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RV Natsushima Cruise Report
NT11-09

Hyper-Dolphin 3000 Dive Research

Myojin Knoll, Suiyo Seamount (Izu-Ogasawara Area)
Off Hatsushima (Sagami Bay)

June15, 2011-June 26, 2011

Chief Scientist

Koji INOUE

(The University of Tokyo)

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

●**Contents**

1. CRUISE INFORMATION

1) Cruise ID: NT11-09

2) Name of vessel: R/V Natsushima

3) Title of the cruise: FY2011 Hyper-Dolphin 3000 Dive Research

4) Title of proposal

Studies on mechanisms of hypotraurine synthesis and its role in adaptation to sulfides in hydrothermal vent-specific organisms. (K. Inoue)

Culture experiment of *Paralvinella hessleri* in different temperature, and cDNA cloning of heat resistance relating gene. (T. Mori)

The analyses of symbiosis mechanism by in situ PLA technique and the symbiotic-specific monoclonal antibody library in connection with the *Calyptogena* symbiosis. (Y. Nakamura)

Is it universal phenomenon for the hydrothermal vent community to detoxify hydrogen sulfide using thiotaurine?: Study on correlation between hydrogen sulfide concentration and the amount of amino acids. (T. Koito)

Immune defense system of deep-sea hydrothermal-vent mussels belonging to *Bathymodiolus*. (K. Ohishi)

5) Cruise period

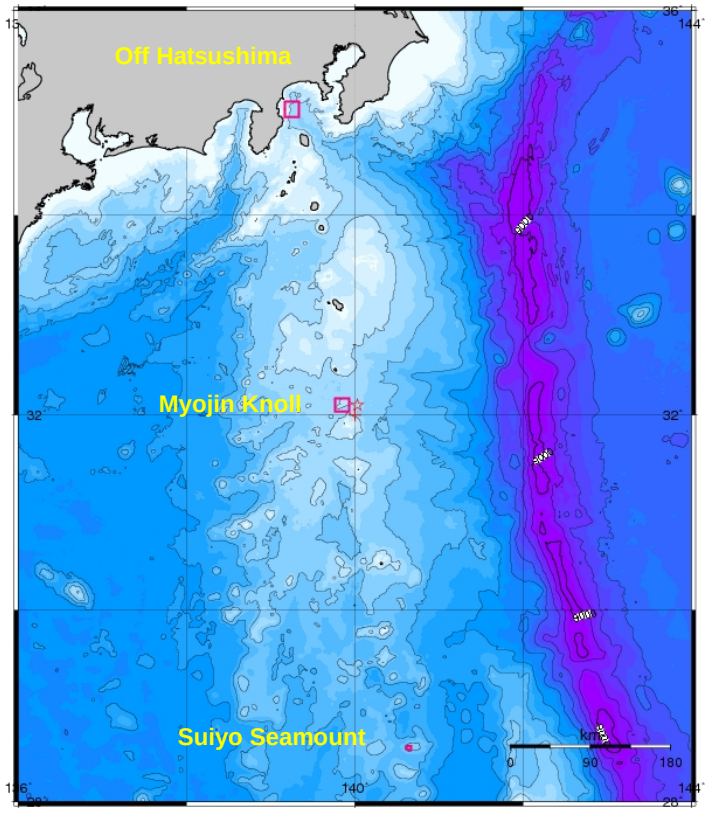
June 15, 2011-June 26, 2011

6) Ports of call

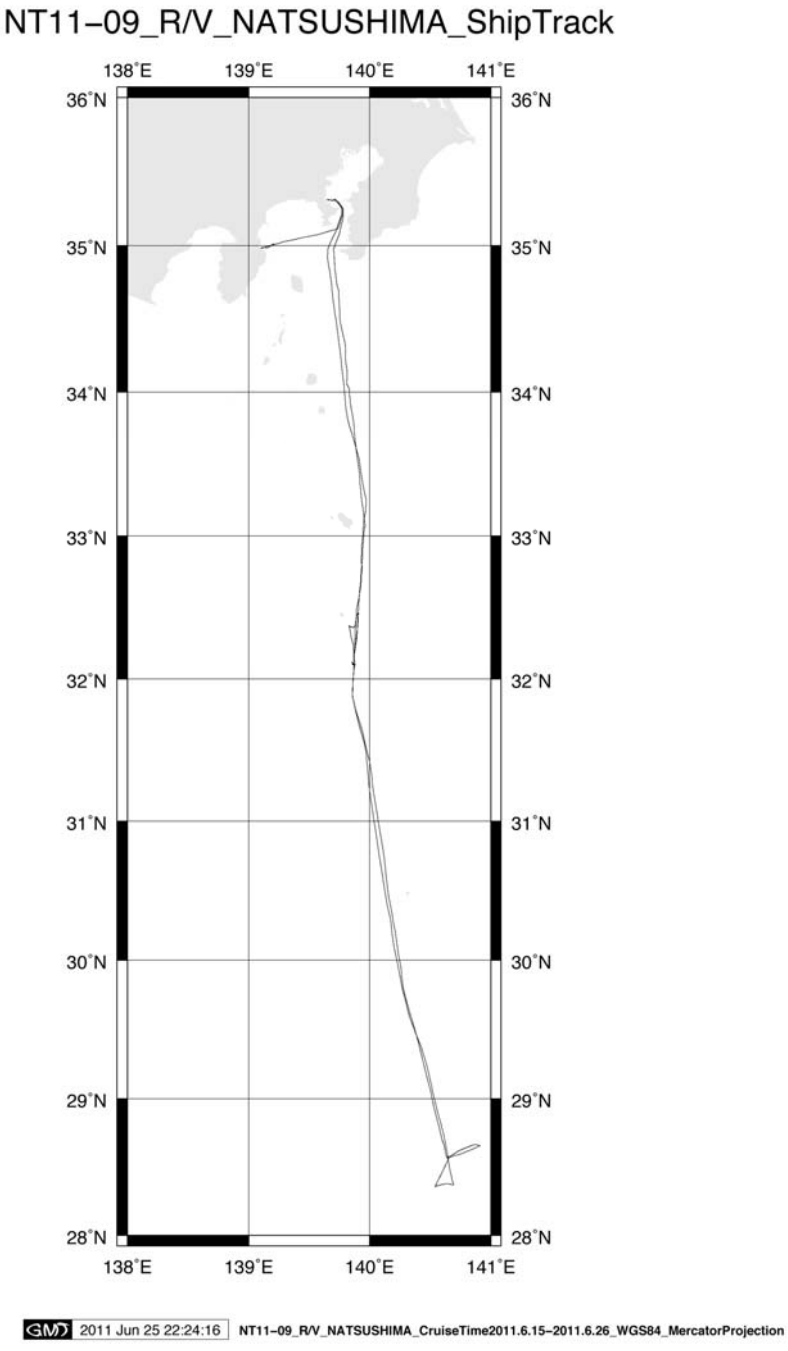
Yokosuka (JAMSTEC) to Yokosuka (JAMSTEC). (Change of Scientists on June 23 at Yokosuka)

7) Research area

Izu-Bonin Area (Myojin Knoll and Suiyo Seamount), Sagami Bay (Off Hatsushima)



Research Area of NT11-09



Cruise track of NT11-09

2. RESEARCHERS

1) Chief scientist:

Koji INOUE [Atmosphere and Ocean Research Institute (AORI), The University of Tokyo]

2) Representative of the Science Party

Koji INOUE [AORI, The University of Tokyo]
Tsukasa MORI [Nihon University]
Yoshimitsu NAKAMURA [JAMSTEC]
Tomoko KOITO [Nihon University]
Kazue OHISHI [JAMSTEC]

3)Member of the science party (on board)

Ryusaku DEGUCHI (Miyagi Educational University)
Koji INOUE (AORI, The University of Tokyo)
Yuki HONGO (JAMSTEC)
Azusa KINJO (AORI, The University of Tokyo)
Madoka KITAJIMA (Enoshima Aquarium)
Wen LIU (Kyoto University)
Satomi MINAMIZAWA (Nippon Marine Enterprises, Ltd., Observation Technician)
Yoshimitsu NAKAMURA (JAMSTEC)
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Suguru NEMOTO (Enoshima Aquarium)
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Daisuke SEKINE (JAMSTEC)
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Akihiro TAME (Marine Work Japan)
Haruhiko TOYOHARA (Kyoto University)
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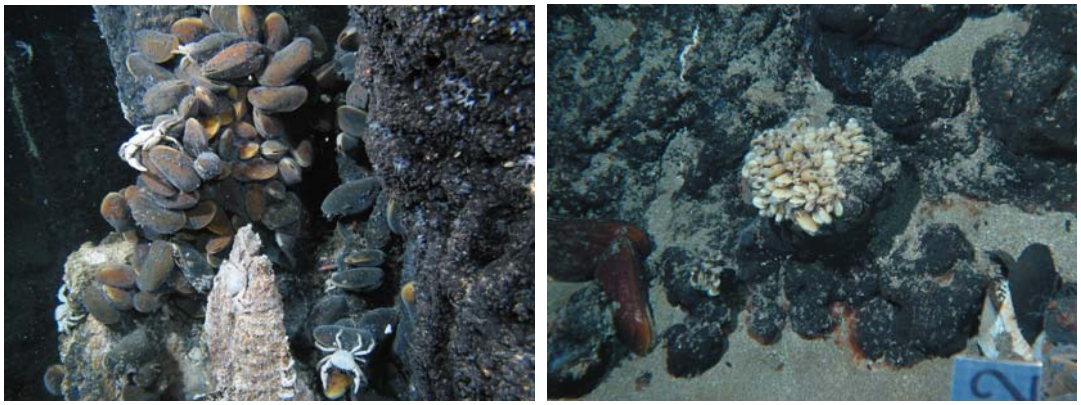
Shosei YAMAGAMI (Okayama University)
Yu YAMAMOTO (AORI, The University of Tokyo)
Takefumi YORISUE (AORI, The University of Tokyo)
Takao YOSHIDA (JAMSTEC)

Science parties of NT11-09. First leg (upper) and second leg (lower).

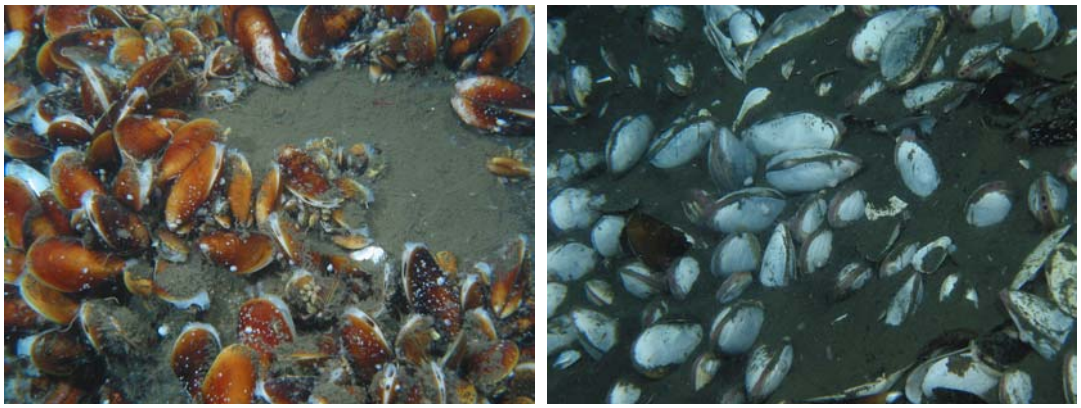
3. OBSERVATION

1) Overview of the cruise

In this cruise, two days of researches were performed at each of three areas, Myojin Knoll, Suiyo Seamount, and Off Hatsushima (6 days in total). Five research groups participated to this cruise. As the total number of scientists who wanted to join the cruise was more than the number of the bed of Natsushima, we divided the cruise into two legs; first one is to Izu-Ogasawara (Bonin) and the other one to Off Hatsushima. We replaced some members after the first leg completed. As shown in the later sections, the research subjects of the five groups were physiological, biochemical or molecular-biological studies of hydrothermal vent- or cold seep-specific invertebrates (see Section 4), and thus we spent most time to collect live samples, e.g., deep-sea mussels, vesicomyid clams, polychaetes, and so on (see the pictures below). In addition, environmental parameters, including water temperature and sulfide concentration, of the mussel and polychaet colonies were analyzed. Some samples are also used for short-term rearing experiments. Other samples were kept alive and brought back to AORI, JAMSTEC, and Enoshima Aquarium for rearing experiments. Detailed analyses of genes, amino acids, and enzymes will be performed after the cruise. The preliminary reports of each group are in the section 4.



Mussels and polychaetes at Myojin Knoll (left) and young mussel colony at Suiyo Seamount (right)



Mussels (left) and vesicomyid clams at Off Hatsushima

2) Cruise Log (By Ms. Minamizawa)

NT11-09 Shipboard Log & Ship Track				
Date	**Time**	**Description**	**Remarks**	**Position/Weather/ Wind/Sea condition (Noon)**
15Jun11	8:00	Scientists embark on Natsushima		12:00(GMT+9h) 34-52.3N,139-39.6E Overcast East-3(Gentle breeze) Sea smooth
	9:00	Left YOKOSUKA for leaving point		
	10:30-11:00	Carried out onboard education & training for scientists		
	16:40-17:00	Konpira ceremony		
	18:00-19:30	Scientific meeting		
16Jun11	3:30	Arrived at research area	Myojin knoll	12:00(GMT+9h) 32-06.3N,139-52.1E Overcast ESE-5 (Fresh breeze) Sea slight
	5:57	Released XBT	at 32-05.9100N, 139-51.5458E	
	7:23	Launched HPD on the surface		
	7:36	HPD dove & started het operation	HPD#1284	
	8:28	HPD landed on sea bottom (D=1342m)	32-06.288N, 139-51.996E	
	15:03	HPD left sea bottom (D=1243m)	32-06.206N, 139-52.048E	
	15:40	HPD floated		
	15:57	Recovered HPD & finished her operation		
	16:10	Com'ced proceeding to Suiyo SMt.		
	19:00-19:30	Scientific meeting		
17Jun11	13:04	Released XBT	28-40.5694N, 140-36.4661E	12:00(GMT+9h) 28-47.2N,140-34.2E Fine but cloudy SSW-4 (Moderate breeze) Sea smooth
	15:00	Arrived at IZU OGASAWARA research area	Suiyo SMt.	
	19:00-19:30	Scientific meeting		
18Jun11	8:23	Launched HPD on the surface		12:00(GMT+9h) 28-34.3N, 140-38.7E Fine but cloudy SSW-4 (Moderate breeze) Sea smooth
	7:15	HPD dove & started het operation	HPD#1285	
	9:25	HPD landed on sea bottom (D=1386m)	28-34.282N, 140-38.679E	
	11:28	HPD left sea bottom (D=1383m)	28-34.272N, 140-38.662E	
	12:07	HPD floated		
	12:24	Recovered HPD & finished her operation		
	13:41	Launched HPD on the surface		
	13:57	HPD dove & started het operation	HPD#1286	
	14:43	HPD landed on sea bottom (D=1386m)	28-34.285N, 140-38.668E	
	16:41	HPD left sea bottom (D=1383m)	28-34.281N, 140-38.682E	
	17:23	HPD floated		
	17:39	Recovered HPD & finished her operation		
	19:00-19:30	Scientific meeting		

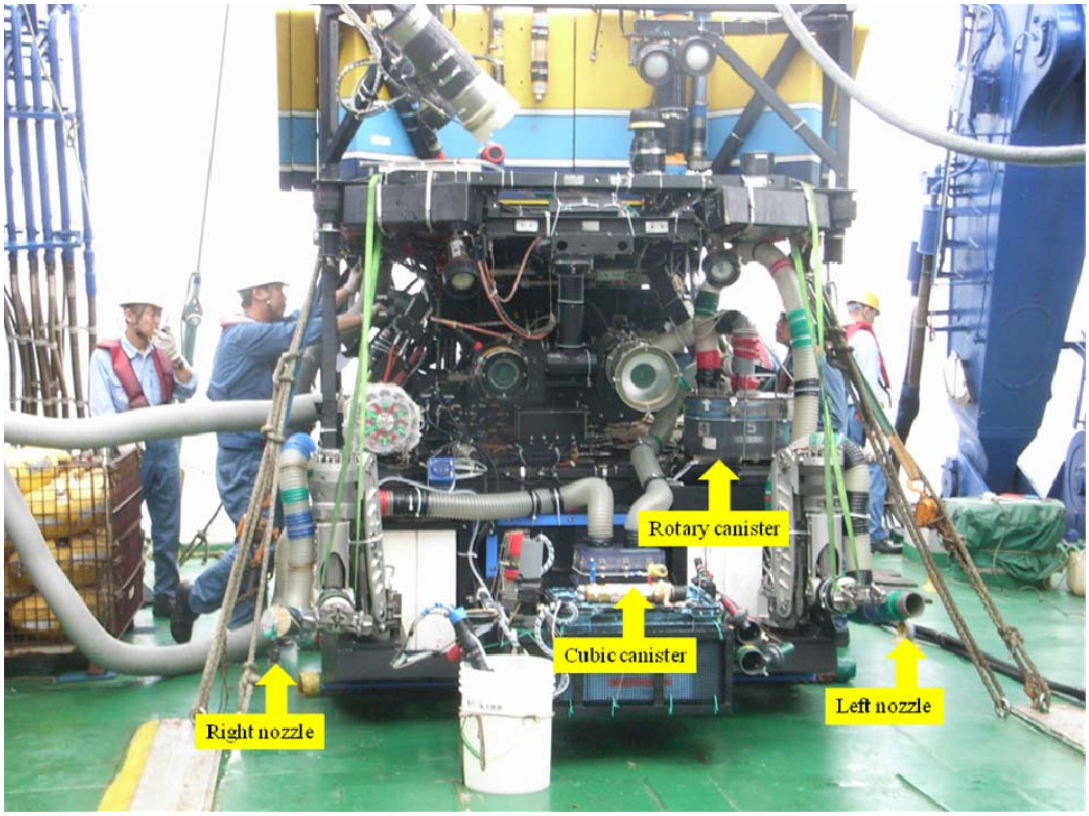
19Jun11	8:30	Launched HPD on the surface		12:00(GMT+9h) 28-34.3N, 140-38.6E Fine but cloudy SSW-4 (Moderate breeze) Sea slight
	8:43	HPD dove & started het operation	HPD#1287	
	9:32	HPD landed on sea bottom (D=1386m)	28-34.280N, 140-38.632E	
	14:25	HPD left sea bottom (D=1382m)	28-34.327N, 140-38.580E	
	15:07	HPD floated		
	15:24	Recovered HPD & finished her operation		
	15:50	Com'ced proceeding to IZU OGASAWARA Myojin knoll		
	19:00-19:30	Scientific meeting		
20Jun11	15:30	Sighted Aoga-shima		12:00(GMT+9h) 31-55.3N,139-51.2E Overcast SSW-5 (Fresh breeze) Sea slight
	19:00-19:30	Scientific meeting		
21Jun11	6:00	Arrived at dive point		12:00(GMT+9h) 32-06.3N,139-52.0E Overcast SSW-5 (Fresh breeze) Sea slight
	7:15	Launched HPD on the surface		
	7:26	HPD dove & started het operation	HPD#1288	
	8:14	HPD landed on sea bottom (D=1327m)	32-06.331N, 139-51.135E	
	10:21	HPD left sea bottom (D=1269m)	32-06.287N, 139-52.183E	
	11:00	HPD floated		
	11:15	Recovered HPD & finished her operation		
	12:40	Launched HPD on the surface		
	12:50	HPD dove & started het operation	HPD#1289	
	13:38	HPD landed on sea bottom (D=1327m)	32-06.262N, 139-52.009E	
	15:12	HPD left sea bottom (D=1265m)	32-06.233N, 139-52.086E	
	15:48	HPD floated		
	16:02	Recovered HPD & finished her operation		
	16:20	Left research area for YOKOSUKA		
	18:00-18:30	Scientific meeting		
22Jun11	14:00	Arrived at YOKOSUKA		12:00(GMT+9h) 35-11.9N,139-46.8E Fine but cloudy SSW-3 (Gentle breeze) Sea smooth
	15:30	5 Scientists disembark from NATSUSHIMA		
23Jun11	8:30	left YOKOSUKA for research area		12:00(GMT+9h) 35-03.3N,139-27.5E Fine but cloudy SW-7 (Near gale) Sea moderate
	10:00-10:30	Carried out onboard education & training for scientiss		
	13:03	Released XBT	at 35-01.6N, 139-17.3E	
	14:20	Let go her anchor in 45m of water at Ito Ko		
	15:15-15:45	Practiced boat, fire & collison drill at Ito Ko		
	15:45-16:15	Practiced ISPS training for deter attacker brom approaching to ship at Ito Ko		
	15:42	Left go her anchor with 3ss on deck		
	18:00-18:30	Scientific meeting		

24Jun11	6:15	Com'ced proceeding to research area		12:00(GMT+9h) 35-00.9N, 139-13.4E Fine but cloudy SW-6 (Strong breeze) Sea slight
	7:00	Arrived at dive point		
	8:26	Launched HPD on the surface		
	8:39	HPD dove & started het operation	HPD#1290	
	9:12	HPD landed on sea bottom (D=937m)	35-00.934N, 139-13.393E	
	11:03	HPD left sea bottom (D=855m)	35-00.956N, 139-13.329E	
	11:30	HPD floated		
	11:46	Recovered HPD & finished her operation		
	13:04	Launched HPD on the surface		
	13:20	HPD dove & started het operation	HPD#1293	
	13:51	HPD landed on sea bottom (D=873m)	35-00.961N, 139-13.383E	
	16:01	HPD left sea bottom (D=854m)	35-00.955N, 139-13.322E	
	16:27	HPD floated		
	16:42	Recovered HPD & finished her operation		
25Jun11	8:32	Launched HPD on the surface		
	8:47	HPD dove & started het operation	HPD#1292	
	9:26	HPD landed on sea bottom (D=937m)	35-00.054N, 139-13.545E	
	11:12	HPD left sea bottom (D=1176m)	35-00.072N, 139-13.470E	
	11:30	HPD floated		
	11:58	Recovered HPD & finished her operation		
	13:08	Launched HPD on the surface		
	13:20	HPD dove & started het operation	HPD#1293	
	14:03	HPD landed on sea bottom (D=933m)	35-00.923N, 139-13.405E	
	16:01	HPD left sea bottom (D=854m)	35-00.959N, 139-13.332E	
	16:27	HPD floated		
	16:42	Recovered HPD & finished her operation		
26Jun11	9:30	Arrived at YOKOSUKA		
		Scientists disembark from NATSUSHIMA		

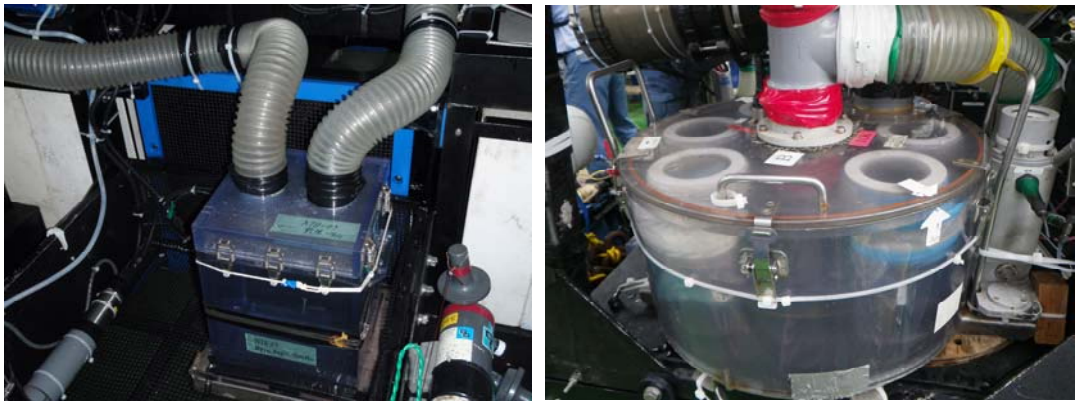
3) Major equipments loaded to Hyper-Dolphin

a) Slurp Gun (Suction sampler)

It was used to collect benthos and fish. The nozzle attached to the left hand of the manipulator was connected to a rotary canister containing 6 bottles, which enable to keep samples from different points separated. Bottles were removed when necessary. In this cruise, another nozzle was set on the right hand, which was connected to another canister, which is cubic shape and contained no bottle.



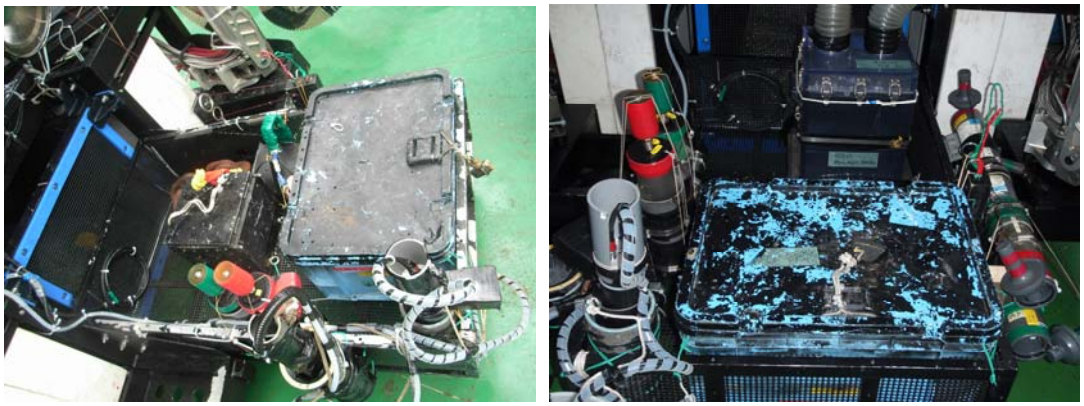
Arrangement of the slurp gun (suction sampler) in the front bay of Hyper-Dolphin



Cubic canister (left) and rotary canister (right)

b) Sample boxes

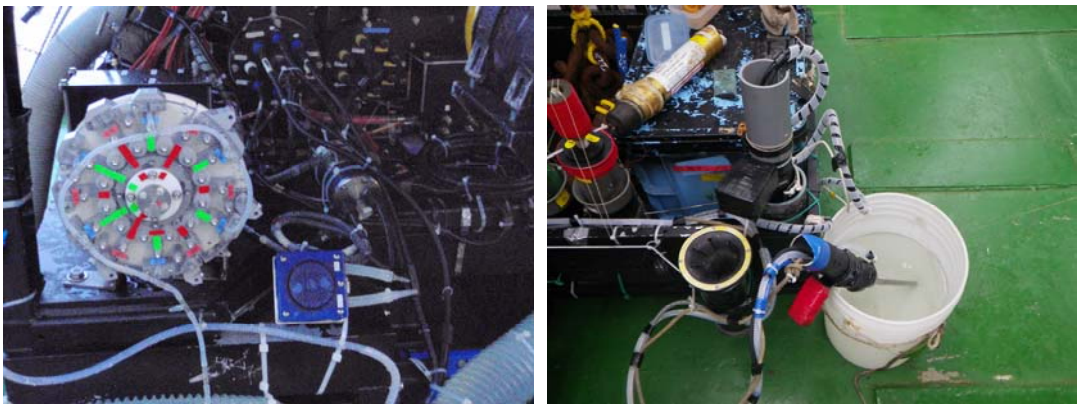
Two sample boxes were loaded in front of the vehicle. They were used to keep specimens collected by shovel and manipulator, and to bring traps



Sample boxes

c) Rotary clean seawater sampler (ROCS) and on-line thermometer

Rotary clean seawater sampler (ROCS) is a system to collect seawater. It consists of a nozzle, 6 polycarbonate bottles, and a pump. It is possible to collect seawater (up to 500 ml) at six specific sites by handling the nozzle with the manipulator. By setting an on-line thermometer in the nozzle, we measured the real-time temperature of the water.



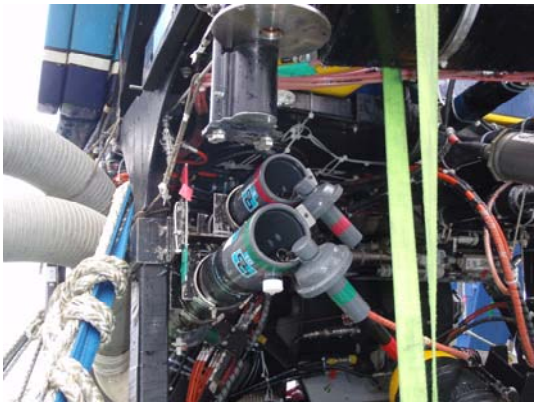
Arrangement of ROCS

d) Niskin water sampler, Van Dorn water sampler and MBARI corer

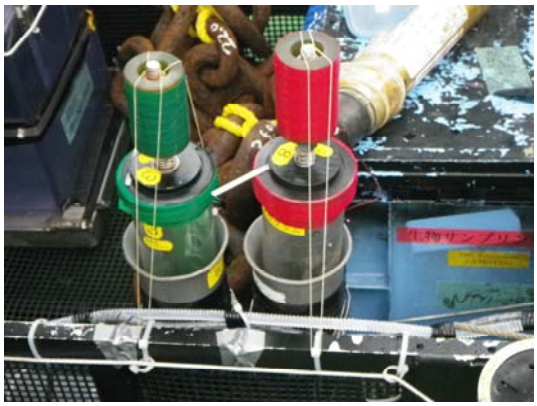
Niskin samplers were used to obtain non-vent and non-seep seawater.

Bandon sampler was used to collect vent and plume water.

MBARI corers were used for sediment collection.



Niskin water sampler

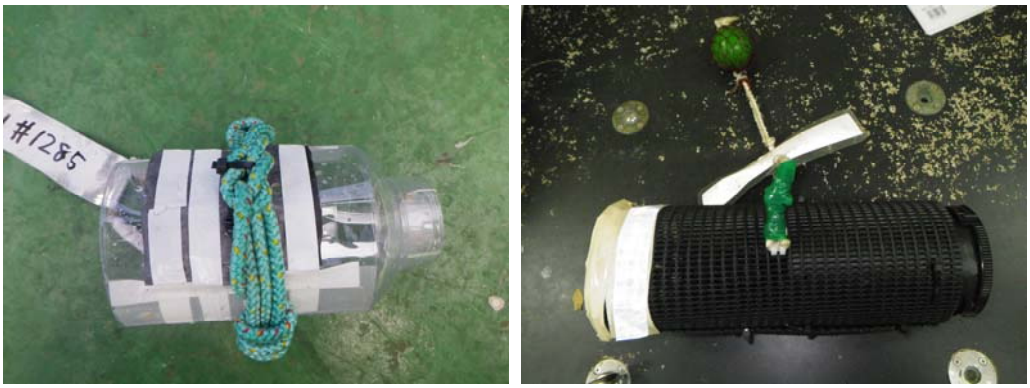


MBARI corers

Van Dorn water sampler

e) Fish trap “Hodohodo-Kun”

Two types of trap were used to catch small fish (Hodohodo-Kun Nos. 1 & 2).



Two types of fish trap

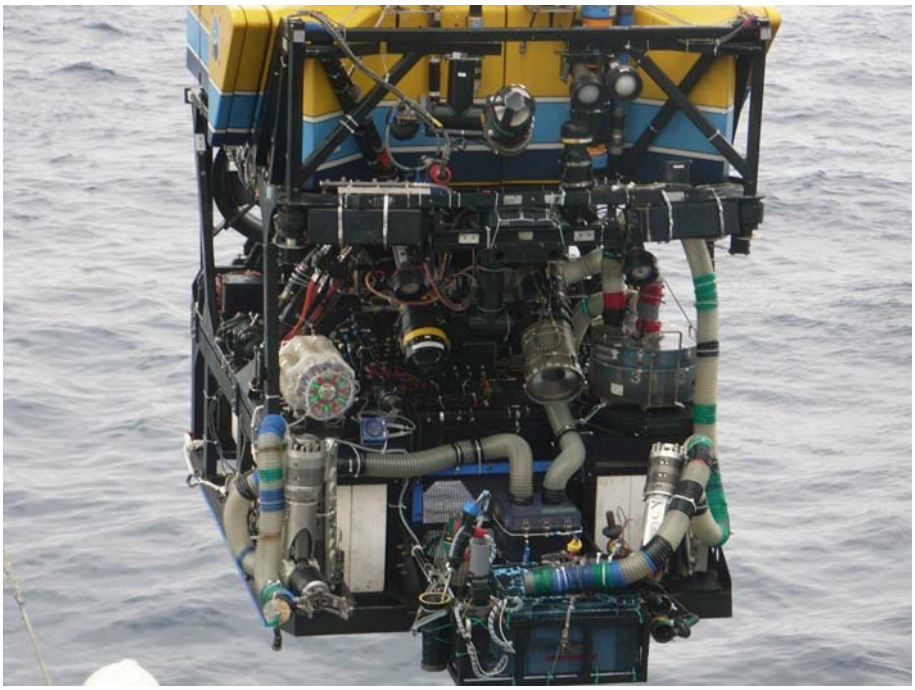
4) Dive information (Dive point and track are in Appendix)

a) Dive 1284 (June 16, Myojin Knoll; Reporter, K. Inoue)

Equipments loaded: Suction sampler (Slurp gun) with a rotary canister containing 6-bottles, and that with a cubic canister, Rotary clean seawater sampler (ROCS), On-line sulfide sensor, On-line thermometer, Niskin water sampler, Sample Box, MBARI corer, Fish Trap “Hodohodo-Kun”.

Sampling and Operation

1. Water sampling using Niskin sampler at 600m depth
2. Water sampling using ROCS around an active chimney.
3. Sulfide monitoring around an active chimney.
4. Sediment sampling using MBARI corer
5. Sampling of mussels and polychaets using suction sampler
6. Sampling of chimney pieces
7. Measurement of the temperature of vent water at a chimney.
8. Taking picture of a mussel colony for long-range observation



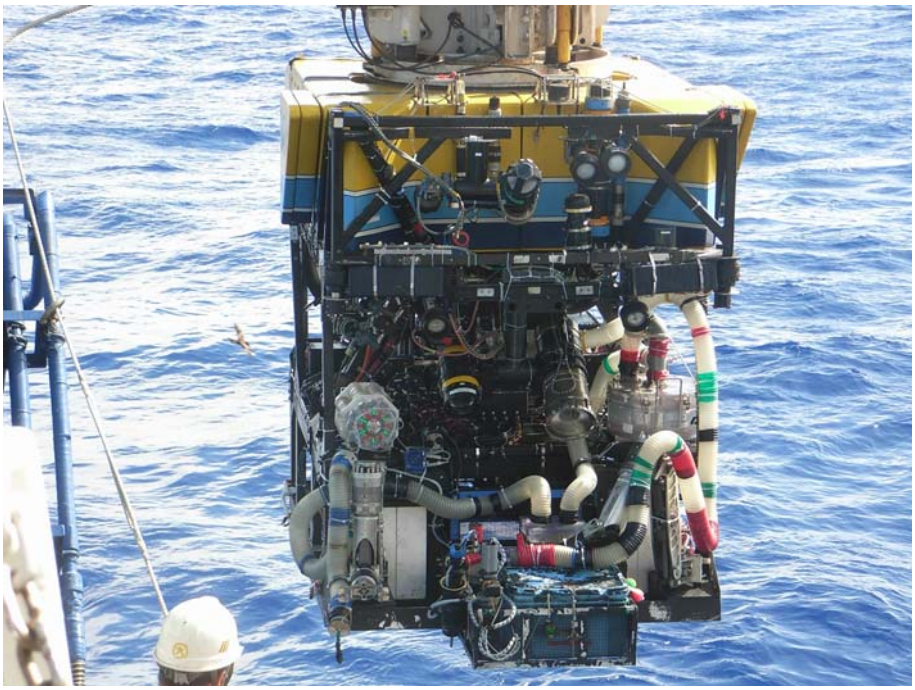
Arrangement of research equipments at Dive #1284

b) Dive #1285 (June 18, 2011; Suiyo Seamount; Reporter, K. Inoue)

Equipments loaded: Suction sampler (Slurp gun) with a rotary canister containing 6-bottles, and that with a cubic canister, Rotary clean seawater sampler (ROCS), On-line sulfide sensor, On-line thermometer, Niskin water sampler, Sample Box, MBARI corer, Van Dorn water sampler, Fish Trap "Hodohodo-Kun" (No.1 & 2).

Sampling and Operation

1. Water sampling using Niskin sampler at 600m depth
2. Sampling of vent water using Van Dorn sampler.
3. Fish traps were set.
4. Sampling of snails
5. Water sampling using ROCS around an active chimney.
6. Sulfide monitoring around an active chimney.
7. Mussel sampling.
8. Water sampling using Niskin sampler before leaving the bottom.



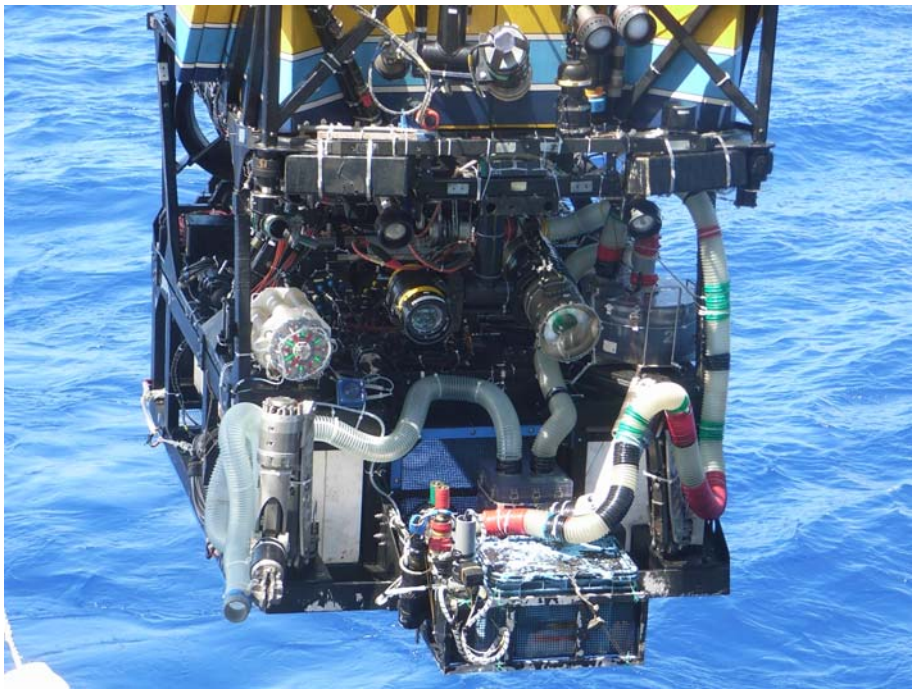
Arrangement of research equipments at Dive #1285

c) Dive #1286 (June 18, 2011; Suiyo Seamount; Reporter, K. Inoue)

Equipments loaded: Suction sampler (Slurp gun) with a rotary canister containing 6-bottles, and that with a cubic canister, Rotary clean seawater sampler (ROCS), On-line sulfide sensor, On-line thermometer, Niskin water sampler, Van Dorn water sampler, Sample Box, MBARI corer, Fish Trap "Hodohodo-Kun".

Sampling and Operation

1. Mussel sampling
2. Recovery of traps.
3. Sampling of vent water using Van Dorn sampler.
4. Sampling of crabs.
5. Water temperature measurement around crabs
5. Water sampling using ROCS around an active chimney.
6. Sulfide monitoring around an active chimney and mussel colonies.



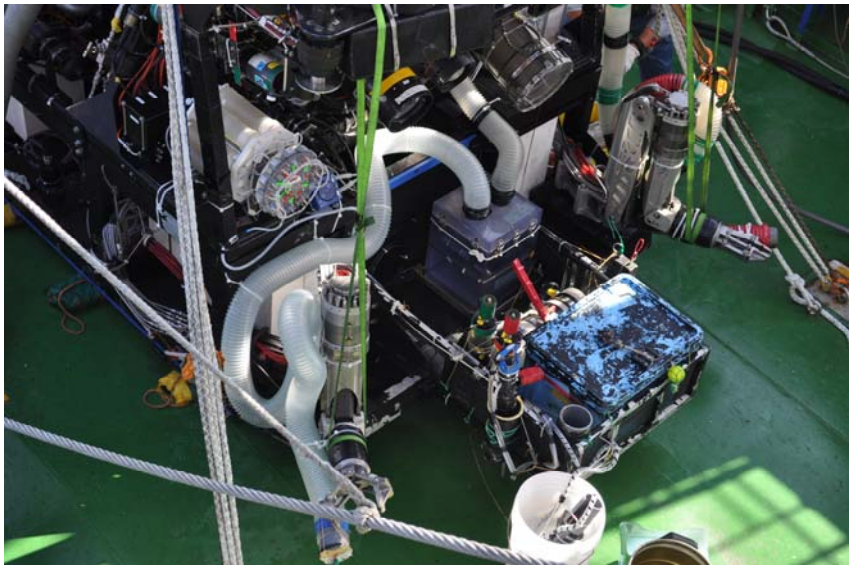
Arrangement of research equipments at Dive #1286

d) Dive 1287 (June 19, Suiyo Sea Mount; Reporter, T. Koito)

Equipments loaded: Suction sampler (Slurp gun) with a rotary canister containing 6-bottles, and that with a cubic canister, Rotary clean seawater sampler (ROCS), On-line sulfide sensor, On-line thermometer, Niskin water sampler, Van Dorn water sampler, Sample Box, MBARI corer, Fish Trap "Hodohodo-Kun".

Sampling and Operation

1. Observation of some animals (octopus, Bathymodiolid mussels, etc..).
2. Sampling of Yunohana crub using suction sampler.
3. Water sampling using Van Dorn water sampler from a hydrothermal plume.
4. Sampling of crustacean using suction sampler.
6. Water sampling using ROCS around hydrothermal plume.
7. Sulfide monitoring around an active chimney.
8. Sediment sampling using MBARI corer
9. Sampling of mussels using suction sampler
10. Sampling of an octopus
11. Sampling of rock with bacterial mat
12. Observation of Central Cone of Suiyo Sea Mount



Arrangement of research equipments at Dive #1287

e) Dive 1288 (June 21, Myojin Knoll; Reporter, K. Inoue)

Equipments loaded: Suction sampler (Slurp gun) with a rotary canister containing 6-bottles, and that with a cubic canister, Rotary clean seawater sampler (ROCS), On-line sulfide sensor, On-line thermometer, Niskin water sampler, Sample Box, MBARI corer, Fish Trap "Hodohodo-Kun".

Sampling and Operation

1. Failed to sample water, using Niskin sampler, at 600m because the shutter did not work.
2. Sampling of chimney pieces containing polychaetes.
3. Sampling of a chimney piece with barnacles
4. Sampling of polychaetes using suction sampler
5. Sampling of mussels using suction sampler
6. Water sampling using a Niskin sampler before leaving the bottom, but was not successful; the sample water did not remain.

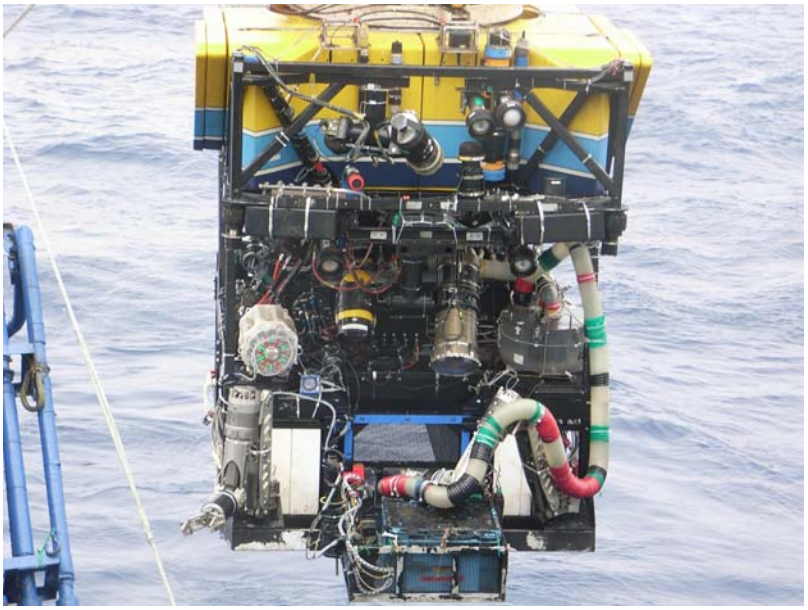
Arrangement of research equipments at Dive #1288

f) Dive 1289 (June 21, Myojin Knoll; Reporter, K. Inoue)

Equipments loaded: Suction sampler (Slurp gun) with a rotary canister containing 6-bottles, and that with a cubic canister, Rotary clean seawater sampler (ROCS), On-line sulfide sensor, On-line thermometer, Niskin water sampler, Sample Box, MBARI corer, Fish Trap "Hodohodo-Kun".

Sampling and Operation

1. Water sampling, using Niskin sampler, at 600m.
2. Cruise to the direction of point 6.
3. At a dead chimney, water sampling using ROCS.
4. Sulfide monitoring using the sulfide sensor.
5. Sampling of the chimney.
6. Cruise to find a small active chimney.
7. In front of the chimney, sediment sampling using a shovel.
8. Water sampling at a mussel colony using ROCS.
9. Sulfide sensing.
10. Water sampling using a Niskin sampler.
11. Sampling of mussels using suction sampler



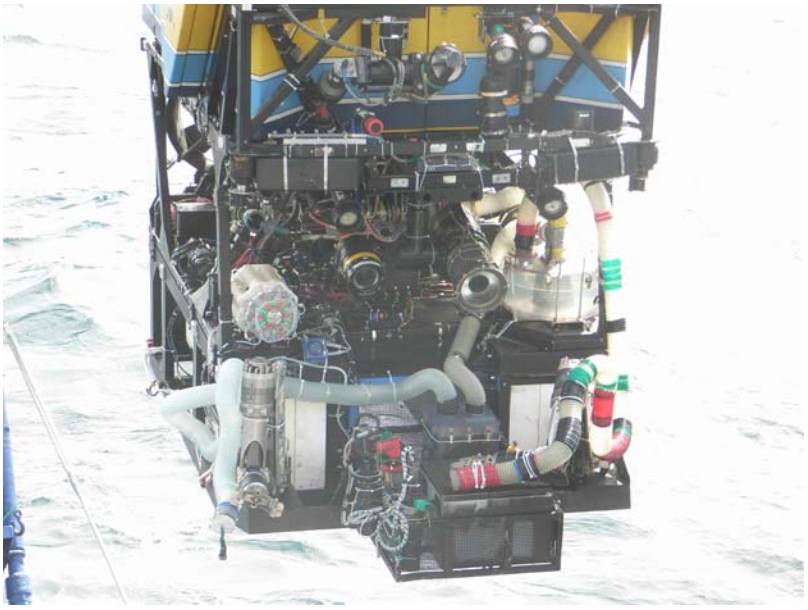
Arrangement of research equipments at Dive #1289

g) Dive 1290 (June 24, Off Hatsushima; Reporter, Y. Nakamura)

Equipments loaded: Suction sampler (Slurp gun) with a rotary canister without 6-bottles, and that with a cubic canister, Rotary clean seawater sampler (ROCS), On-line sulfide sensor, On-line thermometer, Niskin water sampler, Sample Box (x1), MBARI corer, Fish Trap "Hodohodo-Kun", Shovel (Scoop sampler).

Sampling and Operation

1. Water sampling using Niskin sampler at 500m depth.
2. Observation of a *Calyptogena* colony.
3. Water sampling using Niskin sampler at the bottom.
4. Sampling of *Calyptogena* with scoop sampler.
5. Observation of a *Bathymodiolus* colony.
6. Sampling of *Bathymodiolus* with suction sampler.
7. Sampling of *Calyptogena* with suction sampler.



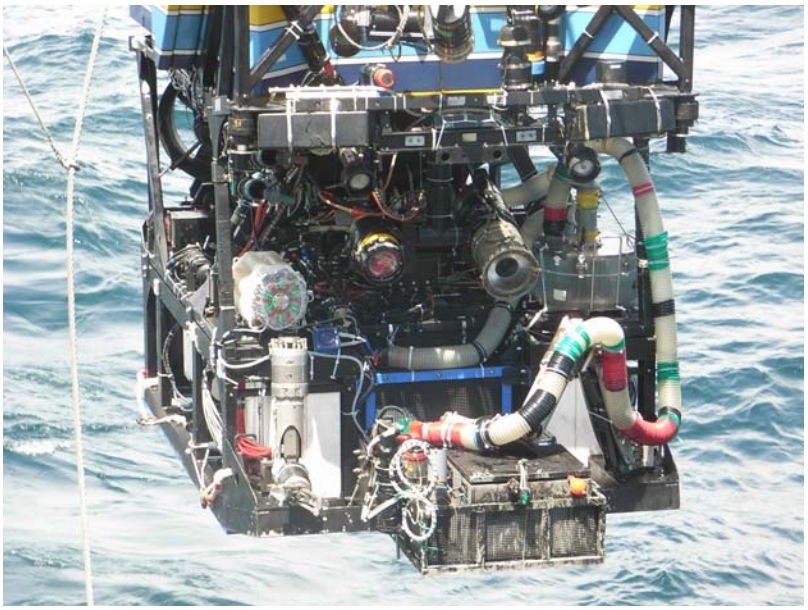
Arrangement of research equipments at Dive #1290

h) Dive 1291 (June 24, Off Hatsushima; Reporter, Y. Nakamura)

Equipments loaded: Suction sampler (Slurp gun) with a cubic canister, Rotary clean seawater sampler (ROCS), On-line sulfide sensor, On-line thermometer, Niskin water sampler, Sample Box (x2), MBARI corer, Fish Trap "Hodohodo-Kun", Shovel (Scoop sampler).

Sampling and Operation

1. Water sampling using Niskin sampler at 500m depth.
2. Observation of a mussel colony.
3. Water sampling using Niskin sampler at the bottme.
4. Water sampling using ROCS around a *Bathymodiolus* colony.
5. Measurement of the concentration of H2S in a *Bathymodiolus* colony.
6. Sampling of *Bathymodiolus* with suction sampler.
7. Water sampling using ROCS around a *Calyptogena* colony.
8. Measurement of the concentration of H2S in a *Calyptogena* colony.
9. Sampling of bottom mud with MBARI core x 2 (Green and Red).
10. Sampling of Fishes with fish trap "HodoHodo-kun".



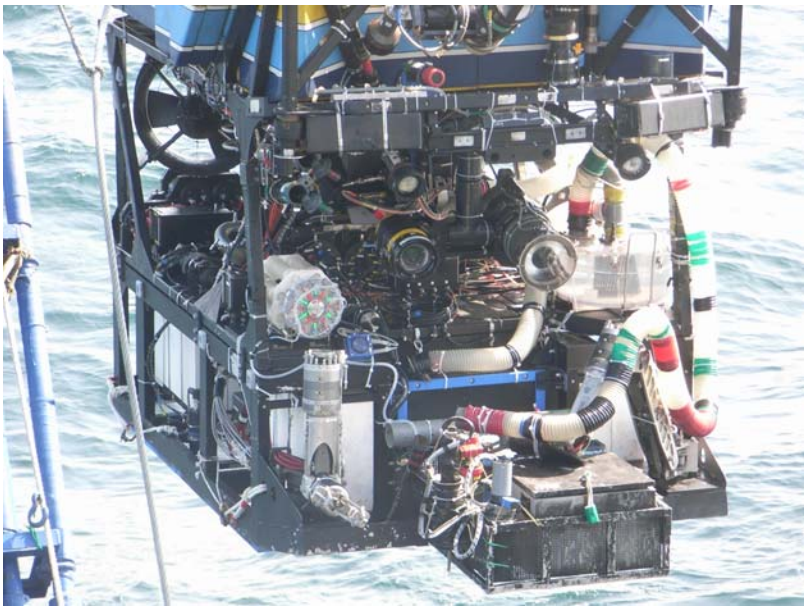
Arrangement of research equipments at Dive #1291

i) Dive 1292 (June 25, Off Hatsushima; Reporter, Y. Nakamura)

Equipments loaded: Suction sampler (Slurp gun) with a cubic canister, Rotary clean seawater sampler (ROCS), On-line sulfide sensor, On-line thermometer, Niskin water sampler, Sample Box (x2), MBARI corer, Fish Trap "Hodohodo-Kun", Shovel (Scoop sampler).

Sampling and Operation

1. Water sampling using Niskin sampler at 500m depth.
2. Observation of a *Calyptogena* colony.
3. Water sampling using Niskin sampler at the bottome.
4. Water sampling using ROCS around a *Calyptogena* colony.
5. Measurement of the concentration of H2S in a *Calyptogena* colony.
6. Sampling of *Calyptogena* with scoop sampler.
7. Sampling of Fishes with fish trap "HodoHodo-kun".



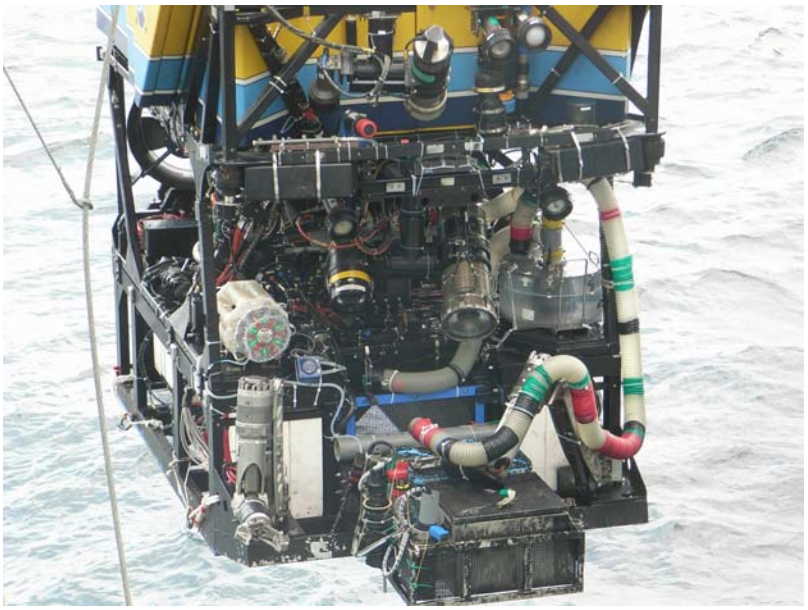
Arrangement of research equipments at Dive #1292

j) Dive 1293 (June 25, Off Hatsushima; Reporter, Y. Nakamura)

Equipments loaded: Suction sampler (Slurp gun) with a cubic canister, Rotary clean seawater sampler (ROCS), On-line sulfide sensor, On-line thermometer, Niskin water sampler, Sample Box (x2), MBARI corer, Fish Trap "Hodohodo-Kun", Shovel (Scoop sampler).

Sampling and Operation

1. Observation of a *Alaysia* sp. colony.
2. Water sampling using ROCS around a *Alaysia* sp. colony.
3. Measurement of the concentration of H2S in a *Alaysia* sp. colony.
4. Sampling of *Alaysia* sp. with Hyper dolphin manipulator.
5. Sampling of *Alvinocaris longirostris* around a tubeworm colony with suction sampler.
6. Observation of a *Lamellibrachia* sp. colony.
7. Water sampling using ROCS around a *Lamellibrachia* sp. colony.
8. Measurement of the concentration of H2S in a *Lamellibrachia* sp. colony.
9. Sampling of *Lamellibrachia* sp. with Hyper dolphin manipulator.
10. Observation of a Calyptogena colony.
11. Measurement of the concentration of H2S in a *Calyptogena* colony.
12. Sampling of *Calyptogena* with scoop sampler.
13. Sampling of Fishes with fish trap "HodoHodo-kun".



Arrangement of research equipments at Dive #1293

4. RESEARCH INFORMATION

1) Studies on mechanisms of hypotaurine synthesis and its role in adaptation to toxic sulfide in hydrothermal vent-specific organisms

Koji Inoue[1], Tomoko Koito[2], Toshihiro Nagasaki[1], Azusa Kinjo[1], Yu Yamamoto[1], Wen Liu[3], and Haruhiko Toyohara[3]

[1]Atomosphere and Ocean Research Institute, The University of Tokyo, [2]College of Bioresource and Sciences, Nihon University, [3]Graduate School of Agriculture, Kyoto University

Background

The hydrothermal-vent specific animals must adapt to toxic hydrogen sulfide in vent water. A possible mechanism is the use of hypotaurine, which can react with sulfide and generate non-toxic thiotaurine. However, the pathway of hypotaurine synthesis has not been reported in marine invertebrates.

Methods and Results

In this cruise, we collected the deep-sea mussel *Bathymodiolus septemdierum* to study the hypotaurine synthesis pathway. During the cruise, we collected the mussels using suction sampler at Myojin Knoll and Suiyo Seamount. The mussels are dissected and frozen immediately after sampling or after exposure to certain conditions.

Future Plan

The mussels will be used for amino acid analyses and expression analyses of the enzyme genes involved in hypotaurine synthesis.

2) Culture experiment of Paralvinella hessleri in different temperature, and cDNA cloning of heat resistance relating gene.

Tsukasa Mori[1], Takao Yoshida[2], Shyuich Shigeno[2].

[1]Laboratory of Marine Molecular Biochemistry, Department of Nihon University College of Bioresource Sciences.

[2]Japan Agency for Marine-Earth Science and Technology (JAMSTEC).

Background

Although annelid *Paralvinella grasslei* is known as a deep-sea vent endemic species that have heat tolerance, this tolerance might be greatly cooperation of cold water intake from gill. Therefore, we

exposed the relative spices of *Paralvinella grasslei* to the hot sea water in this experiment, and examined whether they can alive or not in the hot sea water.

Methods and Results

In this cruise, we collected the *Paralvinella hessleri* to study the metabolic analysis. During the cruise, we collected the whole body of the *Paralvinella hessleri* exposed hot sea water and cold sea water. These samples are frozen immediately after sampling, and stored in the -80C.

Future Plan

These samples will be used for cDNA synthesis and expression analyses for obtaining heat resistance relating gene.

3) Study on Symbiotic systems of deep-sea clam *Calyptogena* and intracellular sulfur oxidizing bacteria

Yoshimitsu Nakamura[1], Yuki Hongo[1], Akihiro Tame[1], Genki Ozawa[1], Daisuke Sekine[1], Ryusaku Deguchi[2] and Takao Yoshida[1] (JAMSTEC)

[1]*Japan Agency for Marine-Earth Science and Technology (JAMSTEC).*

[2]*Miyagi University of Education*

Objective

Vesicomyid clams (*Calyptogena* spp.) are the dominant members in deep-sea chemosynthesis-based communities and harbor sulfur-oxydizing bacteria in the gill tissue cells. The non-functional degenerated digestive organs and the large size and structure of the gill of vesicomyids suggest that the hosts are not a filter feeder and rely on symbiot mediated autotrophic nutrition (Cavanaugh, 1983, Fiala-Medioni, 1984, 1986, Kennish, 1992). Genomic analyses of the symbionts as well as histological and ultrastructural observations of the host gill tissue endorse the hypothesis that endocellular chemoautotrophic bacteria play an important role in the nutrition of the clam (Fiala-Medioni, 1986, Kuwahara, 2007, 2008, Newton, 2007).

The symbionts of vesicomyids are housed only within the specific cell (bacteriocyte) in the gill tissue (Fiala-Medioni, 1986). It is assumed that the bacteriocytes peculiarly express the molecules associated with the symbiosis, so that the host raises the symbionts within the bacteriocytes. Though we recognize the importance of determining the bacteriocyte specific expressions, these examining approaches are still in their infancy. There are several reasons why it cannot be easily to identify the bacteriocyte specific expressions: uncultivable host and symbiont, many types of cells including bacteriocytes in the gill tissue

and a difficulty of the isolation of only bacteriocytes.

In this study we attempt to detect the molecules specifically expressed by the bacteriocyte in the gill tissue, utilizing histocytochemical approaches that is the direct detection assay system of bacteriocyte specific expressions by histocytochemical analysis using monoclonal antibody raised for the gill tissue.

Scientific Results

We collected *Calyptogena* sp. at the two sites of off Hatsushima Sagami Bay (Dive # 1290, 1291, 1293: 821m, 35°00.940' N, 139°13.247' E, and Dive # 1292: 1171m, 35°00.072' N, 139°13.503' E) and *Bathymodiolus septemdirum* (Dive # 1284: 1303m, 32°06.278' N, 139°52.081' E) by the ROV "Hyperdorphin" and dissected out the clams and mussels; gill, gonad, blood cells and other tissues. Then, the tissues to be cut out were immediately fixed in 4% paraformaldehyde or stored at -80ºC.

Future works

In this cruse, we were successful in the sampling of fresh alive *Calyptogena* clams and *Bathymodiolus septemdirum*. We have plans for the investigations as follows:

1. Development of monoclonal antibody against bacteriosyte specific molecules.
2. in-situ analyses for the symbiotic specific gene expressions.
3. Tissue specific expression and localization of the symbiotic specific gene products.
4. Proteomics of the symbiotic bacteria.
5. Morphological and functional analysis of hemocytes.

4) Is it universal phenomenon for the hydrothermal vent community to detoxify hydrogen sulfide using thiotaurine? –Study on correlation between hydrogen sulfide concentration and the amount of amino acids.—

Tomoko Koito[1], Kei Sato[2], Shosei Yamagami[3], Takuya Yahagi [4] and Takefumi Yorisue[4]

[1]*College of Bioresource Sciences*, *Nihon University*, [2]*The University Museum*, *The University of Tokyo*, [3]*Department of Earth Sciences*, *Okayama University*, [4]*Atomosphere and Ocean Research Institute*, *The University of Tokyo*

Background

It has been considered that the hydrothermal vent and cold seep endemic animals detoxify the ambient hydrogen sulfide to synthesize a non-toxic amino acid, thiotaurine using hypotaurine. However, it has not revealed that the correlation between concentration of hydrogen sulfide at the hydrothermal vent and the amount of thiotaurine in animals which inhabiting around the hydrothermal vent.

Methods and Results

In this cruise, we monitored the concentration of the hydrogen sulfide at Myojin Knoll and Suiyo Seamount which included active and non-active hydrothermal vents using hydrogen sulfide sensor and conducted water sampling at the same point using ROCS water sampler. Then, we collected chimney-attached animals at measuring hydrogen sulfide position, and counted the number of species, individuals and attached position of the chimney.

Future Plan

The collected animals will be used for amino acid and stable isotope analyses to reveal the correlation between the concentration of hydrogen sulfide and the amount of thiotaurine and the circulation of sulfur atom.

5) Study on immunity in the deep-sea hydrothermal vent mussels

Kazue Ohishi[1], Dai Sekine[1], Yoshimitsu Nakamura[1], Akihiro Tame[2], Yuki Hongo[1], Takao Yoshida[1], Sumihiro Koyama[1], and Tadashi Maruyama[1]

[1]Japan Agency for Marine-Earth Science and Technology, [2]Marine Works Ltd.Co.

Background

Inverterbrates possess innate immunity for protection against pathogens. The bivalve innate immune system is based on cellular immunity and soluble hemolymph factors. Blood cells are thought to play a central role in the innate immune system. The deep-sea mussels are found in association with large faunal communities living in chemosynthetic environments at the bottom of the sea floor, and they possess symbiotic bacteria in their gills.

Purpose and Objectives

Our final goal is to clarify what blood cells are involved in the innate immune system and how do the immune system distinguish the symbiont bacteria from pathogens. First, we aim to obtain the fundamental information of the immunity in the blood cells of the deep-sea mussles.

Materials and Methods

In this cruise, we sampled the deep-sea mussel *Bathymodiolus septemdierum, B. japonicus, and B. platifrons*. The blood cells were obtained by use a 5ml syringe and 23G needle. After dissection, tissue samples such as gills and mantle, were collected. The samples were immediately freezed or fixed, and

used for immunological analysis.

Research results

We observed some blood cells, which were morphologically and biochemically distinguishable. We are going to examine the function of these cells.

Future Plan

We will classify the blood cells in the deep-sea mussels, and examine the distribution in the whole mussel body and their role in the immunity.

5. ACKNOWLEDGMENTS

The science party expresses sincere thanks to the crew of RV Natsushima and the operation team of ROV Hyper-Dolphin.

6. NOTICE ON USING

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

Appendix

(Point maps and track charts)

S: 1/3000

12-1ﾏｰｶｰ
ﾁﾑﾆｰ
熱水 (199℃)
D=1, 312m

#896ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=1, 296m

ﾁﾑﾆｰ、白色域
ﾕﾉﾊﾅｶﾞﾆ
A=4m
D=1, 311m

#7-1ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=1, 292m

#6-4ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
ﾁﾑﾆｰ
D=1, 287m

#954-1ﾏｰｶｰ
熱水 (111℃)
#955-1ﾏｰｶｰ
D=1, 338m

#6-1ﾏｰｶｰ
D=1, 364m

H743-2ﾏｰｶｰ
D=1, 339m

着底点
D=1, 350m

#3ADP台座
D=1, 286m

ﾁﾑﾆｰ群
D=1, 329m

#6-3ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
ﾕﾉﾊﾅｶﾞﾆ
ﾁﾑﾆｰ
D=1, 284m

H312-5, 6
植木鉢ﾏｰｶｰ
D=1, 291m

ｼﾝｶｲﾋﾊﾞﾘｶﾞｲｺﾛﾆｰ
D=1, 281m

#9-1ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=1, 286m

ﾋﾞｯｸﾞﾁﾑﾆｰ頂上
ﾌﾞﾗｯｸｽﾓｰｶｰ A=18m
D=1, 254m
H824ﾏｰｶｰ A=23m
D=1, 246m

ﾁﾑﾆｰ群
D=1, 255m

ﾋﾊﾞﾘｶﾞｲ多数
D=1, 236m

#112ﾏｰｶｰ
割れ目, ﾌｼﾞﾂﾎﾞ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=1, 219m
H185-6植木鉢ﾏｰｶｰ
D=1, 227m

#1, #2ｱｸﾘﾙ筒
D=1227m
H819ﾏｰｶｰ
D=1223m

#115ｴｻ付ﾏｰｶｰﾌﾞｲ
#116放流ﾈｯﾄ
D=1, 290m

ﾏｰｶｰﾌﾞｲ設置
(番号なし)
D=1, 227m

ﾁﾑﾆｰ
D=1, 219m

H970-1植木鉢ﾏｰｶｰ
H970-2植木鉢ﾏｰｶｰ
D=1, 225m

(11 6)
(NT1109)

HYPERDOLPHIN

No.1284 Dive

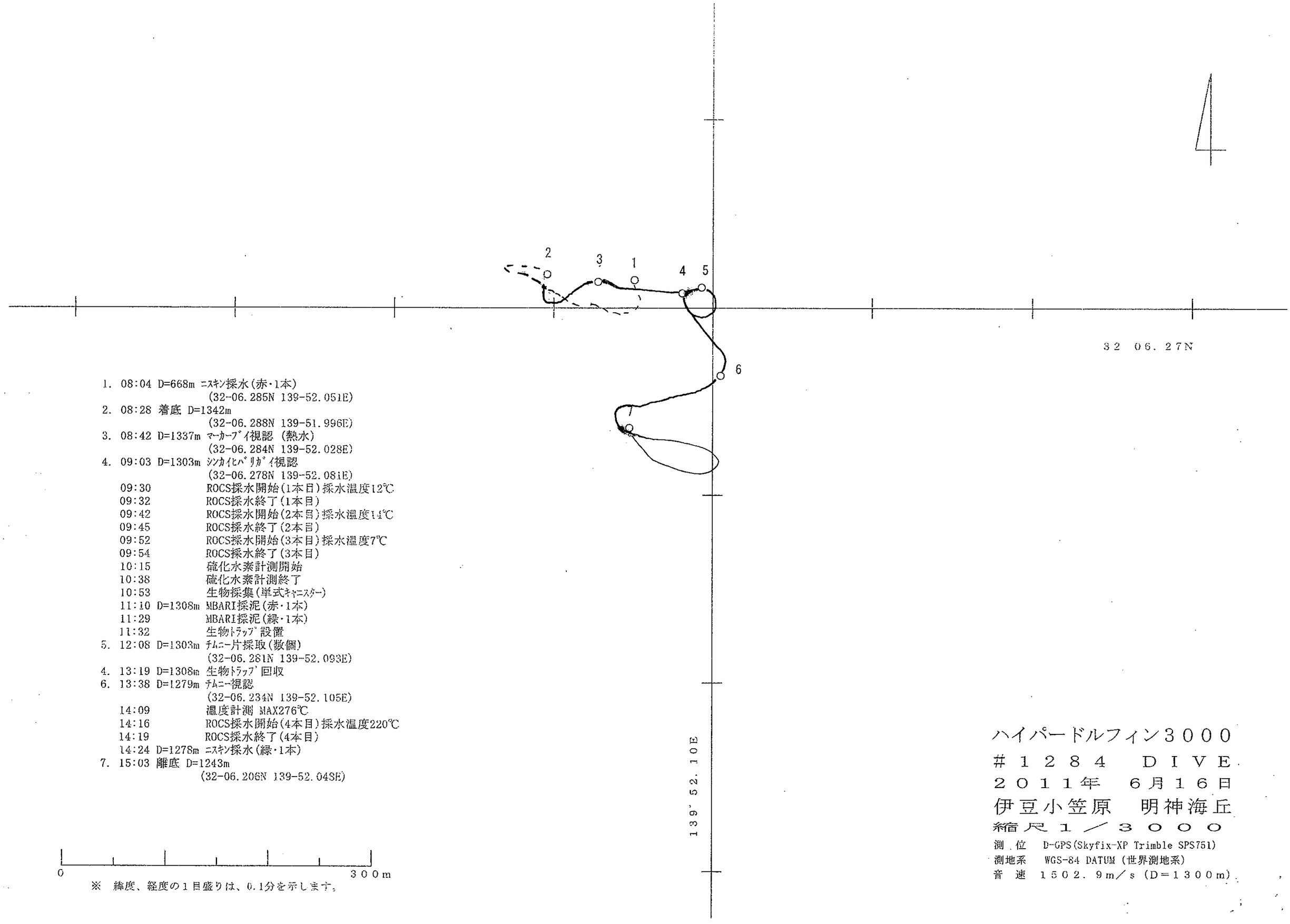
IZUOGASAWARA
MYOJINKAIKYU

CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:

DATUM
(WGS84)

XY ORIGIN 32-6.270N 139-52.100E

CENTER 32-6.270N 139-52.100E



1. 08:04 D=668m ﾆｽｷﾝ採水(赤・1本)
(32-06.285N 139-52.051E)
2. 08:28 着底 D=1342m
(32-06.288N 139-51.996E)
3. 08:42 D=1337m ﾏｰｶｰﾌﾞｲ視認 (熱水)
(32-06.284N 139-52.028E)
4. 09:03 D=1303m ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ視認
(32-06.278N 139-52.081E)
09:30 ROCS採水開始(1本目)採水温度12℃
09:32 ROCS採水終了(1本目)
09:42 ROCS採水開始(2本目)採水温度14℃
09:45 ROCS採水終了(2本目)
09:52 ROCS採水開始(3本目)採水温度7℃
09:54 ROCS採水終了(3本目)
10:15 硫化水素計測開始
10:38 硫化水素計測終了
10:53 生物採集(単式ｷｬﾆｽﾀｰ)
11:10 D=1308m MBARI採泥(赤・1本)
11:29 MBARI採泥(緑・1本)
11:32 生物ﾄﾗｯﾌﾟ設置
5. 12:08 D=1303m ﾁﾑﾆｰ片採取(数個)
(32-06.281N 139-52.093E)
4. 13:19 D=1308m 生物ﾄﾗｯﾌﾟ回収
6. 13:38 D=1279m ﾁﾑﾆｰ視認
(32-06.234N 139-52.105E)
14:09 温度計測 MAX276℃
14:16 ROCS採水開始(4本目)採水温度220℃
14:19 ROCS採水終了(4本目)
14:24 D=1278m ﾆｽｷﾝ採水(緑・1本)
7. 15:03 離底 D=1243m
(32-06.206N 139-52.048E)

0 300m

※ 緯度、経度の1目盛りは、0.1分を示します。

ハイパードルフィン3000
#1284 DIVE
2011年 6月16日
伊豆小笠原 明神海丘
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 1502.9m／s (D=1300m)

S: 1/2000

APSK05 (310℃)
#302ﾏｰｶｰ
D=1, 379m

熱水噴出孔
ﾁﾑﾆｰ
D=1, 376m

中央火口
#948-1ﾏｰｶｰ
D=1, 375m

AP01
D=1, 377m

APSK06
D=1, 380m

熱水噴出孔 (50℃)
#389ﾏｰｶｰ
D=1, 388m

ｼﾝｶｰ
D=1, 395m

APSK04
熱水噴出孔 (310℃)
D=1, 394m

ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ

H675ﾏｰｶｰ
D=1, 388m

着底点
D=1, 385m

熱水噴出孔
#387-2ﾏｰｶｰ
D=1, 382m

白色域
熱水噴出孔
#387-1ﾏｰｶｰ
D=1, 386m

ODP-A
D=1, 372m

AP04
#381-2ﾏｰｶｰ
#385-1ﾏｰｶｰ
D=1, 376m

AP03
D=1, 379m

APSK09
#570-1ﾏｰｶｰ
D=1, 387m

APSK08
D=1, 386m

ｼｪﾙｶｰﾍﾟｯﾄ
D=1, 381m

APSK10
#381-1ﾏｰｶｰ
H473-1ﾏｰｶｰ
D=1, 389m

APSK03
D=1, 375m

APSK07
D=1, 383m

APSK01
D=1, 388m

H677ﾏｰｶｰ
D=1, 385m

(11- 6-)
(NT11-09)

HYPER-DOLPHIN

No.1285 Dive
No.1286 Dive

IZU-OGASAWARA
SUIYO-KAIZAN

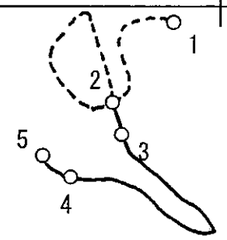
CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:

DATUM
(WGS84)

XY ORIGIN 28-34.300N 140-38.600E

CENTER 28-34.300N 140-38.600E

28° 34. 30N



1. 09:00 D=637m ﾆｽｷﾝ採水(赤・1本)
(28-34.297N 140-38.690E)
2. 09:25 着底 D=1386m
(28-34.282N 140-38.677E)
3. 09:53 D=1382m ﾊﾞﾝﾄﾞﾝ採水(1本)
(28-34.276N 140-38.679E)
10:01 生物ﾄﾗｯﾌﾟ(ほどほどくん)1号,2号設置
10:03 生物付岩石採取(1個)
4. 10:19 D=1381m 熱水噴出孔視認
(28-34.268N 140-38.668E)
10:21 H1285-1ﾏｰｶｰ設置
10:29 生物採集・岩石採取(#2ｷｬﾆｽﾀｰ)
5. 10:46 温度計測(MAX105℃)
(28-34.272N 140-38.662E)
10:49 ROCS採水開始(1本目)採水温度10℃
10:51 ROCS採水終了(1本目)
10:59 ROCS採水開始(2本目)採水温度5℃
11:03 ROCS採水終了(2本目)
11:12 ﾊﾞｸﾃﾘｱﾏｯﾄ採集 (#1ｷｬﾆｽﾀｰ)
11:24 生物採集 (単式ｷｬﾆｽﾀｰ)
11:28 離底 D=1383m

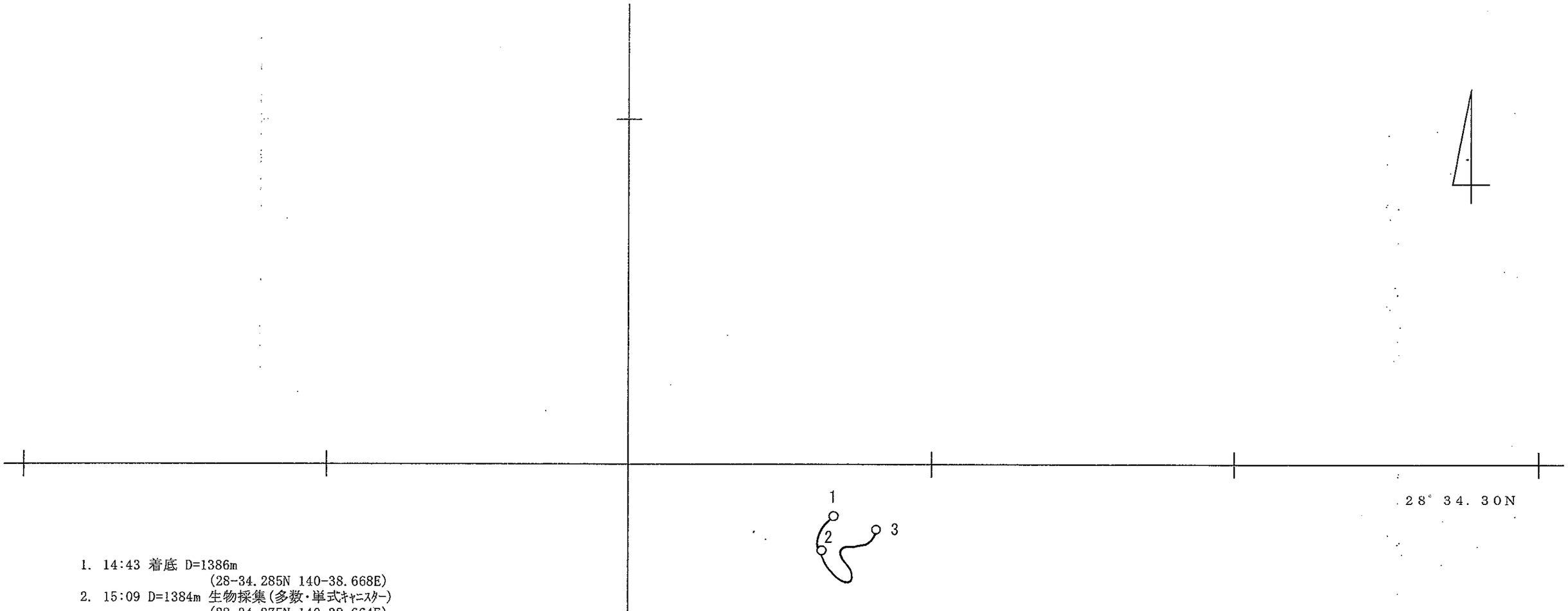
0 200m

※ 緯度、経度の1目盛りは、0.1分を示します。

140° 38. 60E

ハイパードルフィン3000
#1285 DIVE
2011年 6月18日
伊豆小笠原 水曜海山
縮尺 1／2000

測 位 D-GPS(Skyfix-XP Trimble SPS751)
測地系 WGS-84 DATUM (世界測地系)
音 速 1499.7m／s (D=1400m)



1. 14:43 着底 D=1386m
   (28-34.285N 140-38.668E)
2. 15:09 D=1384m 生物採集(多数・単式ｷｬﾆｽﾀｰ)
   (28-34.275N 140-38.664E)
3. 15:17 D=1381m 生物ﾄﾗｯﾌﾟ(ほどほどくん)視認
   (28-34.281N 140-38.682E)

15:35	生物採集(#2ｷｬﾆｽﾀｰ)
	生物ﾄﾗｯﾌﾟ(ほどほどくん)1号,2号回収
15:45	ﾊﾞﾝﾄﾞﾝ採水(1本)
15:58	生物採集(#3ｷｬﾆｽﾀｰ)
16:12	ROCS採水開始(3本目)採水温度26℃
16:15	ROCS採水終了(3本目)
16:23	ROCS採水開始(4本目)採水温度8℃
16:25	ROCS採水終了(4本目)
16:30	硫化水素計測開始
16:36	硫化水素計測終了

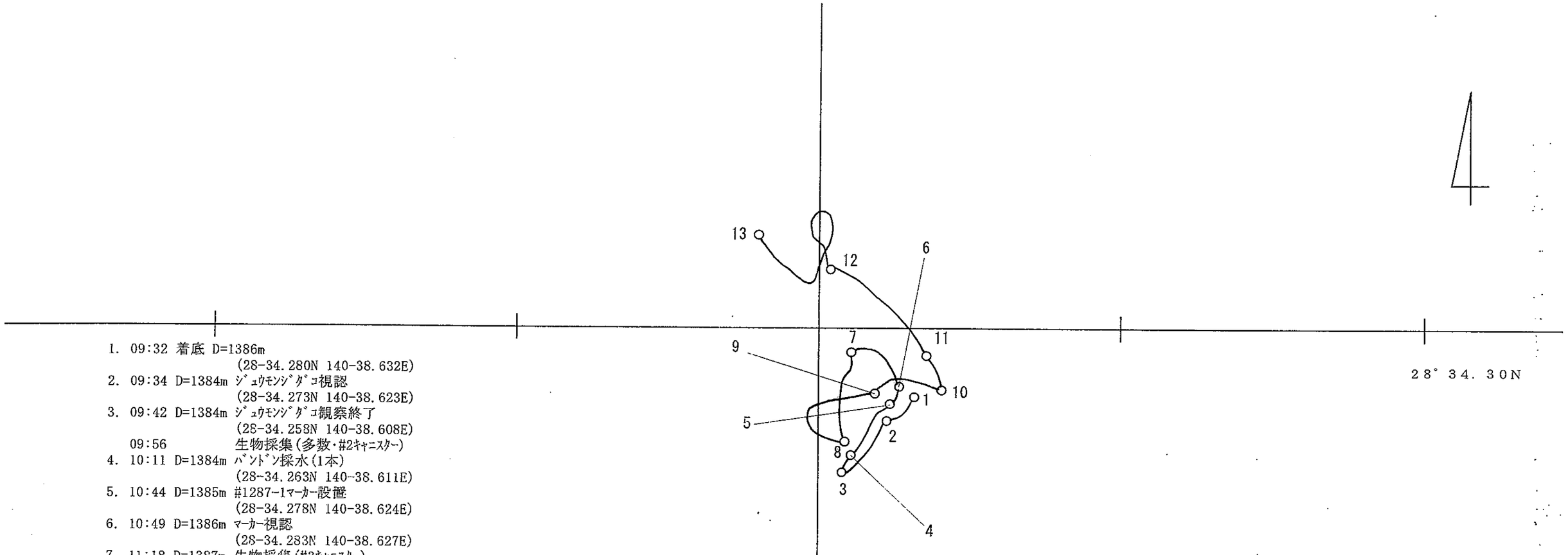
16:41 離底 D=1383m

0 ―――― 200m

※ 緯度、経度の１目盛りは、0.1分を示します。

ハイパードルフィン３０００
＃１２８６ ＤＩＶＥ
２０１１年 ６月１８日
伊豆小笠原 水曜海山
縮尺１／２０００

測 位 D-GPS(Skyfix-XP Trimble SPS751)
測地系 WGS-84 DATUM (世界測地系)
音 速 １４９９．７m／s (D＝１４００m)



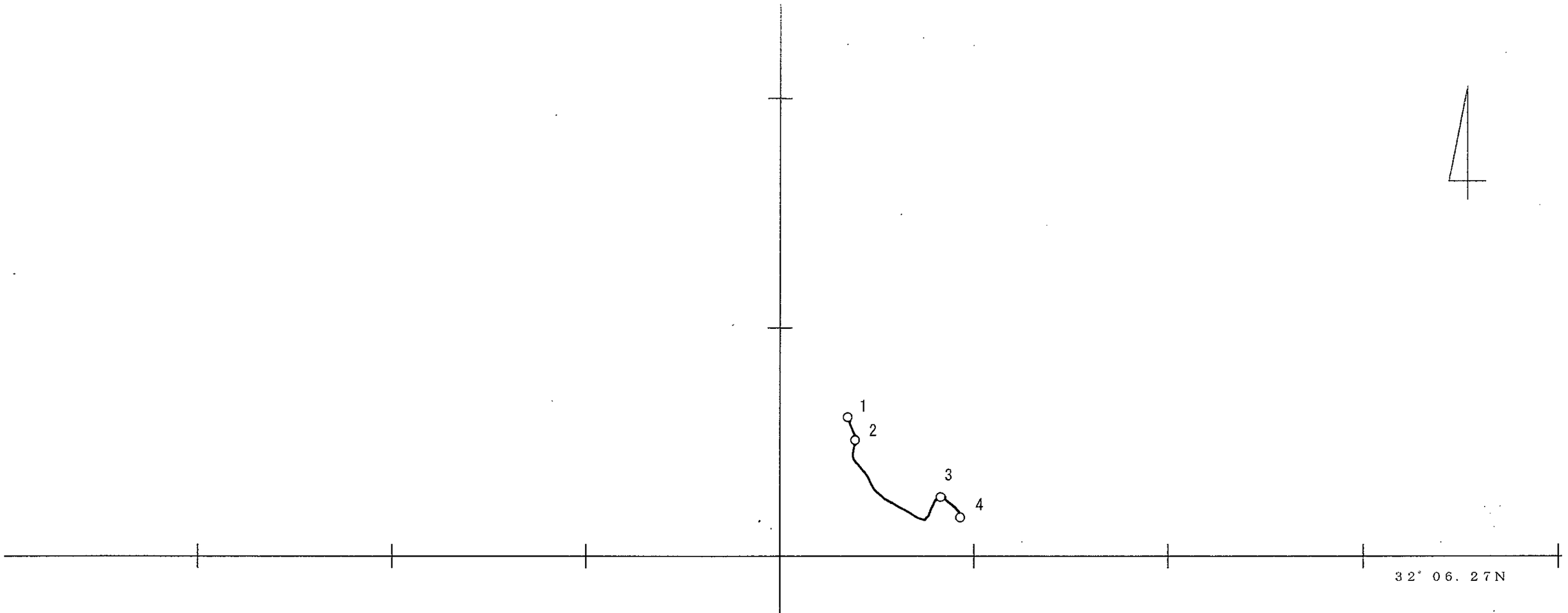
1. 09:32 着底 D=1386m
   (28-34.280N 140-38.632E)
2. 09:34 D=1384m ｼﾞｭｳﾓﾝｼﾞﾀﾞｺ視認
   (28-34.273N 140-38.623E)
3. 09:42 D=1384m ｼﾞｭｳﾓﾝｼﾞﾀﾞｺ観察終了
   (28-34.258N 140-38.608E)
   09:56 生物採集(多数・#2ｷｬﾆｽﾀｰ)
4. 10:11 D=1384m ﾊﾞﾝﾄﾞﾝ採水(1本)
   (28-34.263N 140-38.611E)
5. 10:44 D=1385m #1287-1ﾏｰｶｰ設置
   (28-34.278N 140-38.624E)
6. 10:49 D=1386m ﾏｰｶｰ視認
   (28-34.283N 140-38.627E)
7. 11:18 D=1387m 生物採集(#3ｷｬﾆｽﾀｰ)
   (28-34.293N 140-38.611E)
   11:30 ROCS採水開始(1本目)採水温度21℃
   11:33 ROCS採水終了(1本目)
   11:43 ROCS採水開始(2本目)採水温度24℃
   11:46 ROCS採水終了(2本目)
8. 12:12 D=1384m ROCS採水開始(3本目)採水温度24℃
   (28-34.267N 140-38.609E)
   12:14 ROCS採水終了(3本目)
   12:20 ROCS採水開始(4本目)採水温度24℃
   12:22 ROCS採水終了(4本目)
   12:28 ROCS採水開始(5本目)採水温度22℃
   12:30 ROCS採水終了(5本目)
   12:40 ﾆｽｷﾝ採水(赤・1本)
   12:43 ﾆｽｷﾝ採水(緑・1本)
   12:54 MBARI採泥(緑・1本)
   13:02 生物採集(多数・単式ｷｬﾆｽﾀｰ)
9. 13:13 D=1384m ﾏｰｶｰ3個視認
   (28-34.281N 140-38.619E)
10. 13:26 D=1388m MBARI採泥(赤・1本)
   (28-34.282N 140-38.641E)
11. 13:32 D=1387m ﾀｺ視認
   (28-34.292N 140-38.636E)
   13:36 ﾀｺ採集(単式ｷｬﾆｽﾀｰ)
12. 13:50 D=1384m #307ﾏｰｶｰ視認
   (28-34.317N 140-38.604E)
13. 14:18 D=1382m 岩石1個採取
   (28-34.327N 140-38.580E)
   14:25 離底 D=1382m

0 200m

※ 緯度、経度の１目盛りは、0.1分を示します。

ハイパードルフィン３０００
＃１２８７　ＤＩＶＥ
２０１１年　６月１９日
伊豆小笠原　水曜海山
縮尺１／２０００

測　位　D-GPS(Skyfix-XP Trimble SPS751)
測地系　WGS-84 DATUM（世界測地系）
音　速　１４９９．７m／s（D＝１４００m）



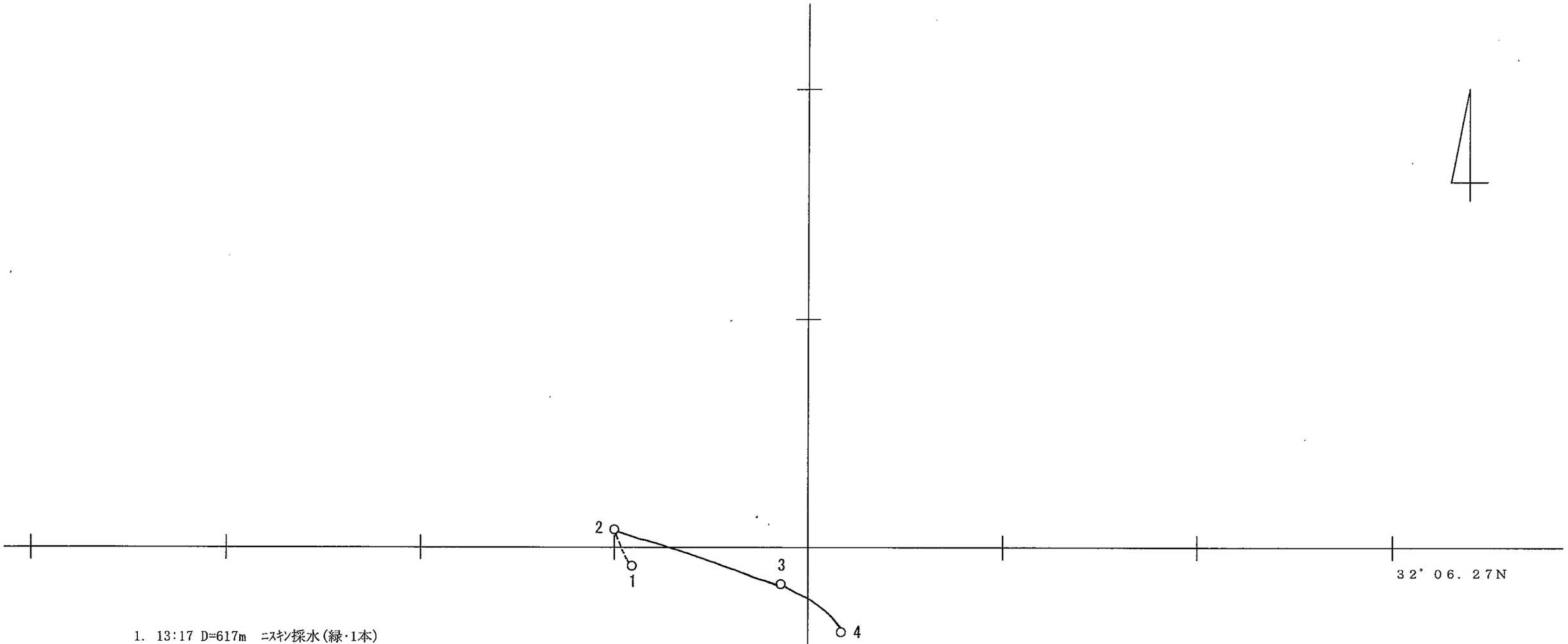
1. 08:14 着底 D=1327m
   (32-06.331N 139-52.135E)
2. 08:19 D=1317m 白色域視認
   (32-06.321N 139-52.139E)
3. 08:43 D=1288m 植木鉢ﾏｰｶｰ視認
   (32-06.296N 139-52.183E)
   09:01 ﾁﾑﾆｰ片採取
4. 09:32 D=1278m 生物付岩石採取
   (32-06.287N 139-52.193E)
   09:47 D=1277m ｺﾞｶｲ採集(#1ｷｬﾆｽﾀｰ)
   10:02 D=1275m ﾁﾑﾆｰ採取
   10:18 D=1273m 生物採集(単式ｷｬﾆｽﾀｰ)
   10:21 D=1269m ﾆｽｷﾝ採水(赤・1本)
   10:21 離底 D=1269m

0 ３００m

※ 緯度、経度の１目盛りは、0.1分を示します。

ハイパードルフィン３０００
＃１２８８ ＤＩＶＥ
２０１１年 ６月２１日
伊豆小笠原 明神海丘
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 １５０２．９m／s (D＝１３００m)



1. 13:17 D=617m ﾆｽｷﾝ採水(緑･1本)
   (32-06.262N 139-52.009E)
2. 13:38 着底 D=1327m
   (32-06.275N 139-52.000E)
3. 14:15 D=1292m ROCS採水開始(1本目)採水温度5.6℃
   (32-06.254N 139-52.086E)
   14:17 ROCS採水終了(1本目)
   14:20 硫化水素計測開始(1回目)
   14:23 硫化水素計測終了(1回目)
   14:28 ﾁﾑﾆｰ片採取
4. 14:50 D=1265m ｸﾏﾃﾞによる採泥
   (32-06.233N 139-52.117E)
   14:54 ROCS採水開始(2本目)採水温度5.5℃
   14:57 ROCS採水終了(2本目)
   14:59 硫化水素計測開始(2回目)
   15:02 硫化水素計測終了(2回目)
   15:04 ﾆｽｷﾝ採水(赤･1本)
   15:11 ｽﾗｰﾌﾟｶﾞﾝによる生物採集
   15:12 離底 D=1265m

0 300m

※ 緯度、経度の１目盛りは、0.1分を示します。

ハイパードルフィン３０００

＃１２８９ ＤＩＶＥ

２０１１年 ６月２１日

伊豆小笠原 明神海丘

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 １５０２．９m／s (D＝１３００m)

S: 1/3000

立入禁止区域

H1235-MB1
D=855m

ｼﾛｳﾘｶﾞｲｺﾛﾆｰ
D=805m

#2成長速度実験BOX
D=805m

ｼﾛｳﾘｶﾞｲｺﾛﾆｰ(広範囲)
H927ﾏｰｶｰﾌﾞｲ
D=856m

丸太
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=905m

着底点
D=940m

ﾊｵﾘﾑｼ
D=796m

ﾊｲｶﾌﾞﾘﾆﾅ
ｼﾛｳﾘｶﾞｲｺﾛﾆｰ
D=821m

ｼﾝｶｲﾋﾊﾞﾘｶﾞｲｺﾛﾆｰ
D=858m

ﾁｭｰﾌﾞﾜｰﾑ
6K 1007丸太
H927ｴｻ付ﾏｰｶｰ
H928ｴｻ付ﾏｰｶｰ
ﾄﾗｯﾌﾟ
D=852m

(11-6-)
(NT11-09)

HYPER-DOLPHIN

No.1290 Dive
No.1291 Dive

SAGAMI-WAN
HATSUSHIMA-OKI

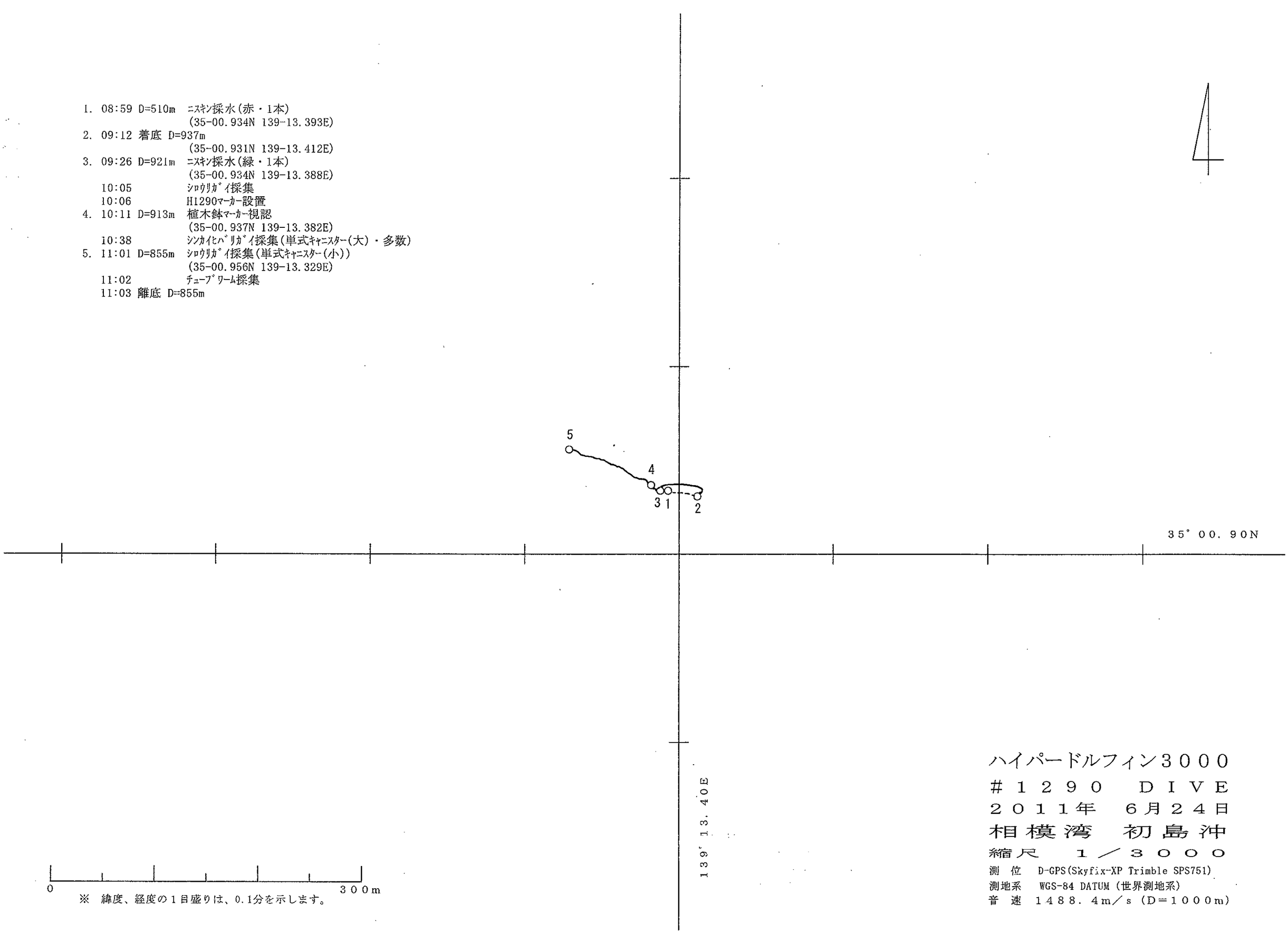
CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:

DATUM
(WGS-84)

XY ORIGIN 35-0.900N 139-13.400E

CENTER 35-0.900N 139-13.400E

1. 08:59 D=510m ﾆｽｷﾝ採水(赤・1本)
(35-00.934N 139-13.393E)
2. 09:12 着底 D=937m
(35-00.931N 139-13.412E)
3. 09:26 D=921m ﾆｽｷﾝ採水(緑・1本)
(35-00.934N 139-13.388E)
10:05 ｼﾛｳﾘｶﾞｲ採集
10:06 H1290ﾏｰｶｰ設置
4. 10:11 D=913m 植木鉢ﾏｰｶｰ視認
(35-00.937N 139-13.382E)
10:38 ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ採集(単式ｷｬﾆｽﾀｰ(大)・多数)
5. 11:01 D=855m ｼﾛｳﾘｶﾞｲ採集(単式ｷｬﾆｽﾀｰ(小))
(35-00.956N 139-13.329E)
11:02 ﾁｭｰﾌﾞﾜｰﾑ採集
11:03 離底 D=855m

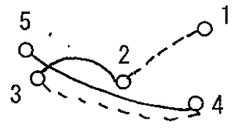


0 300m

※ 緯度、経度の1目盛りは、0.1分を示します。

ハイパードルフィン3000
#1290 DIVE
2011年 6月24日
相模湾 初島沖
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 1488.4m／s (D＝1000m)

1. 13:40 D=511m ﾆｽｷﾝ採水(赤・1本)
(35-00.961N 139-13.383E)
2. 13:51 着底 D=873m
(35-00.946N 139-13.355E)
3. 14:02 D=857m 高度をとって移動
(35-00.947N 139-13.326E)
4. 14:17 D=910m ﾆｽｷﾝ採水(緑・1本)
(35-00.940N 139-13.380E)
14:23 ROCS採水開始(1本目)採水温度4.3℃
14:25 ROCS採水終了(1本目)
14:27 硫化水素計測開始(1回目)
14:30 硫化水素計測終了(1回目)
14:39 ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ採集(単式ｷｬﾆｽﾀｰ)
14:48 D=909m ROCS採水開始(2本目)採水温度4.4℃
14:50 ROCS採水終了(2本目)
14:55 ROCS採水開始(3本目)採水温度4.5℃
14:57 ROCS採水終了(3本目)
14:59 硫化水素計測開始(2回目)
15:06 硫化水素計測終了(2回目)
5. 15:31 D=855m ROCS採水開始(4本目)採水温度4.76℃
(35-00.955N 139-13.322E)
15:33 ROCS採水終了(4本目)
15:36 硫化水素計測開始(3回目)
15:39 硫化水素計測終了(3回目)
15:41 MBARI採泥(緑・1本)
15:44 MBARI採泥(赤・1本)
15:48 生物ﾄﾗｯﾌﾟ(ほどほどくん)設置
15:56 ｸﾏﾃﾞによる採泥
16:00 生物ﾄﾗｯﾌﾟ(ほどほどくん)回収
16:01 離底 D=854m



0 300m

※ 緯度、経度の１目盛りは、0.1分を示します。

ハイパードルフィン３０００
＃１２９１ ＤＩＶＥ
２０１１年 ６月２４日
相模湾 初島沖
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 １４８８．４m／s (D＝１０００m)

S: 1/3000

立入禁止区域

#144M
H634-1マーカー
D=1,074m
生物コロニー
コンクリーション
チューブワーム
D=1,095m
シロウリガイコロニー
#323-2M
チューブワーム(ヤキソバ)
D=1,138m
チューブワーム
D=1,055m
#325M
シロウリガイコロニー
D=1,129m
チューブワーム
#323-1M
D=1,149m
#242M
(付着板付)
D=1,177m
旧ステーション
HOMER:ID=38
D=1,182m
新ヘルメットブイ
コデラート
HOMER:ID=10
D=1,163m
電位差計Nセンサー
D=1,179m
H974植木鉢マーカー
D=1,176m
電位差計Eセンサー
D=1,187m
長期観測ステーション
ハクヨウマーカー
赤色域
JAMSTECブイ
S-OBEM
地震計/圧力計
水中LEDライト
H1208地中温度計
電極付テストケーブル
D=1,182m
ウエイト
D=1,178m
GALI-10
マーカーブイ
D=1,172m
H1236-MB2
D=1,171m
長期観測ランダー設置
D=1,177m
HOMER:ID=14
D=1,176m
H1209-1マーカー
H1209-3マーカー
D=1,173m
#829M放流柵(青)
#830M放流柵(白)
D=1,166m
#908M
D=1,134m
#244(MB-2)
H1236-MB1
D=1,177m
仲大王ブイ
D=1,144m
フジツボ岩
2K記念マーカー
H795-1,2,6付着用塩ビ筒
D=1,167m
#246(MB-3)
D=1,171m
着底点
#1087M
D=1,186m

(11-6-)
(NT11-09)

HYPER-DOLPHIN

No.1292 Dive

SAGAMI-WAN
HATSUSHIMA-OKI

CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:

DATUM
(WGS-84)

XY ORIGIN 35-0.200N 139-13.450E

CENTER 35-0.200N 139-13.450E

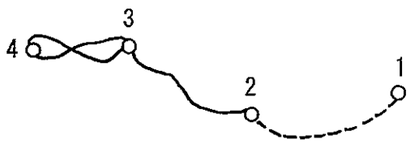
35° 00. 20N

1. 09:05 D=501m ﾆｽｷﾝ採水(赤・1本)
(35-00.060N 139-13.595E)
2. 09:26 着底 D=1186m
(35-00.054N 139-13.545E)
3. 09:44 D=1176m ﾆｽｷﾝ採水(緑・1本)
(35-00.073N 139-13.503E)
09:47 生物ﾄﾗｯﾌﾟ(ほどほどくん)設置
09:53 ROCS採水開始(1本目)採水温度3.7℃
09:55 ROCS採水終了(1本目)
09:58 硫化水素計測開始(1回目)
10:01 硫化水素計測終了(1回目)
10:04 H1292ﾏｰｶｰ設置
10:16 ｼｮｳﾘｶﾞｲ採集
4. 10:41 D=1166m H795-1,2,6付着用塩ビ筒回収
(35-00.072N 139-13.470E)
11:01 ｸﾏﾃﾞによる採泥
3. 11:09 D=1176m 生物ﾄﾗｯﾌﾟ(ほどほどくん)回収
11:09 H1292ﾏｰｶｰ回収
11:12 離底 D=1175m

0 300m

※ 緯度、経度の１目盛りは、0.1分を示します。

3

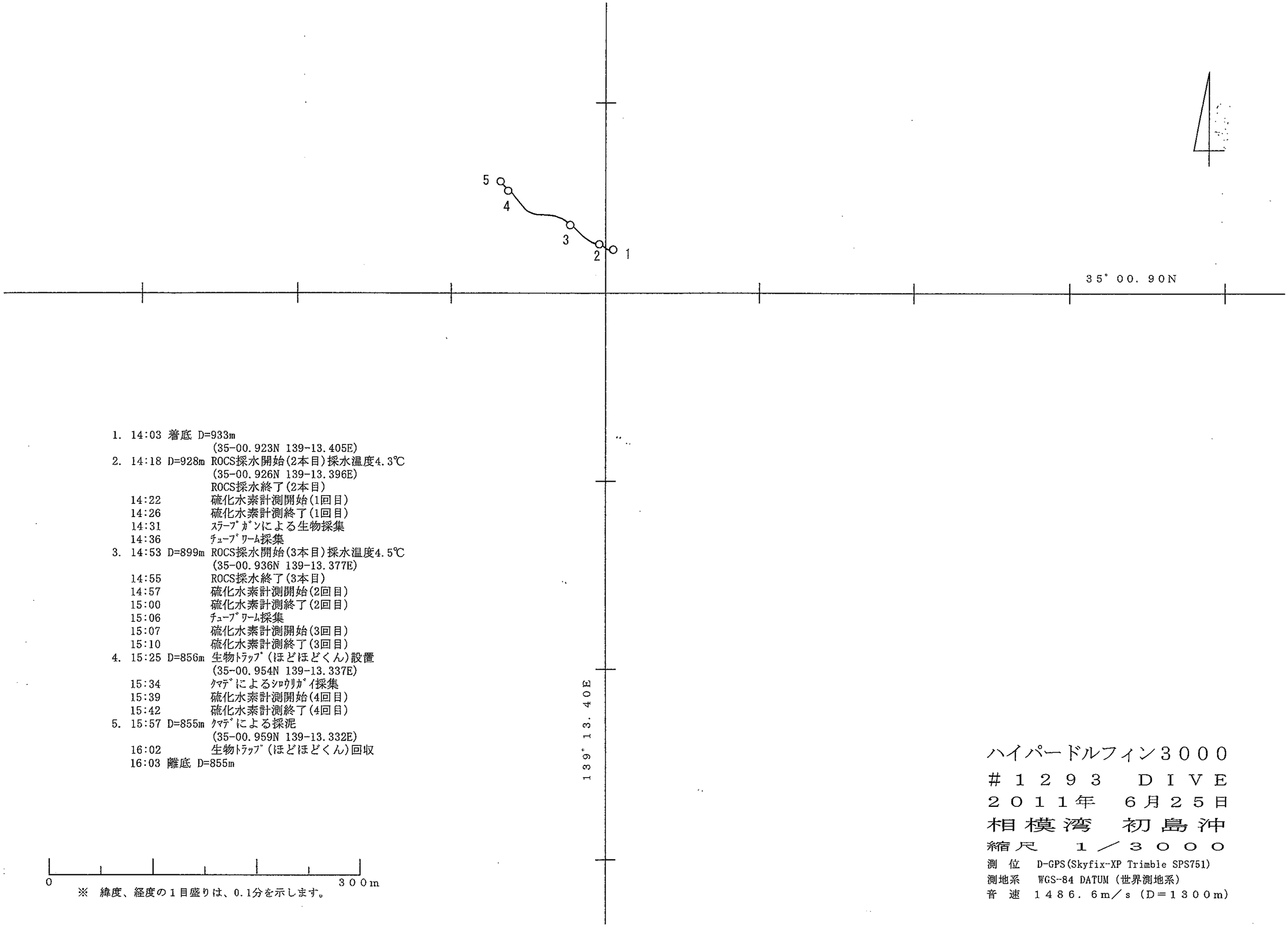


139° 13. 45E

ハイパードルフィン３０００
＃１２９２　ＤＩＶＥ
２０１１年　６月２５日
相模湾　初島沖

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　１４８６．６ｍ／ｓ（Ｄ＝１３００ｍ）



1. 14:03 着底 D=933m
   (35-00.923N 139-13.405E)
2. 14:18 D=928m ROCS採水開始(2本目)採水温度4.3℃
   (35-00.926N 139-13.396E)
   ROCS採水終了(2本目)
   14:22 硫化水素計測開始(1回目)
   14:26 硫化水素計測終了(1回目)
   14:31 ｽﾗｰﾌﾟｶﾞﾝによる生物採集
   14:36 ﾁｭｰﾌﾞﾜｰﾑ採集
3. 14:53 D=899m ROCS採水開始(3本目)採水温度4.5℃
   (35-00.936N 139-13.377E)
   14:55 ROCS採水終了(3本目)
   14:57 硫化水素計測開始(2回目)
   15:00 硫化水素計測終了(2回目)
   15:06 ﾁｭｰﾌﾞﾜｰﾑ採集
   15:07 硫化水素計測開始(3回目)
   15:10 硫化水素計測終了(3回目)
4. 15:25 D=856m 生物ﾄﾗｯﾌﾟ(ほどほどくん)設置
   (35-00.954N 139-13.337E)
   15:34 ｸﾏﾃﾞによるｼﾛｳﾘｶﾞｲ採集
   15:39 硫化水素計測開始(4回目)
   15:42 硫化水素計測終了(4回目)
5. 15:57 D=855m ｸﾏﾃﾞによる採泥
   (35-00.959N 139-13.332E)
   16:02 生物ﾄﾗｯﾌﾟ(ほどほどくん)回収
   16:03 離底 D=855m

0 ― 300m

※ 緯度、経度の１目盛りは、0.1分を示します。

ハイパードルフィン３０００
＃１２９３ ＤＩＶＥ
２０１１年 ６月２５日
相模湾 初島沖

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 １４８６．６m／s (D＝１３００m)