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Hyper-Dolphin/Natsushima

Cruise Report

NT 10-13 Leg.2

Photo by Taro Nakagawa

Over the rainbow
Someday I'll wish upon a star
and where the clouds are far behind me
Were troubles melt like lemon drops
Away above the chimney tops, that's where you'll find me !

NW Rota, NW Eifuku, Nikko Seamounts

Mariana Fore Arc

July 25 – August 8, 2010

Contents

Participants

Natsushima Crew

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Chief Officer: AKIHISA TSUJI, 2nd Officer: HIROYUKI KATO, 3rd Officer: SAITO TAKATA

Chief Engineer: HIROYUKI SHIBATA

1st Engineer: KOJI FUNAE, 2nd Engineer: YOSHINOBU HIRATSUKA, 3rd Engineer: KENICHI SHIRAKATA

Chief Radio Officer: TOKINORI NASU

2nd Radio Officer: YOHEI YAMAMOTO, 3rd Radio Officer: MICHIYASU KATAGIRI

Boat Swain: KINGO NAKAMURA

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Cruise Summary

「伊豆･小笠原～マリアナ島弧における熱水噴出孔生物群集の特異性と生活史に関する研究」

土田真二

目的・背景

伊豆・小笠原～マリアナ島弧の熱水域は、南北２千 km に渡り点在し、すべて海底火山の山頂部付近に存在するため、幼生の分散過程は複雑な海流に支配されていると考えられる。伊豆・小笠原～北マリアナ島弧の熱水域は、群集の規模や優占種は異なるが、サイト間で共通する種が多く存在する。南部マリアナ島弧には、E Diamante 海山や NW Rota-1 海山などで熱水噴出活動の存在が知られている（Embley et al. 2006, 図 1）が、生物群集に関する情報はまだ十分に得られていない。マリアナ島弧の西側に位置するマリアナ背弧海盆では、活発な熱水噴出活動とそれにともなう生物群集の存在が知られている（Hessler and Lonsdale 2001)。しなしながら、マリアナ背弧海盆の生物群集は、地理的な距離は近いにも関わらず、生物群集の情報が得られている北マリアナ島弧とは大きく異なっている。このように熱水噴出孔生物群集の分布は、浮遊幼生期の分散様式は海流や水温、溶存酸素濃度、化学成分などの様々な環境要因に支配されていると考えられる。しかしながら、これら生物群集の浮遊幼生は、現場海域からほとんど採集することができず、多くの種については浮遊期に関する情報はまったく得られていない。そこで本研究では、比較的成体の飼育が容易で、伊豆・小笠原～マリアナ島弧に広く分布するユノハナガニやオハラエビ類を対象として、その浮遊幼生期と好適な飼育条件を明らかにし、現場海域における海流や水温など環境要因、各サイトにおける遺伝的多様性や分布情報をもとに、伊豆・小笠原～マリアナ島弧における熱水性十脚甲殻類の幼生分散を推定する。

実施項目・手法・観測機器

本航海では、NW Rota-1および東日光海山において潜航調査を行った。生物の分布や生態などをHDカメラやデジタルカメラなどで記録した。また適宜吸引式生物採集装置（スラープガン）やキャニスタなどを活用し、効率のよい生物採集を試みた。サイトによっては、採水、CTDプロファイラーなどによる環境要因の測定も行った。

観測結果・実施結果

NW Rota-1は、これまでの地質学的な調査により、最も活発な火山活動を行っているサイトの一つである。海山の頂上付近は、熱水噴出活動が活発で、砂礫に覆われていた。生物の多様性は低いが、多数のトウロウオハラエビなど生息していた。他には、ウロコムシ類やカサガイ類などが確認され、ユノハナガニ科短尾類も採集することができた。

東日光海山
本サイトは、日光海山熱水域から北東7kmに位置する別峰の海山となる。
NOAAの調査により、熱水域の存在を示すプルームがわずかに検出されている。本潜航では、海底付近でわずかなゆらぎが確認されたのみで、熱水噴出やそれにともなう特異的な生物群集は発見できなかった。しかしながら、これまで採集記録の少ないセンジュエビ類や深海性のシャコその他甲殻類を数多く確認し、採集することができた。

"Studies on the life history of hydrothermal vent communities distributed to Izu-Bonin and Mariana Arcs"

Shinji Tsuchida

Deep-sea volcanic chains extend from Mariana Arc (12°N) in south to Izu and Bonin Arcs (32°N) in north. In these areas, hydrothermal vent fields and vent-associated communities were found at several deep-sea volcanoes around 400-1600m depths (Fig. 1). Dominant species and biomass of these sites are different each other, but some species are common in each site like as bythograeid crab, alvinocaridid shrimps, limpets, bathymodiolid mussels, and so on. However hydrothermal venting is known from E Diamante and NW Rota-1 in South Mariana Arc, still species composition and faunas in those sites are poorly understood. Also faunas in Mariana Back-Arc Basin as Alice Spring Fields are known to be quite different from those in North Mariana Fore Arc in spite of close geological distance. It is considered that the distributions of vent-associated animals would be correlated to the environmental factors like as current, temperature, chemical components, and so on, rather than those geological distances. Our knowledge for the larval stages of those animals is quite limited because of its difficult sampling from the fields. Here, we examined to reveal the detailed distributions of vent-associated animals. And, I will try to keep the matured adults such as bythograeid crabs and alvinocaridid shrimps, which are relatively easy to rear under the laboratory atmospheric conditions for breeding the larvae. I will seek the suitable conditions as salinity and temperature for growth of these larvae. Finally, I will estimate the larval dispersals between hydrothermal vent fields in Izu-Bonin and Mariana Arcs.

Methods

Two dives for this proposal were carried out at the NW Rota-1 and East Nikko Seamounts respectively. HDTV and CCD cameras recorded the movies of distributions and habitats of animals. Digital camera was used to take high quality still photos of animals and habitats. Specimens were collected using by suction sampler loaded on the *Hyper-Dolphin*. Plumes were sampled by Niskin and RI vacuum sampler. Hydrothermal vent fluids were sampled by

WHATS and bag sampler. Environment conditions were measured using by pH sensor, turbidity meter, D-port (hydrogen sulfide meter), DO meter, and CTD/DO profiler.

Preliminary results

NW Rota-1 is known as one of most eruptive deep-sea volcano by the previous geological surveys. Around the top of the seamount was covered by sand and gravel with dense patch of the alvinocaridid shrimp, *Opaepele loihi*. And also, scale worms and limpets were found. Only one bythograeid crab *Gandalfus yunohana* was collected.

East Nikko Seamount is a different peak located at seven kirometer in north-east from the main peak of Nikko Seamount. Previous NOAA survey detected a week signal of plume suggesting the active hydrothermalism in this peak. In this survey, we found no active hydrothermal venting, but just faint simmering on the bottom. While, we collected some rare non-vent species such as Polychelid lobster, deep-sea stomatopod, leucosiid, majid and progeryonid crabs which are new records for seamount faunas.

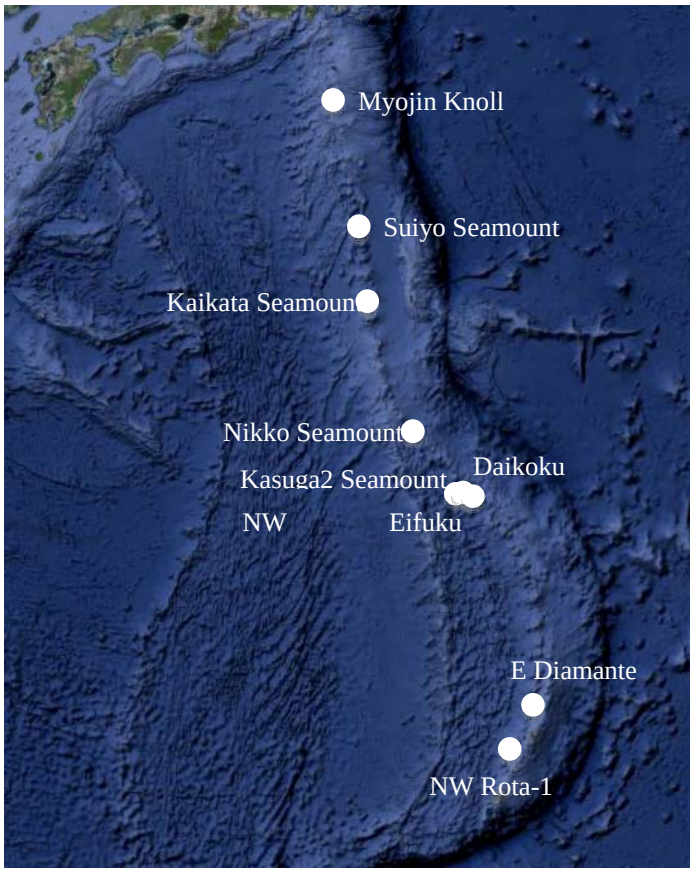

図 1 伊豆・小笠原～北マリアナ島弧の熱水域分布図

Fig. 1 Distribution map of hydrothermal vents in Izu-Bonin, and Mariana Arcs.

「北部マリアナ孤 NW Eifuku 海山にて解き明かす鉄-微生物相互作用：鉄を含む地殻内流体、岩石およびマグマガス成分の地球科学的相互作用によって支えられた微生物生態系」

牧田　寛子

目的・背景

太陽光の届かない深海・地殻内といった環境では、化学合成微生物による一次生産が生態系を支え、物質循環に大きな影響を及ぼしていることは間違いない。それらの微生物が海洋地殻や海底で利用する最も重要なエネルギー源は、玄武岩に含まれる二価の鉄であると考えられているため、鉄にエネルギーを依存する生態系の解明が近年注目されている。一次生産活動や物質循環を担う鉄利用微生物の重要性には疑いがないにもかかわらず、深海底・地殻内での鉄利用微生物の種類、存在量、活性に関しては、最近発見された新規な鉄酸化独立栄養微生物であるゼータプロテオバクテリアに属す*Mariprofundus*属を除いては、ほとんど分かっていないのが現状である。そこで、本研究はこれまでに知られる最も大規模な酸化鉄被膜及び熱水性酸化鉄堆積物を有するマリアナ弧北部の栄福海山北西部小海山（NW Eifuku 海山）熱水活動域にて潜航調査を行い、鉄利用微生物の単離、現場での分布様式および活性の解明、生理・生態的特徴の解明を行うことを目的とした。

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実施項目・手法・観測機器

次の調査を実施した。1）温度計付き採水口を持つ保圧採水器およびニスキン採水器、バッグポンプ採水器を用いた採水、２）M式採泥器、エクマンバージ採泥器、SUDO型採泥器を用いた採泥、３）スラープガンを用いた生物試料の採取、４）濁度計によるプルームの探査、５）岩石の採集、６）電気化学的測定。

観測結果・実施結果
NW Eifuku海山への3回の潜航調査によって、酸化鉄被膜域の褐色堆積物、岩石、海水、間隙水、さらに化学的なデータを得た。船上にて適切に保存処理を施したサンプルを用いて、分子生物学的手法や培養手法などを駆使して、鉄利用微生物の現場での分布様式および活性の解明、生理・生態的特徴を明らかにする予定である。

“Research for microbial interaction with iron provided from subseafloor hydrothermal aquifer in the NW Eifuku Seamount of the northern Mariana Arc: Microbial ecosystem sustained by weathering of iron-containing fluids and rocks and biogeochemical interaction with abundant magmatic volatiles.”

by Hiroko Makita

Purpose and Background:
Our objective is to research microbial interactions with iron provided from subseafloor hydrothermal aquifer in the northern Mariana Arc. Two dives are planned to visit at NW Eifuku seamount and to obtain rocks, iron mat and fluid samples to examine the associations between endlithic microorganisms and rock alteration processes at deep-sea hydrothermal fields. During the Ring of Fire cruise 2004 by using *ROV ROPOS*, massive yellow-orange mats were observed at the summit and western ridge of the NW Eifuku Seamount (Embley, *et al*., 2004). The iron mat samples were soft and fluffy texture, and were probably composed of amorphous silica and iron hydroxides (Embley, *et al*., 2004, Nakamura, *et al*., 2005). There is no doubt that the mat consists of iron-utilizing biosphere. In recent years, culture –depend and –independent microbiological characterization has demonstrated that the zeta-proteobacteria “*Mariprofundus ferrooxidans*” (Emerson D., *et al*., 2007), which utilizing ferrous iron choemolithoautotrophic microorganism, commonly observed in some deep-sea low-temperature hydrothermal fields; rocks alteration regions and iron mat site (Davis and Moyer, 2008, Kato *et al*., 2009). This kind of iron utilizing chemolithoautotroph microorganisms has the most significant ecological roles, such as iron and carbon cycling, in microbial communities occurring in deep-sea low-temperature hydrothermal field (Bach *et al*., 2003). However, little is known about these iron-utilizing chemolithomicroorganisms, how many types existing, what is dominant species in each site, what exactly do they role in natural habitats, and how do they interact with other microorganisms and rocks. Objectives of our microbiological studies include, 1) the evaluation of microbial diversity and distribution, 2) the measurement of microbial activity by using cultivation-, enzymatic-, DNA and RNA approaches, and metabolic product analysis. Results of the analyses will provide insights into

contribution of microorganisms to alteration of oceanic rocks, and iron utilizing microorganism's diversity. In addition, during each dive the transmissivity of water had been measured and pH sensor and electrochemical analyzing system (D-Pote2) were tested.

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Methods and Instruments:

For accomplish the purpose, we sampled seawater (Niskin bottle, bag pump sampler, RI bottle sampler and WHATS with temperature probe), sediments (M-type, SUDO-type and Ekman-Birge type sediment sampler), rocks and organisms (bivalve, shrimp, etc. with suction sampler). In addition, during each dive the transmissivity of water had been measured and pH and D-POTE2 sensors were tested.

Research results:

We have collected iron mat, rocks, fluid samples and some chemical data during NT10-13 Leg2. Samples were onboard prepared for future studies. Results of the analyses will provide insights into contribution of microorganisms to alteration of oceanic rocks, and iron utilizing microorganism's activity and diversity.

Objectives of our microbiological studies include, 1) the evaluation of microbial diversity and distribution by using DNA and RNA approaches (e.g. 16S rRNA gene analysis), Fluorescence in situ hybridization (FISH), quantitative polymerase chain reaction (Q-PCR) and T-RFLP analysis, 2) the measurement of microbial activity by using cultivation-, enzymatic-, DNA and RNA approaches, and metabolic product analysis.

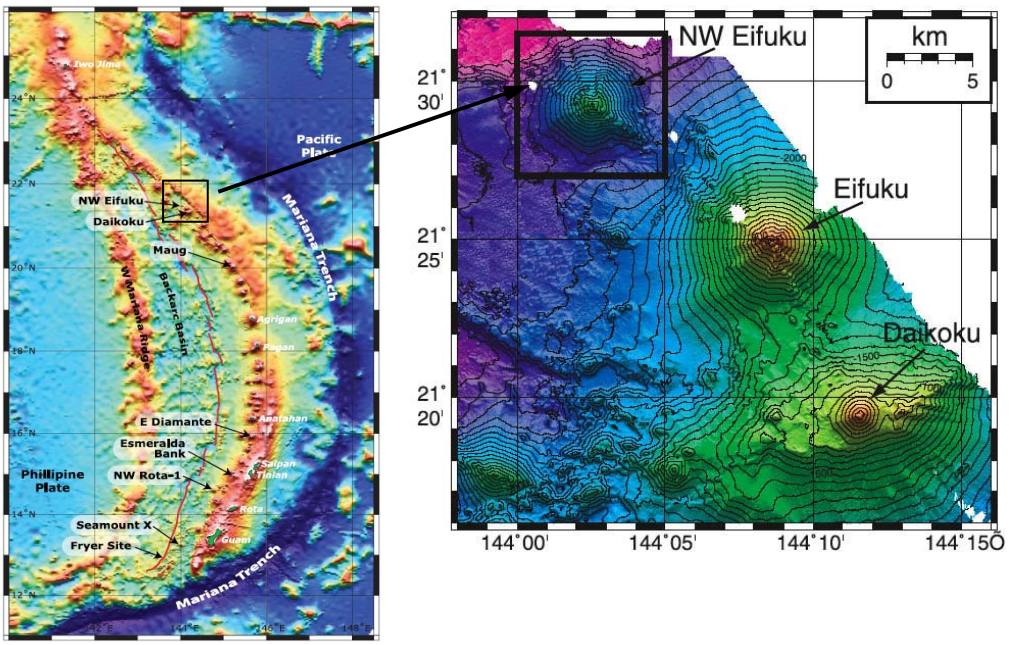


図1 調査海域

Fig.1 Research area

「環形動物サツマハオリムシの細胞外巨大ヘモグロビンの構造機能相関の研究」

中川　太郎

背景と目的

伊豆・小笠原孤とマリアナ弧北端部に位置する日光海山は、比高約2900mの円錐状の海底火山であり、山頂部のカルデラ内には、多くの低・中温の熱水噴出孔が存在する。また、サツマハオリムシ、ユノハナガニ、オハラエビ、アズマガレイ、オオマユイガイ等の多くの熱水生物が棲息しており、世界でも有数の大規模な熱水生物群集が形成されている。一般的に、これらの熱水生物群は、有毒な硫化水素や重金属に対する耐性をもち、有機物の獲得のために共生細菌を利用しているものが多いが、未だに生物学的には不明な点が多い。そこで、本調査では、日光海山の熱水噴出孔域に棲息する深海熱水生物の観察、採集、環境調査、および、設置作業を行い、特にサツマハオリムシに注目して、サツマハオリムシの血液中の巨大ヘモグロビンやレクチンの構造機能相関性を解明、および、飼育を通じて、サツマハオリムシの適応生理機能、共生機構、および、生活史を生物学的に理解することを目的とした。

調査テーマ：日光海山の熱水噴出孔域に棲息する深海熱水生物群集の観察、採集、環境調査、および、設置作業

実施日：平成22年 7月30日（#1163、#1164）、8月3日（#1168）、8月4日（#1169）

採集機器：スラープガン、単式キャニスター、6 連ロータリーキャニスター、プランクトンネット、3 連ゲートサンプラー、ニスキン採水器、バッグ採水器、RI 保圧採水器、M 式採泥器、サンプルボックス

測定機器：D-Pote、pH センサー、DO センサー、RMT 温度計

設置・回収物：スポンジアガー培地、牛骨

潜航結果

今回の日光海山での４回の潜航調査を通して、我々は、サツマハオリムシを始めとした多くの熱水生物群集（ハオリムシ、カニ、エビ、カレイ、イガイ、ヤドカリ、ヒトデ、星口動物、環形動物）等の観察・採集に成功した。得られたこれら生物は全て、船内にて、分類され、すぐに飼育、標本、実験試料調整のために適切な処置を行った。また、サツマハオリムシの生息地や熱水噴出孔周辺の環境調査（採水、採泥、温度測定, 溶存酸素濃度測定、pH 測定、硫化水素濃度測定）も合わせて実施し、多くの環境情報を得ることに成功した。また、ハオリムシのコロニー周辺に、バクテリア培養用スポンジ培地の設置と回収、および、ハオリムシの定着実験のための牛骨の設置も行った。さらに、プランクトンネットを用いて、白濁した熱水プルーム中の熱水生物群集の幼生やプランクトンの採集を行い、船内にて観察・飼育を行った。また、この日光海山の多くの熱水噴出孔より噴出された熱水プルームは、海山上部の水深約 380m にまで到達し、混ざり合い、大規模な白濁したプルーム層を形成していた。これらの

結果は、日光海山の熱水環境に棲息する熱水生物群集の適応生理機能、共生関係、生活史を生物学的に理解する上で手掛かりになるものと思われる。

Study on the relationship between structure and function of the extracellular giant hemoglobins of *Lamellibrachia satsuma* (vestimentifera, annelid)

by Taro Nakagawa

Overview of the observation

1) Background and Purpose

Nikko seamount located in between the south Izu-Bonin arc and the north Mariana fore-arc, is the circular conic submarine volcano at the relative elevation of about 2900 m. There are many hydrothermal vents with low or medium temperature in the caldera on the mountaintop. This area formed into the large greatest hydrothermal-vent community in the world, which lived in the vent specific animals of the tubeworm, crab, shrimp, tongue fish, and mussel, etc. It has been reported that these hydrothermal vent animals could generally possess the toxic resistances of hydrogen sulfide and heavy metals, and could utilize the symbiotic bacterium for acquisition of organic substance, but it is still unclear to understand them biologically. So, we tried to research the vent-specific animals and plankton living in the hydrothermal vent and plume by observation and collection, the measurements of environmental factors (water, med, rock, soil, temperature, DO, pH and H_2S) , and placing (picking up) the sponge agar mediums and beef bones in the Nikko seamount.
Predominately the tubeworm in the spotlight, we performed the research with the views to clarification of the relationship between structure and function of the extracellular giant hemoglobins and lectins in the blood of the tubeworm, and to biological understanding of the adaptive physiology, symbiontic relationship, and life history of the tubeworm by captive breeding.

2) Research themes

・#1163, #1164, #1169: Collection of the vent-specific organisms and environment research in the hydrothermal vent of Nikko seamount.
・#1168: Collection of the planktons in the plume layer and the vent-specific organisms in the hydrothermal vent of Nikko seamount.

3) Date of operations

July. 30 (#1163, #1164), August. 3 (#1168), and August. 4 (#1169)

3) Instruments for collection

・Slurp gun, square canister, rotary canister with or without 6 bottles, plankton net, three gate sampler, Niskin water sampler, Bag-type water sampler, RI pressure-keeping water sampler, M-type bottom sampler, and Sample box

4) Instruments for measurement

・D-Pote, pH sensor, DO sensor, and RMT thermometer

5) Instruments for placing and picking up

・Sponge agar mediums (1163-1, 1163-2, 1163-3, 1163-4, 1163-5, and 1163-6), and Flame boxes containing beef bones (FL-101, FL-102, FL-103, and FL-104)

6) Research results

We succeeded in collection and observation many hydrothermal-vent animals and communities which are tubeworm, crab, shrimp, tongue fish, mussel, hermit crab, starfish, sipunculid, and annelids, near the hydrothermal vents on Nikko seamount through the 4 dives of Hyper-Dolphin in this research. These animals obtained were all classified on board a ship, and soon implemented appropriate measures for captive breeding, sampling, and experimental sample preparation. We also succeeded in obtaining many environmental information from the measurements which are water sampling, mud sampling, temperature, dissolved oxygen concentration, pH, and sulfide concentration, inside or near the tubeworm habitat and hydrothermal vents on Nikko seamount. And we performed the placing and picking up the sponge agar mediums for bacteria cultivation, and setting on the flame boxes containing beef bones for putting down roots of the tubeworm around the their colony. Moreover, we collected the plankton and larva of the hydrothermal-vent animals in the hydrothermal plume with foggy white smokes from 380 m to 450 m depth above the bottom, and performed their observation and breeding on board a ship. We found that the foggy white plume emerged from many hydrothermal vents in Nikko seamount, were mixed and arrived at 380 m depth above the mountaintop, and formed to the large plume layer with white smoke. These results will provide insights into the biological understanding of the adaptive physiology, symbiontic relationship, and life history of the vent-specific animals living in the hydrothermal environment on Nikko seamount.

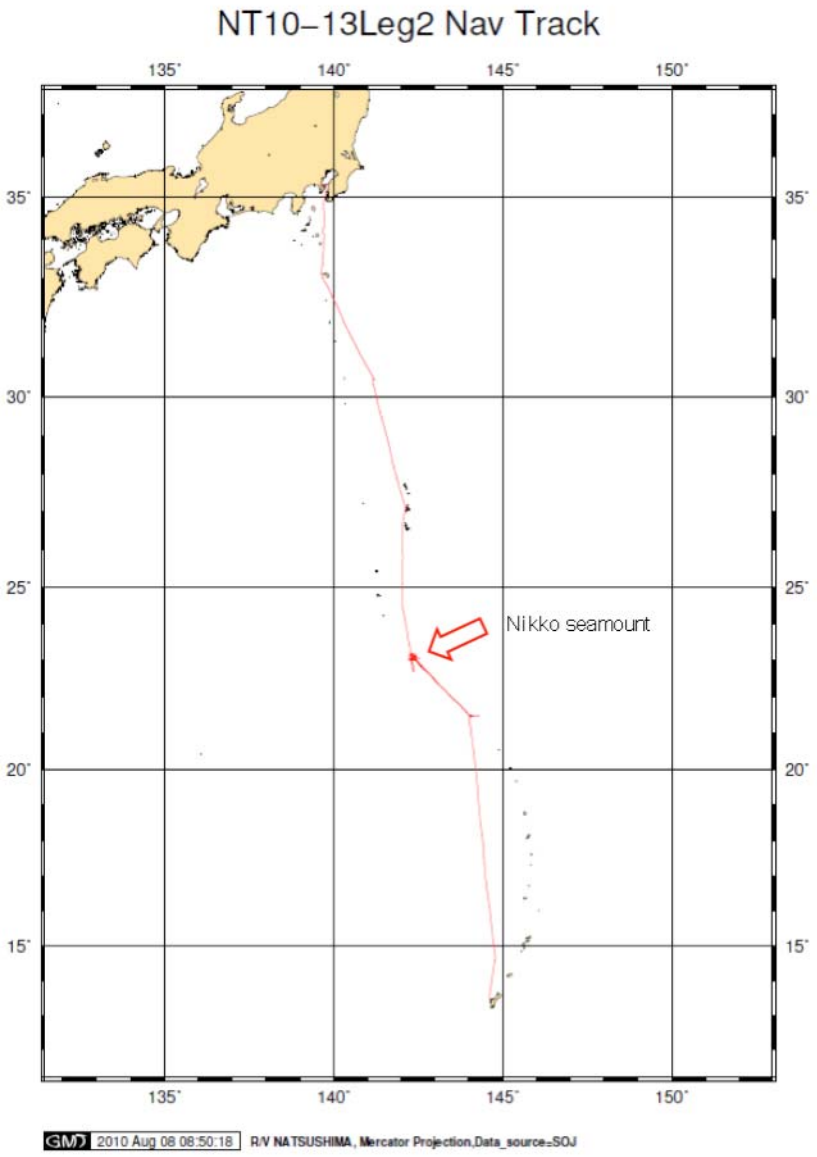
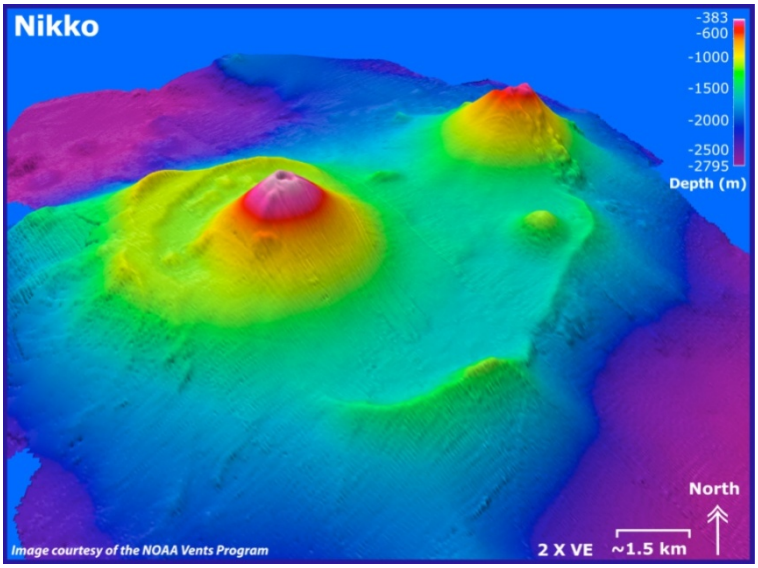

NT10–13Leg2 Nav Track
135°
140°
145°
150°
35°
30°
25°
20°
15°
Nikko seamount
GMT 2010 Aug 08 08:50:18
R/V NATSUSHIMA, Mercator Projection,Data_source=SOJ

Fig.1


Nikko
-383
-600
-1000
-1500
-2000
-2500
-2795
Depth (m)
North
Image courtesy of the NOAA Vents Program
2 X VE
~1.5 km

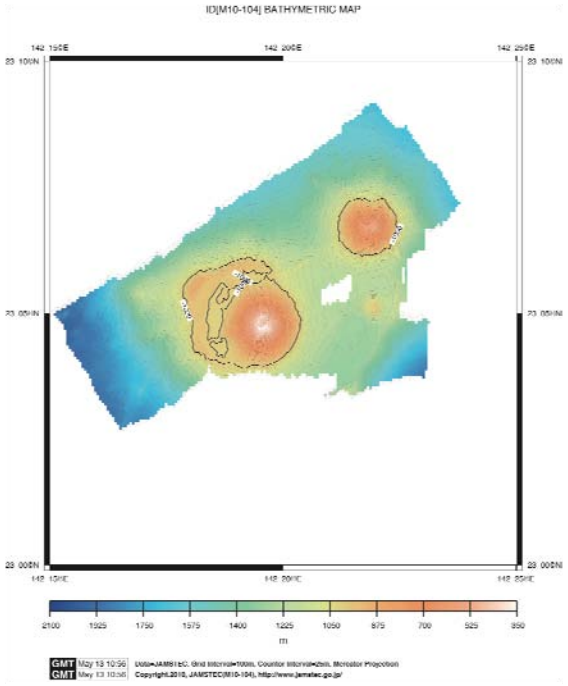

ID[M10-104] BATHYMETRIC MAP
142.195E
142.200E
142.205E
23.100N
23.095N
23.090N
142.195E
142.200E
142.205E
2100
1925
1750
1575
1400
1225
1050
875
700
525
350
m

Fig. 2

Shipboard Log

2010/07/25

Weather: fine but cloudy/ Wind direction: East/ Wind force: 3/ Wave: 1m/ Swell: 1 m/ Visibility: 8nautical miles (12:00 JST + 1h)

10:00	Onboard
11:00-11:30	Scientific Meeting
13:00	Departure from Guam
14:00-15:00	Briefing about ship's life and safety
19:00-19:30	Scientific Meeting

2010/07/26

Weather: cloudy/ Wind direction: ENE/ Wind force: 5/ Wave: 4m/ Swell: 3 m/ Visibility: 7nautical miles (12:00 JST + 1h)

06:30	Arrived at survey area
06:31	XBT
08:35	Launch HPD (HPD#1161dive)
09:15	HPD lands (625m)
16:15	HPD leaves the bottom (526m)
16:52	HPD on deck
19:00-19:30	Scientific meeting

2010/07/27

Weather: fine but cloudy / Wind direction: East/ Wind force: 5/ Wave: 3m/ Swell: 2 m/ Visibility: 8nautical miles (12:00 JST + 1h)

Transit to “NW Eifuku Seamount”

19:15-19:45	Scientific meeting

2010/07/28

Weather: fine but cloudy / Wind direction: ENE/ Wind force: 4/ Wave: 3m/ Swell: 2 m/ Visibility: 8nautical miles (12:00 JST + 1h)

06:25	XBT
10:15	Start of MBES survey
16:27	End of MBES survey
18:00-18:05	Scientific meeting

2010/07/29

Weather: fine but cloudy / Wind direction: East/ Wind force: 3/ Wave: 2m/ Swell: 2 m/

Visibility: 8nautical miles (12:00 JST + 1h)

08:19	Launch HPD (HPD#1162dive)
09:20	HPD lands (1,689m)
15:50	HPD leaves the bottom (1,612m)
16:51	HPD on deck
19:00-19:30	Scientific meeting

2010/07/30

Weather: fine but cloudy / Wind direction: ESE/ Wind force: 4/ Wave: 2m/ Swell: 2 m/
Visibility: 8nautical miles (12:00 JST + 1h)

05:59	XBT
08:24	Launch HPD (HPD#1163dive)
08:51	HPD lands (449m)
11:17	HPD leaves the bottom (472m)
11:46	HPD on deck
13:21	Launch HPD (HPD#1164dive)
13:46	HPD lands (427m)
16:14	HPD leaves the bottom (468m)
16:53	HPD on deck
17:10	Start of MBES survey
19:00-19:30	Scientific meeting

2010/07/31

Weather: fine but cloudy / Wind direction: ESE/ Wind force: 4/ Wave: 2m/ Swell: 2 m/
Visibility: 8nautical miles (12:00 JST + 1h)

03:45	End of MBES survey
08:18	Launch HPD (HPD#1165dive)
08:54	HPD lands (677m)
16:15	HPD leaves the bottom (520m)
16:48	HPD on deck
17:46	Start of MBES survey
19:00-19:30	Scientific meeting

2010/08/01

Weather: passing showers/ Wind direction: East/ Wind force: 2/ Wave: 1m/ Swell: 1 m/
Visibility: 8nautical miles (12:00 JST + 1h)

04:09	End of MBES survey

Transit to Eifuku Seamount

19:00-19:30 Scientific meeting

2010/08/02

Weather: overcast / Wind direction: SSE/ Wind force: 4/ Wave: 2m/ Swell: 2 m/ Visibility: 8nautical miles (12:00 JST + 1h)

08:30 Launch HPD (HPD#1166dive)
09:34 HPD lands (1,569m)
11:54 HPD leaves the bottom (1,546m)
12:48 HPD on deck
14:20 Launch HPD (HPD#1167dive)
15:27 HPD lands (1,559m)
17:10 HPD leaves the bottom (1,545m)
18:10 HPD on deck
19:00-19:30 Scientific meeting

2010/08/03

Weather: rain / Wind direction: SE/ Wind force: 7/ Wave: 6m/ Swell: 5 m/ Visibility: 5nautical miles (12:00 JST + 1h)

08:21 Launch HPD (HPD#1168dive)
09:42 HPD lands (470m)
11:04 HPD leaves the bottom (445m)
12:06 HPD on deck
15:00-15:30 Scientific meeting

2010/08/04

Weather: fine but cloudy / Wind direction: ESE/ Wind force: 4/ Wave: 2m/ Swell: 2 m/ Visibility: 8nautical miles (12:00 JST + 1h)

10:19 Launch HPD (HPD#1169dive)
10:48 HPD lands (469m)
11:48 HPD leaves the bottom (470m)
12:25 HPD on deck
15:00-15:30 Scientific meeting

2010/08/05

Weather: fine but cloudy / Wind direction: ENE/ Wind force: 5/ Wave: 3m/ Swell: 2 m/ Visibility: 8nautical miles (12:00 JST)

Transit to JAMSTEC

08:30 Arrived at Futami bay
An emergency have a medical examination

11:00 Departure from Futami bay

2010/08/06

Weather: fine but cloudy / Wind direction: East/ Wind force: 5/ Wave: 4m/ Swell: 3 m/
Visibility: 8nautical miles (12:00 JST)

Transit to JAMSTEC

07:03-10:12 Free fall

10:16-15:38 Free falll

2010/08/07

Weather: fine but cloudy / Wind direction: SE/ Wind force: 4/ Wave: 3m/ Swell: 2 m/
Visibility: 8nautical miles (12:00 JST)

Transit to JAMSTEC

09:00-09:30 Scientific meeting

2010/08/08 (JST)

08:45 Arrival at YOKOSUKA(JAMSTEC), NT10-13_Leg2 finish and disembarkation

Dive Report HPD#1161

Date: July 26, 2010

Site: NW Rota, Mariana Arc **Depth:** 520-625m

Landing (Lat., Long., Time, Depth): 14°36.060'N, 144°46.444'E, 09:15, 625m

Leaving (Lat., Long., Time, Depth): 14°36.072'S, 144°46.574'E, 15:00, 526m

Pilot: Keita Matsumoto **Co-Pilot**: Homare Wakamatsu

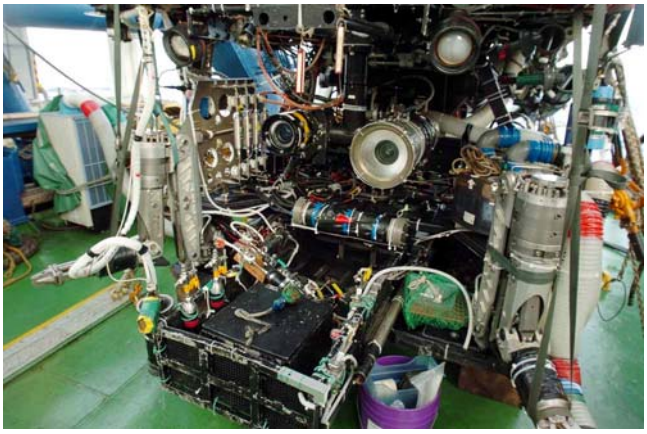
Theme: Studies on the life history for vent-associated animals in Izu-Bonin to Mariana Island Arcs.

Purpose:

1. Sampling and observing on vent-associated animals around hydrothermal vents on the Rota Seamount.
2. Water sampling on the plume and vent fluid.
3. Rock sampling around hydrothermal vents.
4. Measuring the environmental factors (temperature, salinity, DO, pH and H_2S) at the habitat of vent-associated animals.

Payload Equipment:

slurp gun, suction sampler with six collection canisters, WHATS water sampler (six bottles), bag water sampler, Niskin water sampler, sample box, RI vacuum water sampler, pH sensor, turbidity meter, D-port (hydrogen sulfide meter), DO meter



HPD#1161 Payload

Sampling Points and Markers:

Events	*Time*	*Depth (m)*	*Sample*	*Lat./ Long.*
Niskin water sampling (green)	09:07	623	Plume	14°36.080’N/144°46.401’E
RI vacuum water sampling	09:12	618	Plume	14°36.057’N/144°46.415’E
WHATS water sampling	09:30	570	Vent fluid (#1, 5)	14°36.054’N/144°46.501’E
Bag water sampling		570	Vent fluid	14°36.054’N/144°46.501’E
Rock sampling	10:25	570	Rock	14°36.054’N/144°46.501’E
Suction sampling	11:09	550	Vent-associated animals	14°36.071’N/144°46.522’E
Niskin water sampling (red)	12:32	517	Plume	14°36.048’N/144°46.528’E
RI vacuum water sampling	12:40	517	Plume	14°36.053’N/144°46.517’E
Suction sampling	13:58	543	Vent-associated animals	14°36.047’N/144°46.571’E
Rock sampling	14:50	525	Rock	14°36.060’N/144°46.569’E
Suction sampling	15:00	522	Vent-associated animals	14°36.064’N/144°46.567’E
Rock sampling	15:16	523	Rock with organisms	14°36.064’N/144°46.567’E
Suction sampling	16:01	524	Vent-associated animals	14°36.069’N/144°46.571’E
Suction sampling	16:13	526	Vent-associated animals	14°36.072’N/144°46.574’E
Rock sampling	16:14	526	Rock	14°36.072’N/144°46.574’E

Dive Summary

Hyper-Dolphin #1161 started to descend at the NW Rota (8:35 am). Before landing 23m altitude layer from the bottom, plume water was collected by the Niskin water sampler (red) and RI vacuum water sampler and then, we directed to the event mark#1. Around the event mark #1, we observed the bottom (rock and rubble) and climbing the slope to the center of caldera. On the way to the caldera, we observed active hydrothermal venting on the rocky bottom and landed at the front of vent. Vent fluid was sampled by WHATS (#1.5), but soon stopped to sample depend on the communication error of the sampler. Then, we used the bag sampler for vent fluid sampling. Here, we sampled one piece of rock. After this sampling, we climbed on the steep slope to the summit of NW Rota observing the distribution of vent-associated animals. On the steep slope, 556m depth, we landed on the bottom and observed patch of alvinocaridid shrimps, and examined to sample shrimps and scale worms. Near the top of caldera wall, 528m depth, a bythograeid crab was observed, but we failed to

slurp. We moved several meters from that point, and sampled many alvinocaridid shrimp and a bythograeid crab. Then we moved across on the center of summit of NW Rota where is deep hole. When we went through dense plume from the center of summit, plume was sampled by the Niskin and RI vacuum sampler. Around the top of the seamount, lots of alvinocaridid shrimps were observed and sampled. Also several rocks with limpet and other animals were collected by the manipulators.

Dive Log

Time	***X***	***Y***	***Depth***	***Descriptions***
8:35				Start to descend to the bottom
8:46			210	observed scale-like fragments
8:49	115	-320	278	
8:56	120	-270	440	moving to the vent mark No. 1
9:04	70	-280	620	moving to the vent mark No. 1
9:06	60	-270	626	sampling water with Niskin sampler and RI
9:13			618	start to move to the vent mark No. 1
9:15	20	-200	625	Observed bottom (rock and rubble)
9:18			620	observed a fish (Beryx?)
9:20	30	-150	603	going upward along slope
9:23	20	-110	577	observed vent fluid??; bottom rocks
9:26	10	-90	567	observed vent fulid (white smoker); landing
9:39	6	-90	568	sampling vent fluid with WHATS (maximum wt 103°C), and WHATS communication error
10:09			569	finished fluid sampling
10:16				WHATS communication system restarted
10:23	10	-90	569	sampling sulpher
10:28				start to move to next site
10:29			567	obserdved white smoker
10:33	40	-90	582	rock, rough bottom
10:38	50	-60	569	observed rock wall
10:43	40	-50	566	observed alvinocaridids and scale worm
10:56			557	suction sampling (bottle No. 2)
11:10	40	-50	549	moving up along wall
11:20	40	-40	528	observed bythograeid crab and alvinocaridids
11:27			528	sampling bottle was changed to No. 3, and failed, continue to use the bottle No. 2
11:30				started again to sample shrimps

11:47	36	-37	527	sampled club and shrimps
11:48				checked suction sumpler bottles and observed shrimps, samples were out of sampling bottles
11:50				sampled shrimps
11:55	36	-40	527	sampled shripms
11:58	47	-41	526	sampled shrimps
12:06				large shrimp eat small shrimp
12:07				finished sampring
12:13				moving to plume water sampling point(up)
12:18	27	-40	445	moving to plume water sampling point(up)
12:19	30	-30	431	moving to plume water sampling point(up)
12:23	30	-14	421	moving to plume water sampling point(down)
12:27	30	-20	471	moving to plume water sampling point(down)
12:32	1	-30	517	stoped to moving and sampled water (Niskin No. 2 red)
12:37	0	-50	517	sampled water (RI WHATS)
12:45				moving to point No.8
12:48	30	-30	515	chimney
12:56	-40	80	498	down
12:59	-20	70	571	observed sea floor
13:17				moving up to recover the cable position
13:23				moving down, to move the point of observing sea floor
13:35	-20	30	543	observed many white fragments
13:39	-10	40	571	observed sea floor and moving up along wall
13:46	0	30	545	landing on the wall
13:51	0	40	543	observed shrimps and other creatures
13:56				sampled shrimps
13:59				finished sampling and moving up along wall
14:02	-10	40	537	stoped to moving up and sampled shrimps, white and large?
14:09				finished sampling and moving up along wall again
14:12	0	50	532	many white fragments
14:13	0	40	533	landing on the wall
14:14				observed and sampled shrimps
14:24				finished sampling and moving up along wall again
14:25	0	40	531	landing and samped shrimps, many (thousands?) shrimps was observed
14:33				sea max to take a picture of habitat
14:36				moving up along wall

14:40	20	30	526	observed the rock on the wall
14:47	20	30	526	sampled the yellow rock
14:54	20	30	523	observed,take a pic. and sampled shrimps
15:02			523	moving along the top of the wall
15:04	30	30	523	observed and sampled shrimps and shell attached on the rock
15:27			523	finished sampling and heading to north
15:34			524	observed and sampled shrimps and shell and urokomushi
16:02	39	39	525	morving the front rock
16:04	40	50	526	observed and sampled shell and other creatures and rock
16:15			526	start to up to surface

平成２２年
ハイパードルフィン　調査潜航
＃１１６１ＤＩＶＥ
マリアナ前弧 NW Rota

2010年7月26日

１．測 地 系	ＷＧＳ－８４（世界測地系）
２．測　位	Ｄ－ＧＰＳ（Skyfix-XP Trimble SPS751）
３．ＸＢＴ	計測　　Ｓ／Ｖ=　　ｍ／ｓ（Ｄ=　　ｍ）
４．ＸＰＯＮＤＥＲ	設置せず
５．作図中心	１４－３６．０５０Ｎ　ＡＮＧＬＥ　０°
	１４４－４６．５５０Ｅ　ＳＣＡＬＥ　１／２０００
６．着底点（特異点①）	１４－３６．０７８Ｎ　Ｄ＝　６４５　ｍ
	１４４－４６．４５６Ｅ　Ｃｏ＝
７．潜航配置	指　揮　：運航長
	ｺﾝﾃﾅPILOT　：松本(竹ノ内)　若松　甲板PILOT：近藤
８．潜航目的	「伊豆・小笠原～マリアナ島弧における熱水噴出孔生物群集の特異性と生活史に関する研究」
９．作業内容	海底観察、採水・生物採集
	(WHATS採水器+ボトル2本、Bag採水器、ｻﾝﾌﾟﾙﾎﾞｯｸｽ、真空採水器×2本、pHｾﾝｻｰ、濁度計、DO計、D-Port2、ｶﾏｷﾘｶｯﾀｰ)

１０．日　程

	NW Rota　海域着
	XBT計測
０７：４５	作業開始
０８：３０	潜航開始　No.4
〜	
１６：３０	ビークル浮上
１７：００	揚収完了
	終了後、栄福海山向け

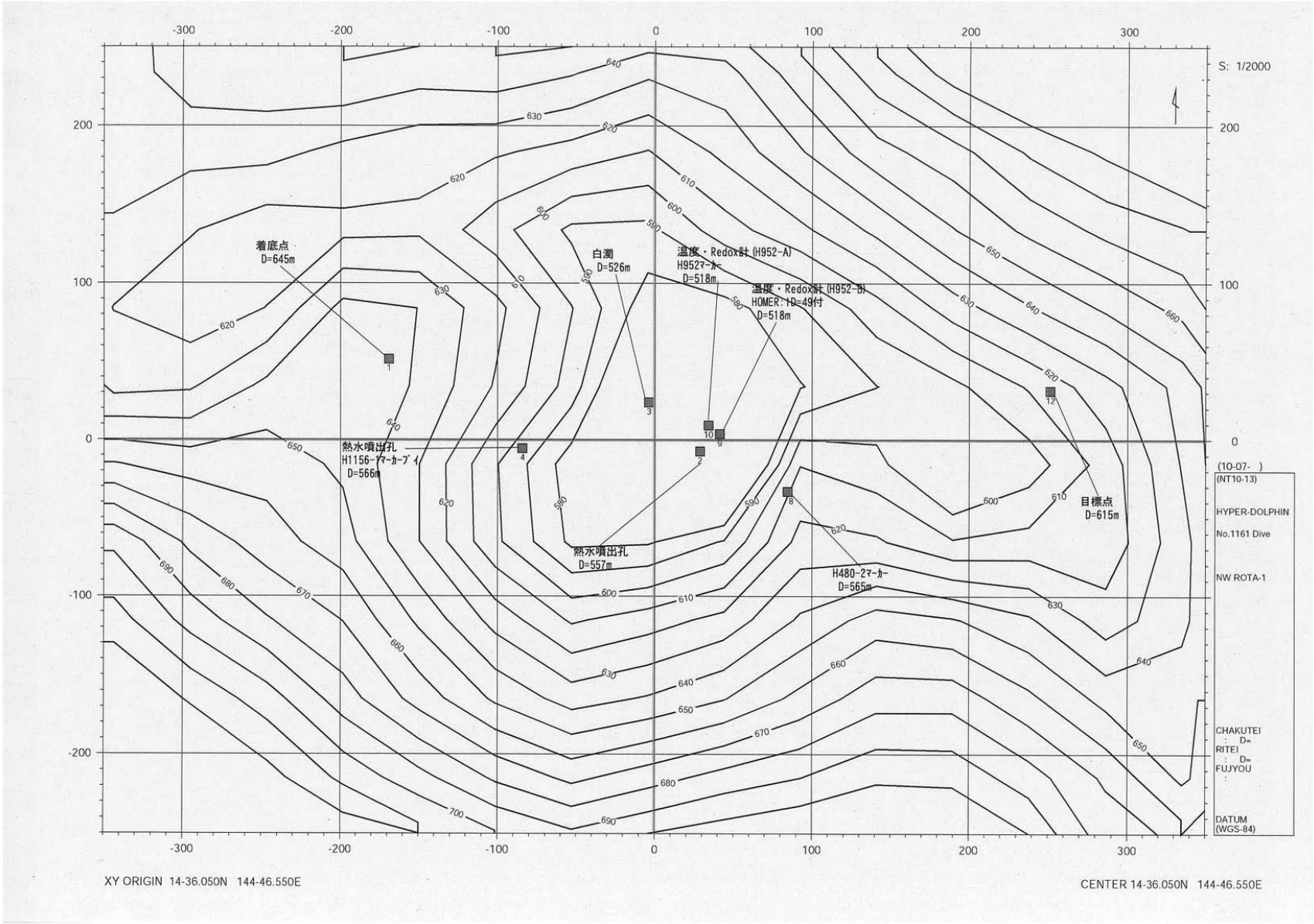
１１．備　考

・特異点は「別紙」参照
・＃４アルゴス送信機：ＩＤ＝２Ｃ６９Ｂ３５
・ＪＸトランスポンダ：２Ａ－１
・ＬＣＴ（ＪＳＴ＋１ｈ）/(UTC+10h)

別紙

特　異　点

	緯　度	経　度	水 深	備　考
①	14-36.078N	144-46.456E	645	着底点
②	14-36.046N	144-46.566E	557	熱水噴出孔
③	14-36.063N	144-46.548E	526	白濁
④	14-36.047N	144-46.503E	566	熱水噴出孔、H1156-1ﾏｰｶｰﾌﾞｲ
⑤				
⑥				
⑦				
⑧	14-36.032N	144-46.597E	565	H480-2ﾏｰｶｰ
⑨	14-36.052N	144-46.573E	518	温度･Redox計(H952-B) HOMER:ID=49付
⑩	14-36.055N	144-46.569E	518	温度・Redox計(H952-A)、H952ﾏｰｶｰ
⑪				
⑫	14-36.067N	144-46.690E	615	目標点
⑬				
⑭				
⑮				
⑯				
⑰				
⑱				
⑲				
⑳				


S: 1/2000
着底点
D=645m
白濁
D=526m
温度・Redox計(H952-A)
H952マーカー
D=518m
温度・Redox計(H952-B)
HOMER:ID=49付
D=518m
熱水噴出孔
H1156-1マーカーブイ
D=566m
熱水噴出孔
D=557m
H480-2マーカー
D=565m
目標点
D=615m
(10-07-)
(NT10-13)
HYPER-DOLPHIN
No.1161 Dive
NW ROTA-1
CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:
DATUM
(WGS-84)
XY ORIGIN 14-36.050N 144-46.550E
CENTER 14-36.050N 144-46.550E

ハイパードルフィン　潜航記録

平成 22 年　NT10-13　行動　　記載者　松本 恵太

潜航年月日　2010/07/26
潜航回数　4回
通算潜航回数　1161回

位置　作図中心位置
緯度　14° 36.050 ' N
経度　144° 46.550 ' E
WGS-84

潜航海域　マリアナ前弧　NW Rota

潜航目的　調査潜航　「伊豆・小笠原～マリアナ島弧における熱水噴出孔生物群集の特異性と生活史に関する研究」

調査主任　土田 真二
ビークル指揮　大野 芳生

Pilot　松本 恵太
Co. Pilot　若松 誉

作業経過時刻	
吊揚	08:20
着水	08:23
潜航開始	08:35
着底	09:15
離底	16:15
浮上	16:38
揚収完了	16:52

累計時間		
潜航時間		8:03
通算潜航		5438:35
ケーブル	ケーブルNo.	4
	使用時間	8:32
	通算時間	489:54

気象・海象

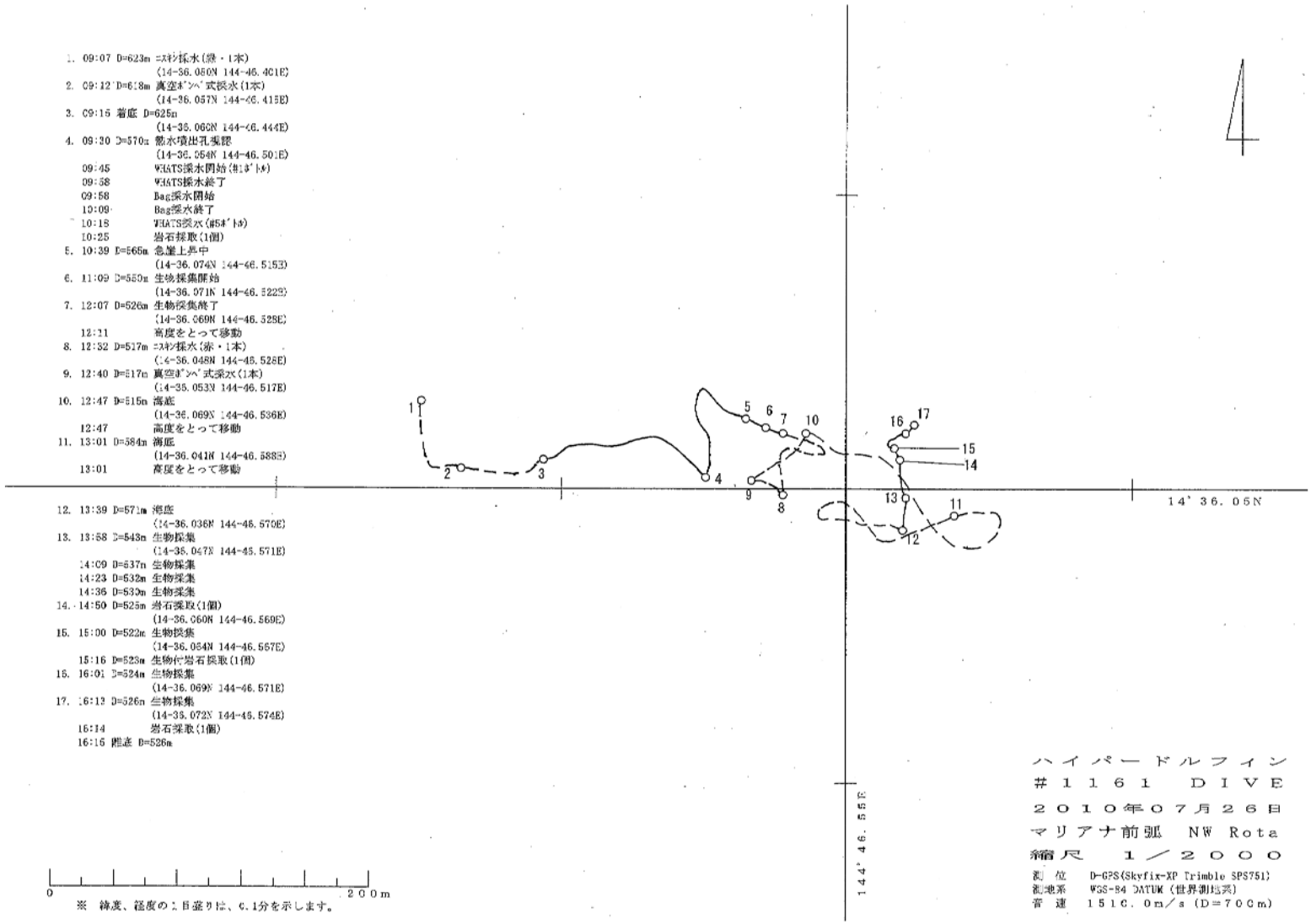
天候	風向	風力	風浪	うねり	視程
c	ENE	5	4	3	7

最大潜航深度　625 m
着底深度　625 m
着底底質　礫

離底深度　526 m
離底底質　礫

記事　海底を観察しながら航走し、採水(WHATS・ボトル・Bag)及びスラープガンによる生物の採集を行った。

1. 09:07 D=623m ﾆｽﾝ採水(昼・1本)
(14-36.050N 144-46.401E)
2. 09:12 D=618m 真空ﾎﾞﾝﾍﾞ式採水(1本)
(14-36.057N 144-46.415E)
3. 09:15 着底 D=625m
(14-36.060N 144-46.444E)
4. 09:30 D=570m 熱水噴出孔観察
(14-36.054N 144-46.501E)
09:45 VHATS採水開始(ﾎﾙﾀﾞｰﾄﾙ)
09:58 VHATS採水終了
09:58 Bag採水開始
10:09 Bag採水終了
10:18 VHATS採水(ﾎﾙﾀﾞｰﾄﾙ)
10:25 岩石採取(1個)
5. 10:39 D=565m 急崖上昇中
(14-36.074N 144-46.515E)
6. 11:09 D=550m 生物採集開始
(14-36.071N 144-46.522E)
7. 12:07 D=526m 生物採集終了
(14-36.069N 144-46.528E)
12:11 高度をとって移動
8. 12:32 D=517m ﾆｽﾝ採水(赤・1本)
(14-36.048N 144-46.528E)
9. 12:40 D=517m 真空ﾎﾞﾝﾍﾞ式採水(1本)
(14-35.053N 144-46.517E)
10. 12:47 D=515m 海底
(14-36.069N 144-46.536E)
12:47 高度をとって移動
11. 13:01 D=584m 海底
(14-36.041N 144-46.588E)
13:01 高度をとって移動
12. 13:39 D=571m 海底
(14-36.036N 144-46.570E)
13. 13:58 D=543m 生物採集
(14-36.047N 144-46.571E)
14:09 D=537m 生物採集
14:23 D=532m 生物採集
14:36 D=530m 生物採集
14. 14:50 D=525m 岩石採取(1個)
(14-36.060N 144-46.569E)
15. 15:00 D=522m 生物採集
(14-36.054N 144-46.567E)
15:16 D=523m 生物付岩石採取(1個)
15. 16:01 D=524m 生物採集
(14-36.069N 144-46.571E)
17. 16:12 D=526m 生物採集
(14-36.072N 144-46.574E)
16:14 岩石採取(1個)
16:16 離底 D=526m



0 200m
※ 緯度、経度の二目盛りは、C.1分を示します。

ハイパードルフィン
＃１１６１ ＤＩＶＥ
２０１０年０７月２６日
マリアナ前弧 NW Rota
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 １５１６．０m／s (D＝７００m)

Dive Report HPD#1162

Date: July 29, 2010

Site: NW Eifuku, Mariana Arc **Depth:** 1500-2000 m

Landing (Lat., Long., Time, Depth): 21°29.353'N, 144°02.400'E, 09:20, 1689m

Leaving (Lat., Long., Time, Depth): 21°29.250'N, 144°02.481'E, 09:20, 1612m

Pilot: Homare Wakamatsu **Co-Pilot**: Tomoe Kondo

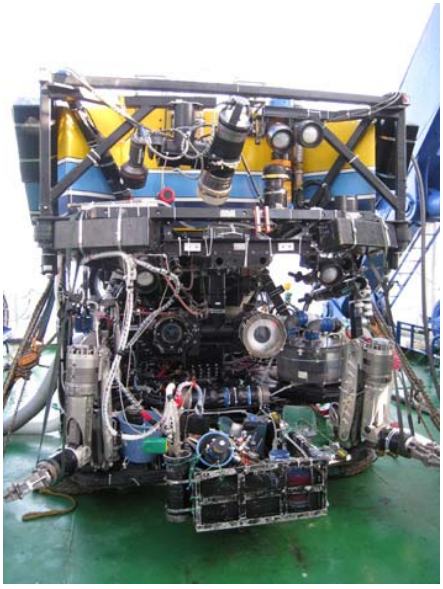
Theme: Research for microbial interaction with iron provided from subseafloor hydrothermal aquifer in the NW Eifuku Seamount of the northern Mariana Arc: Microbial ecosystem sustained by weathering of iron-containing fluids and rocks and biogeochemical interaction with abundant magmatic volatiles.

Purpose:

5. To observe the horizontal distribution of the Iron mat in NW Eifuku.
6. To collect Iron mat
7. To collect environmental factors (temperature, salinity, DO, pH and H_2S)
8. To set the GARI on the iron mat
9. To collect animals

Payload Equipment:

Suction sampler with six collection canisters, WHATS, Niskin sampler, Bag sampler, GARI (Genba - AtsuRyoku - *in situ* Incubation system), RI bottle sampler, SUDO-Type sediment sampler, D-Pote2, Turbidity meter, DO meter, pH meter



HPD#1162

Sampling Points and Markers:

Events	*Time*	*Depth (m)*	*Sample*	*Lat./Long.*
Rock sampling	09:46	1677	Rock	21°29.353'N, 144°02.400'E
Rock sampling	09:48	1657	Rock	21°29.314'N, 144°02.452'E
RI vacuum water sampling	12:59	1545	Sea water	21°29.223'N, 144°02.567'E
WHATS water sampling	13:57	1545	Sea water	21°29.223'N, 144°02.567'E
GARI-I&II	13:57	1545	Set on the iron mat	21°29.223'N, 144°02.567'E
Niskin water sampling	14:26	1605	Plume	21°29.265'N, 144°02.465'E
RI vacuum water sampling	14:30	1604	Plume	21°29.265'N, 144°02.465'E
WHATS water sampling	15:26	1612	Sea water	21°29.250'N, 144°02.481'E
Bag water sampling	15:30	1612	Sea water	21°29.250'N, 144°02.481'E
GARI-III	15:40	1612	Set on the iron mat	21°29.250'N, 144°02.481'E
Suction sampler	15:49	1612	Animals	21°29.250'N, 144°02.481'E

Dive Summary

Hyper-Dolphine #1162 started to descend at 8:19 am. *Hyper-Dolphine* (HPD) landed at 1,693 m water depth of the west side of the NW Eifuku seamount, close to point where Bacterial Ball. At the landing point, we observed many rocks. We were going over champagne vent site to NT05-18 cruise scientist set #H492 marker at the site in 2005. Although, we could not find #492 marker, we could find white mat cover seafloor. Then, many shrimps and some small hydrothermal vents were observed at white mat site. After going near the summit of the NW Eifuku seamount, we successfully found the massive iron mat site. And, we set the two GARI-I and II (Genba AtuRyoku lithoautotroph *in situ* colonization system). We tried collecting iron mat with SUDO-type sediment sampler. Additionally, we collected fluid in the iron mat with three bottles of WHATS sampler and one RI bottle. Then, we conducted the D-POTE2 for H_2S and Fe^{2+} measurements into the iron mat. After these operations, we went back to the champagne vent site. At near the champagne vent site, we collected hydrothermal fluid and plume with WHATS or RI-bottle. And some animals (bivalve and shrimp) collected with suction sampler. Then, we set the two GARI-III. After taking samples, HPD left the bottom, at 15:50 pm. Then, water depth was 1,612 m.

Dive Log

Time	*X*	*Y*	*Depth*	*Descriptions*
8:08				sea level
8:19			20	Start to descend to the bottom
8:20	-45	145	50	observed small fish
8:23	21.8	125	98	observed small fish（same one observed depth 50?）
9:19	280	-160	1687	observed bottom
9:23			1693	observed sediments like iron oxides
9:26	160	-130	1679	observed sediments like iron oxides
9:27	245	-115	1676	observed flaffy iron precipitates.observed shrimp. landing
9:32	250	-120	1676	Fe layer thickness was 2-3 cm,the bottom layer was black.
9:39	248	-118	1676	sampled fragile crastal iron to the bukket
9:46	210	-120	1676	sampled hard crastal iron to the bukket
9:52	210	-80	1657	landing. Observed the area.take some picture.
10:05	205	-85	1656	observed rocks surrunded by white brume.
10:13	160	-110	1647	white area observed shrimp
10:26	115	-75	1645	observed shrimps,crabs and shells, observed diffusing flow
10:32	95	-35	1627	way point Obserbed many shirmps at white area.
10:37	100	-20	1614	white area ended
10:46	78	24	1575	observed diffusing flow, observed bubbles
11:03	115	-13	1608	observed bubbles at the white area
11:13	91	-14	1608	observed diffusing flow
11:16	91	-20	1607	observed bubbles
11:29	78	-10	1583	observed white area(sulfer?) between red rocks
11:52	10	114	1546	landing
12:16	52	124	1545	get seafloor
12:19	52	124	1545	get seafloor. A blanket iron-mat
12:33	52	124	1545	sampled iron-mat
12:59	52	124	1545	RI-WHATS
13:12	52	124	1545	D-PORT
13:28	52	124	1545	D-PORT（into iron-mat）
13:34	52	124	1545	temp 2℃
13:41	52	124	1545	started WHATS1
13:45	52	124	1545	started WHATS2
13:51				finished WHATS2
13:54				finished WHATS6 temp 1．4℃
13:57				GARI-1 set

14:02	52	124	1545	GARI-2 set
14:19	123	-10	1592	left seafloor. Go to partical point9。
14:25	112	-57	1607	identified seafloor
14:28	112	-57	1600	samped water (NISKIN) green
14:36	180	-37	1610	RI-WHATS
14:42	86	-27	1611	on the way to 9
14:48				D-PORT was taked out sheath and putted on basket
14:57				temp. maximum13℃
15:06	100	-34	1612	moving
15:18	93	-37		found hot spring 162.5℃
15:22				started WHATS3
15:25				finished WHATS3 maximum175℃
15:26				started WHATS4、5 average174℃
15:29				finished WHATS4,5 started sampled to bag average171℃
15:33				finished sampled to bag
15:37				started D-PORT
15:39				finished D-PORT into the basket
15:40				GARI-3 set
15:50				sampled shell and urokomushi
				start to up to surface

平成２２年
ハイパードルフィン　調査潜航
＃１１６２ＤＩＶＥ
マリアナ前弧　栄福海山

2010年7月29日

１．測 地 系　　ＷＧＳ－８４（世界測地系）

２．測　位　　Ｄ－ＧＰＳ（Skyfix-XP Trimble SPS751）

３．ＸＢＴ　　計測　　Ｓ／Ｖ=　　ｍ／ｓ（Ｄ=　　ｍ）

４．ＸＰＯＮＤＥＲ　　設置せず

５．作図中心　　２１－２９．２００Ｎ　　ＡＮＧＬＥ　　０°
１４４－０２．５００Ｅ　　ＳＣＡＬＥ　１／２０００

６．着底点（特異点①）　　２１－２９．３２８Ｎ　　Ｄ＝１７１５ｍ
１４４－０２．４３０Ｅ　　Ｃｏ＝　ＳＷ

７．潜航配置　　指　揮　：運航長
ｺﾝﾃﾅPILOT　：若松　　近藤　　甲板PILOT：飯嶋

８．潜航目的　　「北部マリアナ弧　NW Eifuku 海山にて解き明かす鉄-微生物相互作用：鉄を含む地殻内流体、岩石およびマグマガス成分の地球科学的相互作用によって支えられた微生物生態系」

９．作業内容　　海底観察、採水、採泥、生物採集、GARI（現場培養器）設置
（ｽﾗｰﾌﾟｶﾞﾝ、単式ｷｬﾆｽﾀｰ、WHATS採水器+ボトル2本、Bag採水器、ﾆｽｷﾝ採水器×2本、pHｾﾝｻｰ、濁度計、DO計、D-Port2、保圧RI採水器、SUDO型採泥器）

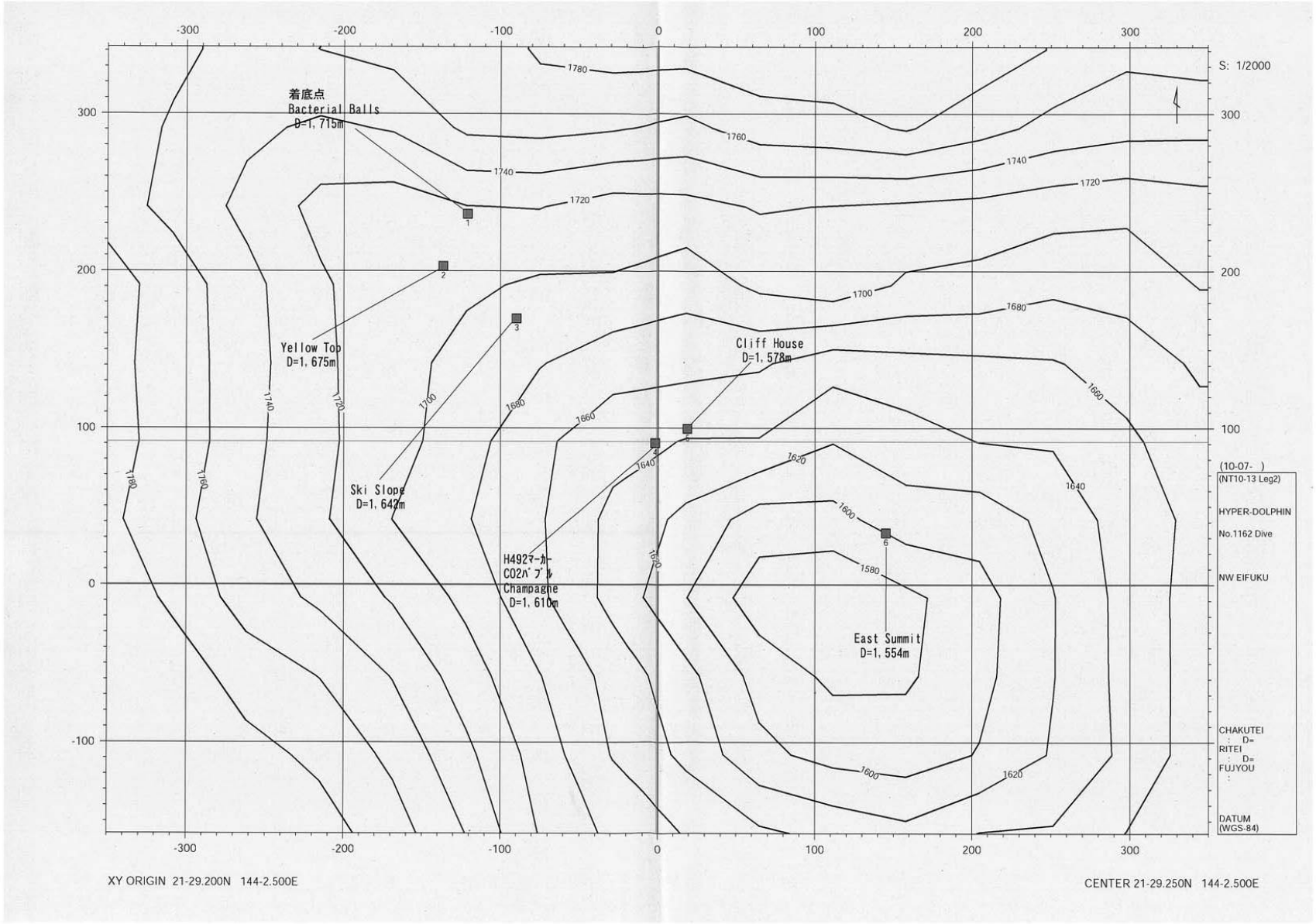
１０．日　程

	栄福海山着
	XBT計測
０７：４５	作業開始
０８：３０	潜航開始　No.5
〜	
１６：３０	ビークル浮上
１７：００	揚収完了
	終了後、日光海山向け

１１．備　考
・特異点は「別紙」参照
・＃４アルゴス送信機：ＩＤ＝２Ｃ６９Ｂ３５
・ＪＸトランスポンダ：２Ａ－１
・ＬＣＴ（ＪＳＴ＋１ｈ）/(UTC+10h)

別紙

特　異　点				
	緯　度	経　度	水 深	備　考
①	21-29.328N	144-02.430E	1715m	着底点、Bacterial Balls
②	21-29.310N	144-02.421E	1675m	Yellow Top
③	21-29.292N	144-02.448E	1642m	Ski Slope
④	21-29.249N	144-02.499E	1610m	H492ﾏｰｶｰ、CO2ﾊﾞﾌﾞﾙ、Champane
⑤	21-29.254N	144-02.511E	1578m	Cliff House
⑥	21-29.218N	144-02.584E	1554m	East Summit
⑦				
⑧				
⑨				
⑩				
⑪				
⑫				
⑬				
⑭				
⑮				
⑯				
⑰				
⑱				
⑲				
⑳				


着底点
Bacterial Balls
D=1,715m
Yellow Top
D=1,675m
Ski Slope
D=1,642m
H492ﾏｰｶｰ
CO2ﾊﾞﾌﾞﾙ
Champagne
D=1,610m
Cliff House
D=1,578m
East Summit
D=1,554m
S: 1/2000
(10-07-)
(NT10-13 Leg2)
HYPER-DOLPHIN
No.1162 Dive
NW EIFUKU
CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:
DATUM
(WGS-84)
XY ORIGIN 21-29.200N 144-2.500E
CENTER 21-29.250N 144-2.500E

ハイパードルフィン　潜航記録

平成 22 年　NT10-13　行動　　記載者　若松 誉

潜航年月日　2010/07/29
潜航回数　5回
通算潜航回数　1162回

位置　作図中心位置
緯度　21° 29.200 ' N
経度　144° 02.500 ' E
WGS-84

潜航海域　マリアナ前弧　栄福海山

潜航目的　調査潜航　「北部マリアナ弧 NW Fifuku 海山にて解き明かす鉄-微生物相互作用：鉄を含む地殻内流体、岩石及びマグマガス成分の地球科学的相互作用によって支えられた微生物生態系」

調査主任　土田 真二
ビークル指揮　大野 芳生

Pilot　若松 誉
Co. Pilot　近藤 友栄

作業経過時刻	
吊揚	8:05
着水	8:08
潜航開始	8:19
着底	9:20
離底	15:50
浮上	16:37
揚収完了	16:51

累計時間		
潜航時間		8:18
通算潜航		5446:53
ケーブル	ケーブルNo.	4
	使用時間	8:46
	通算時間	498:40

気象・海象

天候	風向	風力	風浪	うねり	視程
bc	E	4	3	2	8

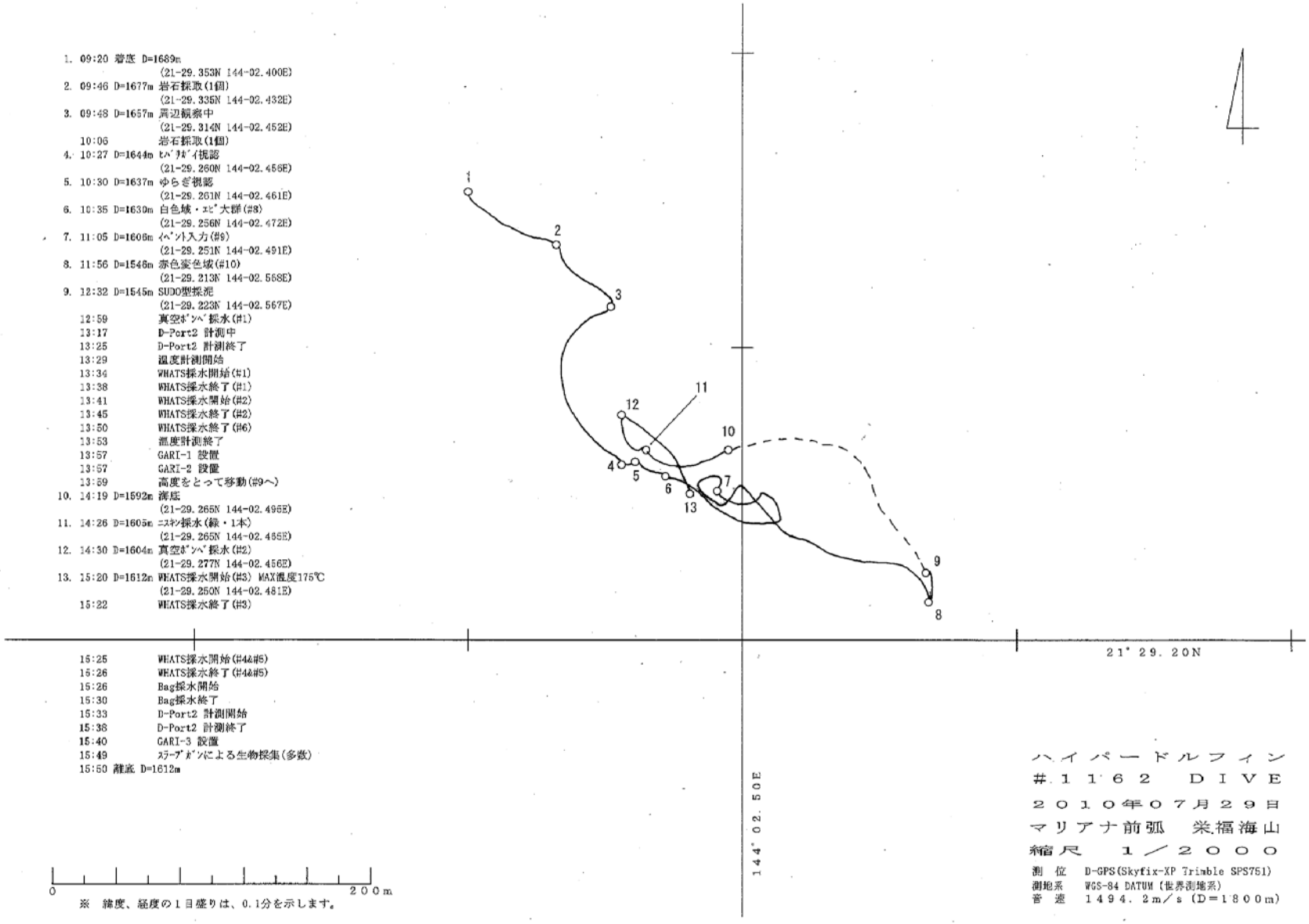
最大潜航深度　1689 m
着底深度　1689 m
着底底質　岩

離底深度　1612 m
離底底質　岩

記事　海底を観察しながら航走し、採水・採泥・岩石採取・培養器設置及び生物の採集を行った。

1. 09:20 着底 D=1689m
(21-29.353N 144-02.400E)
2. 09:46 D=1677m 岩石採取(1個)
(21-29.335N 144-02.432E)
3. 09:48 D=1657m 周辺観察中
(21-29.314N 144-02.452E)
10:06 岩石採取(1個)
4. 10:27 D=1644m ﾋﾊﾞｸｶﾞｲ視認
(21-29.260N 144-02.456E)
5. 10:30 D=1637m ゆらぎ視認
(21-29.261N 144-02.461E)
6. 10:35 D=1630m 白色域・ｴﾋﾞ大群(#8)
(21-29.256N 144-02.472E)
7. 11:05 D=1606m ｲﾍﾞﾝﾄ入力(#9)
(21-29.251N 144-02.491E)
8. 11:56 D=1546m 赤色変色域(#10)
(21-29.213N 144-02.568E)
9. 12:32 D=1545m SUDO型採泥
(21-29.223N 144-02.567E)
12:59 真空ﾎﾞﾝﾍﾞ採水(#1)
13:17 D-Port2 計測中
13:25 D-Port2 計測終了
13:29 温度計測開始
13:34 WHATS採水開始(#1)
13:38 WHATS採水終了(#1)
13:41 WHATS採水開始(#2)
13:45 WHATS採水終了(#2)
13:50 WHATS採水終了(#6)
13:53 温度計測終了
13:57 GARI-1 設置
13:57 GARI-2 設置
13:59 高度をとって移動(#9へ)
10. 14:19 D=1592m 海底
(21-29.265N 144-02.495E)
11. 14:26 D=1605m ﾆｽｷﾝ採水(緑・1本)
(21-29.265N 144-02.485E)
12. 14:30 D=1604m 真空ﾎﾞﾝﾍﾞ採水(#2)
(21-29.277N 144-02.456E)
13. 15:20 D=1612m WHATS採水開始(#3) MAX温度175℃
(21-29.250N 144-02.481E)
15:22 WHATS採水終了(#3)

15:25 WHATS採水開始(#4&#5)
15:26 WHATS採水終了(#4&#5)
15:26 Bag採水開始
15:30 Bag採水終了
15:33 D-Port2 計測開始
15:38 D-Port2 計測終了
15:40 GARI-3 設置
15:49 ｽﾗｰﾌﾟｶﾞﾝによる生物採集(多数)
15:50 離底 D=1612m



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
#1162 DIVE
2010年07月29日
マリアナ前弧 栄福海山
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 1494.2m／s (D=1800m)

Dive Report HPD#1163

Date: July 30, 2010
Site: Nikko seamount, Northern Mariana fore-arc **Depth:** 380-472m
Landing (Lat., Long., Time, Depth): 23°04.877'N, 142°19.526'E, 08:51, 449m
Leaving (Lat., Long., Time, Depth): 23°04.830'N, 142°19.554'E, 11:17, 472m
Pilot: Tomoe Kondo **Co-Pilot**: Kazuki Iijima

Theme: Collection of the vent-specific organisms and environment research in the hydrothermal vent on Nikko seamount.

Purpose:

1. Collection and observation of the tubeworm, *Lamellibrachia satsuma* living in the Nikko seamount.
2. Picking and observation of the hydrothermal vent-specific animals in the Nikko seamount.
3. Water collection of the plume and vent fluid on the Nikko seamount.
4. Rock and mud collections around the hydrothermal vents on the Nikko seamount.
5. Measurement of the environmental factors (temperature, DO, pH and H_2S) at the habitat of the vent-specific animals on the Nikko seamount.
6. Placing the sponge agar mediums and beef bones near the hydrothermal vents around the tubeworm bush in the Nikko seamount.

Payload Equipment:

Double slurp gun of the suction sampler equipped with two nozzles, a square canister and a rotary canister with six bottles, Niskin water sampler, Bag-type water sampler, Sample box, M-type bottom sampler, RMT thermometer, DO meter (Hyper-Dolphin equipment), pH sensor, D-Pote (hydrogen sulfide meter), Sponge agar mediums, and Flame boxes containing the beef bones.

HPD#1163 Payload

Events and Sampling Points:

Events	***Time***	***Depth (m)***	***Sample / Measurement***	***Lat. / Long.***
Niskin water sampling	08:43	393	Plume water	23°04.895'N/142°19.521'E
Placing the sponge agar mediums (H1163-1, H1163-2, H1163-3, H1163-4, H1163-5, H1163-6)	09:41	471	Sponge agar mediums (H1163-1, H1163-2, H1163-3, H1163-4, H1163-5, H1163-6)	23°04.828'N/142°19.519'E (Point No. 23)
Placing the beef bones (FL-101, FL-102)	09:54	471	Beef bones (FL-101, FL-102)	23°04.828'N/142°19.519'E (Point No. 23)
Measuring the H_2S concentration inside the tubeworm colony with D-Pote	10:33	472	H_2S concentration	23°04.830'N/142°19.554'E
Bag-type water sampling inside the tubeworm colony	10:37	472	Water	23°04.830'N/142°19.554'E
Mud sampling with M-type bottom sampler around the tubeworm colony	10:42	472	Mud	23°04.830'N/142°19.554'E
Measuring the temperature with RMT thermometer inside the tubeworm colony	10:49	472	Temperature	23°04.830'N/142°19.554'E
Suction sampling with the slurp gun and canisters	11:05	472	Vent-specific animals	23°04.830'N/142°19.554'E
Tubeworm collection	11:16	472	Tubeworms	23°04.830'N/142°19.554'E

Dive Summary

The dive #1163 of Hyper-Dolphin was carried out in the good oceanic condition all morning. The vehicle went in the hydrothermal plume layer of white smoke at 381 m depth. We collected the plume water by Niskin water sampler at 392 m depth. The vehicle landed on the bottom of the north position of the point No. 7 at 449 m depth in the north area of the caldera on Nikko seamount. We could hardly observe the tubeworm bush, shrimps, crabs, tongue fishes on the sulfur bottom despite the abundant population of the vent-specific animals in this area, because the foggy hydrothermal smokes caused our visibility to reduce to almost zero everywhere. Then, the vehicle moved to the direction to the point No. 17 with

increasing altitude. The vehicle landed on the seafloor at the south position of the point No. 17. We observed the tubeworm bush and sulfur rocks in the foggy white smoke. To set on the sponge agar mediums and beef bones, the vehicle moved slowly to the direction of the point No. 4. We found the small hydrothermal vent near the tubeworm colonies with clear our vision, and the vehicle settled there at 471 m depth between the point No. 11 and 17. This vent position was named as the point No. 23. The sponge agar mediums (H1163-1, H1163-2, H1163-3, H1163-4, H1163-5, H1163-6) and flame boxes containing the beef bones (FL-101, FL-102) were placed on the gray bottom nearby the hydrothermal vent. We found many crabs and tongue fishes around the vent, but the tubeworm colonies were dotted on the sulfur rocks in this area. The vehicle moved again to the direction of the point No. 4, and landed on the bottom at 472 m depth nearby the tubeworm bush at the east position of the point No. 3. Inside the tubeworm bush, we measured the H_2S concentration with D-Pote, and the temperature with RMT thermometer. The seawater in the bush was collected by bag-type water sampler. The mud sampling was performed with M-type bottom sampler nearby the tubeworm colony. After observation of the many vent-specific animals (shrimps, crabs, tongue fishes, mussels, tubeworms, annelids, gastropods, etc.) in this area, we much collected them with the double slurp gun of the suction sampler equipped with a square canister and a rotary canister with six bottles. After the suction sampling, we plucked and collected many tubeworms on the sulfur rocks which were attached well to the tubeworms as scaffolding, into and on the sample box and basket by using the manipulators. The vehicle holding in the tubeworms by the arms, left from the bottom.

Dive Log

Drawing center: *23°04.800'N / 142°19.500'E (**X**=0, **Y**=0) ,* ***Angle:*** *0°,* ***Scale:*** *1/2000.*

Time	***X***	***Y***	***Depth***	***Descriptions***
8:12				Landing on the water.
8:23				Starting to descend to the bottom.
8:40			381	Observing the plume layer of white smoke.
8:42	170	30	392	Plume water sampling with Niskin sampler.
8:48	150	45	436	
8:49			449	Observing the tongue fishes.
8:50	140	40	449	Landing on the bottom at the north position of the point No. 7. Observing the white smoke everywhere.
8:54			452	Moving up. Observing the tubeworms with white smoke.
8:57			440	Observing the tubeworm bush, shrimps, crabs, and tongue fishes with white smoke.

9:00	140	34	440	Moving to the direction of the point No. 17 with increasing altitude.
9:08	30	10	466	Landing on the bottom of the south position of the point No. 17. Observing the tubeworm bush and rocks.
9:14			465	Moving up.
9:15	50	15	465	Moving to the direction of the point No. 4. Observing the rocks
9:18	50	30	471	Landing on the bottom of the position between the point No. 11 and 17. This point was named as the point No.23. Observing many tubeworms, crabs, tongue fishes, and rocks in the small hydrothermal vent.
9:25	50	30	471	Placing the sponge agar mediums (H1163-1, H1163-2, H1163-3) nearby the tubeworm colony at the point No. 23.
9:33	50	30	471	Placing the sponge agar mediums (H1163-4, H1163-5, H1163-6) nearby the tubeworm colony at the point No. 23.
9:41	50	30	471	Finishing the setting on the sponge agar mediums.
9:54	50	30	471	Placing the flame boxes containing the beef bones (FL-101, FL-102) nearby the tubeworm colony at the point No. 23.
10:00	50	30	471	Finishing the setting on the beef bones. Moving to the direction of the point No. 4.
10:06	60	60	472	Observing the tubeworm bush.
10:12	50	93	472	Landing on the bottom of the east position of the point No. 3.
10:20	50	91	472	Starting on the measurement of the H_2S concentration inside the tubeworm colony with D-Pote.
10:31	50	91	472	Ending on the measurement of the H_2S concentration inside the tubeworm colony with D-Pote.
10:35	50	91	472	Starting on the water sampling inside the tubeworm colony by bag-type water sampling.
10:37	50	91	472	Ending on the water sampling inside the tubeworm colony by bag-type water sampling.
10:42	50	91	472	Mud sampling nearby the tubeworm colony with M-type bottom sampler
10:45	50	91	472	Starting on the measurement of the temperature inside the tubeworm colony with RMT thermometer
10:49	50	91	472	Ending on the measurement of the temperature inside the tubeworm colony with RMT thermometer

10:55	50	91	472	Suction sampling of the vent-specific animals in the tubeworm bush with slurp gun equipped with a square canister and rotary canister at No. 2.
10:56	50	91	472	Suction sampling of the vent-specific animals around the tubeworm bush with slurp gun equipped with a square canister and rotary canister at No. 3.
10:57	50	91	472	Crab collection by slurp gun and rotary canister at No. 4.
11:01	50	91	472	Suction sampling of the vent-specific animals around the tubeworm bush with slurp gun equipped with a square canister and rotary canister at No. 5.
11:05	50	91	472	Suction sampling of the vent-specific animals around the tubeworm bush with slurp gun equipped with a square canister and rotary canister at No. 6.
	50	91	472	Ending on the suction sampling by slurp gun and canisters.
11:06	50	91	472	Starting on the collection of many tubeworms on the sample box and basket.
11:11	50	91	472	Ending on the collection of the many tubeworms.
11:17	50	91	472	Leaving from the bottom.
11:46				Landing on deck.

平成２２年
ハイパードルフィン　調査潜航
＃１１６３ＤＩＶＥ
マリアナ前弧　日光海山

2010年7月30日

１．測 地 系　　ＷＧＳ－８４（世界測地系）

２．測　位　　Ｄ－ＧＰＳ（Skyfix-XP Trimble SPS751）

３．ＸＢＴ　　計測　　Ｓ／Ｖ=　　ｍ／ｓ（Ｄ=　　ｍ）

４．ＸＰＯＮＤＥＲ　　設置せず

５．作図中心　　２３－０４．８００Ｎ　　ＡＮＧＬＥ　　０°
１４２－１９．５００Ｅ　　ＳＣＡＬＥ　１／２０００

６．着底点（特異点①）　　２３－０４．８９０Ｎ　　Ｄ＝　４２０　ｍ
１４２－１９．４８９Ｅ　　Ｃｏ＝

７．潜航配置　　指　揮　　：運航長
ｺﾝﾃﾅPILOT　：近藤　　飯嶋　　甲板PILOT：竹ノ内

８．潜航目的　　「環形動物サツマハオリムシの細胞外巨大ヘモグロビンの構造機能相関の研究」

９．作業内容　　生物採集、採水、採泥、温度計測、牛骨設置、ｽﾎﾟﾝｼﾞ設置

（ｽﾗｰﾌﾟｶﾞﾝ、単式ｷｬﾆｽﾀｰ、6連ｷｬﾆｽﾀｰ、Bag採水器、ﾆｽｷﾝ採水器、pHｾﾝｻｰ、濁度計、DO計、D-Port2、M式採泥器、MBARI採泥器、牛骨×2、BOX、RMT温度計、ｽﾎﾟﾝｼﾞ）

１０．日　程

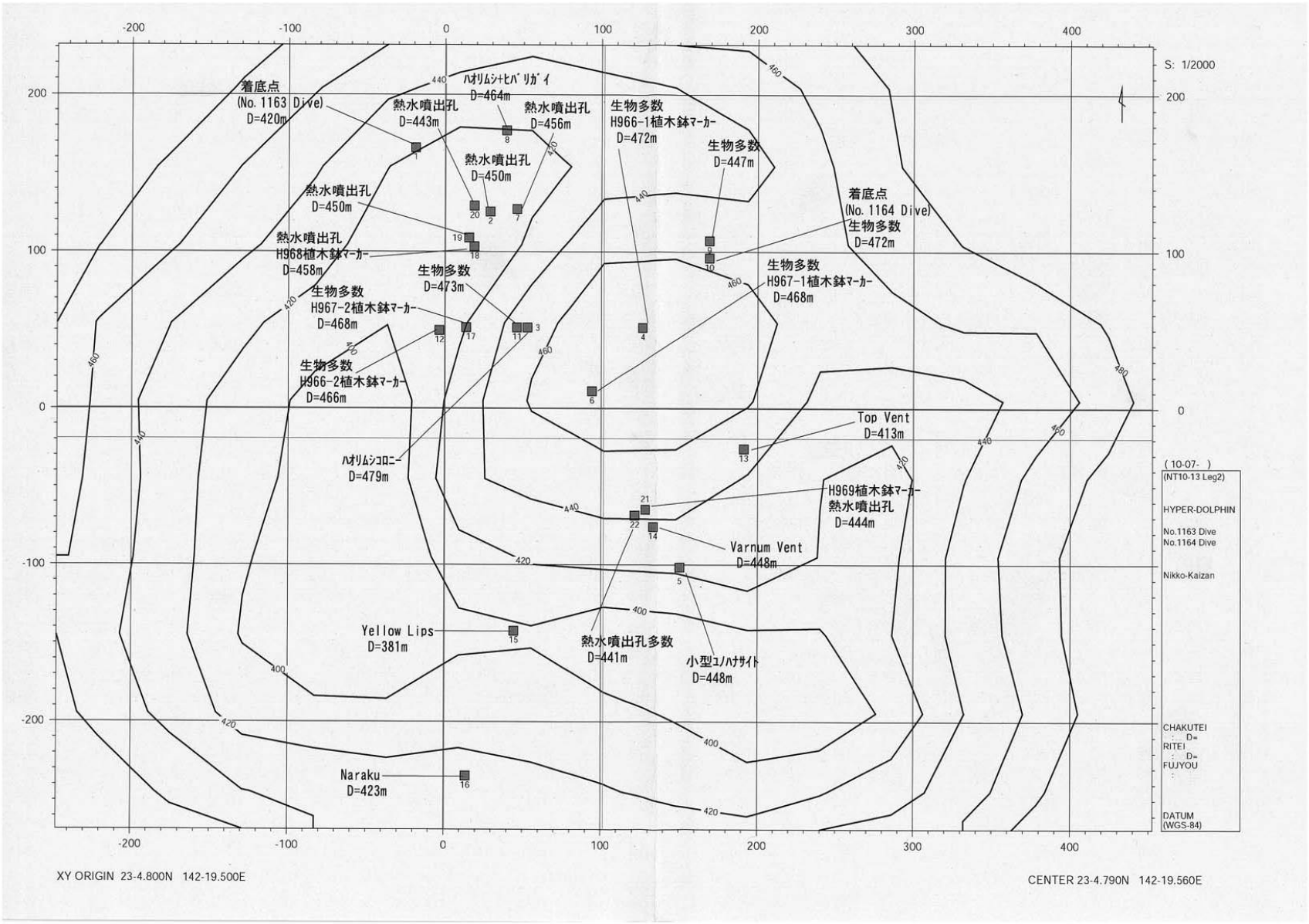
	日光海山着
	XBT計測
０７：４５	作業開始
０８：３０	潜航開始　No.6
〜	
１１：３０	ビークル浮上
１２：００	揚収完了

１１．備　考
・特異点は「別紙」参照
・＃４アルゴス送信機：ＩＤ＝２Ｃ６９Ｂ３５
・ＪＸトランスポンダ：２Ａ－１
・ＬＣＴ（ＪＳＴ＋１ｈ）／(UTC+10h)

別紙

特　異　点

	緯　度	経　度	水 深	備　考
①	23-04.890N	142-19.489E	420m	着底点(#1163Dive)
②	23-04.868N	142-19.517E	450m	熱水噴出孔
③	23-04.828N	142-19.531E	479m	ハオリムシコロニー
④	23-04.828N	142-19.574E	472m	生物多数 H966-1植木鉢ﾏｰｶｰ
⑤	23-04.745N	142-19.588E	448m	小型ユノハナサイト
⑥	23-04.806N	142-19.555E	468m	生物多数 H967-1植木鉢ﾏｰｶｰ
⑦	23-04.869N	142-19.527E	456m	熱水噴出孔
⑧	23-04.896N	142-19.523E	464m	ハオリムシ＋ヒバリガイ
⑨	23-04.858N	142-19.599E	447m	生物多数
⑩	23-04.852N	142-19.599E	472m	着底点(#1164Dive) 生物多数
⑪	23-04.828N	142-19.527E	473m	生物多数
⑫	23-04.827N	142-19.498E	466m	生物多数 H966-2植木鉢ﾏｰｶｰ
⑬	23-04.786N	142-19.612E	413m	Top　Vent
⑭	23-04.759N	142-19.578E	448m	Varnum　Vent
⑮	23-04.723N	142-19.526E	381m	Yellow　Lips
⑯	23-04.673N	142-19.508E	423m	Naraku
⑰	23-04.828N	142-19.508E	468m	生物多数 H967-2植木鉢ﾏｰｶｰ
⑱	23-04.856N	142-19.511E	458m	熱水噴出孔 H968植木鉢ﾏｰｶｰ
⑲	23-04.859N	142-19.509E	450	熱水噴出孔
⑳	23-04.870N	142-19.511E	443	熱水噴出孔


着底点
(No. 1163 Dive)
D=420m
熱水噴出孔
D=443m
ハオリムシ+ヒバリガイ
D=464m
熱水噴出孔
D=456m
生物多数
H966-1植木鉢マーカー
D=472m
生物多数
D=447m
熱水噴出孔
D=450m
熱水噴出孔
D=450m
着底点
(No. 1164 Dive)
生物多数
D=472m
熱水噴出孔
H968植木鉢マーカー
D=458m
生物多数
D=473m
生物多数
H967-1植木鉢マーカー
D=468m
生物多数
H967-2植木鉢マーカー
D=468m
生物多数
H966-2植木鉢マーカー
D=466m
ハオリムシコロニー
D=479m
Top Vent
D=413m
H969植木鉢マーカー
熱水噴出孔
D=444m
Varnum Vent
D=448m
Yellow Lips
D=381m
熱水噴出孔多数
D=441m
小型ユノハナサイト
D=448m
Naraku
D=423m
S: 1/2000
(10-07-)
(NT10-13 Leg2)
HYPER-DOLPHIN
No.1163 Dive
No.1164 Dive
Nikko-Kaizan
CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:
DATUM
(WGS-84)
XY ORIGIN 23-4.800N 142-19.500E
CENTER 23-4.790N 142-19.560E

ハイパードルフィン　潜航記録

平成 22 年　NT10-13　行動　　記載者　近藤 友栄

潜航年月日　2010/07/30
潜航回数　6回
通算潜航回数　1163回

位置　作図中心位置
緯度　23° 04.800 ' N
経度　142° 19.500 ' E
WGS-84

潜航海域　マリアナ前弧　日光海山

潜航目的　調査潜航　「環形動物サツマハオリムシの細胞外巨大ヘモグロビンの構造機能相関の研究」

調査主任　土田 真二
ピークル指揮　大野 芳生

Pilot　近藤 友栄
Co. Pilot　飯嶋 一樹

作業経過時刻	
吊揚	08:09
着水	08:12
潜航開始	08:24
着底	08:51
離底	11:17
浮上	11:33
揚収完了	11:46

累計時間		
潜航時間		3:09
通算潜航		5450:2
ケーブル	ケーブルNo.	4
	使用時間	3:37
	通算時間	502:17

気象・海象

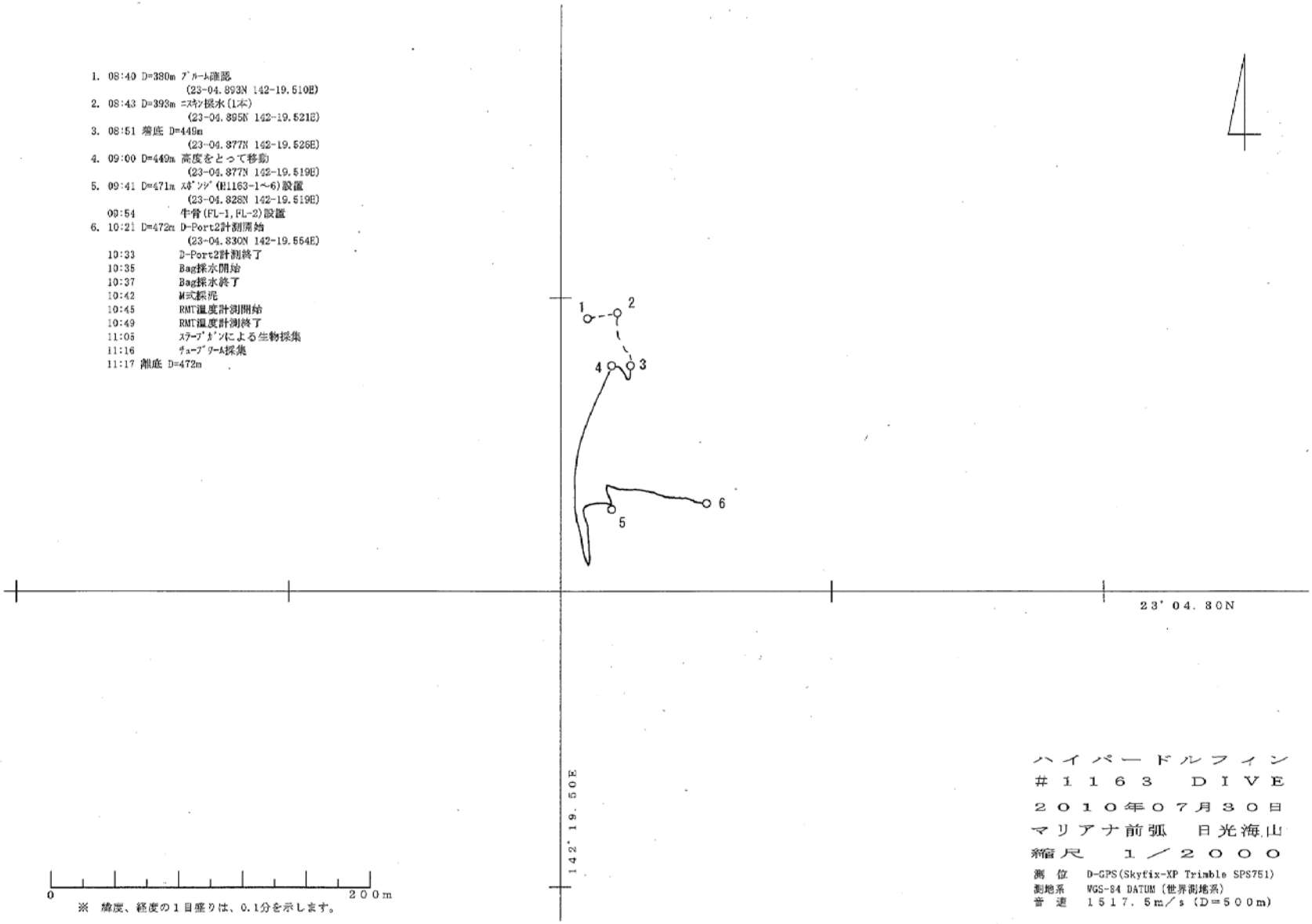
天候	風向	風力	風浪	うねり	視程
bc	ESE	4	3	2	8

最大潜航深度　472 m
着底深度　449 m
着底底質　岩

離底深度　472 m
離底底質　泥

記事　海底を観察しながら航走し、生物採集、採泥、温度計測、採水、D-Port2センサー計測及び、牛骨(2セット)とスポンジ(6個)の設置を行った。

1. 08:40 D=380m ｱﾝｶｰ確認
(23-04.893N 142-19.510E)
2. 08:43 D=393m =ｽｷﾝ採水(1本)
(23-04.895N 142-19.521E)
3. 08:51 着底 D=449m
(23-04.877N 142-19.526E)
4. 09:00 D=449m 高度をとって移動
(23-04.877N 142-19.519E)
5. 09:41 D=471m ｽﾎﾟﾝｼﾞ(H1163-1～6)設置
(23-04.828N 142-19.519E)
09:54 牛骨(FL-1,FL-2)設置
6. 10:21 D=472m D-Port2計測開始
(23-04.830N 142-19.554E)
10:33 D-Port2計測終了
10:35 Bag採水開始
10:37 Bag採水終了
10:42 M式採泥
10:45 RMT温度計測開始
10:49 RMT温度計測終了
11:05 ｽﾗｰﾌﾟｶﾞﾝによる生物採集
11:16 ﾁｭｰﾌﾞﾜｰA採集
11:17 離底 D=472m



※ 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
＃１１６３　ＤＩＶＥ
２０１０年０７月３０日
マリアナ前弧　日光海山
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　１５１７．５m／s（D＝５００m）

Dive Report HPD#1164

Date: July 30, 2010
Site: Nikko seamount, Northern Mariana fore-arc **Depth:** 377-472m
Landing (Lat., Long., Time, Depth): 23°04.831'N, 142°19.602'E, 13:46, 427m
Leaving (Lat., Long., Time, Depth): 23°04.830'N, 142°19.500'E, 16:14, 468m
Pilot: Kazuki Iijima **Co-Pilot**: Atsushi Takenouchi

Theme: Collection of the vent-specific organisms and environment research in the hydrothermal vent on Nikko seamount.

Purpose:

1. Collection and observation of the tubeworm, *Lamellibrachia satsuma* living in the Nikko seamount.
2. Picking and observation of the hydrothermal vent-specific animals in the Nikko seamount.
3. Water collection of the plume and vent fluid on the Nikko seamount.
4. Rock and mud collections around the hydrothermal vents on the Nikko seamount.
5. Measurement of the environmental factors (temperature, DO, pH and H_2S) at the habitat of the vent-specific animals and hydrothermal vent on the Nikko seamount.
6. Placing the beef bones near the tubeworm habitat around the hydrothermal vents in the Nikko seamount.

Payload Equipment:

Double slurp gun of the suction sampler equipped with two nozzles, a square canister and a rotary canister with six bottles, Niskin water sampler, Bag-type water sampler, Sample box, M-type bottom sampler, RMT thermometer, DO meter (Hyper-Dolphin equipment), pH sensor, D-Pote (hydrogen sulfide meter), and the Flame boxes containing the beef bones.

HPD#1164 Payload

Events and Sampling Points:

Events	***Time***	***Depth (m)***	***Sample / Measurement***	***Lat. / Long.***
Niskin water sampling	13:41	378	Plume water	23°04.831’N/142°19.602’E
Placing the flame boxes containing the beef bones (FL-103, FL-104)	14:02	471	Beef bones (FL-103, FL-104)	23°04.831’N/142°19.566’E (Point No. 4)
Suction sampling with the slurp gun and canisters	14:29	471	Vent-specific animals	23°04.831’N/142°19.566’E (Point No. 4)
Measuring the temperature with RMT thermometer in the hydrothermal vent	14:54	471	Temperature	23°04.825’N/142°19.517’E
Measuring the H_2S concentration in the hydrothermal vent with D-Pote	15:19	471	H_2S concentration	23°04.825’N/142°19.517’E
Bag-type water sampling in the hydrothermal vent	15:19	471	Hydrothermal water	23°04.825’N/142°19.517’E
Mud sampling with M-type bottom sampler around the hydrothermal vent	15:25	471	Vent mud	23°04.825’N/142°19.517’E
Suction sampling with the slurp gun and canisters around the hydrothermal vent	15:51	468	Vent-specific animals	23°04.830’N/142°19.500’E
Measuring the H_2S concentration inside the tubeworm colony with D-Pote	15:57	468	H_2S concentration	23°04.830’N/142°19.500’E
Measuring the temperature with RMT thermometer inside the tubeworm colony	16:04	468	Temperature	23°04.830’N/142°19.500’E
Tubeworm collection	16:13	468	Tubeworm	23°04.830’N/142°19.500’E

Dive Summary

The dive #1164 of Hyper-Dolphin was carried out in the good oceanic condition from the afternoon to early-evening. The vehicle went in the hydrothermal plume layer of white smoke at 377 m depth. We collected the plume water by Niskin water sampler at 378 m depth. The vehicle landed on the bottom of the east position of the point No. 4 at 427 m depth in the central area of the caldera on Nikko seamount. The vehicle moved to the direction to the point No. 4 for setting on the flame boxes containing the beef bones. We observed many crabs and tongue fishes on the gray sulfur bottom, and found the H966-1 marker placed in the point No. 4 at the dive of NT09-05 Leg.2 which the sea anemones adhered on the marker surface. The vehicle settled on there at 470 m depth, and we placed the flame boxes containing the beef bones (FL-103, FL-104) on the seafloor from some distance away of the tubeworm's habitat. We collected many crabs and tongue fishes with the slurp gun and rotary canister at the point No. 4. The vehicle moved to the direction of the point No. 12. On the halfway through, we found many crabs nearby the small hydrothermal vent with the bobbled white smoke. So, the vehicle landed on this seafloor of the south position of the point No. 23, which located near the setting point of the sponge agar mediums and beef bones at the #1163 dive. We measured the temperatures of the crabs' place on mud and the bobbled white smoke water erupting from the hydrothermal vent, with RMT thermometer. We collected many crabs on white mud near the vent by the slurp gun and rotary canister. After sampling, we also measured the H_2S concentration of the bobbled white smoke with D-Pote, and collected the water with bag-type water sampler in the hydrothermal vent. The mud sampling of the crabs' colony nearby the vent was performed with M-type bottom sampler. After we changed the equipping of the rotary canister to square canister, the vehicle moved again to direction of the point No. 12. We observed the shrimps and small hydrothermal vents in the foggy white smoke. The vehicle gradually went in the foggy hydrothermal smokes which cause our visibility to reduce. At the bottom of the north position of the point No. 12 at 468 m depth, the vehicle landed on and we observed the large tubeworm bush and shrimps in the foggy white smoke. The many shrimps in the tubeworm bush were collected by the slurp gun and square canister. The H_2S concentration in the tubeworm bush was measured by the D-Pote. The water temperature in the tubeworm bush was also measured by the RMT thermometer. Finally, the long tubeworms were much plucked and collected on the sample box and basket as much as possible by the manipulators. The shrimps were also sucked into the square canister with slurp gun during the tubeworm collection. The vehicle holding in the many tubeworms by the arms, left from the bottom.

Dive Log

Drawing center: *23°04.800'N / 142°19.500' E (**X**=0, **Y**=0) ,* ***Angle:*** *0°,* ***Scale:*** *1/2000.*

Time	***X***	***Y***	***Depth***	***Descriptions***
13:10				Landing on the water.
13:21				Starting to descend to the bottom.
13:39			377	Observing the plume layer of white smoke.
13:41	60	160	378	Plume water sampling with Niskin sampler.
13:46	60	180	427	Observing the bottom. Landing on bottom of the east position of the point No. 4.
			430	Moving to the direction of the point No. 4. Observing many crabs.
13:52	60	120	470	Landing on the bottom of the point No. 4. Observing the H966-1 marker at NT09-05 Leg.2 which sea anemones adhered on the marker surface. Observing many crabs and tongue fishes on the gray bottom.
14:00	60	110	471	Placing the flame boxes containing the beef bones (FL-103, FL-104) from some distance away of the tubeworm habitat of the point No. 4.
14:09	60	110	471	Suction sampling of the many crabs and tongue fishes with slurp gun and rotary canister.
14:30			472	Moving to the direction of the point No. 12.
14:42	50	30	471	Landing on the bottom of the south position of the point No. 23. Observing a small hydrothermal vent with bobbled white smoke. Observing many crabs on the white mud nearby the vent.
14:47	50	30	471	Measuring the water temperature at the mud living in many crabs nearby the hydrothermal vent with RMT thermometer.
14:54	50	30	471	Measuring the temperature of the bobbled white water erupting from the vent with RMT thermometer.
14:56	50	30	471	Observing many crabs, shrimps, tongue fishes, rocks and a small hydrothermal vent on the bottom. Suction sampling of the many crabs and shrimps with slurp gun and rotary canister.
15:03	50	30	471	Measuring the H_2S concentration of the hydrothermal water in the vent with D-Pote.

15:13	50	30	471	Bag-type water sampling of the hydrothermal water in the vent.
15:20	50	30	471	White mud sampling of the crabs' habitat nearby the hydrothermal vent with M-type bottom sampler.
15:30	50	30	471	Changing from the rotary canister to square canister. Moving up.
15:31	50	20	467	Observing the shrimps and small hydrothermal vents.
15:35			467	Moving to the direction of the point No. 12.
15:36				Observing the foggy white smoke from the hydrothermal vents.
15:39	50	10	467	Moving up.
15:41	50	0	467	Observing the foggy white smoke from the hydrothermal vents.
15:43	60	0	468	Landing on the bottom of the north position of the point No. 12. Observing the large tubeworm bush with foggy white smoke.
15:45	60	0	468	Suction sampling of the shrimps in the tubeworm bush with slurp gun and square canister.
15:54	60	0	468	Measuring the H_2S concentration in the tubeworm bush with D-Pote.
16:00	60	0	468	Measuring the water temperature in the tubeworm bush with RMT thermometer.
16:05	60	0	468	Collection of many long tubeworms and sulfur rock with manipulator. Suction sampling of the shrimps with slurp gun and square canister.
16:14	60	0	468	Leaving from the bottom.
16:53				Landing on deck.

平成２２年
ハイパードルフィン　調査潜航
＃１１６４ＤＩＶＥ
マリアナ前弧　日光海山

2010年7月30日

１．測 地 系	ＷＧＳ－８４（世界測地系）
２．測　位	Ｄ－ＧＰＳ（Skyfix-XP Trimble SPS751）
３．ＸＢＴ	計測　　Ｓ／Ｖ=　　ｍ／ｓ（Ｄ=　　ｍ）
４．ＸＰＯＮＤＥＲ	設置せず
５．作図中心	２３－０４．８００Ｎ　ＡＮＧＬＥ　０°
	１４２－１９．５００Ｅ　ＳＣＡＬＥ　１／２０００
６．着底点（特異点①）	２３－０４．８５２Ｎ　Ｄ＝　４７２　ｍ
	１４２－１９．５９９Ｅ　Ｃｏ＝
７．潜航配置	指　揮　：運航長
	ｺﾝﾃﾅPILOT　：飯嶋　竹ノ内　甲板PILOT：松本
８．潜航目的	「環形動物サツマハオリムシの細胞外巨大ヘモグロビンの構造機能相関の研究」
９．作業内容	生物採集、採水、採泥、温度計測、牛骨設置
	（ｽﾗｰﾌﾟｶﾞﾝ、単式ｷｬﾆｽﾀｰ、6連ｷｬﾆｽﾀｰ、Bag採水器、ﾆｽｷﾝ採水器、pHｾﾝｻｰ、濁度計、DO計、D-Port2、M式採泥器、MBARI採泥器、牛骨×2、BOX、RMT温度計）

１０．日　程

１３：００	作業開始
１３：３０	潜航開始　No.6
〜	
１６：３０	ビークル浮上
１７：００	揚収完了
	終了後、付近海域漂泊

１１．備　考

・特異点は「別紙」参照
・＃４アルゴス送信機：ＩＤ＝２Ｃ６９Ｂ３５
・ＪＸトランスポンダ：２Ａ－１
・ＬＣＴ（ＪＳＴ＋１ｈ）/(UTC+10h)

ハイパードルフィン　潜航記録

平成 22 年　NT10-13　行動　　記載者　飯嶋 一樹

潜航年月日　2010/07/30
潜航回数　7回
通算潜航回数　1164回

位置　作図中心位置
緯度　23° 4.800 ' N
経度　142° 19.500 ' E
WGS-84

潜航海域　マリアナ前弧　日光海山

潜航目的　調査潜航　「環形動物サツマハオリムシの細胞外巨大ヘモグロビンの構造機能相関の研究」

調査主任　土田 真二
ビークル指揮　大野 芳生

Pilot　飯嶋 一樹
Co. Pilot　竹ノ内 純

作業経過時刻	
吊揚	13:07
着水	13:10
潜航開始	13:21
着底	13:46
離底	16:14
浮上	16:35
揚収完了	16:53

累計時間		
潜航時間		3:14
通算潜航		5453:16
ケーブル	ケーブルNo.	4
	使用時間	3:46
	通算時間	506:3

気象・海象

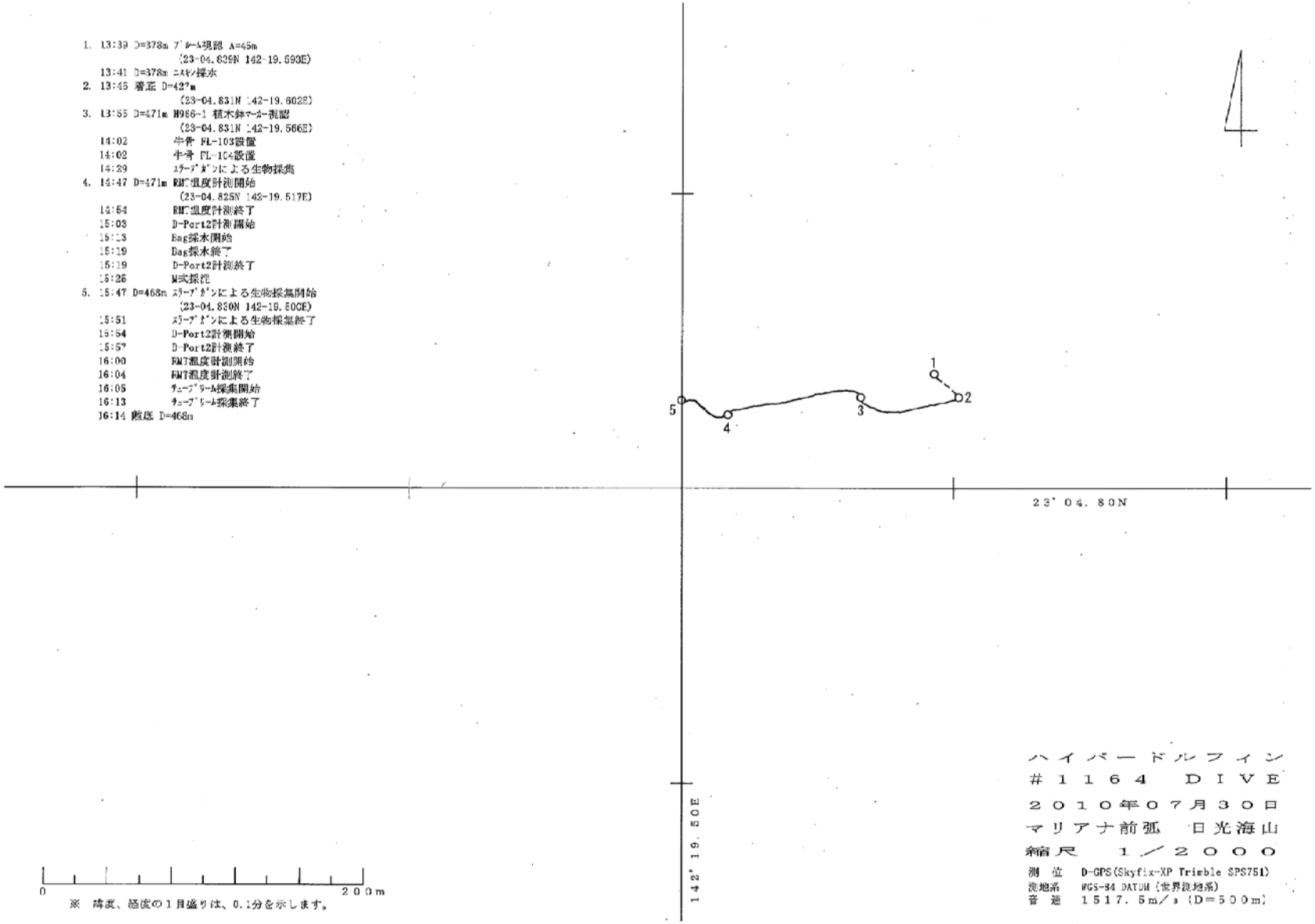
天候	風向	風力	風浪	うねり	視程
bc	SE	3	2	2	8

最大潜航深度　471 m
着底深度　427 m
着底底質　岩

離底深度　468 m
離底底質　岩

記事　海底を観察しながら航走し、生物採集、採泥、温度計測、採水、D-Port2センサー計測及び、牛骨の設置を行った。

1. 13:39 D=378m ﾌﾞｰﾑ現認 A=45m
   (23-04.639N 142-19.593E)
   13:41 D=378m ﾆｽｷﾝ採水
2. 13:45 着底 D=427m
   (23-04.831N 142-19.602E)
3. 13:55 D=471m H986-1 植木鉢ﾏｰｶｰ視認
   (23-04.831N 142-19.566E)
   14:02 半骨 FL-103設置
   14:02 半骨 FL-104設置
   14:29 ｽﾗｰﾌﾟｶﾞﾝによる生物採集
4. 14:47 D=471m RMT温度計測開始
   (23-04.825N 142-19.517E)
   14:54 RMT温度計測終了
   15:03 D-Port2計測開始
   15:13 Bag採水開始
   15:19 Bag採水終了
   15:19 D-Port2計測終了
   15:26 M式採泥
5. 15:47 D=468m ｽﾗｰﾌﾟｶﾞﾝによる生物採集開始
   (23-04.830N 142-19.500E)
   15:51 ｽﾗｰﾌﾟｶﾞﾝによる生物採集終了
   15:54 D-Port2計測開始
   15:57 D-Port2計測終了
   16:00 RMT温度計測開始
   16:04 RMT温度計測終了
   16:05 ｻｸｰﾌﾟﾗｰﾑ採集開始
   16:13 ｻｸｰﾌﾟﾗｰﾑ採集終了
   16:14 離底 D=468m



※ 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
＃１１６４　ＤＩＶＥ
２０１０年０７月３０日
マリアナ前弧　日光海山
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　1517.5m／s (D＝500m)

Dive Report HPD#1165

Date: July 31, 2010

Site: E Nikko Seamount, Mariana Arc **Depth:** 522-677m

Landing (Lat., Long., Time, Depth): 23°06.754'N, 142°21.509'E, 08:54, 677m

Leaving (Lat., Long., Time, Depth): 23°06.687'S, 142°21.901'E, 16:15, 520m

Pilot: Atsushi Takenouchi **Manipulator**: Keita Matsumoto

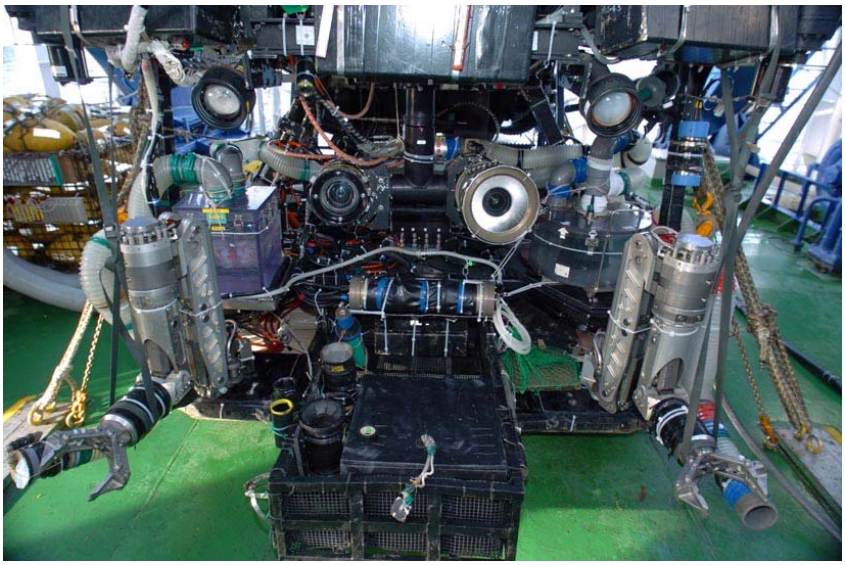
Theme: Studies on the life history for vent-associated animals in Izu-Bonin to Mariana Island Arcs.

Purpose:

1. Searching a vent field on the E Nikko Seamount.
2. Sampling and observing of animals on the E Nikko Seamount.
3. Sampling water in the plume by Niskin sampler.
4. Sampling sediment by MBARI corer.

Payload Equipment:

Slurp gun, single canisters (x2), sample box, Niskin water sampler, RMT thermometer, MBARI corer



HPD#1165 Payload

Sampling Points and Markers:

Events	*Time*	*Depth (m)*	*Sample*	*Lat./ Long.*
Suction sampling	09:03	677	Hermit crab	23°06.754'N/142°21.509'E
Suction sampling	09:13	667	Polychelid lobster	23°06.754'N/142°21.509'E
Suction sampling	09:32	668	Hermit crab	23°06.754'N/142°21.521'E
Suction sampling	09:41	658	Brachyuran crab	23°06.750'N/142°21.539'E
Suction sampling	09:47	648	Pandalid shrimps	23°06.749'N/142°21.544'E
Suction sampling	09:59	636	Spider crab	23°06.748'N/142°21.554'E
Suction sampling	11:31	562	Brachyuran crab	23°06.712'N/142°21.848'E
Suction sampling	11:38	562	Mantis shrimp	23°06.712'N/142°21.848'E
Suction sampling	11:46	553	Brachyuran crab	23°06.709'N/142°21.873'E
Rock sampling	11:53	553	Rock	23°06.709'N/142°21.873'E
Suction sampling	11:59	553	Spider crab	23°06.709'N/142°21.873'E
Fish observing	12:03	552	Anglerfish	
Suction sampling	12:16	523	Squat lobster and brachyuran crab	23°06.709'N/142°21.911'E
Suction sampling	13:14	564	Squat lobster	23°06.791'N/142°21.935'E
Suction sampling	13:17	564	Squat lobster and Pandalid shrimp	23°06.787'N/142°21.935'E
Suction sampling	13:38	564	Leucosid crab	23°06.766'N/142°21.934'E
Suction sampling	14:07	572	Mantis shrimp	23°06.645'N/142°21.951'E
Suction sampling	14:52	610	Coral	23°06.600'N/142°21.826'E
Rock sampling	14:53	610	Rock	23°06.600'N/142°21.826'E
Suction sampling	15:02	604	Polychelid lobster	23°06.608'N/142°21.831'E
Suction sampling	15:13	595	Leucosid crab	23°06.617'N/142°21.836'E
Suction sampling	15:22	576	Leucosid crab	23°06.639'N/142°21.848'E
Suction sampling	15:27	571	Mantis shrimp	23°06.642'N/142°21.851'E
Rock sampling	15:29	571	Rock	23°06.642'N/142°21.851'E
Suction sampling	15:46	556	Brachyuran crab	23°06.679'N/142°21.889'E
Rock sampling	15:49	556	Rock	23°06.679'N/142°21.889'E
Suction sampling	15:58	549	Brachyuran crab	23°06.687'N/142°21.901'E

Dive Summary

Hyper-Dolphin #1165 started to descend to the west slope at the east peak of Nikko Seamount (8:20 am). Just after landing at 677m depths, we found a rare species of polychelid lobster. At this point, we collected some animals including polychelid and hermit crab. Then, we directed to east toward the top of peak. Around this area lots of animals such as pandalid shrimps, stomatopod, progeryonid crabs were observed under broken crusts. At the depth of 562m, a mantis shrimp was found on the gravel bottom with whitish eyes and collected by the slurp gun. Near the top of the peak (523m depth), we sampled a squat lobster and brachyuran crab on the dense bed of broke coral. Then we pass through to the north of the peak in 300m distances with high altitude from the bottom. We landed at 618m depths in the north slope of

the peak and climbed again toward the peak. At the north slope of the peak, squat lobsters, leucosid crabs, pandalid shrimps were observed and collected. And also, lots of large gorgoninans observed on the rocky bottom. At the depth of 572m, a mantis shrimp found again and sampled by the slurp gun. Then, we left the bottom and moved at high altitude from the bottom to the southwest point from the peak. We landed at 300m distances in south-west from the top and observed a polychelid lobster. We tried to sample it, but the lobster was quickly escaped by flapping the tail. Another? polychelid lobster was found soon after moving and succeed to get the specimen. Around this area very week simmering was observed at the bottom, but no hydrothermal vent was found. Again, moving to the top of peak, some luecosid and progeryonid crabs were collected. Near the top of peak, this dive was finished and left the bottom to the surface. In this dive, we succeed to collect some live specimens including rare species of polychelid lobster, deep-sea stomatopods and so on.

Dive Log

Time	***X***	***Y***	***Depth***	***Descriptions***
8:20				Start to descend to the bottom
8:23			100	observed marine snow
8:27			157	ムネエソ観察
8:53	90	-409		observed bottom
8:54			677	on bottom; rock
8:55			678	observed hermit crabs, polychelid, galatheids, hexactenellid, etc.
8:58			678	sampled hermit crabs
9:12	100	-410	679	sampled polychelid lobster
9:16			678	observed Dicranodromia crab
9:23			677	start to move eastward
9:27	100	-390	667	observed stomatopod, pagurid, Heterocarpus laevigatus, eel
9:34			667	continue to move eastward (direction 100°)
9:39	90	-360	650	observed and sampled Progeryon crab
9:42			652	continue to move eastward
9:45	90	-370	647	observed and sampled crab (failure) and Heterocarpus laevigatus
9:52				continue to move eastward
9:55	90	-330	637	observed goneplacid and Cyrtomaia ap.
10:06				observed scorpaenid fish and Cyrtomaia sp.
10:07				continue to move eastward (direction 100°)
10:12	75	-300	625	

10:19	60	-250	593	
10:25	40	-190	608	
10:33	15	m-20	593	observed fishes
10:38	10	-120	581	observed dead coral rubble
10:47	-10	-60	551	observed large patch of dead coral rubble
10:52	0	-20	542	mountain top
10:53	0	-5	552	landing
11:02				continue to move eastward
11:05	-10	0	554	observed gorgonarian and many shrimp-like crustaceans swimming
11:08			552	started to descend along steep slope
11:11			561	stopped, observed rocky bottom; shark, fishes, galatheids
11:13	14	41	559	started to ascend along steep slope
11:20	20	120	552	rock bottom
11:24	20	160	562	landing; observed leucosiid (Galilia sp.); bottom consisting of coarse sand and rubble; sampled Galilia sp.
11:35				start to move eastward (direction 100°)
11:36	20	180	562	observed and sampled stomatopod; observed ソコダラ
11:44	20	210	552	observed and sampled Progeryon crab; sampled rock; got escaped Cyrtomaia
11:59	10	210	552	sampled Cyrtomaia; observed アンコウ
12:05				moved eastward
12:13	10	280	523	observed and Progeryon sp. and Eumunida sp.
12:17			521	move eastward
12:30	80	370	580	observed squids
12:45	280	310	561	Start to descend to the bottom
12:49	272	321	618	reach to bottom and start to move top
12:52	263	324	616	observed crab
12:56	252	321	606	observed shrimp
13:12	171	315	565	observed and sampled Eumunida
13:16	163	318	564	sampled shrimp and Eumunida
13:23	162	317	564	cyanista was changed (right slurp gun)
13:28	160	320	563	moved southward
13:35	130	310	551	observed and sampled Galilia sp. on steep slope
13:41	120	310	548	observed gorgonocephalid, アシロ、ハシキンメ
13:52	20	320	541	
14:02	-110	350	571	observed and sampled stomatopod

14:13				moved to SSW (direction 200°)
14:37	-100	130	607	observed bottom
14:39			610	near bottom; rock
14:40	-100	130	609	observed polychelid, scleractinean coral; sampling of polychelid unsuccessful
14:50	-100	130	609	observed ニジクラゲ; sampled scleractinean coral and rock; Munida
14:58				moved to NNE
15:00	-170	140	600	found and sampled polychelid; observed ウミユリ
15:07			600	moved to NNE
15:11	-150	150	595	observed leucosiid (Tanaoa?), Munida (sampled only leucosiid)
15:13				moved to NNE
15:20	-120	160	570	found and sampled leucosiid
15:22				moved to NNE
15:24	-100	180	571	found and sampled stomatopod; sampled rock
15:31				moved to NNE
15:40	-30	230	554	observed bottom; many demersal fishes were seen; sampled goneplacid; sampled rock
15:49			553	moved to NNE; observed ギンメダイ
15:55	-30	260	549	sampled goneplacid?
15:58				moved to NNE
16:01	-10	260	542	observed bottom (many gorgonarians)
16:02				moved to NNE; observed sea bottom; gogonarian and ophiuroids
16:15			520	departure

平成２２年
ハイパードルフィン　調査潜航
＃１１６５ＤＩＶＥ
マリアナ前弧　日光海山

2010年7月31日

１．測 地 系	ＷＧＳ－８４（世界測地系）
２．測　位	Ｄ－ＧＰＳ (Skyfix-XP Trimble SPS751)
３．ＸＢＴ	計測済み　Ｓ／Ｖ＝ １５０６．４ ｍ／ｓ （Ｄ＝８００ ｍ）
４．ＸＰＯＮＤＥＲ	設置せず
５．作図中心	２３－０６．７００Ｎ　ＡＮＧＬＥ　０°
	１４２－２１．７５０Ｅ　ＳＣＡＬＥ　１／３０００
６．着底点 (特異点①)	２３－０６．７５０Ｎ　Ｄ＝ ７００ ｍ
	１４２－２２．０００Ｅ　Ｃｏ＝
７．潜航配置	指　揮　：運航長
	ｺﾝﾃﾅPILOT　：竹ノ内　松本　甲板PILOT：若松
８．潜航目的	「伊豆・小笠原～マリアナ島弧における熱水噴出孔生物群集の特異性と生活史に関する研究」
９．作業内容	生物採集、採泥、温度計測
	(ｽﾗｰﾌﾟｶﾞﾝ、単式ｷｬﾆｽﾀｰ×2個、ﾆｽｷﾝ採水器、pHｾﾝｻｰ、濁度計、DO計、MBARI採泥器、BOX、RMT温度計)

１０．日　程

	日光海山着
０７：４５	作動確認
０８：３０	潜航開始　No.8
〜	
１１：３０	ビークル浮上
１２：００	揚収完了

１１．備　考

・特異点は「別紙」参照
・＃４アルゴス送信機：ＩＤ＝２Ｃ６９Ｂ３５
・ＪＸトランスポンダ：２Ａ－１
・ＬＣＴ（ＪＳＴ＋１ｈ）/(UTC+10h)

別紙

特　異　点

	緯　度	経　度	水 深	備　考
①	23-06.750N	142-21.520E	700m	着底点
②	23-06.700N	142-21.800E	580m	目標点
③	23-06.600N	142-22.000E	800m	離底予定点
④				
⑤				
⑥				
⑦				
⑧				
⑨				
⑩				
⑪				
⑫				
⑬				
⑭				
⑮				
⑯				
⑰				
⑱				
⑲				
⑳				
21				
22				

着底点
D=700m
目標点
D=580m
離底予定点
D=620m
S: 1/3000
(10-07-)
(NT10-13 Leg2)
HYPER-DOLPHIN
No.1165 Dive
East Nikko-Kaizan
CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:
DATUM
(WGS-84)
XY ORIGIN 23-6.700N 142-21.750E
CENTER 23-6.700N 142-21.750E

ハイパードルフィン　潜航記録

平成　22　年　　NT10-13　行動　　記載者　　竹ノ内　純

潜航年月日　2010/07/31
潜航回数　8回
通算潜航回数　1165回

位置　作図中心位置
緯度　23° 06.700 ' N
経度　142° 21.750 ' E
WGS-84

潜航海域　マリアナ前弧　　日光海山

潜航目的　調査潜航　「伊豆・小笠原～マリアナ島弧における熱水噴出孔生物群集の特異性と生活史に関する研究」

調査主任　土田 真二
ビークル指揮　大野 芳生

Pilot　竹ノ内 純
Co. Pilot　松本 恵太

作業経過時刻	
吊　揚	08:03
着　水	08:07
潜航開始	08:18
着　底	08:54
離　底	16:15
浮　上	16:34
揚収完了	16:48

累計時間		
潜航時間		8:16
通算潜航		5461:32
ケーブル	ケーブルNo.	4
	使用時間	8:45
	通算時間	514:48

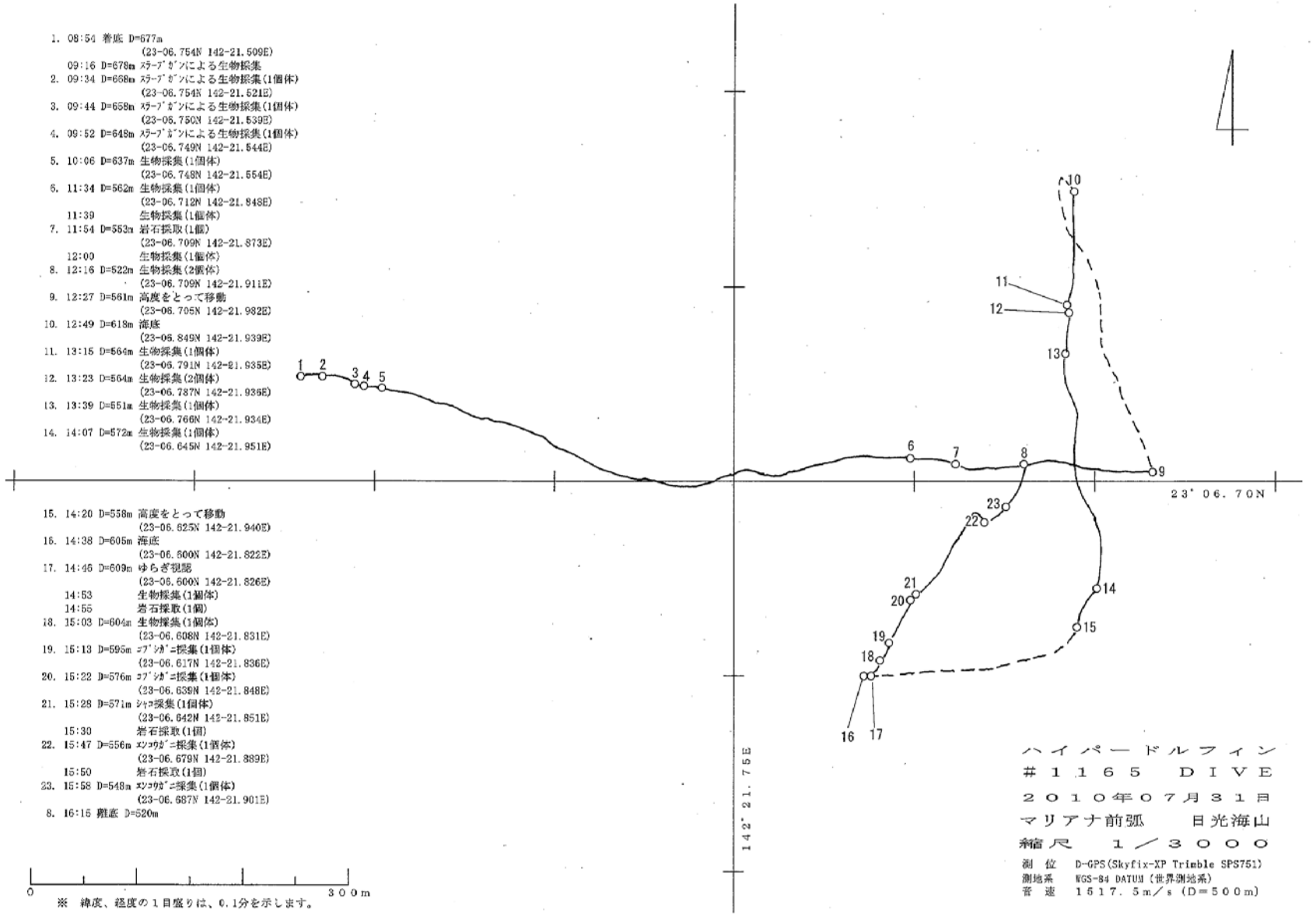
気象・海象

天候	風向	風力	風浪	うねり	視程
bc	ESE	4	2	2	8

最大潜航深度　678 m
着底深度　677 m
着底底質　岩盤

離底深度　520 m
離底底質　岩盤

記事　海底を観察しながら航走し、生物採集を行った。


1. 08:54 着底 D=677m
(23-06.754N 142-21.509E)
09:16 D=678m スラープガンによる生物採集
2. 09:34 D=668m スラープガンによる生物採集(1個体)
(23-06.754N 142-21.521E)
3. 09:44 D=658m スラープガンによる生物採集(1個体)
(23-06.750N 142-21.539E)
4. 09:52 D=648m スラープガンによる生物採集(1個体)
(23-06.749N 142-21.544E)
5. 10:06 D=637m 生物採集(1個体)
(23-06.748N 142-21.554E)
6. 11:34 D=562m 生物採集(1個体)
(23-06.712N 142-21.848E)
11:39 生物採集(1個体)
7. 11:54 D=553m 岩石採取(1個)
(23-06.709N 142-21.873E)
12:09 生物採集(1個体)
8. 12:16 D=522m 生物採集(2個体)
(23-06.709N 142-21.911E)
9. 12:27 D=561m 高度をとって移動
(23-06.705N 142-21.982E)
10. 12:49 D=618m 海底
(23-06.849N 142-21.939E)
11. 13:15 D=564m 生物採集(1個体)
(23-06.791N 142-21.935E)
12. 13:23 D=564m 生物採集(2個体)
(23-06.787N 142-21.936E)
13. 13:39 D=551m 生物採集(1個体)
(23-06.766N 142-21.934E)
14. 14:07 D=572m 生物採集(1個体)
(23-06.645N 142-21.951E)
15. 14:20 D=558m 高度をとって移動
(23-06.625N 142-21.940E)
16. 14:38 D=605m 海底
(23-06.600N 142-21.822E)
17. 14:46 D=609m ゆらぎ視認
(23-06.600N 142-21.826E)
14:53 生物採集(1個体)
14:55 岩石採取(1個)
18. 15:03 D=604m 生物採集(1個体)
(23-06.608N 142-21.831E)
19. 15:13 D=595m ﾆﾌﾞｼｶﾞﾆ採集(1個体)
(23-06.617N 142-21.836E)
20. 15:22 D=576m ﾆﾌﾞｼｶﾞﾆ採集(1個体)
(23-06.639N 142-21.848E)
21. 15:28 D=571m ｼﾔｺ採集(1個体)
(23-06.642N 142-21.851E)
15:30 岩石採取(1個)
22. 15:47 D=556m ﾒﾝｺｳｶﾞﾆ採集(1個体)
(23-06.679N 142-21.889E)
15:50 岩石採取(1個)
23. 15:58 D=548m ﾒﾝｺｳｶﾞﾆ採集(1個体)
(23-06.687N 142-21.901E)
8. 16:16 離底 D=520m
0
300m
※ 緯度、経度の1目盛りは、0.1分を示します。
23° 06.70N
142° 21.75E
ハイパードルフィン
#1165 DIVE
2010年07月31日
マリアナ前弧 目光海山
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 1517.5m／s (D=500m)

Dive Report HPD#1166

Date: August 02, 2010

Site: NW Eifuku, Mariana Arc **Depth:** 1500-2000 m

Landing (Lat., Long., Time, Depth): 21°29.244'N, 144°02.585'E, 09:20, 1569m

Leaving (Lat., Long., Time, Depth): 21°29.228'N, 144°02.569'E, 11:51, 1546m

Pilot: Keita Matsumoto **Co-Pilot**: Homare Wakamatsu

Theme: Research for microbial interaction with iron provided from subseafloor hydrothermal aquifer in the NW Eifuku Seamount of the northern Mariana Arc: Microbial ecosystem sustained by weathering of iron-containing fluids and rocks and biogeochemical interaction with abundant magmatic volatiles.

Purpose:

1. To collect Iron mat
2. To collect environmental factors (temperature, salinity, DO, pH and H_2S)
3. To collect the GARI and to set new GARI on the iron mat
4. To collect animals

Payload Equipment:

Suction sampler with collection canister, WHATS, Niskin sampler, Bag sampler, SUDO-Type sediment sampler, D-Pote2, Turbidity meter, DO meter, pH meter, Water temperature meter

HPD#1166 Payload

Sampling Points and Markers:

Events	***Time***	***Depth (m)***	***Sample***	***Lat./Long.***
GARI-IV&V	11:14	1677	Set on the iron mat	21°29.228'N, 144°02.569'E
Manipulator	11:36	1657	GARI-1&II Set	21°29.228'N, 144°02.569'E
M-type sediment sampler	11:44	1545	Iron mat	21°29.228'N, 144°02.569'E

Dive Summary

Hyper-Dolphine #1166 started to descend at 8:30 am. *Hyper-Dolphine* (HPD) landed at 1,569 m water depth near the GARI setting point. At the landing point, we observed many rocks. At the iron mat site, we collected two GARI (GARI-I & -II), and installed new two GARI (GARI-IV & -V) at same point. Before, we checked depth of iron mat with HPD manipulator. Then, we tried collecting iron mat with Ekman-Birge type sediment sampler and M-type sediment sampler. And, we conducted the several temperature measurements into the iron mat. After taking samples, HPD left the bottom, at 11:51 pm. Then, water depth was 1,546 m.

Dive Log

Time	***X***	***Y***	***Depth***	***Descriptions***
8:30	0	0	25	Start to descend to the bottom
9:34	80	160	1567	confirmed sea floor
9:42	55	110	1540	found GARI-1．2
9:46	50	120	1545	landing
9:52	50	120	1545	cheched the thickness of the iron mat by manupulator
9:59	50	120	1545	measured temperature at a surface area of the sea floor
10:04	50	120	1545	measured temperature at a 10cm depth from the sea floor
10:09	50	120	1545	measured temperature at a 20cm depth from the sea floor
10:25	52	113	1546	moved to the point of heavy iron mat
10:35	52	113	1546	measured temperature
10:38	52	113	1546	put GARI-4,5
10:47	52	113	1546	sampled iron mat by eggman (cap remained opened)
11:28	52	113	1546	collected GARI-1,2
11:35	52	113	1546	collected iron mat by SUDO type (failed?)
11:38	52	113	1546	collected iron mat by M type.
11:51	52	113	1546	start to up to the surface

平成２２年
ハイパードルフィン　調査潜航
＃１１６６ＤＩＶＥ
マリアナ前弧　栄福海山

2010年8月2日

１．測 地 系	ＷＧＳ－８４（世界測地系）
２．測　位	Ｄ－ＧＰＳ（Skyfix-XP Trimble SPS751）
３．ＸＢＴ	計測済み　　Ｓ／Ｖ＝　１４９４．２　ｍ／ｓ　（Ｄ＝１８００ｍ）
４．ＸＰＯＮＤＥＲ	設置せず
５．作図中心	２１－２９．２００Ｎ　　ＡＮＧＬＥ　　０°
	１４４－０２．５００Ｅ　　ＳＣＡＬＥ　１／２０００
６．着底点（特異点①）	２１－２９．２４２Ｎ　　Ｄ＝　１６２０　ｍ
	１４４－０２．５４７Ｅ　　Ｃｏ＝　ＳＷ
７．潜航配置	指　　揮　　：運航長
	ｺﾝﾃﾅPILOT　：松本　　若松　　甲板PILOT：近藤（斎藤）
８．潜航目的	「北部マリアナ弧　NW Eifuku 海山にて解き明かす鉄-微生物相互作用：鉄を含む地殻内流体、岩石およびマグマガス成分の地球科学的相互作用によって支えられた微生物生態系」
９．作業内容	海底観察、採水、採泥、生物採集、GARI（現場培養器）設置・回収、温度計測、D-Portｾﾝｻｰ計測
	（ｽﾗｰﾌﾟｶﾞﾝ、単式ｷｬﾆｽﾀｰ、WHATS採水器、Bag採水器、ﾆｽｷﾝ採水器×2本、pHｾﾝｻｰ、濁度計、DO計、D-Port2、GARI×2個、SUDO型採泥器、ｴｯｸﾞﾏﾝ採泥器、M式採泥器×2本、自己記録式温度計）

１０．日　程

	栄福海山着
０７：４５	作動確認
０８：３０	潜航開始　No.9
〜	
１６：３０	ビークル浮上
１７：００	揚収完了
	終了後、日光海山向け

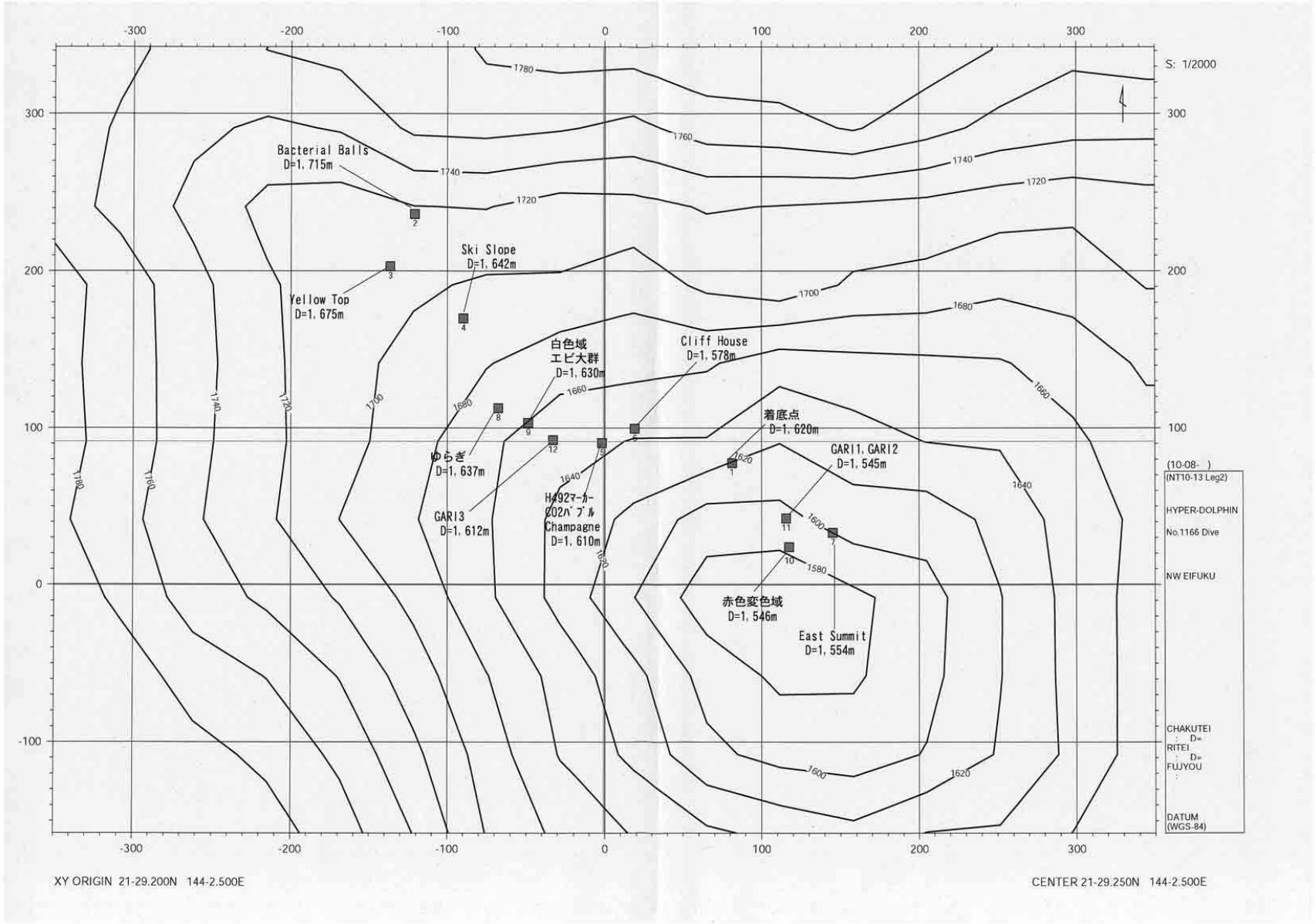
１１．備　考

・特異点は「別紙」参照
・＃４アルゴス送信機：ＩＤ＝２Ｃ６９Ｂ３５
・ＪＸトランスポンダ：２Ａ－１
・ＬＣＴ（ＪＳＴ＋１ｈ）/(UTC+10h)

別紙

特　異　点

	緯　度	経　度	水深	備　考
①	21-29.242N	144-02.547E	1620m	着底点
②	21-29.328N	144-02.430E	1715m	Bacterial Balls
③	21-29.310N	144-02.421E	1675m	Yellow Top
④	21-29.292N	144-02.448E	1642m	Ski Slope
⑤	21-29.249N	144-02.499E	1610m	H492ﾏｰｶｰ、CO2ﾊﾞﾌﾞﾙ、Champane
⑥	21-29.254N	144-02.511E	1578m	Cliff House
⑦	21-29.218N	144-02.584E	1554m	East Summit
⑧	21-29.261N	144-02.461E	1637m	ゆらぎ
⑨	21-29.256N	144-02.472E	1630m	白色域、エビ大群
⑩	21-29.213N	144-02.568E	1546m	赤色変色域
⑪	21-29.223N	144-02.567E	1545m	GARI1, GARI2
⑫	21-29.250N	144-02.481E	1612m	GARI3
⑬				
⑭				
⑮				
⑯				
⑰				
⑱				
⑲				
⑳				


S: 1/2000
Bacterial Balls
D=1,715m
Ski Slope
D=1,642m
Yellow Top
D=1,675m
白色域
エビ大群
D=1,630m
Cliff House
D=1,578m
着底点
D=1,620m
GAR11, GAR12
D=1,545m
ゆらぎ
D=1,637m
GAR13
D=1,612m
H492マーカー
CO2バブル
Champagne
D=1,610m
赤色変色域
D=1,546m
East Summit
D=1,554m
(10-08-)
(NT10-13 Leg2)
HYPER-DOLPHIN
No.1166 Dive
NW EIFUKU
CHAKUTEI
: D=
RITEI
: D=
FUJYOU
:
DATUM
(WGS-84)
XY ORIGIN 21-29.200N 144-2.500E
CENTER 21-29.250N 144-2.500E

ハイパードルフィン　潜航記録

平成 22 年　NT10-13　行動　　記載者　松本 恵太

潜航年月日　2010/08/02
潜航回数　9回
通算潜航回数　1166回

位置　作図中心位置
緯度　21° 29.200 ' N
経度　144° 02.500 ' E
WGS-84

潜航海域　マリアナ前弧　栄福海山

潜航目的　調査潜航　「北部マリアナ弧 NW Eifuku海山にて解き明かす鉄-微生物相互作用:鉄を含む地殻内流体、岩石およびマグマガス成分の地球科学的相互作用によって支えられた微生物生態系」

調査主任　土田 真二
ピークル指揮　大野 芳生

Pilot　松本 恵太
Co. Pilot　竹ノ内 純

作業経過時刻	
吊揚	08:14
着水	08:18
潜航開始	08:30
着底	09:34
離底	11:51
浮上	12:35
揚収完了	12:48

累計時間		
潜航時間		4:05
通算潜航		5465:37
ケーブル	ケーブルNo.	4
	使用時間	4:34
	通算時間	519:22

気象・海象

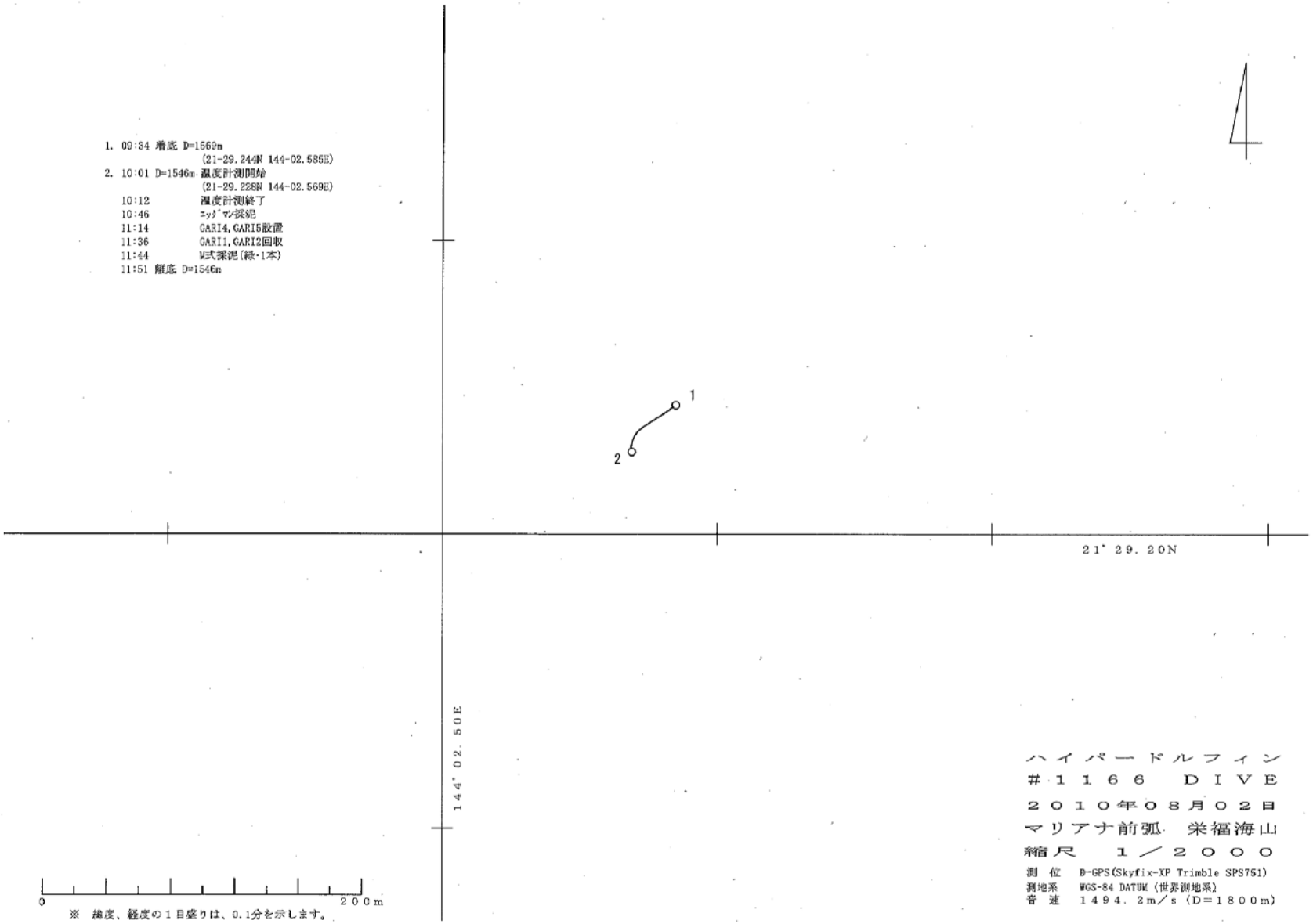
天候	風向	風力	風浪	うねり	視程
o	S	5	3	2	7

最大潜航深度　1569 m
着底深度　1569 m
着底底質　岩

離底深度　1546 m
離底底質　泥

記事　GARI回収(1. 2)及び設置(3. 4)
SUDO採泥及びM式採泥を行った。

1. 09:34 着底 D=1569m
   (21-29.244N 144-02.585E)
2. 10:01 D=1546m 温度計測開始
   (21-29.228N 144-02.569E)
   10:12 温度計測終了
   10:46 ﾆｯﾀﾞﾏﾝ採泥
   11:14 GARI4, GARI5設置
   11:36 GARI1, GARI2回収
   11:44 M式採泥(緑・1本)
   11:51 離底 D=1546m



※ 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
＃１１６６ ＤＩＶＥ
２０１０年０８月０２日
マリアナ前弧 栄福海山
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 １４９４．２m／s (D＝１８００m)

Dive Report HPD#1167

Date: August 02, 2010

Site: NW Eifuku, Mariana Arc **Depth:** 1500-2000 m

Landing (Lat., Long., Time, Depth): 21°29.250'N, 144°02.578'E, 15:27, 1559m

Leaving (Lat., Long., Time, Depth): 21°29.223'N, 144°02.567'E, 17:13, 1520m

Pilot: Homare Wakamatsu **Co-Pilot**: Tomoe Kondo

Theme: Research for microbial interaction with iron provided from subseafloor hydrothermal aquifer in the NW Eifuku Seamount of the northern Mariana Arc: Microbial ecosystem sustained by weathering of iron-containing fluids and rocks and biogeochemical interaction with abundant magmatic volatiles.

Purpose:

1. To collect Iron mat
2. To collect environmental factors (temperature, salinity, DO, pH and H_2S)

Payload Equipment:

Suction sampler with collection canisters, Niskin sampler, SUDO-type sediment sampler, M-type sediment sampler, E.B.-type sediment sampler, D-Pote2, Turbidity meter, DO meter, pH meter

Sampling Points and Markers:

Events	*Time*	*Depth (m)*	*Sample*	*Lat./ Long.*
Manipulator	09:46	1677	Rock	21°29.248'N, 144°02.568'E
E.B.-type sediment sampler	09:48	1657	Iron mat	21°29.223'N, 144°02.567'E
M-type sediment sampler	12:59	1545	Iron mat	21°29.223'N, 144°02.567'E
SUDO-type sediment sampler	13:57	1545	Iron mat	21°29.223'N, 144°02.567'E
M-type sediment sampler	13:57	1545	Iron mat	21°29.223'N, 144°02.567'E
Niskin	14:26	1605	Sea water	21°29.223'N, 144°02.567'E
Niskin	14:30	1604	Sea water	21°29.223'N, 144°02.567'E

DIVE SUMMARY

Hyper-Dolphine #1167 started to descend at 14:20 am. *Hyper-Dolphine* (HPD) landed at 1,559 m water depth near the GARI-IV and -V setting point. At the landing point, we observed many rocks. We found partly oxidized rocks on the way to iron mat site. We collected rock sample with manipulator. At the iron mat site, we collected thick iron mat with Ekman-Birge type sediment sampler, SUDO-type sediment sampler and M-type sediment sampler. We successfully collected a many iron mat samples. Then, we collected fluids surrounding the iron mat with Niskin sampler. After taking samples, HPD left the bottom, at 17:10 pm. Then, water depth was 1,545 m.

Dive Log

Time	***X***	***Y***	***Depth***	***Descriptions***
15:28	84	179	1559	confirmed sea floor
15:29				get seafloor
15:30				sampled rock
15:33				moving
15:40	52	119	1545	get seafloor
15:43				sampled iron-mat (eguman) not closed
15:50				ageined sampled iron-mat (eguman) not closed
15:53				ageined sampled iron-mat (eguman) not closed
16:06				ageined sampled iron-mat (eguman) not closed
16:10				scooped sample iron-mat by eguman
16:12				scooped sample iron-mat by eguman, agein
16:18				almost a cover closed
16:22				backed tosample box
16:25				sampled iron-mat by M-siki red three times
16:44				started sampled by Sudo-siki
17:02				succeed sampled
17:06				started sampled black layer under iron-mat by M-siki green
17:08				finished sampled black layer
17:11				go up
17:13	40	110	1513	sampled water(NISKIN)
17:14				start to up to surface

ハイパードルフィン　潜航記録

平成　22　年　　NT10-13　行動　　記載者　　若松　誉

潜航年月日　2010/08/02
潜航回数　10回
通算潜航回数　1167回

位置　作図中心位置
緯度　21° 29.200 ' N
経度　144° 02.500 ' E
WGS-84

潜航海域　マリアナ前弧　　栄福海山

潜航目的　調査潜航　「北部マリアナ弧 NW Eifuku海山にて解き明かす鉄-微生物相互作用：鉄を含む地殻内流体、岩石およびマグマガス成分の地球科学的相互作用によって支えられた微生物生態系」

調査主任　土田 真二
ビークル指揮　大野 芳生

Pilot　若松 誉
Co. Pilot　近藤 友栄

作業経過時刻	
吊　揚	14:05
着　水	14:08
潜航開始	14:20
着　底	15:27
離　底	17:10
浮　上	17:56
揚収完了	18:10

累計時間		
潜航時間		3:36
通算潜航		5469:13
ケーブル	ケーブルNo.	4
	使用時間	4:05
	通算時間	523:27

気象・海象

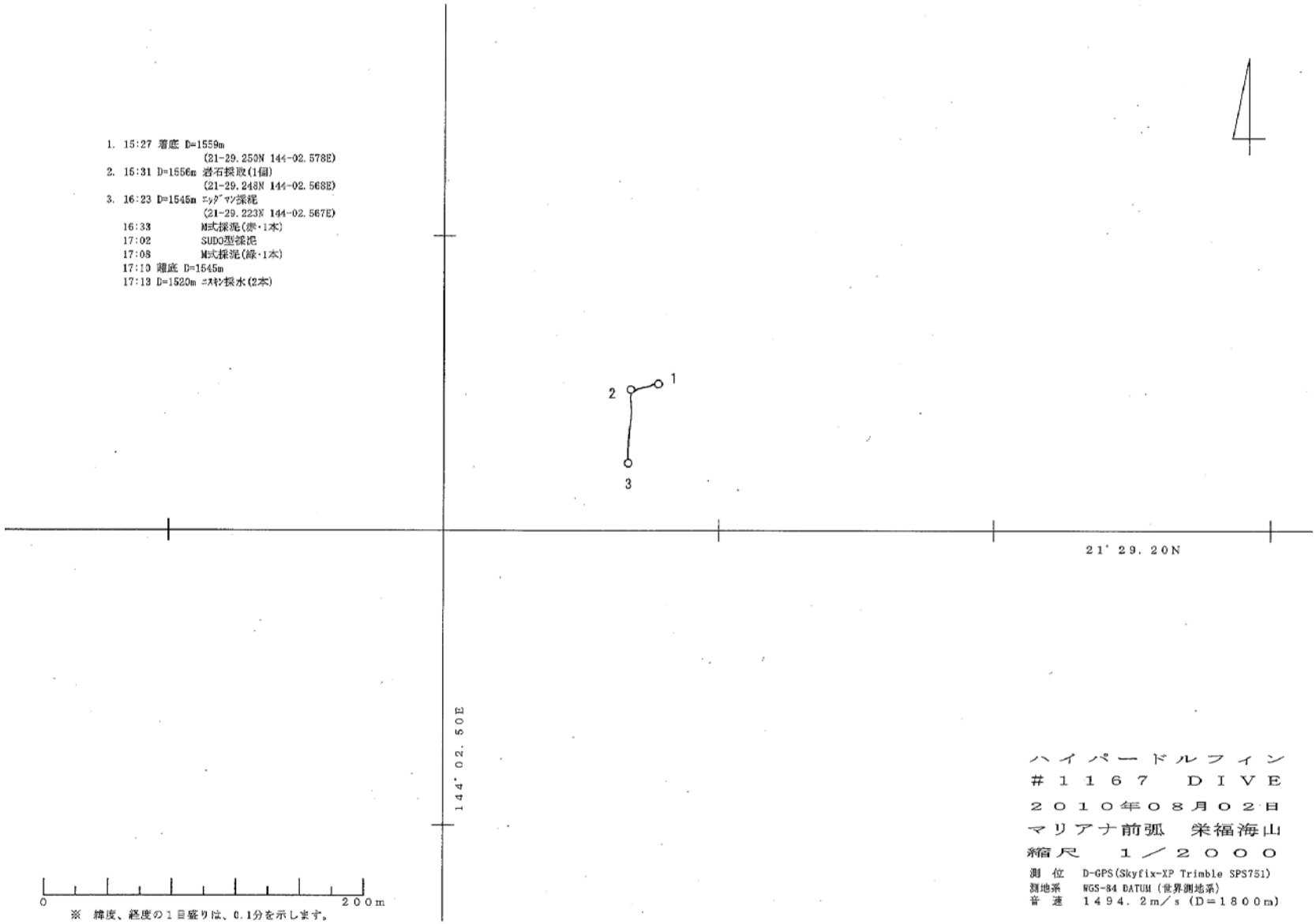
大候	風向	風力	風浪	うねり	視程
p	SSW	5	3	1	4

最大潜航深度　1559 m
着底深度　1559 m
着底底質　岩

離底深度　1545 m
離底底質　岩

記事　GARI設置付近に着底後、エックマン・M式及びSUDO式による採泥を行った。

1. 15:27 着底 D=1559m
   (21-29.250N 144-02.578E)
2. 15:31 D=1556m 岩石採取(1個)
   (21-29.248N 144-02.568E)
3. 16:23 D=1545m ﾆｯﾀﾞﾏﾝ採泥
   (21-29.223N 144-02.567E)
   16:33 M式採泥(赤・1本)
   17:02 SUDO型採泥
   17:08 M式採泥(緑・1本)
   17:10 離底 D=1545m
   17:13 D=1520m ﾆｽﾝ採水(2本)



※ 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
＃１１６７ ＤＩＶＥ
２０１０年０８月０２日
マリアナ前弧 栄福海山
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 １４９４．２m／s (D＝１８００m)

Dive Report HPD#1168

Date: August 3, 2010
Site: Nikko seamount, Northern Mariana fore-arc **Depth:** 340-472m
Landing (Lat., Long., Time, Depth): 23°04.812'N, 142°19.555'E, 09:42, 470m
Leaving (Lat., Long., Time, Depth): 23°04.767'N, 142°19.579'E, 11:04, 445m
Pilot: Tomoe Kondo **Co-Pilot**: Kazuki Iijima

Theme: Collection of the plankton and vent-specific organisms in the plume layer and hydrothermal vent on Nikko seamount.

Purpose:

1. Plankton sampling in the plume layer of the hydrothermal smoke on Nikko seamount.
2. Collection and observation of the tubeworm, *Lamellibrachia satsuma* living in the Nikko seamount.
3. Picking and observation of the hydrothermal vent-specific organisms in the Nikko seamount.
4. Water collection of the plume and vent fluid on the Nikko seamount.
5. Measurement of the environmental factors (DO, pH and H_2S) in the plume layer and hydrothermal vent on the Nikko seamount.

Payload Equipment:

Double slurp gun of the suction sampler equipped with two nozzles and a rotary canister without bottle, Plankton-net with the three gate sampler connected to the slurp gun, Niskin water sampler, DO meter (Hyper-Dolphin equipment), pH sensor, and D-Pote (hydrogen sulfide meter). Sea-Max camera was removed from the vehicle.

HPD#1168 Payload

Events and Sampling Points:

Events	***Time***	***Depth (m)***	***Sample / Measurement***	***Lat. / Long.***
Plankton sampling at 340 m depth (gate sampler of No. 3.)	08:46-08:57	340	Plankton	23°04.852’N/142°19.566’E
Starting the plankton sampling at 380 m depth in the plume layer	09:03-09:07	380	Plankton	23°04.858’N/142°19.573’E
Starting the plankton sampling at 400 m depth in the plume layer	09:09-09:11	400	Plankton	23°04.813’N/142°19.576’E
Starting the plankton sampling at 420 m depth in the plume layer	09:15-09:20	420	Plankton	23°04.866’N/142°19.567’E
Starting the plankton sampling below 450 m depth in the plume layer	09:28-09:42	450	Plankton	23°04.812’N/142°19.568’E
Suction sampling with the slurp gun and canisters.	09:56		Vent-specific crabs	
Suction sampling with the slurp gun and canisters.	09:59		Vent-specific crabs	
Suction sampling with the slurp gun and canisters.	10:11	472	Vent-specific crabs	23°04.828’N/142°19.564’E
Suction sampling with the slurp gun and canisters.	10:25	468	Vent-specific crabs	23°04.812’N/142°19.555’E
Suction sampling with the slurp gun and canisters.	10:32		Vent-specific crabs	
Tubeworm collection.	10:45	468	Tubeworm	23°04.812’N/142°19.555’E

Dive Summary

The dive #1168 of Hyper-Dolphin was carried out in the unfavorable oceanic condition changing to the worse in the morning. After the vehicle arrived at the hydrothermal plume layer of white smoke at 350 m depth, the vehicle moved up to 340m depth above the plume layer. We performed the plankton sampling at 340 m depth above the plume layer with the horizontal movement at intervals of 100 m by the plankton-net and gate sampler of No. 3 from south to north, back and forth. Next, we collected the plankton in the plume layer from 380 m to 420 m depth by the net and gate sampler of No. 2, by the same way. We also performed the plankton sampling below 450 m depth in the plume by the net and gate sampler of No. 1. The vehicle landed on the bottom of the north position of the point No. 4 at 470 m depth in the central area of the caldera on Nikko seamount. We observed the placed beef bones of FL-103 and FL-104 at the point No. 4 in the distance, and found many crabs and hermit crabs living in the tubeworm's tube, in there. We collected the vent-specific crabs with the slurp gun and rotary canisters without bottles. The vehicle moved around the area and performed the several collections of the crabs again. We also observed the starfish and many vent-specific animals in there. Moved to the direction of the point No. 6, we found many vent-crabs and tubeworms in the bottom near the east position of the point No. 6, and collected them at several times. The tubeworms were loaded on the sample box and basket with the vehicle's manipulators. After sampling of many crabs and tubeworms, the vehicle moved to the direction of the point No. 14 in the south area of the caldera on Nikko seamount. We observed no or little in this area, because the white smokes of the hydrothermal vents were too foggy everywhere. The vehicle moved slowly and landed on the sulfur rock bottom near the north position of the point No. 21 at 445 m depth. We couldn't find the H969 marker set on the NT09-05 Leg.2 dive in the point No. 21. We judged stopping the observation and collection of the animals in this smoke area. The vehicle holding in the tubeworms on the sample box and basket by the arms, left from the bottom. However, when the hoist of the vehicle on deck, the many collected tubeworms were lost in the sea unfortunately, due to the fast worsening weather occurred to the windy and bad sea swell in the ocean.

Dive Log

Drawing center: *23°04.800'N / 142°19.500' E (**X**=0, **Y**=0) ,* ***Angle:*** *0°,* ***Scale:*** *1/2000.*

Time	***X***	***Y***	***Depth***	***Descriptions***
8:09				Landing on water
8:21				Starting to descend to the bottom.
8:42	100	100	350	Observing the plume layer of white smoke. Moving up to 340m depth above the plume layer.

			340	Opening the gate sampler of No. 3.
8:47	100	110	340	Plankton sampling at 340 m depth using the plankton-net connected to slurp gun and gate sampler with the horizontal movement at intervals of 100 m toward south.
8:53	0	120	340	U-turning and plankton sampling at 340 m depth with the horizontal movement at intervals of 100 m toward north.
8:57	120	130	340	Ending of the plankton sampling at 340 m depth.
	120	130	340	Closing the gate sampler of No. 3.
	120	130	340	Opening the gate sampler of No. 2.
9:00			340	Moving down to 380 m depth in the plume layer.
9:02	110	120	380	Plankton sampling at 380 m depth using the plankton-net connected to slurp gun and gate sampler with the horizontal movement at intervals of 100 m toward south.
9:07	0	120	380	Ending of the plankton sampling at 380 m depth. Moving down to 400 m depth in the plume layer.
9:09	20	130	400	Plankton sampling at 400m depth using the plankton-net connected to slurp gun and gate sampler with the horizontal movement at intervals of 100 m toward north.
9:12			400	Ending of the Plankton sampling at 400 m depth. Moving down to 420 m depth in the plume layer.
9:14	120	120	420	Plankton sampling at 420m depth using the plankton-net connected to slurp gun and gate sampler with the horizontal movement at intervals of 100 m toward south.
9:20	0	130	420	Ending of the Plankton sampling at 420 m depth. Moving down to 450 m depth in the plume layer.
	0	130	420	Closing the gate sampler of No. 2
	0	130	420	Opening the gate sampler of No. 1
9:28	15	120	450	Plankton sampling at 450m depth using the plankton-net connected to slurp gun and gate sampler with the horizontal movement at intervals of 100 m toward north.
9:33	120	90	450	U-turning and plankton sampling at 450 m depth with the horizontal movement at intervals of 100 m toward south.
9:38	0	110	450	U-turning and plankton sampling at 450m depth using the plankton-net connected to slurp gun and gate sampler with

				the horizontal movement in the direction of the point No. 4 toward north.
				Ending of the plankton sampling at 450 m depth.
9:42	50	110	470	Landing on the bottom near the point No. 4.
9:42	50	110	470	Stopping the slurp gun connected to the plankton-net. Closing the gate sampler of No. 1. Moving up.
9:48				Observing the beef bones of FL-103, 104 at the point No. 4.
9:55				Observing many crabs and hermit crabs in the tubeworm's tube.
9:56				Collection of the many crabs and hermit crabs by slurp gun and a rotary canister without bottle.
9:58	50	110	470	Moving around the area.
9:59				Observing the starfish.
				Collection of the crabs by slurp gun and a rotary canister without bottle.
10:02				Moving up.
10:03	60	110	470	Collection of the crabs by slurp gun and a rotary canister without bottle.
10:12				Moving to the direction of the point No. 6
10:17	20	100	470	Landing on the bottom near the east position of the point No. 6.
10:18				Observing the crabs.
10:21				Collection of the crabs by slurp gun and a rotary canister without bottle.
10:25				End sampling.
10:28				Collection of the crabs by slurp gun and a rotary canister without bottle.
10:30				End sampling
10:32				Collection of the tubeworms on the gate sampler with the manipulator.
10:43				End sampling

10:45				Moving to the direction of the point No. 14
10:53	-20	100	445	Landing on the bottom
10:54				Moving to direction of the point No. 14
11:02			445	Landing on the bottom near the north position of the point No. 21.
11:03				no visibility due to the hydrothermal white smoke everywhere.
11:04				Leaving from the bottom
12:06				Landing on deck

平成２２年
ハイパードルフィン　調査潜航
＃１１６８ＤＩＶＥ
マリアナ前弧　日光海山

2010年8月3日

１．測 地 系	ＷＧＳ－８４（世界測地系）
２．測　位	Ｄ－ＧＰＳ（Skyfix-XP Trimble SPS751）
３．ＸＢＴ	計測済み　　Ｓ／Ｖ＝ １５１７．５ ｍ／ｓ　（Ｄ＝ ５００ ｍ）
４．ＸＰＯＮＤＥＲ	設置せず
５．作図中心	２３－０４．８００Ｎ　ＡＮＧＬＥ　　０°
	１４２－１９．５００Ｅ　ＳＣＡＬＥ　１／２０００
６．着底点（特異点④）	２３－０４．８３１Ｎ　Ｄ＝ ４７１ ｍ
	１４２－１９．５６６Ｅ　Ｃｏ＝
７．潜航配置	指　揮　　：運航長
	ｺﾝﾃﾅPILOT　：近藤　　飯嶋　　甲板PILOT：齋藤（竹ノ内）
８．潜航目的	「環形動物サツマハオリムシの細胞外巨大ヘモグロビンの構造機能相関の研究」
９．作業内容	ﾌﾟﾗﾝｸﾄﾝ採集、生物採集、採水
	（ｽﾗｰﾌﾟｶﾞﾝ、6連ｷｬﾆｽﾀ、ﾆｽｷﾝ採水器、pHｾﾝｻｰ、D-Port2、ﾌﾟﾗﾝｸﾄﾝﾈｯﾄ、3連ｹﾞｰﾄｻﾝﾌﾟﾗｰ）

１０．日　程

	日光海山着
０７：４５	作動確認
０８：３０	潜航開始　No.11
〜	
１１：３０	ビークル浮上
１２：００	揚収完了

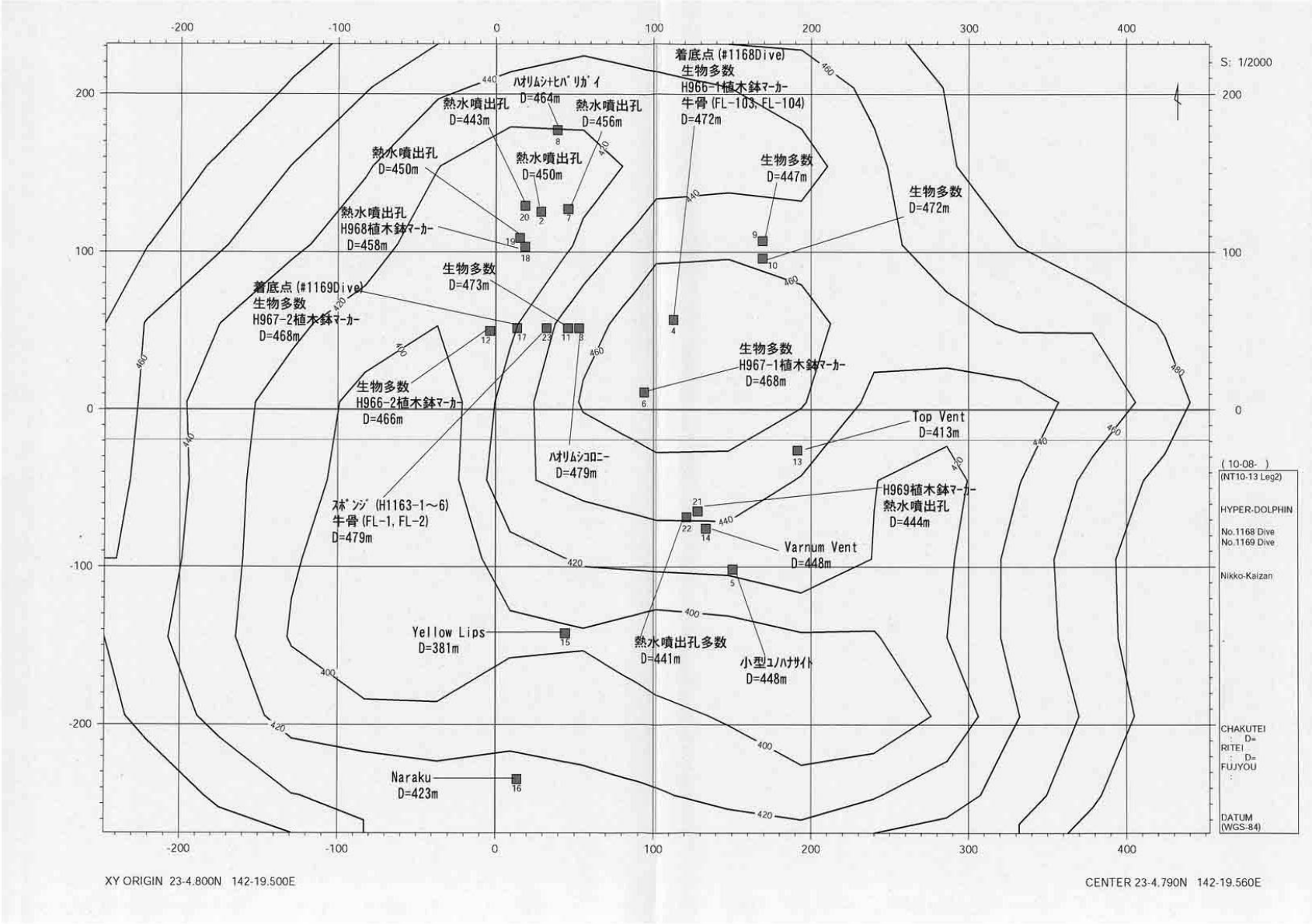
１１．備　考

・特異点は「別紙」参照
・＃４アルゴス送信機：ＩＤ＝２Ｃ６９Ｂ３５
・ＪＸトランスポンダ：２Ａ－１
・ＬＣＴ（ＪＳＴ＋１ｈ）／(UTC+10h)

別紙

特　異　点

	緯　度	経　度	水深	備　考
①				
②	23-04.868N	142-19.517E	450m	熱水噴出孔
③	23-04.828N	142-19.531E	479m	ハオリムシコロニー
④	23-04.831N	142-19.566E	471m	着底点(#1168Dive) H966-1植木鉢ﾏｰｶｰ 牛骨FL-103,牛骨FL-104,生物多数
⑤	23-04.745N	142-19.588E	448m	小型ユノハナサイト
⑥	23-04.806N	142-19.555E	468m	生物多数 H967-1植木鉢ﾏｰｶｰ
⑦	23-04.869N	142-19.527E	456m	熱水噴出孔
⑧	23-04.896N	142-19.523E	464m	ハオリムシ＋ヒバリガイ
⑨	23-04.858N	142-19.599E	447m	生物多数
⑩	23-04.852N	142-19.599E	472m	生物多数
⑪	23-04.828N	142-19.527E	473m	生物多数
⑫	23-04.827N	142-19.498E	466m	生物多数 H966-2植木鉢ﾏｰｶｰ
⑬	23-04.786N	142-19.612E	413m	Top　Vent
⑭	23-04.759N	142-19.578E	448m	Varnum　Vent
⑮	23-04.723N	142-19.526E	381m	Yellow　Lips
⑯	23-04.673N	142-19.508E	423m	Naraku
⑰	23-04.828N	142-19.508E	468m	着底点(#1169Dive),生物多数 H967-2植木鉢ﾏｰｶｰ
⑱	23-04.856N	142-19.511E	458m	熱水噴出孔 H968植木鉢ﾏｰｶｰ
⑲	23-04.859N	142-19.509E	450m	熱水噴出孔
⑳	23-04.870N	142-19.511E	443m	熱水噴出孔
21	23-04.765N	142-19.575E	444m	H969植木鉢ﾏｰｶｰ,熱水噴出孔
22	23-04.763N	142-19.571E	441m	熱水噴出孔多数
23	23-04.828N	142-19.519E	471m	ｽﾎﾟﾝｼﾞ(H1163-1～6),牛骨(FL-1,FL-2) 設置


着底点 (#1168Dive)
生物多数
H966-1植木鉢マーカー
牛骨 (FL-103, FL-104)
D=472m
ハオリムシ+ヒバリガイ
D=464m
熱水噴出孔
D=443m
熱水噴出孔
D=456m
熱水噴出孔
D=450m
熱水噴出孔
D=450m
生物多数
D=447m
生物多数
D=472m
熱水噴出孔
H968植木鉢マーカー
D=458m
生物多数
D=473m
着底点 (#1169Dive)
生物多数
H967-2植木鉢マーカー
D=468m
生物多数
H967-1植木鉢マーカー
D=468m
生物多数
H966-2植木鉢マーカー
D=466m
Top Vent
D=413m
ハオリムシコロニー
D=479m
H969植木鉢マーカー
熱水噴出孔
D=444m
スポンジ (H1163-1～6)
牛骨 (FL-1, FL-2)
D=479m
Varnum Vent
D=448m
Yellow Lips
D=381m
熱水噴出孔多数
D=441m
小型ユノハナサイト
D=448m
Naraku
D=423m
S: 1/2000
(10-08-)
(NT10-13 Leg2)
HYPER-DOLPHIN
No.1168 Dive
No.1169 Dive
Nikko-Kaizan
CHAKUTEI D=
RITEI D=
FUJYOU
DATUM
(WGS-84)
XY ORIGIN 23-4.800N 142-19.500E
CENTER 23-4.790N 142-19.560E

ハイパードルフィン　潜航記録

平成 22 年　NT10-13　行動　　記載者　近藤 友栄

潜航年月日　2010/08/03
潜航回数　11回
通算潜航回数　1168回

位置　作図中心位置
緯度　23° 4.800 ' N
経度　142° 19.500 ' E
WGS-84

潜航海域　マリアナ前弧　日光海山

潜航目的　調査潜航　「環形動物サツマハオリムシの細胞外巨大ヘモグロビンの構造機能相関の研究」

調査主任　土田 真二
ビークル指揮　大野 芳生

Pilot　近藤 友栄
Co. Pilot　飯嶋 一樹

作業経過時刻	
吊揚	08:05
着水	08:09
潜航開始	08:21
着底	09:42
離底	11:04
浮上	11:42
揚収完了	12:06

累計時間		
潜航時間		3:21
通算潜航		5472:34
ケーブル	ケーブルNo.	4
	使用時間	4:01
	通算時間	527:28

気象・海象

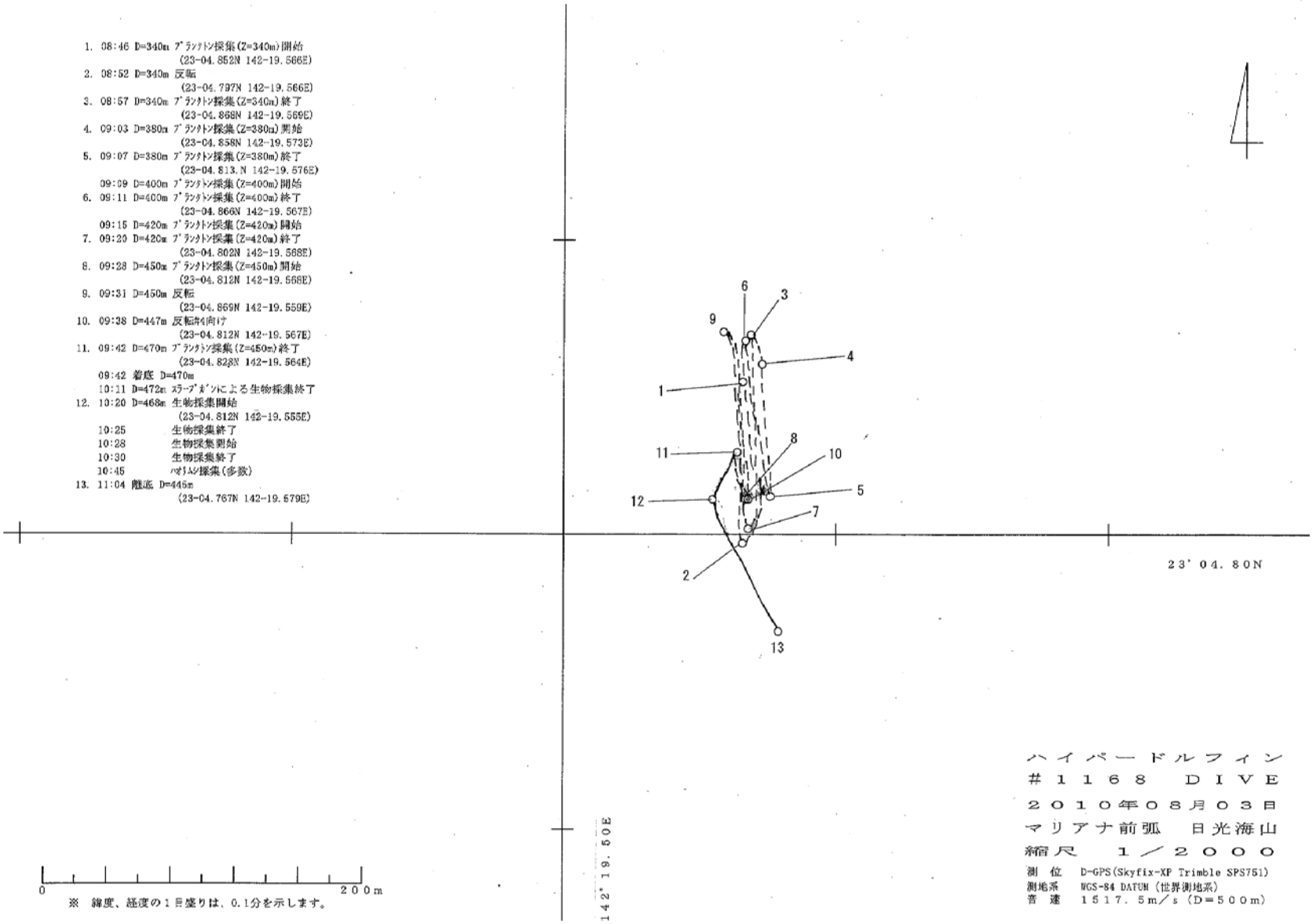
天候	風向	風力	風浪	うねり	視程
r	SSE	5	3	2	7

最大潜航深度　472 m
着底深度　470 m
着底底質　礫

離底深度　445 m
離底底質　岩

記事　プランクトンネットを使用したゲートサンプラーによる中層生物の採集および海底観察・ユノハナガニ・ハオリムシ等の採集を行った。

1. 08:46 D=340m ﾌﾟﾗﾝｸﾄﾝ採集(Z=340m)開始
(23-04.852N 142-19.566E)
2. 08:52 D=340m 反転
(23-04.797N 142-19.566E)
3. 08:57 D=340m ﾌﾟﾗﾝｸﾄﾝ採集(Z=340m)終了
(23-04.868N 142-19.569E)
4. 09:03 D=380m ﾌﾟﾗﾝｸﾄﾝ採集(Z=380m)開始
(23-04.858N 142-19.573E)
5. 09:07 D=380m ﾌﾟﾗﾝｸﾄﾝ採集(Z=380m)終了
(23-04.813.N 142-19.576E)
09:09 D=400m ﾌﾟﾗﾝｸﾄﾝ採集(Z=400m)開始
6. 09:11 D=400m ﾌﾟﾗﾝｸﾄﾝ採集(Z=400m)終了
(23-04.866N 142-19.567E)
09:15 D=420m ﾌﾟﾗﾝｸﾄﾝ採集(Z=420m)開始
7. 09:20 D=420m ﾌﾟﾗﾝｸﾄﾝ採集(Z=420m)終了
(23-04.862N 142-19.568E)
8. 09:28 D=450m ﾌﾟﾗﾝｸﾄﾝ採集(Z=450m)開始
(23-04.812N 142-19.568E)
9. 09:31 D=450m 反転
(23-04.869N 142-19.559E)
10. 09:38 D=447m 反転斜め向け
(23-04.812N 142-19.567E)
11. 09:42 D=470m ﾌﾟﾗﾝｸﾄﾝ採集(Z=450m)終了
(23-04.828N 142-19.564E)
09:42 着底 D=470m
10:11 D=472m ｽﾗｰﾌﾟｶﾞﾝによる生物採集終了
12. 10:20 D=468m 生物採集開始
(23-04.812N 142-19.555E)
10:25 生物採集終了
10:28 生物採集開始
10:30 生物採集終了
10:45 ﾊﾞｹﾘｽﾞﾝ採集(多数)
13. 11:04 離底 D=445m
(23-04.767N 142-19.579E)



※ 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
＃１１６８　ＤＩＶＥ
２０１０年０８月０３日
マリアナ前弧　日光海山
縮尺　１／２０００
測　位　D-GPS(Skyfix-XP Trimble SPS751)
測地系　WGS-84 DATUN（世界測地系）
音　速　１５１７．５m／s（D＝５００m）

Dive Report HPD#1169

Date: August 4, 2010
Site: Nikko seamount, Northern Mariana fore-arc **Depth:** 360-470m
Landing (Lat., Long., Time, Depth): 23°04.830'N, 142°19.512'E, 10:48, 469m
Leaving (Lat., Long., Time, Depth): 23°04.835'N, 142°19.512'E, 11:48, 470m
Pilot: Kazuki Iijima **Co-Pilot**: Atsushi Takenouchi

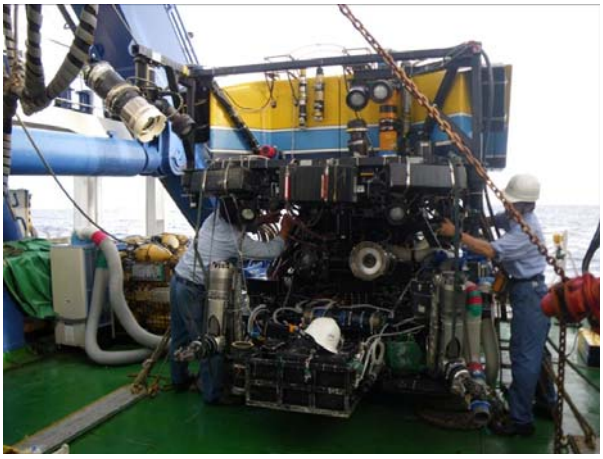
Theme: Collection of the vent-specific organisms and environment research in the hydrothermal vent of Nikko seamount.

Purpose:

1. Collection and observation of the tubeworm, *Lamellibrachia satsuma* living in the Nikko seamount.
2. Picking and observation of the hydrothermal vent-specific animals in the Nikko seamount.
3. Water collection of the plume and vent fluid on the Nikko seamount.
4. Rock and soil collections around the tubeworm colony on the Nikko seamount.
5. Measuring the environmental factors (DO, pH and H_2S) at the tubeworm colony on the Nikko seamount.
6. Picking up the sponge agar mediums set on the point No. 23 at the # 1163 dive, near the hydrothermal vents around the tubeworm bush in the Nikko seamount.

Payload Equipment:

Double slurp gun of the suction sampler equipped with two nozzles, a square canister and a rotary canister without bottles, Niskin water sampler, Bag-type water sampler, RI pressure-keeping water sampler, Sample box, DO meter (high precision), DO meter (Hyper-Dolphin equipment), pH sensor, and D-Pote (hydrogen sulfide meter).



HPD#1161 Payload

Sampling Points and Markers:

Events	***Time***	***Depth (m)***	***Sample / Measurement***	***Lat. / Long.***
Niskin water sampling (green)	10:37	365	Plume water	23°04.827’N/142°19.510’E
RI pressure-keeping water sampling	10:39	365	Plume water	23°04.827’N/142°19.510’E
Picking up the placed sponge agar mediums (H1163-1, H1163-2, H1163-3, H1163-4, H1163-5, H1163-6)	11:03	471	Placed sponge agar mediums (H1163-1, H1163-2, H1163-3, H1163-4, H1163-5, H1163-6)	23°04.832’N/142°19.518’E (Point No. 23)
Measurement of the H_2S concentration inside the tubeworm colony with D-Pote	11:18	470	H_2S concentration	23°04.835’N/142°19.512’E
Bag-type water sampling inside the tubeworm colony	11:23	472	Water	23°04.835’N/142°19.512’E
Suction sampling with the slurp gun and canisters	11:30	472	Vent-specific animals	23°04.835’N/142°19.512’E
Tubeworm collection	11:45	472	Tubeworms	23°04.835’N/142°19.512’E
Niskin water sampling (red) around the tubeworm colony	11:46	472	Water	23°04.835’N/142°19.512’E

Dive Summary

The short dive #1169 of Hyper-Dolphin was carried out fortunately in the recovered good oceanic condition all morning. The vehicle went in the hydrothermal plume layer of white smoke at 360 m depth. We collected the plume water by Niskin water sampler and RI pressure-keeping water sampler at 365 m depth. The vehicle landed on the bottom of the east position of the point No. 17 at 469 m depth in the central area of the caldera on Nikko seamount. We could find easily the placed sponge agar mediums and beef bones at the point No. 23 in the distance. Then, the vehicle moved to and landed on the bottom of the point No. 23 at 471 m depth. We could pick up the placed sponge agar mediums (H1163-1, H1163-2, H1163-3, H1163-4, H1163-5, H1163-6) in the sample box and basket of the vehicle. The

vehicle moved to the 472 m bottom of the northwest position of the point No. 23, existed in the tubeworm colonies. We observed the tubeworm bush, shrimps, crabs, tongue fishes on the sulfur rock in this area. We performed the measurement of the H_2S concentration with D-Pote and water sampling with bag-type water sampler inside the tubeworm colony. Then, we performed the suction sampling of the vent-specific animals, rock, and soil around the tubeworm colony by using the slurp gun, square canister and rotary canister. The tubeworms were very much plucked and collected on the sample box and basket by the manipulators. After animal sampling, the water around the tubeworm colony was collected by Niskin water sampler. The vehicle holding in the tubeworms by the arms, left from the bottom.

DIVE LOG

Drawing center: *23°04.800'N / 142°19.500' E (**X**=0, **Y**=0) ,* ***Angle:*** *0°,* ***Scale:*** *1/2000.*

Time	***X***	***Y***	***Depth***	***Descriptions***
10:07				Landing on the water.
10:19				Starting to descend to the bottom
10:37	49	19	360	Observing the plume layer of white smoke.
10:37	50	20	365	Plume water sampling with Niskin sampler.
10:39	50	20	365	Plume water sampling with RI pressure-keeping water sampler.
10:47	60	20	468	Observing the bottom and the placed sponge agar mediums and beef bones at the point No. 23 in the distance.
				Moving to the point No. 23, and landing on there.
10:56	60	30	470	Starting to pick up the sponge agar mediums (1163-1, 1163-2, 1163-3, 1163-4, 1163-5, 1163-6) placed on the point No. 23 at the # 1163 dive.
11:03	60	30	470	Ending to pick up the sponge agar mediums placed on the point No. 23 at the # 1163 dive.
			470	Moving to the northwest position of the point No. 23.
				Landing on the northwest position of the point No. 23.
	60	20	470	Observing the tubeworm colony, crabs shrimps and tongue fishes.
11:13	60	20	470	Starting to measure the H_2S concentration inside the tubeworm colony with D-Pote.
11:18	60	20	470	Ending to measure the H_2S concentration inside the tubeworm colony with D-Pote.
11:20	60	20	470	Starting the water sampling inside the tubeworm colony by

				bag-type water sampling.
11:23	60	20	470	Ending the water sampling inside the tubeworm colony by bag-type water sampling.
11:24	60	20	470	Starting the suction sampling of the vent-specific animals, rock, and soil around the tubeworm colony by the slurp gun, square canister and rotary canister.
11:30	60	20	470	Ending the suction sampling of the vent-specific animals, rock, and soil around the tubeworm colony by the slurp gun, square canister and rotary canister.
11:31	60	20	470	Starting the collection of many tubeworms by manipulators
11:44	60	20	470	Ending the collection of many tubeworms by manipulators
11:45	60	20	470	Water sampling around the tubeworm colony by Niskin water sampler.
11:48	50	91	472	Leaving from the bottom.
12:25				Landing on deck.

平成２２年
ハイパードルフィン　調査潜航
＃１１６９ＤＩＶＥ
マリアナ前弧　日光海山

2010年8月4日

１．測 地 系	ＷＧＳ－８４（世界測地系）
２．測　位	Ｄ－ＧＰＳ（Skyfix-XP Trimble SPS751）
３．ＸＢＴ	計測済み　　Ｓ／Ｖ＝ １５１７．５ ｍ／ｓ　（Ｄ＝ ５００ ｍ）
４．ＸＰＯＮＤＥＲ	設置せず
５．作図中心	２３－０４．８００Ｎ　ＡＮＧＬＥ　　０°
	１４２－１９．５００Ｅ　ＳＣＡＬＥ　１／２０００
６．着底点　(特異点⑰)	２３－０４．８２８Ｎ　Ｄ＝　４６８　ｍ
	１４２－１９．５０８Ｅ　Ｃｏ＝
７．潜航配置	指　揮　　：運航長
	ｺﾝﾃﾅPILOT　：飯嶋　　竹ノ内　甲板PILOT：松本
８．潜航目的	「環形動物サツマハオリムシの細胞外巨大ヘモグロビンの構造機能相関の研究」
９．作業内容	生物採集、採泥、温度計測、採水、ｽﾎﾟﾝｼﾞ回収
	（ｽﾗｰﾌﾟｶﾞﾝ、単式ｷｬﾆｽﾀｰ×2個、ﾆｽｷﾝ採水器、pHｾﾝｻｰ、M式採泥器、BOX、RMT温度計、Bag採水器、RI採水器、D-Port2）

１０．日　程

	日光海山着
０７：４５	作動確認
０８：３０	潜航開始　No.12
〜	
１１：３０	ピークル浮上
１２：００	揚収完了
	終了後、フリーフォール海域向け

１１．備　考

・特異点は「別紙」参照
・＃４アルゴス送信機：ＩＤ＝２Ｃ６９Ｂ３５
・ＪＸトランスポンダ：２Ａ－１
・ＬＣＴ（ＪＳＴ＋１ｈ）/(UTC+10h)

ハイパードルフィン　潜航記録

平成 22 年　NT10-13　行動　　記載者　飯嶋 一樹

潜航年月日　2010/08/04
潜航回数　12回
通算潜航回数　1169回

位置　作図中心位置
緯度　23° 4.800 ' N
経度　142° 19.500 ' E
WGS-84

潜航海域　マリアナ前弧　日光海山

潜航目的　調査潜航　「環形動物サツマハオリムシの細胞外巨大ヘモグロビンの構造機能相関の研究」

調査主任　土田 真二
ビークル指揮　大野 芳生

Pilot　飯嶋 一樹
Co. Pilot　竹ノ内 純

作業経過時刻	
吊　揚	10:04
着　水	10:07
潜航開始	10:19
着　底	10:48
離　底	11:48
浮　上	12:10
揚収完了	12:25

累計時間		
潜航時間		1:51
通算潜航		5474:25
ケーブル	ケーブルNo.	4
	使用時間	2:21
	通算時間	529:49

気象・海象

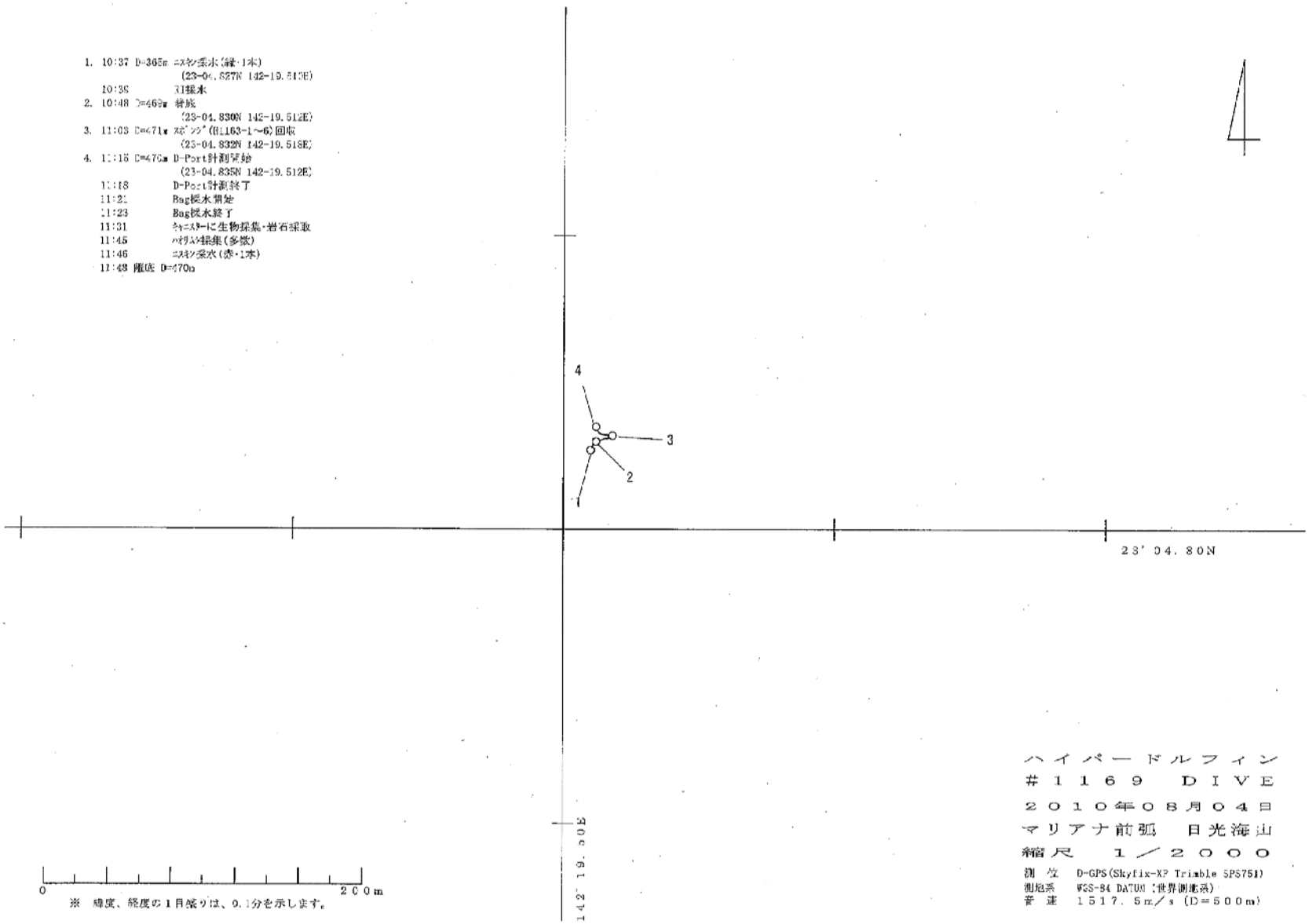
天候	風向	風力	風浪	うねり	視程
bc	ESE	4	2	2	8

最大潜航深度　471 m
着底深度　469 m
着底底質　岩

離底深度　470 m
離底底質　岩

記事　海底を観察しながら航走し、ｽﾎﾟﾝｼﾞ(6個)の回収および生物の採集・採水を行った。

1. 10:37 D=365m ニスキン採水(緑・1本)
   (23-04.827N 142-19.513E)
   10:38 XI採水
2. 10:48 D=469m 着底
   (23-04.830N 142-19.512E)
3. 11:03 D=471m スポンジ(H1163-1~6)回収
   (23-04.832N 142-19.518E)
4. 11:15 D=476m D-Port計測開始
   (23-04.835N 142-19.512E)
   11:18 D-Port計測終了
   11:21 Bag採水開始
   11:23 Bag採水終了
   11:31 キャニスターに生物採集・岩石採取
   11:45 パリス採集(多数)
   11:46 ニスキン採水(赤・1本)
   11:48 離底 D=470m



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
#1169 DIVE
2010年08月04日
マリアナ前弧 日光海山
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 1517.5m／s (D=500m)