doi : 10.17596/0002914

RV Natsushima Cruise Report

NT14-06

Bayonnaise Knoll, Myojin Knoll,

and

Myojin-sho submarine caldera

(Izu-Ogasawara Area)

Apr.11,2014-Apr.20,2014

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

●Contents

1. Cruise Information

1) Cruise ID: NT14-06

2) Name of vessel: R/V Natsushima

3) Title of the cruise: Natsushima/Hyper-Dolphin NT14-06

4) Title of proposal

"The final piece for the study on the hypothesis of the passive meiofaunal migration between hydrothermal vents in "neighbor" seamounts: Research on the Bayonnaise Knoll caldera" (Motohiro SHIMANAGA)

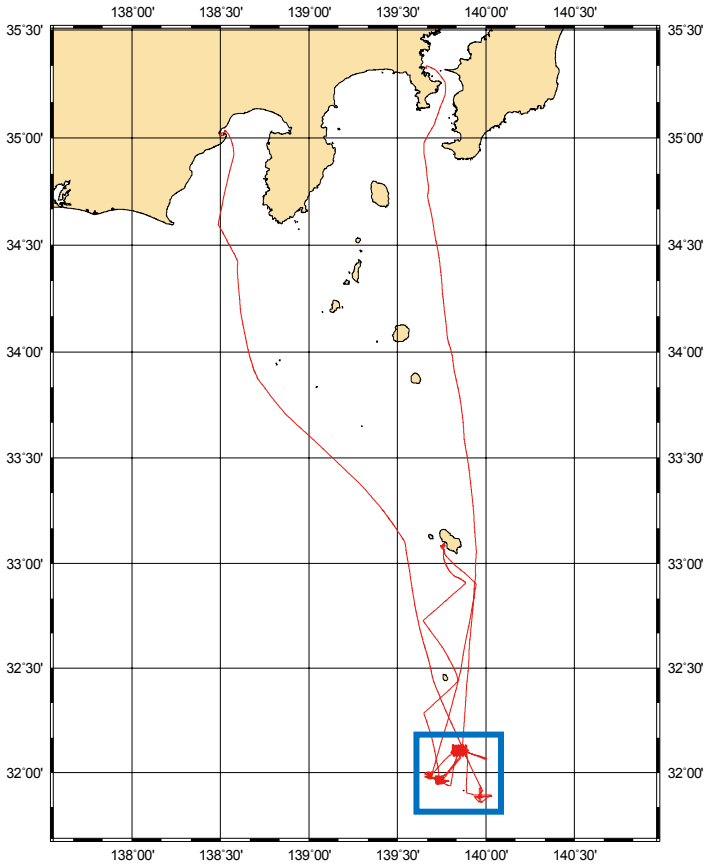
"Elucidation of the hypotaurine-synthesis pathway of deep-sea mussels" (Koji INOUE)

"Time-resolved in situ colonization experiments of basalt at seafloor to understand a deep biosphere ecosystem" (Satoshi MITSUNOBU)

5) Cruise period: 11 th April - 20th April, 2014

6) Ports of call: Yokosuka port / Shimizu port.

7) Research area: Around Izu-Ogasawara arc



Research Area and Cruise track of NT14-06.

2. Researchers

1) Chief scientist

Motohiro SHIMANAGA [Kumamoto University]

2) Representative of the science party

Motohiro SHIMANAGA [Kumamoto University]

Koji INOUE [The University of Tokyo]

Satoshi MITSUNOBU [University of Shizuoka]

3) Members of Science party (on board)

“SHIMANAGA group”

Motohiro SHIMANAGA	Kumamoto University
Hiromi WATANABE	Japan Agency for Marine-Earth Science and Technology
Tomo KITAHASHI	The University of Tokyo
Reina SENOGUCHI	Kumamoto University
Yuki UEJIMA	Kumamoto University
Takuya YAHAGI	The University of Tokyo

“INOUE group”

Koji INOUE	The University of Tokyo
Tomoko KOITO	Nihon University
Azusa KINJO	The University of Tokyo
Mieko SASSA	The University of Tokyo
Syuku SAITO	Nihon University
Suguru NEMOTO	Enoshima Aquarium

“MITSUNOBU Group”

Satoshi MITSUNOBU	University of Shizuoka
Hiroko MAKITA	Japan Agency for Marine-Earth Science and Technology
Tatsuo NOZAKI	Japan Agency for Marine-Earth Science and Technology
Mieko TANAKA	Japan Agency for Marine-Earth Science and Technology
Saki TSUTSUMI	Japan Agency for Marine-Earth Science and Technology

3. Observation

1) Overview of the observation

In this cruise, we visited active hydrothermal venting sites in the Bayonnaise and Myojin Knolls. Eight dives (Dive #1645-1652) were done, during six research days in total. Three research groups participated to this cruise. The purposes of those groups were shown below.

2) Research information

a) SHIMANAGA group

Our major purpose is to investigate spatial differences in meiofaunal community structure among hydrothermal vents in seamounts on the Izu-Ogasawara Arc, evaluating similarities in species diversity and community structure between meiofauna assemblages around hydrothermal vests in different calderas belonging to the same arc. During the cruise (ROV/hyper-Dolphin, Dives #1647, #1648, 1649, 1652), we collected meiofauna in the sediment and on bacteria matts on the walls of vents, using different types of corers and suction samplers. We will sort those collected meiofauna based on morphological structures and DNA sequences. We hope that data obtained through our studies will bring us important information on common and specific features of the meiofaunal community around hydrothermal vent ecosystems.

b) INOUE group

The purpose of the Inoue group is to elucidate the accumulation mechanisms of hypotaurine, an amino acid used to avoid the toxicity of hydrogen sulfide in the hydrothermal-vent water. In this cruise, we collected the deep-sea mussel *Bathymodiolus septemdierum* at Myojin Knoll using the suction sampler (Dives #1645, #1646, #1650, and #1651). A part of the collected mussels are used for physiological and biochemical experiments on board and others are kept in aquaria for the experiments after cruise. In addition, temperature and sulfide level of the sampling points were measured using sensors to understand the influence of environmental conditions on the expression of the hypotaurine accumulation mechanisms.

c) MITSUNOBU group

Our main objective is to understand a litho-biosphere ecosystem beneath sea-floor supported by oxidation of ferrous iron (Fe(II)) in ocean crust, basalt rock. Accordingly, we would perform “time-resolved in situ colonization experiment with fresh basalt” and investigate biotic alteration process of the basalt rock and microbial community related to the alteration, in the view of Fe(II) oxidation reaction. In this cruise, (i) we have installed three incubation vessels in both hydrothermal and non-hydrothermal areas in Beyonnaise knoll (Dives #1647 and #1648), and (ii) we have collected seawater and rock samples on the setting points (Dives #1647, #1648, #1649, and #1652). As the future works, we will analyze the collected seawater and rock samples, to understand environmental condition and thermodynamically

possible reaction at the installation points. The installed incubation vessels will be recovered first in December 2014, which is the second cruise for our project.

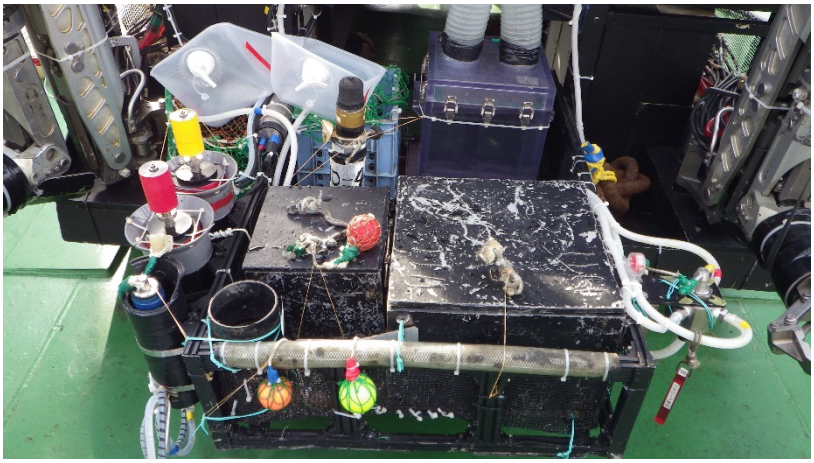
3) Dive information (Details of dive tracks, sampling locations, etc. are shown in Appendix)

a) Dive #1645 (April 12, Myojin Knoll submarine caldera; reporter, K. Inoue)

Equipment loaded: Suction sampler (Slurp gun) with a rotary canister with 7-bottles, and that with a cubic canister, Sulfide sensor, On-line thermometer, Niskin water sampler (x2), Bag-type water sampler, DO meter, Sample Box (x2), H-type corer (x2), RV Homer, Markers (x2)

Sampling and Operation

1. Observation of a deep-sea mussel colony (D=1244 m)
2. DO measurement
3. Sulfide and temperature measurement
4. Sampling of water just above the mussel colonies
5. Mussel sampling
6. Sampling of seawater near the mussel colonies
7. Setting a marker and the RV Homer near the colony.



Arrangement of research equipment at Dive #1645

b) Dive #1646 (April 12, Myojin Knoll submarine caldera; reporter, K. Inoue)

Equipment loaded: Suction sampler (Slurp gun) with a rotary canister with 7-bottles, and that with a cubic canister, Sulfide sensor, On-line thermometer, Niskin water sampler (x2), Bag-type water sampler, DO meter, Sample Box (x2), H-type corer (x2), Markers (x2), Bait trap

Sampling and Operation

1. Bait trap setting
2. Sampling of additional water just above the colony (D=1244 m)
3. Sampling of vent-specific organisms using Slurp Gun
4. Recovery of the bait trap and the RV homer.
5. Seek for another mussel colonies
6. Sulfide and temperature measurement
7. Sampling of water just above the mussel colonies
8. Mussel sampling
9. Sampling of seawater near the mussel colonies
10. Seek for another mussel colonies
11. Sulfide and temperature measurement
12. Mussel sampling
13. Sampling of water just above the mussel colonies

Arrangement of research equipment at Dive #1646

c) Dive #1647 (April 13, Bayonnaise knoll; reporter, M. Shimanaga)

Equipment loaded: Suction sampler (Slurp gun) with a rotary canister with 7-bottles, and that with a cubic canister, Sulfide sensor, On-line thermometer, Niskin water sampler (x2), In situ incubator (x3), DO meter, Sample Box (x1), H-type corer (x4), S-type corer (x4), Vacuum water sampler (x2)

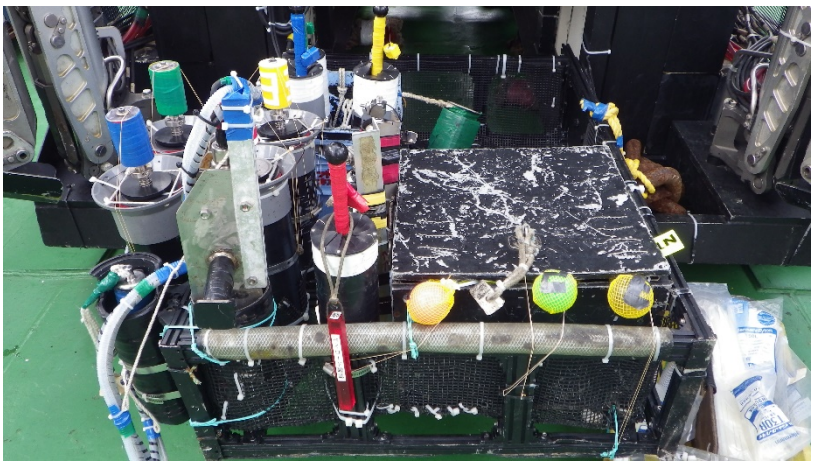
Sampling and Operation

(Shimanaga group)

1. Sampling of sediment (D = 831 m, 778 m, 757 m, 742 m)
2. DO measurement
3. Temperature measurement
4. Sulfide measurement
5. Sampling of benthos samples with slurp gun on the chimneys

(Mitsunobu group)

1. Sampling of rock and sediment samples (D = 831 m, 760 m, 762 m, 742 m, 784 m)
2. Setting of in situ incubators in non-hydrothermal area (D = 778 m)
3. DO measurement
4. Temperature measurement
5. Sulfide measurement
6. Seawater sampling by vacuum water sampler (D = 778 m)



Arrangement of research equipments at Dive #1647

d) Dive #1648 (April 15, Bayonnaise knoll; reporter, S. Mitsunobu)

Equipment loaded: Suction sampler (Slurp gun) with a rotary canister with 7-bottles, and that with a cubic canister, Sulfide sensor, On-line thermometer, Niskin water sampler (x2), In situ incubator (x3), DO meter, Sample Box (x1), H-type corer (x2), M-type sediment sampler (x2), S-type corer (x4) Vacuum water sampler (x2)

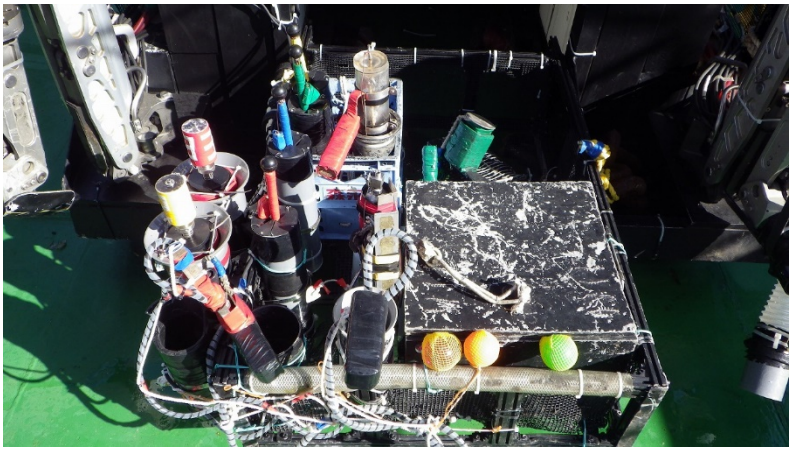
Sampling and Operation

(Shimanaga group)

1. Sampling of sediment (D=832 m, 781 m, 777 m)
2. DO measurement
3. Temperature measurement
4. Sulfide measurement
5. Sampling of benthos sample with slurp gun on the chimney

(Mitsunobu group)

1. Sampling of rock and sediment samples (D = 829 m, 832 m, 781 m, 777 m)
2. Setting of in situ incubators in non-hydrothermal area (D = 832 m)
3. DO measurement
4. Temperature measurement
5. Sulfide measurement
6. Seawater sampling by vacuum water sampler (D = 781 m, 832 m)



Arrangement of research equipment at Dive #1648

e) Dive #1649 (April 16, Bayonnaise knoll; reporter, S. Mitsunobu)

Equipment loaded: Suction sampler (Slurp gun) with a rotary canister with 7-bottles, and that with a cubic canister, Sulfide sensor, On-line thermometer, Niskin water sampler (x2), DO meter, Sample Box (x1), H-type corer (x2), M-type sediment sampler (x2), S-type corer (x4), Marker with reflector (x2) Vacuum water sampler (x2)

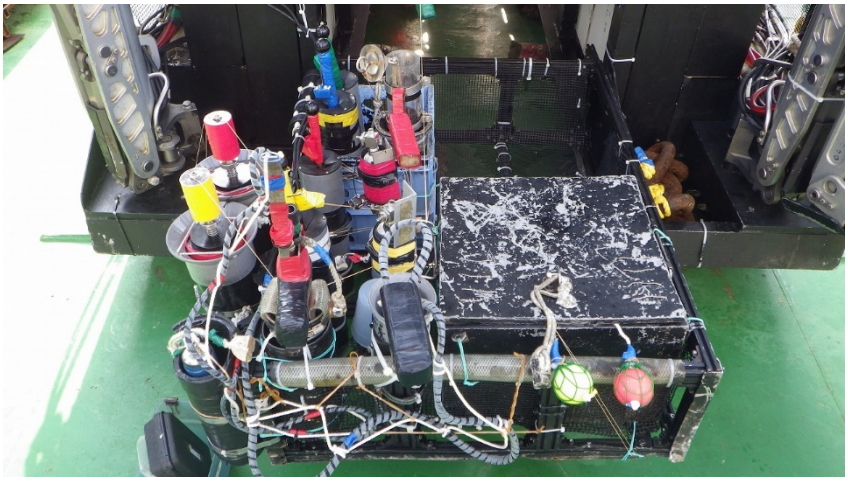
Sampling and Operation

(Shimanaga group)

1. Sampling of plankton sample with slurp gun in middle depth (D = 600 m, 700 m)
2. Sampling of sediment (D=831 m, 779 m, 772 m)
3. DO measurement
4. Temperature measurement
5. Sulfide measurement
6. Sampling of benthos with slurp gun on the chimney

(Mitsunobu group)

1. Sampling yellow/red colored sediment (D = 779 m)
2. Sampling rock sample near chimney vent (D = 774 m, 772 m)
3. DO measurement
4. Temperature measurement
5. Seawater sampling by vacuum water sampler (D = 772 m)



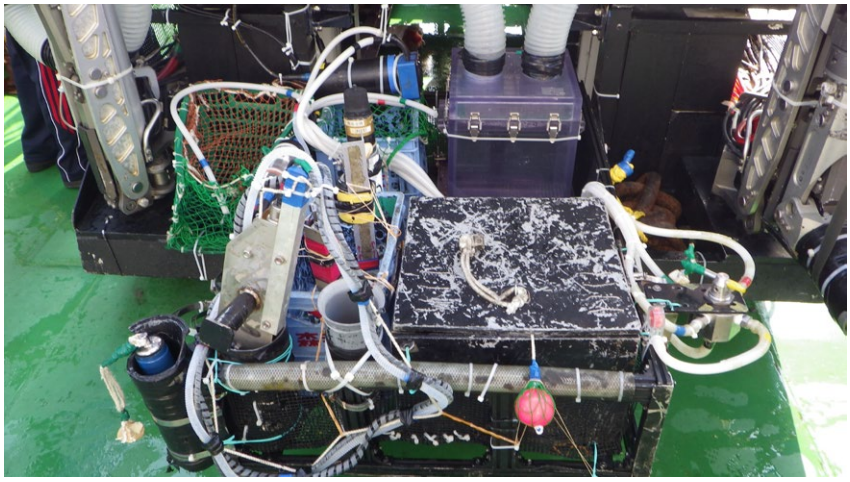
Arrangement of research equipment at Dive #1649

f) Dive #1650 (April 17, Myojin Knoll submarine caldera; reporter, K. Inoue)

Equipment loaded: Suction sampler (Slurp gun) with a rotary canister with 7-bottles, and that with a cubic canister, Sulfide sensor, On-line thermometer, Niskin water sampler (x2), Vacuum water sampler (x2), Bag-type water sampler, DO meter, Sample Box (x2), H-type corer (x2), Markers (x2), Bait trap, RV-homer

Sampling and Operation

1. Observation of a deep-sea mussel colony (D=1278 m)
2. Sulfide and temperature measurement
3. DO measurement
4. Sampling of water just above the mussel colonies (Vacuum sampler)
5. Mussel sampling
6. Sulfide and temperature measurement at a different position
7. DO measurement
8. Sampling of water just above the mussel colonies (Vacuum sampler)
9. Mussel sampling
10. Mover to a neighboring mussel colony
11. Sulfide and temperature measurement
12. DO measurement
13. Mussel sampling
14. Sampling of a piece of chimney



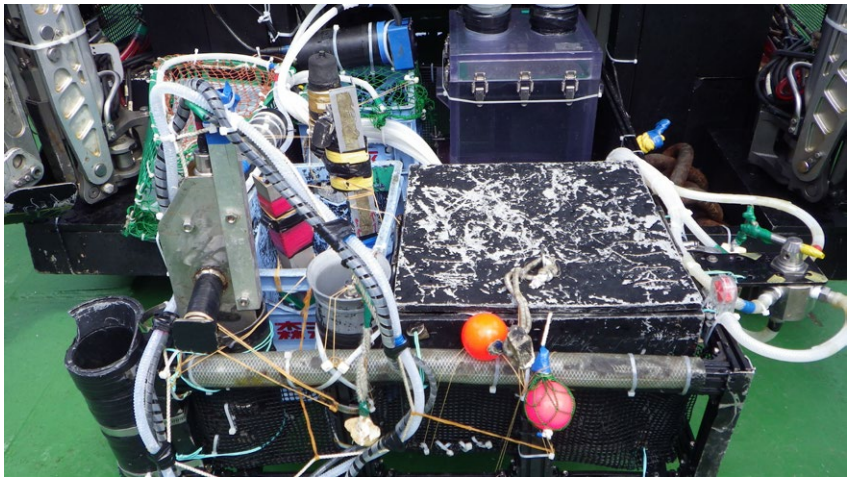
Arrangement of research equipment at Dive #1650

g) Dive #1651 (April 17, Myojin Knoll submarine caldera; reporter, K. Inoue)

Equipment loaded: Suction sampler (Slurp gun) with a rotary canister with 7-bottles, and that with a cubic canister, Sulfide sensor, On-line thermometer, Niskin water sampler (x2), Vacuum water sampler (x2), Bag-type water sampler, DO meter, Sample Box (x2), H-type corer (x2), Markers (x2), Bait trap, RV-homer

Sampling and Operation

1. At the last colony of the dive 1650, water sampling (Vacuum sampler)
2. Bait trap setting
3. Seek for another mussel colonies
4. Sulfide and temperature measurement (D=1278 m)
5. Sampling of water just above the mussel colonies (Vacuum sampler)
6. Mussel sampling
7. Sampling of a piece of chimney
8. Sampling of additional mussels at the last colony of the dive 1650
9. Recovery of the bait trap



Arrangement of research equipment at Dive #1651

h) Dive #1652 (April 18, Myojin-sho caldera; reporter, M. Shimanaga)

Equipment loaded: Suction sampler (Slurp gun) with a rotary canister with 7-bottles, and that with a cubic canister, Sulfide sensor, On-line thermometer, Niskin water sampler (x2), DO meter, Sample Box (x1), H-type corer (x2), M-type sediment sampler (x2), S-type corer (x4) Vacuum water sampler (x2)

Sampling and Operation

(Shimanaga group)

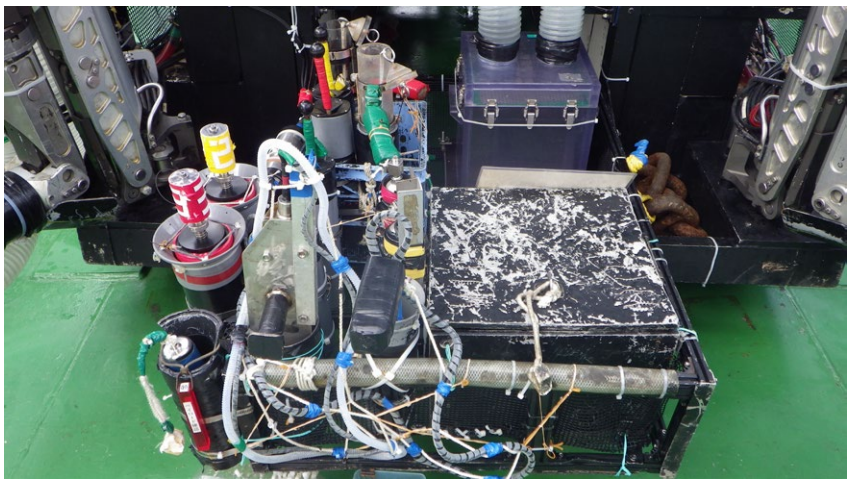
1. Sampling of sediment (D = 853 m, 803 m)
2. DO measurement
3. Temperature measurement
4. Sulfide measurement
5. Sampling of benthos samples with slurp gun on the chimneys

(Inoue group)

1. Sampling of benthos samples with slurp gun on the chimneys

(Mitsunobu group)

1. Seawater sampling by vacuum water sampler (D = 791 m, 809 m)



Arrangement of research equipments at Dive #1652

4. Acknowledgement

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

5. 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

1. 09:29 着底 D=1354m
   (32-06.329N 139-52.045E)
2. 09:40 D=1305m チムニー視認
   (32-06.291N 139-52.079E)
3. 10:19 D=1243m DO計測開始
   (32-06.250N 139-52.157E)

10:22 DO計測終了
10:26 硫化水素計測開始
10:29 温度計測5.3℃
10:34 Bag採水開始
10:41 ﾆｽｷﾝ採水 (2本)
10:47 Bag採水終了
10:49 温度計測5.2℃
10:49 硫化水素計測終了
10:54 1番、2番キャニスタにヒバリガイ採集
10:56 3番キャニスタにカニ採集
11:08 単式キャニスタにヒバリガイ採集
11:10 H1645-1マーカー設置
11:16 ROV HOMER:ID=44設置
11:18 離底 D=1245m

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

12-1ﾏｰｶｰ
ﾁﾑﾆｰ
熱水(199℃)
D=1,312m

着底点
D=1,340m

H1377-1ﾏｰｶｰ
D=1,324m
H1376-2ﾏｰｶｰ
D=1,309m

#896ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=1,296m

#7-1ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=1,292m

H743-2ﾏｰｶｰ
D=1,339m

ﾁﾑﾆｰ群
D=1,329m

#6-4ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
ﾁﾑﾆｰ
D=1,287m

#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=1,223m

H1493ﾏｰｶｰ
D=1,224m

#115ｴｻ付ﾏｰｶｰﾌﾞｲ
#116放流ﾈｯﾄ
D=1,290m

H970-1植木鉢ﾏｰｶｰ
H970-2植木鉢ﾏｰｶｰ
D=1,225m

(14-04-)
(NT14-06)

HYPER-DOLPHIN

No.1645 Dive

MYOJIN-KAIKYU

CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:

DATUM
(WGS-84)

XY ORIGIN 32-06.270N 139-52.100E

CENTER 32-06.270N 139-52.100E

1. 14:55 着底 D=1255m
(32-06.258N 139-52.159E)
2. 15:11 D=1245m ﾍﾞｲﾄﾄﾗｯﾌﾟ設置
(32-06.250N 139-52.157E)
15:19 Bag採水開始 (青)
15:33 Bag採水終了
15:38 1番ｷｬﾆｽﾀにｶﾆ採集
15:39 ﾍﾞｲﾄﾄﾗｯﾌﾟ回収
15:41 ROV HOMER:ID=44回収
3. 16:20 D=1240m 硫化水素および温度計測開始
(32-06.244N 139-52.156E)
16:25 Bag採水開始 (赤)
16:29 Bag採水終了
16:31 硫化水素および温度計測終了
16:37 2番ｷｬﾆｽﾀにﾋﾊﾞﾘｶﾞｲ採集
16:47 D=1236m 3番ｷｬﾆｽﾀにﾋﾊﾞﾘｶﾞｲ採集
16:48 硫化水素および温度計測開始
16:51 硫化水素および温度計測終了
16:52 離底 D=1230m

12-1ﾏｰｶｰ
ﾁﾑﾆｰ
熱水(199℃)
D=1,312m

H1377-1ﾏｰｶｰ
D=1,324m
H1376-2ﾏｰｶｰ
D=1,309m

#896ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=1,296m

#7-1ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=1,292m

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

#6-4ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
ﾁﾑﾆｰ
D=1,287m

H743-2ﾏｰｶｰ
D=1,339m

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

ｼﾝｶｲﾋﾊﾞﾘｶﾞｲｺﾛﾆｰ
D=1,281m

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

着底点
D=1243m

H970-1植木鉢ﾏｰｶｰ
H970-2植木鉢ﾏｰｶｰ
D=1,225m

#112ﾏｰｶｰ
割れ目,ﾌｼﾞｯﾎﾞ
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=1,223m

H1493ﾏｰｶｰ
D=1,224m

ﾋﾊﾞﾘｶﾞｲ多数
D=1,236m

#9-1ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=1,286m

H312-5,6
植木鉢ﾏｰｶｰ
D=1,291m

#115ｴｻ付ﾏｰｶｰﾌﾞｲ
#116放流ﾈｯﾄ
D=1,290m

1400 1350 1300 1250 1200 1150

S: 1/3000

(14-04-)
(NT14-06)
HYPER-DOLPHIN
No.1646 Dive
MYOJIN-KAIKYU

CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:

DATUM
(WGS-84)

XY ORIGIN 32-06.270N 139-52.100E

CENTER 32-06.270N 139-52.100E

S: 1/10000

目標点
D=910m

目標点
D=730m

着底点
D=825m

目標点
D=790m

目標点
D=760m

目標点
D=780m

目標点
D=650m

目標点
D=660m

1. 09:24 着底 D= 828m
(31-57.468N 139-44.560E)
09:26 D= 828m ﾆｽｷﾝ採水 (緑)
2. 09:35 D= 831m H式採泥器 (黄・1本)
(31-57.466N 139-44.559E)
09:39 H式採泥器 (緑・1本)
09:41 DO計測開始
09:42 DO計測終了
09:51 岩石採取(1個)
3. 10:10 D= 807m 観察
(31-57.387N 139-44.684E)
4. 10:12 D= 807m 掘削孔跡
(31-57.382N 139-44.689E)
5. 10:14 D= 798m ﾃﾞｯﾄﾞﾁｭﾆｰ群視認
(31-57.371N 139-44.701E)
6. 10:27 D= 778m ﾆｽｷﾝ採水 (赤)
(31-57.363N 139-44.731E)
10:30 硫化水素計測開始
10:30 温度計測開始
10:33 硫化水素計測終了
10:33 温度計測終了(20℃)
10:33 DO計測開始
10:34 DO計測終了
10:41 1番ｷｬﾆｽﾀに生物採集
10:59 真空採水(1本)
11:08 現場培養器NT14-06-1,2,3設置
11:12 硫化水素計測開始
11:14 硫化水素計測終了
11:15 DO計測開始
11:16 DO計測終了
11:22 真空採水(1本)
7. 11:44 D= 635m 高度を取って移動
(31-57.383N 139-44.712E)
8. 11:59 D= 783m 海底視認
(31-57.381N 139-44.741E)
6. 12:15 D= 778m 現場培養器NT14-06-1再設置
(31-57.363N 139-44.731E)
12:21 H式採泥器 (赤・1本)
12:23 S式採泥器 (赤・1本)
12:26 DO計測開始
12:27 DO計測終了
9. 12:50 D= 760m 2番ｷｬﾆｽﾀに生物採集
(31-57.332N 139-44.752E)
13:01 岩石採取 (1個)
13:16 D= 762m 岩石採取 (1個)
10. 13:27 D= 757m 3番ｷｬﾆｽﾀに生物採集
(31-57.331N 139-44.765E)
13:40 S式採泥器 (青・1本)
13:46 4番ｷｬﾆｽﾀに生物採集
13:48 5番ｷｬﾆｽﾀに生物採集
11. 13:54 D= 742m 岩石採取 (1個)
(31-57.319N 139-44.798E)
14:09 6番ｷｬﾆｽﾀに生物採集
14:19 S式採泥器 (緑・1本)
14:20 DO計測開始
14:23 DO計測終了
12. 14:34 D= 719m 高度を取って移動
(31-57.293N 139-44.852E)
13. 15:03 D= 809m 海底視認
(31-57.515N 139-44.671E)
14. 15:21 D= 786m ﾁﾑﾆｰ鉄ﾏｯﾄ視認
(31-57.477N 139-44.709E)
15. 15:49 D= 784m 岩石採取 (3個)
(31-57.455N 139-44.720E)
16. 16:02 D= 770m ﾐｯﾁﾑﾆｰ
(31-57.435N 139-44.745E)
16:03 離底 D= 770m

(14-04-)
(NT14-06)

HYPER-DOLPHIN

No.1647 Dive

BEYONESU-
KAIKYU

CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:

DATUM
(WGS-84)

XY ORIGIN 31-57.500N 139-44.500E

CENTER 31-57.500N 139-44.500E

S: 1/10000

1. 11:27 着底 D= 829m
(31-57.461N 139-44.541E)
11:43 岩石採取(１個)
2. 11:51 D= 832m H式採泥器（黄・１本）
(31-57.456N 139-44.565E)
11:57 温度計測開始
11:59 温度計測終了
12:03 硫化水素計測開始
12:04 硫化水素計測終了
12:06 DO計測開始
12:07 DO計測終了
12:17 現場培養器NT14-06-4,5,6設置
12:20 温度計測開始
12:21 温度計測終了
12:29 DO計測開始
12:30 DO計測終了
12:31 硫化水素計測開始
12:34 硫化水素計測終了
12:48 真空採水器（赤・１本）
3. 12:58 D= 832m 岩石採取（１個）
(31-57.450N 139-44.576E)
13:04 H式採泥器（赤・1本）
13:07 S式採泥器（赤・1本）
13:11 S式採泥器（青・1本）
13:12 DO計測開始
13:13 DO計測終了
13:15 硫化水素計測開始
13:16 硫化水素計測終了
4. 14:32 D= 781m 温度計測開始
(31-57.463N 139-44.726E)
14:36 温度計測終了(190度)
14:38 DO計測開始
14:40 DO計測終了
14:42 硫化水素計測開始
14:44 硫化水素計測終了
14:51 1番ｷｬﾆｽﾀに生物採集
14:55 2番ｷｬﾆｽﾀに生物採集
15:02 岩石採取(１個)
15:17 真空採水器（青・１本）
15:23 岩石採取(１個)
15:39 M式採泥器（緑・1本）
5. 15:53 D= 777m 温度計測開始
(31-57.444N 139-44.744E)
15:55 温度計測終了
15:56 硫化水素計測開始
15:58 硫化水素計測終了
16:04 DO計測開始
16:05 DO計測終了
16:10 3番ｷｬﾆｽﾀに生物採集
16:12 岩石採取(１個)
16:27 M式採泥器（赤・1本）
16:29 DO計測開始
16:30 DO計測終了
16:32 硫化水素計測開始
16:34 硫化水素計測終了
6. 16:43 D= 773m 観察
(31-57.444N 139-44.749E)
16:44 離底 D= 773m

(14- 04-)
(NT14-06)

HYPER-DOLPHIN

No.1648 Dive

BEYONESU-
KAIKYU

CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:

DATUM
(WGS-84)

目標点
D=910m

着底点
D=825m

目標点
D=730m

目標点
D=790m

ﾐｯﾁﾑﾆｰ
D=770m

現場培養器NT14-06-1,2,3
D=778m

目標点
D=760m

目標点
D=800m

目標点
D=650m

目標点
D=660m

XY ORIGIN 31-57.500N 139-44.500E

CENTER 31-57.500N 139-44.500E

S: 1/10000

1. 09:11 D= 600m プランクトン採集開始
(31-57.469N 139-44.640E)
2. 09:22 D= 600m プランクトン採集終了
(31-57.474N 139-44.706E)
3. 09:30 D= 700m プランクトン採集開始
(31-57.486N 139-44.704E)
4. 09:40 D= 700m プランクトン採集終了
(31-57.468N 139-44.612E)
5. 09:53 着底 D= 831m
(31-57.462N 139-44.562E)
10:00 H式採泥器（黄・1本）
10:03 H式採泥器（赤・1本）
10:05 DO計測開始
10:06 DO計測終了
10:08 硫化水素計測開始
10:11 硫化水素計測終了
6. 11:03 D= 779m M式採泥器（赤・1本）
(31-57.436N 139-44.719E)
11:12 D= 780m 硫化水素計測開始
11:15 硫化水素計測終了
11:17 DO計測開始
11:19 DO計測終了
7. 11:41 D= 768m 観察
(31-57.424N 139-44.744E)
8. 13:21 D= 774m 温度計測開始
(31-57.432N 139-44.736E)
13:22 温度計測終了
13:24 温度計測開始
13:25 温度計測終了
13:43 DO計測開始
13:45 DO計測終了
14:00 3番キャニスターに生物採集
14:02 4番キャニスターに生物採集
14:11 岩石採取(1個)

7. 14:33 D= 772m M式採泥器（緑・1本）
14:37 硫化水素計測開始
14:40 硫化水素計測終了
14:42 DO計測開始
14:43 DO計測終了
14:47 温度計測開始
14:51 温度計測終了
14:55 5番キャニスターに生物採集
15:14 真空採水(赤・1本)
15:15 チムニー採取
15:17 温度計測開始
15:21 温度計測終了
15:27 6番キャニスターに生物採集
15:39 温度計測開始
15:40 温度計測終了
15:48 真空採水(黄・1本)
15:57 岩石採取(1個)
16:12 離底 D= 775m

目標点
D=910m

目標点
D=730m

着底点
D=825m

目標点
D=790m

目標点
D=784m

#1648観察地点
D=773m

現場培養器NT14-06-4, 5, 6
D=832m

ミッチムニー
D=770m

現場培養器NT14-06-1, 2, 3
D=778m

目標点
D=760m

目標点
D=800m

目標点
D=650m

目標点
D=660m

(14- 04-)
(NT14-06)

HYPER-DOLPHIN

No.1649 Dive

BEYONESU-
KAIKYU

CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:

DATUM
(WGS-84)

XY ORIGIN 31-57.500N 139-44.500E

CENTER 31-57.500N 139-44.500E

1. 09:28 着底 D=1297m
(32-06.287N 139-52.128E)
2. 09:52 D=1278m 温度計測開始
(32-06.290N 139-52.184E)
09:57 温度計測終了(32℃)
10:01 DO計測開始
10:04 DO計測終了
10:31 真空採水器 (黄・1本)
10:38 1番、2番ｷｬﾆｽﾀに生物採集
10:42 ﾍﾞｲﾄﾄﾗｯﾌﾟ設置
10:54 温度計測開始
10:56 温度計測終了(4.7℃)
10:58 DO計測開始
11:00 DO計測終了
11:05 真空採水器 (赤・1本)
11:11 3番ｷｬﾆｽﾀにﾋﾊﾞﾘｶﾞｲ採集
3. 11:19 D=1277m 温度計測開始
(32-06.283N 139-52.186E)
11:21 温度計測終了(4.4℃)
11:22 DO計測開始
11:24 DO計測終了
11:33 単式ｷｬﾆｽﾀにﾋﾊﾞﾘｶﾞｲ採集
11:36 ﾍﾞｲﾄﾄﾗｯﾌﾟ回収
11:36 離底 D=1280m

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

12-1ﾏｰｶｰ
ﾁﾑﾆｰ
熱水(199℃)
D=1,312m

H1377-1ﾏｰｶｰ
D=1,324m
H1376-2ﾏｰｶｰ
D=1,309m

着底点
D=1,300m

#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

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

ｼﾝｶｲﾋﾊﾞﾘｶﾞｲｺﾛﾆｰ
D=1,281m

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

H1493ﾏｰｶｰ
D=1,224m

#9-1ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=1,286m

H1645-1ﾏｰｶｰ
D=1,243m

S: 1/3000

(14-04-)
(NT14-06)
HYPER-DOLPHIN
No.1650 Dive
MYOJIN-KAIKYU
CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:
DATUM
(WGS-84)

XY ORIGIN 32-06.270N 139-52.100E

CENTER 32-06.270N 139-52.100E

S: 1/3000

着底点
D=1,300m

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

12-1ﾏｰｶｰ
ﾁﾑﾆｰ
熱水(199℃)
D=1,312m

H1377-1ﾏｰｶｰ
D=1,324m
H1376-2ﾏｰｶｰ
D=1,309m

#7-1ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=1,292m

1. 14:39 着底 D=1291m
(32-06.297N 139-52.170E)
2. 14:54 D=1278m ﾍﾞｲﾄﾄﾗｯﾌﾟ設置
(32-06.289N 139-52.186E)
15:20 真空採水器（黄・１本）
16:05 真空採水器（赤・１本）
16:11 1番ｷｬﾆｽﾀにﾋﾊﾞﾘｶﾞｲ採集
16:16 2番ｷｬﾆｽﾀにﾋﾊﾞﾘｶﾞｲ採集
16:32 ﾁﾑﾆｰ採取（1個）
16:42 Bag採水
17:01 ﾍﾞｲﾄﾄﾗｯﾌﾟ回収
17:01 4番,5番,6番ｷｬﾆｽﾀにﾋﾊﾞﾘｶﾞｲ採集
17:02 離底 D=1279m

#6-4ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
ﾁﾑﾆｰ
D=1,287m

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

ｼﾝｶｲﾋﾊﾞﾘｶﾞｲｺﾛﾆｰ
D=1,281m

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

H1493ﾏｰｶｰ
D=1,224m

#9-1ﾏｰｶｰ
ｼﾝｶｲﾋﾊﾞﾘｶﾞｲ
D=1,286m

H1645-1ﾏｰｶｰ
D=1,243m

(14- 04-)
(NT14-06)
HYPER-DOLPHIN
No.1651 Dive
MYOJIN-KAIKYU
CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:
DATUM
(WGS-84)

XY ORIGIN 32-06.270N 139-52.100E

CENTER 32-06.270N 139-52.100E

1. 09:23 D= 925m ﾆｽｷﾝ採水(緑･1本)
(31-53.009N 139-58.104E)
09:24 着底 D= 929m
2. 10:06 D= 850m 温度計測開始
(31-53.028N 139-58.170E)
10:07 温度計測終了(11℃)
10:11 温度計測開始
10:12 温度計測終了(6.5℃)
10:22 硫化水素計測開始
10:24 硫化水素計測終了
10:24 DO計測開始
10:26 DO計測終了
10:35 1番ｷｬﾆｽﾀに生物採集
10:37 硫化水素計測開始
10:39 硫化水素計測終了
10:40 DO計測開始
10:41 DO計測終了
10:45 2番ｷｬﾆｽﾀに生物採集
3. 11:00 D= 853m M式採泥器 (緑・1本)
(31-53.023N 139-58.172E)
11:02 DO計測開始
11:03 DO計測終了
11:06 硫化水素計測開始
11:08 硫化水素計測終了
4. 11:37 D= 817m 温度計測開始
(31-53.039N 139-58.201E)
11:38 温度計測終了(6.6℃)
11:41 温度計測開始
11:42 温度計測終了(9.2℃)
11:45 硫化水素計測開始
11:48 硫化水素計測終了
11:48 硫化水素計測開始
11:50 硫化水素計測終了
11:54 DO計測開始
11:55 DO計測終了
11:55 DO計測開始
11:56 DO計測終了
12:05 3番ｷｬﾆｽﾀに生物採集
12:07 4番ｷｬﾆｽﾀに生物採集
5. 12:17 D= 807m ﾀｰﾄﾙﾁﾑﾆｰ
(31-53.048N 139-58.203E)
6. 12:26 D= 791m ﾋﾞｯｸﾞﾁﾑﾆｰ視認
(31-53.051N 139-58.212E)
12:33 温度計測開始
12:36 温度計測終了
12:37 硫化水素計測開始
12:39 硫化水素計測終了
12:40 DO計測開始
12:42 DO計測終了
12:43 DO計測開始
12:44 DO計測終了
12:45 硫化水素計測開始
12:47 硫化水素計測終了
12:51 5番ｷｬﾆｽﾀに生物採集
12:58 硫化水素計測開始
12:59 DO計測開始
13:00 硫化水素計測終了
13:00 DO計測終了
13:01 温度計測開始
13:02 温度計測終了
13:06 6番ｷｬﾆｽﾀに生物採集
13:16 岩石採取(１個)
7. 13:45 D= 824m 海底視認
(31-53.046N 139-58.191E)
5. 13:54 D= 809m ﾀｰﾄﾙﾁﾑﾆｰ視認
14:01 岩石採取(１個)
14:15 岩石採取(１個)
14:19 温度計測開始
14:20 温度計測終了(200℃)
14:33 真空採水器 (赤・１本)
14:35 単式ｷｬﾆｽﾀに生物採集
8. 14:54 D= 803m M式採泥器 (赤・1本)
(31-53.049N 139-58.209E)
14:57 S式採泥器 (青・1本)
15:00 硫化水素計測開始
15:02 硫化水素計測終了
15:04 DO計測開始
15:05 DO計測終了
15:10 温度計測開始
15:11 温度計測終了(12.5℃)
15:12 DO計測開始
15:13 DO計測終了
6. 15:27 D= 795m ﾁﾑﾆｰ採取 (1個)
15:36 温度計測開始
15:37 温度計測終了(75.0℃)
15:38 温度計測開始
15:39 温度計測終了(222℃)
15:57 真空採水器 (黄・１本)
16:13 単式ｷｬﾆｽﾀに生物採集
16:14 離底 D= 794m

熱水噴出孔
D=915m
H749-1ﾏｰｶｰ
D=917m
目標点
D=907m
目標点
D=895m
目標点
D=866m
目標点
D=854m
ﾗｲｼﾞﾝｸﾞｽﾀｰ熱水活動域
D=851m
ﾋﾞｯｸﾞﾁﾑﾆｰ
H1295-1ﾏｰｶｰﾌﾞｲ
H487ﾏｰｶｰﾌﾞｲ
D=793m
687DIVEﾏｰｶｰ
D=794m
着底点
D=930m
熱水噴出孔
D=911m
熱水噴出孔
D=894m
ﾁﾑﾆｰ
H1295-2ﾏｰｶｰﾌﾞｲ
D=852m

S: 1/2000

(14- 04-)
(NT14-06)
HYPER-DOLPHIN
No.1652 Dive
MYOUJIN-SHO
CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:
DATUM
(WGS-84)

XY ORIGIN 31-53.000N 139-58.300E
CENTER 31-53.000N 139-58.100E