

1) Background: Deep-sea chemosynthetic animal community is one of the flourish communities in the world while they are inhabited in the ephemeral environment such as hydrothermal vent field and methane seep. The growth

rate of the chemosynthetic animal communities must be one of the important factors when we estimate how the flourish community has been established in deep-sea. The growth line, which can be found in the hard parts of the animals such as shells and bones, is usually formed constantly like clock, and widely used for the studies to estimate growth rates. In the present research, we try to estimate growth rate of the dominant animals (e.g. *Calyptogena* clams and *Bathymodiolus* mussels) in the hydrothermal vent and methane seep communities in deep-sea around Japan.

2) Methods: In this cruise, we carried out both of *in situ* experiments for staining the growth line of the shelled animals in the methane seep sites in Sagami Bay. In the *in situ* experiment, we recovered totally three staining boxes which had been deployed on the two *Calyptogena okutanii* and a single *Bathymodiolus platifrons* assemblages in the hydrothermal vent fields in Iheya Ridge site, Okinawa Trough, Japan, since NT10-17 cruise. These clams and mussels were stained with calcein and strontium chloride *in situ* by ROV *Hyper-Dolphin*. The staining boxes were opened after approximately 17 hours after deployment as clasps were eroded, and the clams and mussels were incubated under *in situ* conditions for about four months. After this cruise, the stained bivalves were dissected in laboratory and processed for the growth-line analyses under microscopes.

3) Expecting Results and Future Studies: We expect to estimate the growth rates of the clams and mussels collected from the hydrothermal vent fields in Iheya Ridge, through the growth-line analyses in laboratory. With the counterpart result from the same growth-line analyses in the methane seep site in Sagami Bay carried out in NT10-19 and KY11-01 cruises, we will figure out the differences in growth manners of *Calyptogena* clams and *Bathymodilus* mussels in between hydrothermal vent and methane seep environments.

3-1-3. Determine the time scale of deep sea hydrothermal activities by ESR

Fumihiko Sato (Okayama University of Science)

Purpose of the study

It is an important issue to determine the time scale of deep sea hydrothermal activities. We have studied ESR (electron spin resonance) dating of barite which is a mineral formed in hydrothermal sulfide deposits. ESR detects unpaired electrons which are created by natural radiation. The natural accumulated doses are estimated from the amount of unpaired electrons measured by ESR. Then, the doses are divided by the natural dose rate to deduce the age. In the course of this dating procedure, we have found that estimation of the natural dose rate from outside of the mineral may have problems. It is necessary, therefore, to make actual measurements of external dose rate in the sea bottom with hydrothermal activities.

In addition to ESR dating, OSL (optically stimulated luminescence) is another possible dating method. OSL is the light near UV emitted from quartz by stimulation with green or blue light. The stimulating light evicts trapped electrons, which are created by natural radiation. When the trapped electrons recombine with electronic holes, lights with shorter wavelength are detected. This method is widely used for dating of sediments but has never been used to date sediments related to deep sea hydrothermal activities.

The performance during the dives. We employed OSL dosimeters placed in titanium tubes to make actual measurement of the external dose at the sea bottom. The dosimeters were placed at Iheya-Outi on Sep. 14, 2010 at NT10-17 cruise. In the present dive HPD#1246, the dosimeters were recovered.

The sea bottom external doses were also measured by a NaI scintillation gamma ray detector. The NaI crystal emits lights when it received gamma rays. The lights are converted to electrons which are subsequently amplified electronically. The energy of the gamma ray is measured as the height of the electronic pulse. The detection system records the energies and number of gamma rays which correspond to the kind of radioactive nuclei and their amounts.

Two sediment cores were successfully taken at HPD#1245 and one at HPD#1246 by MBARI corer for OSL analysis.

Future plans

After taking out the OSL dosimeters of the titanium tubes, doses will be measured by OSL together with those for background. The gamma ray spectra will be analyzed with specific software to obtain the natural gamma ray dose rate and the concentrations of the radioactive nuclei. The consistency of the doses with OSL and NaI will be discussed.

Quartz will be extracted from sediment cores for OSL dating. The natural accumulated doses will be obtained by the OSL method. The radioactive nuclei in the sediments will be analyzed with a low background gamma ray spectrometer to estimate the dose rate. The ages will be calculated by dividing the OSL doses by the dose rates.

3-1-4. Simultaneous measurements on hydrothermal plume using multiple in-situ sensors

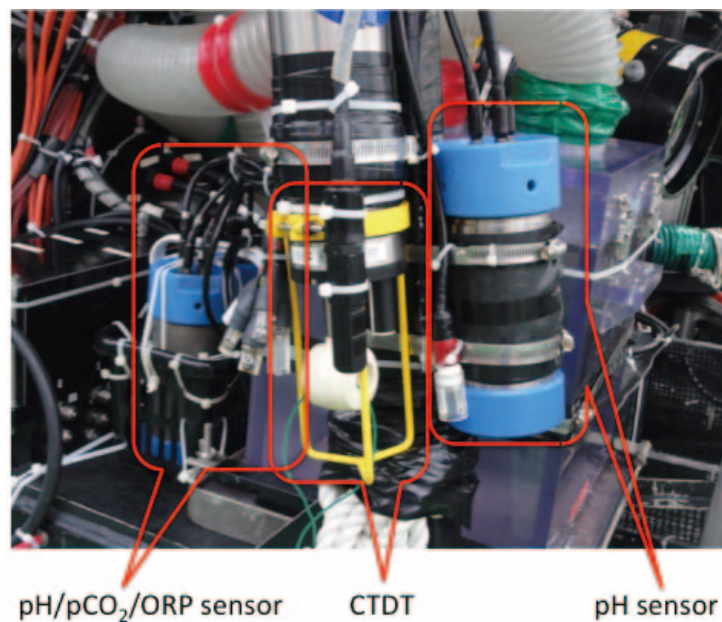
1. Introduction

In this cruise, we aimed to contribute the plume mapping by simultaneous measurement with multiple in-situ sensors of such parameters as pH, pCO₂ (partial pressure of CO₂), ORP (Oxidation-reduction Potential), conductivity, temperature, depth, turbidity. Especially, we newly prepared the communication system through Hyper Dolphin E/O (Electric/Optic) telemetry for real time monitoring on pH, pCO₂, ORP.

2. Method and Result

2.1 pH, pCO₂, ORP, CTD, Turbidity measurements

CTDT (Conductivity, Temperature, Depth and Turbidity) sensor consists of CTD (Maker: FSI) and Turbidity sensor (Maker: Sea Point). This system was connected to a PC in a control room on a ship through a cable. Through this link, salinity, temperature, depth, turbidity can be monitored in real time. Two pH/pCO₂/ORP sensors and pH sensor (Fig. X1) also were mounted on the right-front area of Hyper Dolphin. The pH/pCO₂ sensor used a non-glass type pH electrode, ion-sensitive field-effect transistor (ISFET), and the ORP sensor employed Pt wire as a working electrode. These sensors applied a



chloride ion selective electrode (Cl-ISE) as the reference electrode. In this cruise, one pH/pCO₂/ORP sensor

Fig. X1 Apparatus of in-situ sensor (pH/pCO₂/ORP sensor, CTD, pH sensor).

Fig.X2 shows one of results on pH measurements. This data was calibrated on board with the sea water based standard (AMP: 6.786, TRIS: 8.089). The left side of curve is on dive #1245, and the right on dive #1246. All data on pH was clearly obtained.

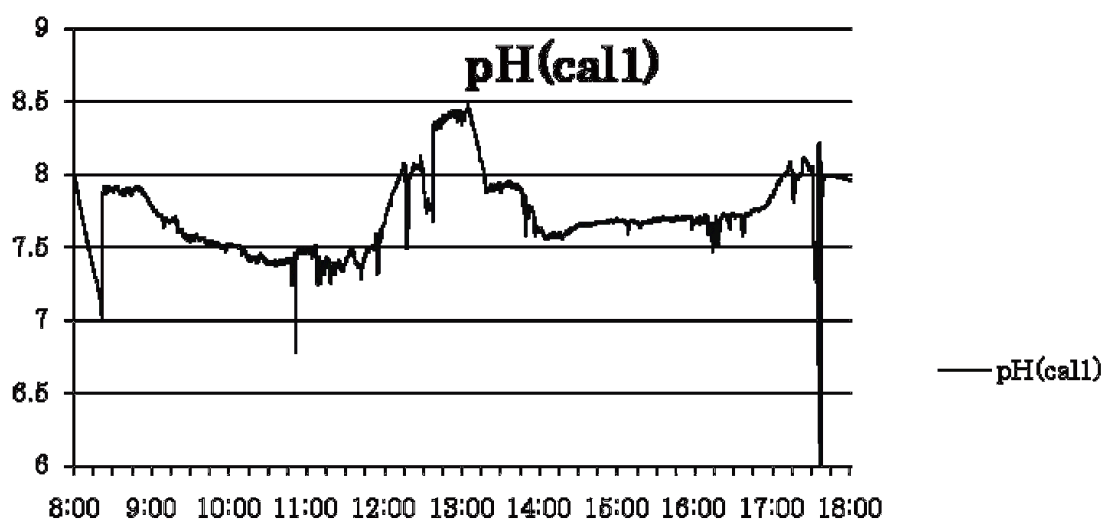


Fig. X2 One example of pH measurement results.

2.2 Rn measurement

In-situ Rn (gamma rays) sensor (Fig. X3) using a NaI(Tl) doped plastic scintillator was installed to HPD. Fig.X3 shows the apparatus of Rn sensor which was installed on the back side of Hyper Dolphin.



Fig.X3 Apparatus of Rn sensor.

3. Future plan

In this cruise, we could confirm both of the new real-time monitoring system for pH/pCO₂/ORP sensors and the existing stand-alone pH sensor worked successfully. However, in the next step, it is necessary to improve on the

display indication software of real-time monitoring for more convenient operation, and also clarify some unknown communication failures which was occurred while multiple connections with other serial port. Processing the data obtained, we are building the contour map by combining with the position data of Hyper-Dolphin. Moreover, we still continue to develop on each sensor, especially chemical sensors for more redundant and functionalized, which enable to be applied for deep sea survey using not only ROV, and also AUV, in order to contribute for wider field on oceanography.

3-1-5. Study on ichthyo-fauna around Iheya Ridge

Hitoshi Ida (School of Marine Life Sciences, Kitasato University)

Objective:The present study aims to clarify the fish fauna formed in the vicinity of hydro-thermally active areas.

Materials & methods: Materials used in this study were underwater photography and specimens taken by slurp gun(suction hose)

Result: The following four fish groups were observed during the survey, KY11-02 leg2.

1. Chimaeridae sp (photo)
2. Anguilliformes sp (photo)
3. Liparidae sp (photo)
4. Zoarcidae sp One individual was collected by slurp gun.

Detailed analysis will be done in laboratories.

3-1-6. Long-term rearing of deep-sea hydrothermal vent animals.

M. Kitada, M. Kitajima: Enoshima Aquarium

We have collected Goemon-Koshiori-Ebi (*Shinkaia crosnieri*), Alvinocaridid shrimps (*Alvinocaris* spp.), *Bathymodiolus* spp., *Provanna* sp. and *Zoarcidae* sp. in vent areas, Iheya Ridge to cultivate and display at our aquarium.

S. crosnieri and *A.* spp. was a dominant and high population density species in the vent field, but population density of Zoarc fish was not high.

Especially, population density of *S. crosnieri* was higher than other above species.

These animals are being cultivated in Enoshima Aquarium. The tank is displayed in the image of Knoll hydrothermal vent areas with real chimney and estimated particular system. In this system, water temperature is kept about 3°C, in addition, hot water including sulfide is ejected from inside one of the displayed chimney and CO₂ bubble is added in the tank. We've been trying to make the observation of these animal behaviors for a long time. In the future, we would like to have these animals breed in our aquarium.

And we released 5 stories of "My traveling diaries" from Enoshima Aquarium's web-page everyday. When many customers accessed the web contents, They can study and understand for fun our institutes and researches on board.



Chemosynthesis ecosystem tank

3-2. List of Observation Instruments

Slurp gun (Suction sampler) with 6 canisters or single canister.

Scoop sampler

MBARI core

Gamma-ray sensor

CTDT (Conductivity, Temperature, Depth and Turbidity) sensor

pH/pCO₂/ORP sensors

pH sensor

In-situ Rn (gamma rays) sensor

3-3. Cruise Log

KY11-02 Leg.2 Shipboard Log:

Date Time Log

2011/2/9

Position: 26-14.2N, 127-40.8E / Weather: fine but cloudy / Wind direction: North/ Wind force:

3/ Wave: 1 m/ Swell: 0 m/ Visibility: 7 nautical miles (12:00 JST)

14:00 Onboard

15:00 Departure from NAHA

15:45 Briefing about ship's life and safety

17:00 Proceeding to the survey area (OKINAWA Trough)

2011/2/10

Position: 27-33.0N, 126-58.2E / Weather: cloudy / Wind direction: ESE / Wind force: 5/ Wave:

3 m/ Swell: 2 m/ Visibility: 6 nautical miles (12:00 JST)

00:30 Arrived at the survey area (OKINAWA Trough)

06:00 Released XBT at 27-33.00N, 126-55.17E

08:22 Launching HPD (HPD#1245)

09:28 HPD landing (1402m)

11:39 HPD leave the bottom (1402m)

12:31 HPD on deck

13:18 Launching HPD (HPD#1246)

15:08 HPD landing (1400m)

16:37 HPD leave the bottom (1398m)

17:26 HPD on deck

17:30 Departure from survey area (OKINAWA Trough)

17:35 Proceeding to NAGO WAN(due to avoiding rough sea)

2011/2/11

Position: 26-23.5N, 127-39.5E / Weather: overcast / Wind direction: NNW/ Wind force: 7/

Wave: 5m/ Swell: 4 m/ Visibility: 5 nautical miles (12:00 JST)

06:30 Arrived at NAGO WAN

10:10 Departure from NAGO WAN (due to avoiding rough sea)

16:45 Arrived at NAKAGUSUKU WAN

2011/2/12

Position: 26-14.2N, 127-51.6E / Weather: cloudy / Wind direction: NNW/ Wind force: 7/
Wave: 4m/ Swell: 1 m/ Visibility: 6 nautical miles (12:00 JST)

15:00 Departure from NAKAGUSUKU WAN

15:05 Proceeding to NAHA

2011/2/13

Position: 26-14.2N, 127-40.8E / Weather: cloudy / Wind direction: NNW/ Wind force: 4/
Wave: 1m/ Swell: 0 m/ Visibility: 6 nautical miles (12:00 JST)

09:20 Arrival at NAHA

09:30 KY11-02 Leg.2 finished

3-4. Dive Report

KY11-02 Leg.2 HD#1245 Dive Report

Date: 2011/2/10

Observer: Hiromi WATANABE (JAMSTEC)

Pilot: Yuta SAKAKIBARA, Ryo SAIGO

Objective: Estimation of growth rate of bivalves in hydrothermal vent field

Diving site: Iheya Ridge, Okinawa Trough

Landing Point: 27°32.9856'N, 126°58.2020'E, 1402m deep

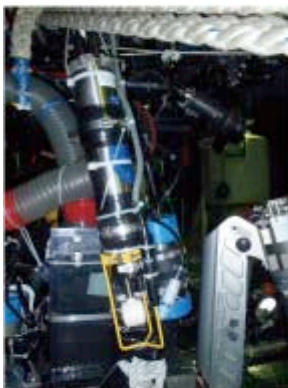
Leaving Point: 27°32.9935'N, 126°58.1595'E, 1402 m deep

Dive Summary:

ROV *Hyper-Dolphin* landed on muddy seafloor around landing target (1402m depth). The ROV sampled MBARI core (blue) where the no clam shells distributed. The ROV headed to HD1183-2 marker to retrieve one of the boxes deployed on *Calyptogena* colony during NT10-17 cruise, to stain and incubate *Calyptogena* for about four months. After observation of the deployed box, Gamma-ray around the box was measured and a core of sediment was collected (MBARI core in red). The deployed box was retrieved and the clams in the box were also collected to the sampling box (large) by scoop sampler. With *Calyptogena* clams (probably *C. okutanii*), we could observe many *Alvinocaris* shrimps but did not collected them. Then, the ROV headed to HD1183-2 marker to retrieve the box deployed in the *Bathymodiolus* colony. A clear boundary between muddy and rocky seafloor could be observed on the way to HD1183-2 marker. The marker and box, together with in situ microbe incubating unit GALI-6, were deployed beside of shimmering vent. Just above the vent, *Alaysia* tubeworms were aggregated. Some *Bathymodiolus*, *Bathymacmaea*, *Lepetodrilus* and *Provanna* gastropods, *Shinkaia* crab and *Alvinocaris* and *Lebbeus* shrimps were sparsely distributed around the vent. Firstly, GALI-6 was retrieved into the small sampling box, and the box including *Bathymodiolus* mussels stained during NT10-17 cruise was retrieved. Finally, a part of the animals assemblages around the vent was collected by suction sampler, and the ROV left the bottom.

Payload:

HD#1245



Dive Result:

ハイパードルフィン 3000 潜航記録

平成 23 年 KY11-02 行動

記載者 榎原 佑太

潜航年月日 2011/02/10

位置 作図中心位置

潜航回数 3回

緯度 27° 33.000 ' N

通算潜航回数 1245回

経度 126° 58.200 ' E

WGS-84

潜航海域 伊平屋海嶺

潜航目的 調査潜航 「貝殻から熱水活動噴出を推定する」

調査主任 三宅 裕志

Pilot 榎原 佑太

ビークル指揮 大野 芳生

Co. Pilot 西郷 亮

作業経過時刻	
吊 揚	08:17
着 水	08:22
潜航開始	08:32
着 底	09:28
離 底	11:39
浮 上	12:20
揚収完了	12:31

累計時間	
潜航時間	3:48
通算潜航	5926:55
ケーブル	ケーブルNo. 5
	使用時間 4:14
	通算時間 210:9

気象・海象

天候	風向	風力	風浪	うねり	視程
c	ESE	5	2	2	6

最大潜航深度 1402 m

着底深度 1402 m

着底底質 泥

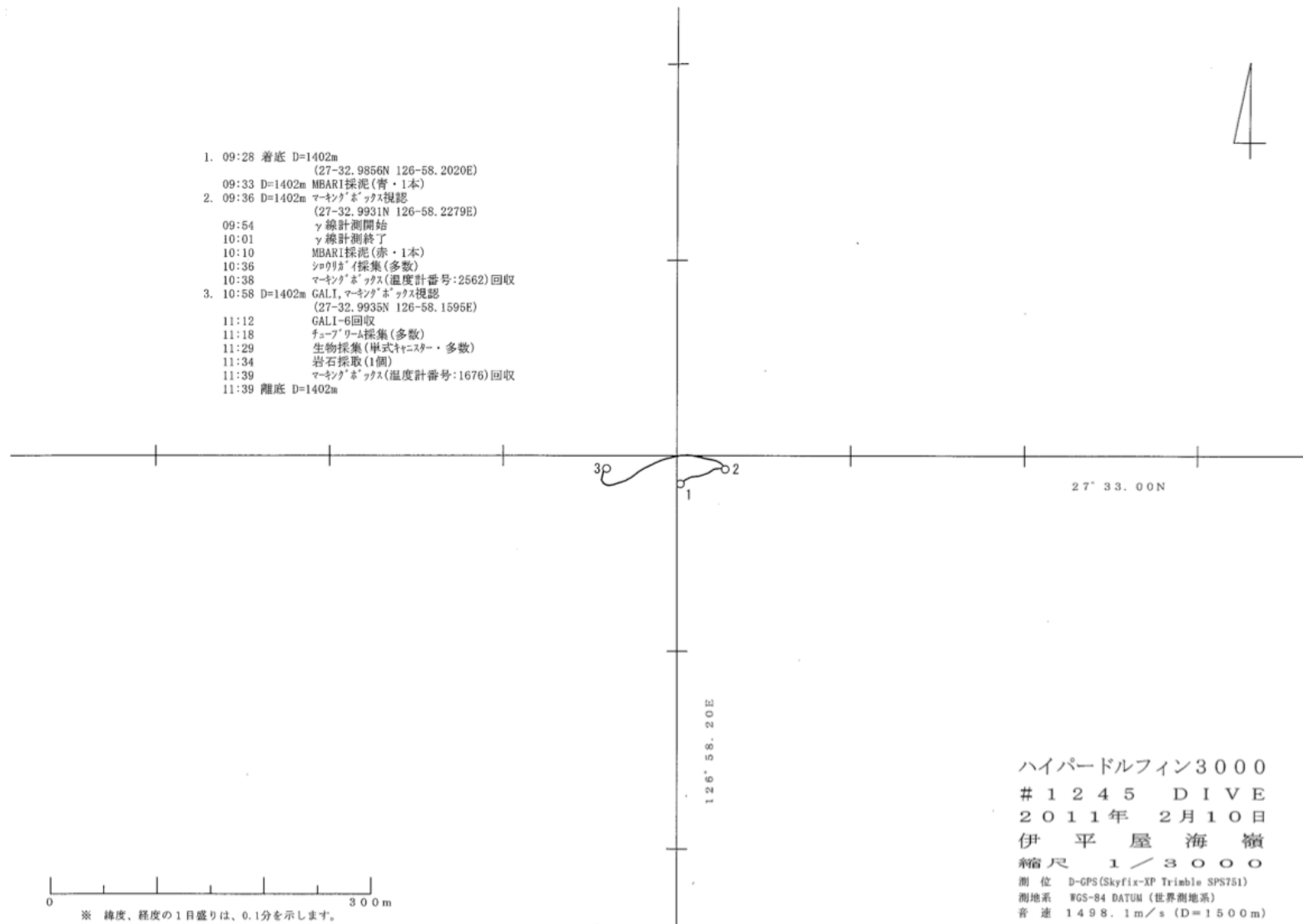
離底深度 1402 m

離底底質 岩盤

記事 染色ボックス、GALIの回収及び採泥、生物採集を行った。

Dive Track:

1. 09:28 着底 D=1402m
(27-32.9856N 126-58.2020E)
- 09:33 D=1402m MBARI採泥(青・1本)
2. 09:36 D=1402m マーキングボックス視認
(27-32.9931N 126-58.2279E)
- 09:54 ヲ線計測開始
- 10:01 ヲ線計測終了
- 10:10 MBARI採泥(赤・1本)
- 10:36 シロリタイ採集(多数)
- 10:38 マーキングボックス(温度計番号:2562)回収
3. 10:58 D=1402m GALI, マーキングボックス視認
(27-32.9935N 126-58.1595E)
- 11:12 GALI-6回収
- 11:18 チョーブワーム採集(多数)
- 11:29 生物採集(単式キャニスター・多数)
- 11:34 岩石採取(1個)
- 11:39 マーキングボックス(温度計番号:1676)回収
- 11:39 離底 D=1402m



ハイパードルフィン3000
#1245 DIVE
2011年 2月10日
伊平屋海嶺
縮尺 1/3000
測位 D-GPS(Skyfix-XP Trimble SPS751)
測地系 WGS-84 DATUM (世界測地系)
音速 1498.1m/s (D=1500m)

KY11-02 Leg.2 HD#1246 Dive Report

Date: 2011/2/10

Observer: Hiroshi MIYAKE (Kitasato University)

Pilot: Kazuki IIJIMA, Jun TAKENOUCHI

Objective: Estimation of growth rate of bivalves in hydrothermal vent field

Diving site: Iheya Ridge, Okinawa Trough

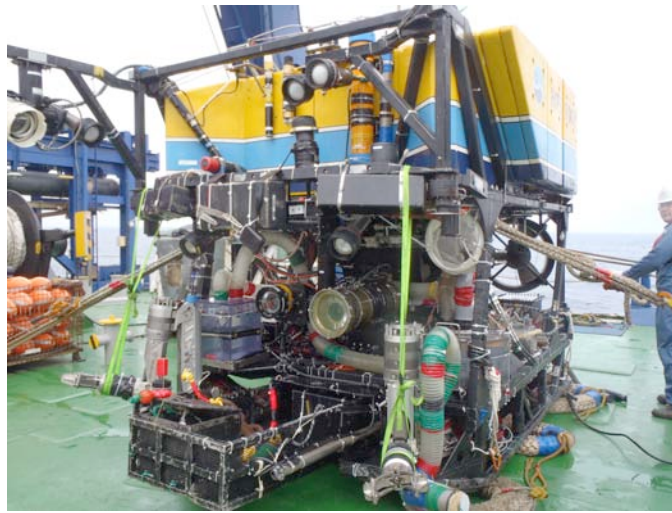
Landing Point: 27°32.9809'N, 126°58.1992'E, 1400m deep

Leaving Point: 27°33.0054'N, 126°58.1745'E, 1398 m deep

Dive Summary:

During descending to the bottom, plankton samplings for collecting vent animals larvae in the # 2 canister and plume mapping were conducted at depths of 1318m where hydrothermal vent plume was observed. After plume mapping, vent animals larvae between vent plume and bottom were collected in the #3 canister. ROV *Hyper-Dolphin* landed in front of HD1183-3 marker and a marking box deployed on *Calyptogen*a colony during NT10-17 cruise, to stain and incubate *Calyptogen*a for about four months. After observation of the deployed box, Gamma-ray around the box was measured and a core of sediment was collected (MBARI core in red). The deployed box was retrieved and the clams in the box were also collected to the sampling box (large) by scoop sampler. With *Calyptogen*a clams (probably *C. okutani*i), we could observe and collect Alvinocaris shrimps around *Calyptogen*a colony. Then the ROV run to look for vent area for sampling vent animals. Small vent area was found and Shinkaia crosnieri and Bathymodiolus mussels were collected by slurp gun, and the ROV left the bottom.

Payload:



Dive Result:

ハイパードルフィン 3000 潜航記録

平成 23 年 KY11-02 行動

記載者 飯嶋 一樹

潜航年月日 2011/02/10

位置 作図中心位置

潜航回数 4回

緯度 27° 33.000 ' N

通算潜航回数 1246回

経度 126° 58.200 ' E

WGS-84

潜航海域 伊平屋海嶺

潜航目的 調査潜航 「貝殻から熱水活動噴出を推定する」

調査主任 三宅 裕志

Pilot 飯嶋 一樹

ビークル指揮 大野 芳生

Co. Pilot 竹ノ内 純

作業経過時刻	
吊 揚	13:14
着 水	13:18
潜航開始	13:28
着 底	15:08
離 底	16:37
浮 上	17:16
揚収完了	17:26

累計時間	
潜航時間	3:48
通算潜航	5930:43
ケーブル	ケーブルNo. 5
	使用時間 4:12
	通算時間 214:21

気象・海象

天候 o	風向 SE	風力 5	風浪 2	うねり 2	視程 5
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最大潜航深度 1402 m

着底深度 1400 m

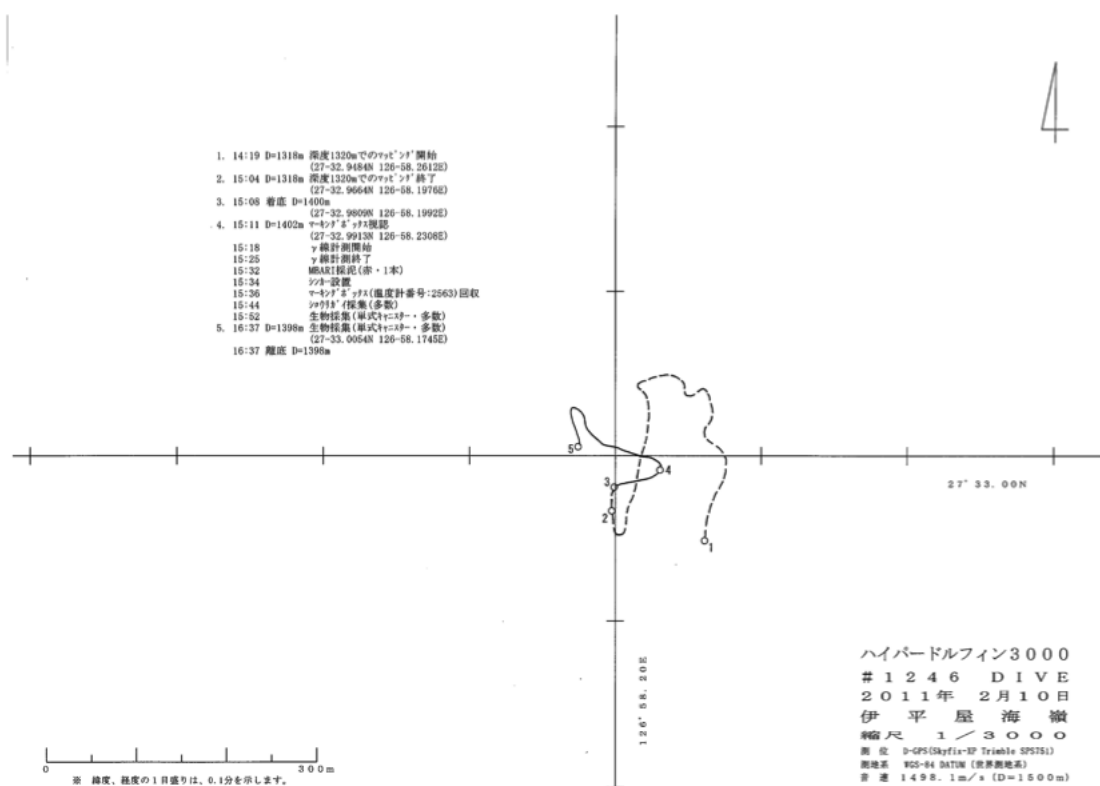
着底底質 泥

離底深度 1398 m

離底底質 岩盤

記事 染色ボックスの回収及び採泥、生物採集を行った。

Dive Track:



No.	On Insect ID	Dye No. (Starch No./Triazine Line Name)	Sample Name (English) / (Scientific Name)	Japanese Name	Archetype (Length, Color, Shape, etc.)	Sampling Method	Fishes	Preservation	Sampling Recorder	Collector Person	Latitude (deg, min, sec)	Longitude (deg, min, sec)	Depth (m)	Date Collected			Remarks	Photo
														Year	Month	Day		
	船上で採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	海産動物(海産生物)の採集	
1	1345-1	HPO-M1345	<i>Oxypterus siluratus</i>	シマエシロウガイイ	K. Fajhure	8	Manipulator	Frozen	Frozen	K. Fajhure	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.2719	E 1402.2011.2	10.16.10	
2	1345-2	HPO-M1345	<i>Bethyllumidius platensis</i>	ヘイトウシロカヒカリガイ	K. Fajhure	8	Hydring Box	Frozen	Frozen	K. Fajhure	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
3	1345-3	HPO-M1345	<i>Bethyllumidius aculeatus</i>	ツバノワタシロコノアヒガサガイイ	K. Fajhure	8	Hydring Box	Frozen	Frozen	K. Fajhure	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
4	1345-4	HPO-M1345	<i>Leptocorbularia</i>	キルノフカサガイ	K. Fajhure	8	Hydring Box	Frozen	Frozen	K. Fajhure	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
5	1345-5	HPO-M1345	<i>Leptocorbularia</i>	キルノフカサガイ	K. Fajhure	many	Hydring Box	Frozen	Frozen	K. Fajhure	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
6	1345-6	HPO-M1345	<i>Tumidus</i> genus sp.		H.Watanabe	2	Manipulator	03.1362m	03.1362m	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.2719	E 1402.2011.2	10.16.10	
7	1345-7	HPO-M1345		コムシ	H.Watanabe	10	Manipulator	03.1362m	03.1362m	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.2719	E 1402.2011.2	10.16.10	
8	1345-8	HPO-M1345	<i>Polysiphonia</i> genus sp.	多毛藻類植物	H.Watanabe	3	Manipulator	03.1362m	03.1362m	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.2719	E 1402.2011.2	10.16.10	
9	1345-9	HPO-M1345	<i>Chloridion</i> genus sp.	クロヒトツ	H.Watanabe	1	Manipulator	03.1362m	03.1362m	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.2719	E 1402.2011.2	10.16.10	
10	1345-10	HPO-M1345	<i>Solenidion</i> genus sp.	スズランガイ	H.Watanabe	11	Manipulator	03.1362m	03.1362m	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.2719	E 1402.2011.2	10.16.10	
11	1345-11	HPO-M1345	<i>Laurocypis</i> sp.		H.Watanabe	1	Manipulator	03.1362m	03.1362m	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.2719	E 1402.2011.2	10.16.10	
12	1345-12	HPO-M1345		短な生き物	H.Watanabe	1	Manipulator	03.1362m	03.1362m	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.2719	E 1402.2011.2	10.16.10	
13	1345-13	HPO-M1345	<i>Polysiphonia</i> sp.	藻類動物	H.Watanabe	1	Manipulator	03.1362m	03.1362m	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.2719	E 1402.2011.2	10.16.10	
14	1345-14	HPO-M1345	<i>Apicalisiphonia</i>		H.Watanabe	3	Manipulator	alive		H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.2719	E 1402.2011.2	10.16.10	
15	1345-15	HPO-M1345	<i>Bethyllumidius platensis</i>	ヘイトウシロカヒカリガイ	Y.Takahashi	20	Manipulator	03.1362m	03.1362m	Y.Takahashi	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
16	1345-16	HPO-M1345	<i>Bethyllumidius platensis</i>	ヘイトウシロカヒカリガイ	Y.Takahashi	3	Manipulator	10% Formalin	20% Ethanol	Y.Takahashi	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
17	1345-17	HPO-M1345	<i>Polysiphonia</i> sp.	ワコムシ	Y.Takahashi	4	Manipulator	2.1%グルーアルブミンD		Y.Takahashi	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
18	1345-18	HPO-M1345		ヒザラガイ	H.Watanabe	1	Manipulator	03.1362m	03.1362m	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
19	1345-19	HPO-M1345		タウフシロガイ	H.Watanabe	2	Manipulator	03.1362m	03.1362m	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
20	1345-20	HPO-M1345	<i>Bethyllumidius platensis</i>	ヘイトウシロカヒカリガイ	Y.Takahashi	8	Slurp gun	10% Formalin	20% Ethanol	Y.Takahashi	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
21	1345-21	HPO-M1345	<i>Polysiphonia</i> sp.	ワコムシ	Y.Takahashi	many	Slurp gun	03.1362m	03.1362m	Y.Takahashi	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
22	1345-22	HPO-M1345	<i>Polysiphonia</i> sp.	ワコムシ	Y.Takahashi	many	Slurp gun	03.1362m	03.1362m	Y.Takahashi	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
23	1345-23	HPO-M1345	<i>Bethyllumidius platensis</i>	ヘイトウシロカヒカリガイ	Y.Takahashi	many	Slurp gun	03.1362m	03.1362m	Y.Takahashi	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
24	1345-24	HPO-M1345	<i>Leptocorbularia</i>	キルノフカサガイ	H.Watanabe	12	Slurp gun	10% Formalin	20% Ethanol	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
25	1345-25	HPO-M1345	<i>Leptocorbularia</i>	キルノフカサガイ	H.Watanabe	51	Slurp gun	10% Formalin	20% Ethanol	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
26	1345-26	HPO-M1345	<i>Leptocorbularia</i>	キルノフカサガイ	H.Watanabe	26	Slurp gun	03.1362m	03.1362m	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8521	N 126.55.1915	E 1402.2011.2	10.11.10	
27	1348-1	HPO-M1348	<i>Oxypterus siluratus</i>	シマエシロウガイイ	K. Fajhure	8	Manipulator	Frozen	Frozen	K. Fajhure	North Knoll of the Days Ridge	Chowee	27	23.8513	N 126.55.2306	E 1402.2011.2	10.15.44	
28	1348-2	HPO-M1348	<i>Solenidion</i> genus sp.	スズランガイ	H.Watanabe	15	Manipulator	Frozen	Frozen	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8513	N 126.55.2306	E 1402.2011.2	10.15.44	
29	1348-3	HPO-M1348		コムシ	H.Watanabe	1	Manipulator	03.1362m	03.1362m	H.Watanabe	North Knoll of the Days Ridge	Chowee	27	23.8513	N 126.55.2306	E 1402.2011.2	10.15.44	

[illegible]

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 Integration and Analysis Group (DIAG) of JAMSTEC.

5. Appendix

クルーズサマリー

航海情報

航海番号：KY11-02 Leg. 2

船舶名：かいよう／ハイパードルフィン

航海名称：「熱水性生物の幼生分散と生物多様性について」

「貝殻から熱水噴出活動を推定する」

主席研究者：三宅裕志（北里大学海洋生命科学部）

課題提案者：三宅 裕志（北里大学）

課 題 名：「熱水性生物の幼生分散と生物多様性について」

課題提案者：渡部 裕美（海洋研究開発機構・海洋・極限環境生物圏領域）

課 題 名：「貝殻から熱水活動噴出を推定する」

航海期間：2011. 2. 9 - 2011. 2. 13

出港地：那覇．帰港地：那覇

調査海域名：沖縄トラフ：伊平屋海嶺

調査概要

沖縄トラフの南奄西海丘、伊平屋海嶺、伊是名海穴の3カ所を3日間で調査を行う予定であったが、天候不順のため初日の潜航だけになった。出港時にすでに初日も潜航時間短縮もあり得ると言うことで、研究目標の最も成果があがるとおもわれる課題である伊平屋海嶺での「貝殻から熱水噴出活動を推定する」を優先した。2潜航行い、先の航海ですでに設置済みの現場飼育ケージを3個回収し、最低限のプルームマッピングを行いながらのプランクトン幼生サンプリングおよび熱水周辺の生物のサンプリングを行った。

Cruise Summary

Cruise Information

Cruise ID : KY11-02 Leg.2

Name of Vessel: R/V Kaiyo & ROV Hyper-Dolphin

Title of the Cruise:

“Larval dispersion and biodiversity of hydrothermal vent animals”

“Estimation of hydrothermal activities using growth line on bivalve shells”,

Chief Scientist: Hiroshi MIYAKE (JAMSTEC)

Cruise Period : 2011.2.9 – 2011.2.13

Port of Call : Naha - Naha

Research Area : Iheya Ridge, Okinawa Trough

Overview of the Observation

Only one site, Iheya Ridge was surveyed because of rough sea condition during our cruise, though we planned to survey three sites, Minami Ensei Knoll, Izena and Iheya Ridge. Two dives of ROV Hyper-Dolphin were carried out to recover three staining boxes which had been deployed on the two *Calyptogenia okutanii* and a single *Bathymodiolus platifrons* assemblages in the hydrothermal vent fields in Iheya Ridge site, Okinawa Trough, Japan, since NT10-17 cruise with collection of plankton and vent animals and mapping plume around vent site on Iheya Ridge.