

## Cruise Report

YK12-12

Off Sanriku and Japan Trench, north-eastern Japan

**Reconnaissance investigation for YK12-13 cruise of the Shinkai 6500, impact by the huge earthquake on marine ecosystem including environment, chemical, geology and geophysics in the Japan Trench**

**Ecosystem dynamics in deep-sea fishery area off Sanriku under the Tohoku Ecosystem-Associated Marine Sciences, since 2011 (TEAMS)**



R. V. Yokosuka

30 July, 2012- 8 August, 2012

BioGeos

東日本海洋生態系変動解析プロジェクトチーム



**JAMSTEC**



**TEAMS**

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## 1. Cruise Information

1-1. Cruise ID: YK12-12

1-2. Name of vessel: R. V. Yokosuka

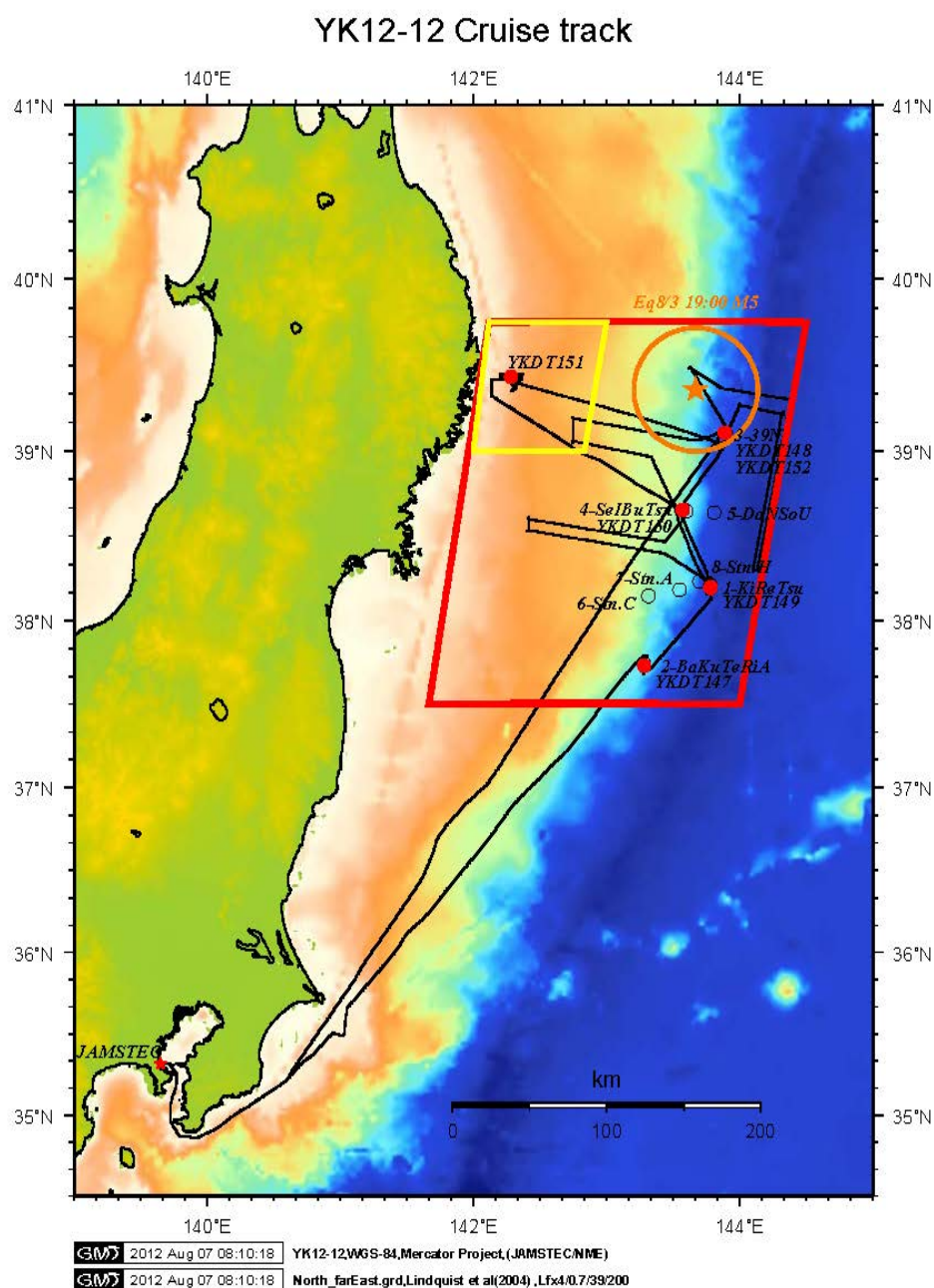
1-3. Title of the cruise:

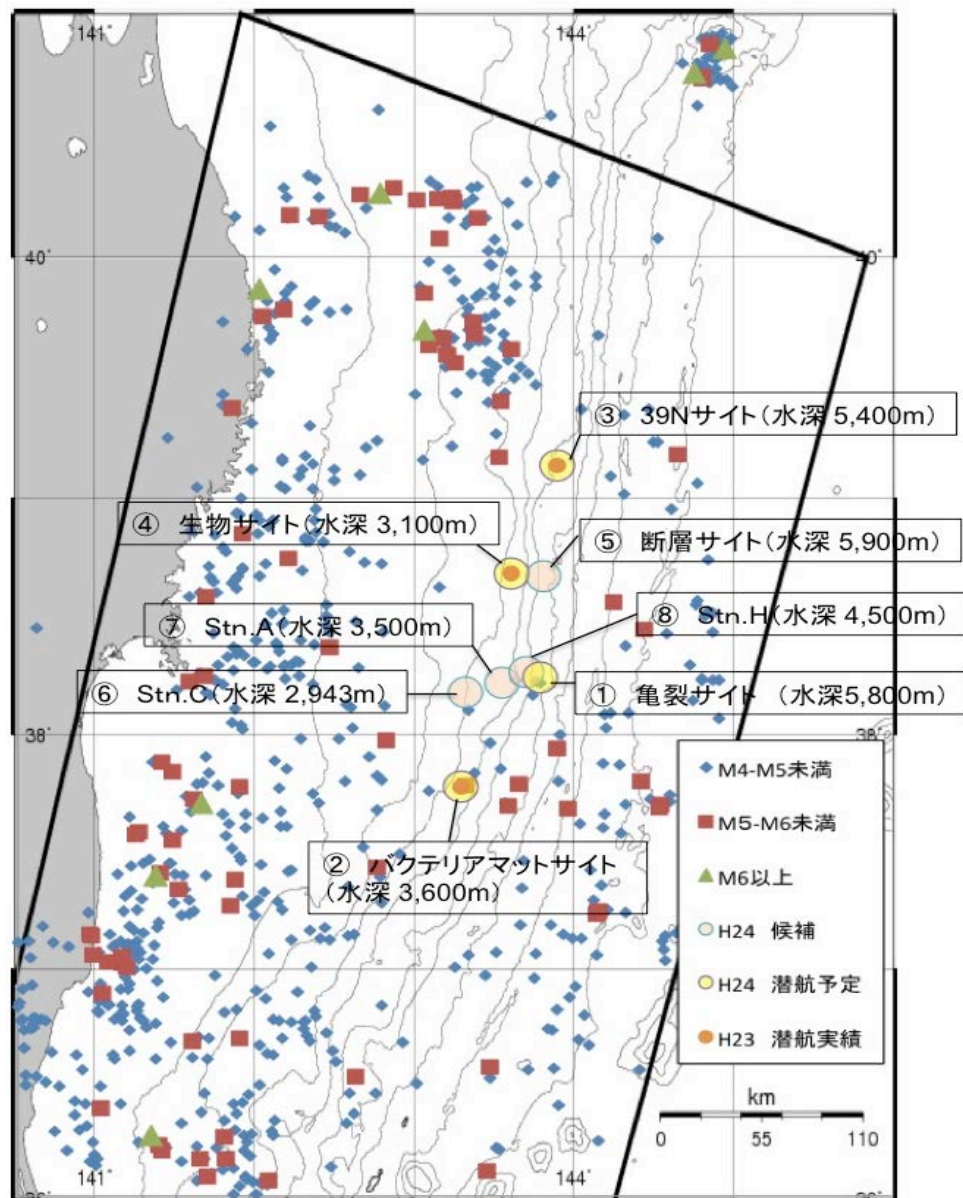
- Reconnaissance investigation for YK12-13 cruise of the Shinkai 6500, impact by the huge earthquake on marine ecosystem including environment, chemical, geology and geophysics in the Japan Trench
- Ecosystem dynamics in deep-sea fishery area off Sanriku under the Tohoku Ecosystem-Associated Marine Sciences, since 2011 (TEAMS)

1-4. Cruise period: 30 July, 2012- 8 August, 2012

1-5. Ports of call: Yokosuka, JAMSTEC 30 July, 2012 – JAMSTEC 8 August, 2012

1-6. Research area and map

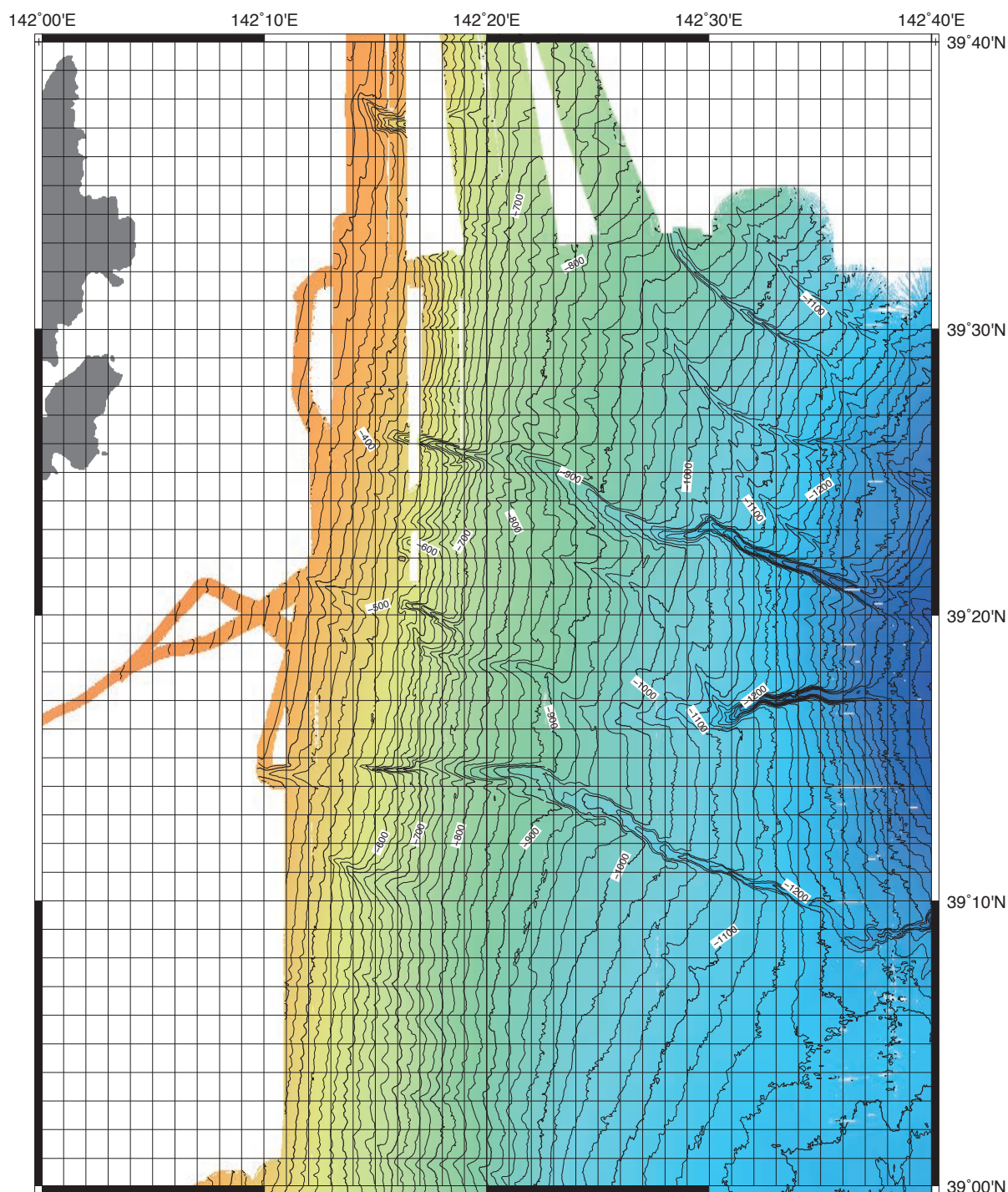




「しんかい 6500」潜航前の安全確認のための「YKDT」曳航地点図. 2011.8.18-2012.6.2 における M4 以上地震震源マップ。(図中の黒枠は気象庁が定める東北地方太平洋沖地震の余震域) 黄色い円①-④

- ① 38°12.5'N, 143°47.0'E を中心とする半径 3 海里の円内(水深 5,800m)
- ② 37°44.5'N, 143°17.0'E を中心とする半径 3 海里の円内(水深 3,600m)
- ③ 39°06.5'N, 143°53.5'E を中心とする半径 3 海里の円内(水深 5,400m)
- ④ 38°39.0'N, 143°36.0'E を中心とする半径 3 海里の円内(水深 3,100m)





## 2. Researchers: Fujikura

### 2-1. Chief scientist

藤倉 克則	FUJIKURA, Katsunori	Principal Scientist	Biodiversity Research Program, Institute of Biogeosciences, JAMSTEC
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### 2-2. Science party

古島 靖夫	FURUSHIMA, Yasuo	Research Scientist	Biodiversity Research Program, Institute of Biogeosciences,
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## JAMSTEC

土田 真二	TSUCHIDA, Shinji	Research Scientist	Biodiversity Research Program, Institute of Biogeosciences, JAMSTEC
加藤 千明	KATO, Chiaki	Principal Scientist	Biodiversity Research Program, Institute of Biogeosciences, JAMSTEC
中嶋 亮太	NAKAJIMA, Ryota	Postdoctoral research fellow	Biodiversity Research Program, Institute of Biogeosciences, JAMSTEC
座間 千夏	ZAMA, Chinatsu	Research Scientist	Biodiversity Research Program, Institute of Biogeosciences, JAMSTEC
金子 健司	KANEKO, Kenji	Assistant Professor	Graduate School of Faculties Sciences, Tohoku University
金子 純二	KANEKO, Junji	Research Scientist	Data Research Center Research Institute,
柴田 晴佳	SHIBATA, Haruka	Ph.D. student	Graduate School of Fisheries, Kitasato University
樋泉 昌之	TOIZUMI, Masayuki	Marine Technician	Nippon Marine Enterprises, LTD

## 2-3. R/V Yokosuka Crews

船 長	鮫島 耕児	Captain	KOJI SAMESHIMA
一航士	三森 靖彦	Chief Officer	YASUHIKO SAMMORI
二航士	藤井 商藏	2nd Officer	SHOZO FUJII
三航士	大前 宙陽	3rd Officer	HIROHARU OMAE
機関長	坂口 栄次	Chief Engineer	EIJI SAKAGUCHI
一機士	大田 隆志	1st Engineer	TAKASHI OTA
二機士	儀武 大輔	2nd Engineer	DAISUKE GIBU
三機士	山口 雄治	3rd Engineer	KATSUTO YAMAGUCHI
電子長	須田 福男	Chief Radio Off.	FUKUO SUDA

二電士	石渡 広樹 2nd Elect. Off.	HIROKI ISHIWATA
三電士	城詰 崇朋 3rd Elect. Off.	TAKATOMO SHIROZUME
甲板長	河村 好昭 BoatSwain	YOSHIAKI KAWAMURA
甲板手	小笠原一美 Able Seaman	KAZUMI OGASAWARA
甲板手	大端 正則 Able Seaman	MASANORI OHATA
甲板手	吉野 勇希 Able Seaman	YUKI YOSHINO
甲板手	宮下 拓也 Able Seaman	TAKUYA MIYASHITA
甲板員	上野 慎也 Sailor	SHINYA UENO
甲板員	中西 透 Sailor	TORU NAKANISHI
操機長	三浦 浩三 No.1 Oiler	KOZO MIURA
操機手	河合 慶憲 Oiler	YOSHINORI KAWAI
操機手	三砂 聡太 Oiler	SOTA MISAGO
機関員	荒武 英司 Assistant Oiler	EIJI ARATAKE
機関員	日高 透 Assistant Oiler	TORU HIDAKA
司厨長	佐々木末人 Chief Steward	SUETO SASAKI
司厨手	有山 重人 Steward	SHIGETO ARIYAMA
司厨手	尾上 龍也 Steward	TATSUNARI ONOUE
司厨手	和田 透 Steward	TORU WADA
司厨員	高田 優 Steward	MASARU TAKADA

## 2-4. YKDT Operation Team

司令	小倉 訓	Operation Manager	SATOSHI OGURA
一等潜技士	柳谷 昌信	1st Submersible Staff	MASANOBU YANAGITANI
一等潜技士	光藤 数也	1st Submersible Staff	KAZUYA MITSUFUJI
二等潜技士	植木 博文	2nd Submersible Staff	HIROFUMI UEKI
二等潜技士	鈴木 啓吾	2nd Submersible Staff	KEIGO SUZUKI
三等潜技士	池田 瞳	3rd Submersible Staff	HITOMI IKEDA

## 3. Investigations

### 3-1. Introduction

The purpose of this cruise is to understand impacts on marine ecosystems by the 2011 Earthquake of the Pacific coast of Tōhoku and Tsunami, and to contribute for recover and rebuild of Sanriku fisheries activities in terms of marine science. Target areas are continental slope and shelf off Sanriku. This cruise is conducted under the TEAMS project, namely Tohoku Ecosystem -Associated of Marine Sciences. Detail investigation subjects are topographic surveys, mapping of scattered debris, distribution patterns and diversity of benthic organisms, seawater and sediments geochemistry, and sediments components. Based on these data and samples, we will construct habitat map for ecosystem management in Sanriku areas.

本航海は、2011年3月11日の東北地方太平洋沖地震と津波により引き起こされた東北地方沖の海洋生態系への影響を評価し、被災地の効果的、効率的な漁業の復興に貢献することを目的とする。この航海は、東北マリンサイエンス拠点形成事業の一環として実施し、海洋研究開発機構は三陸沖の沖合底層生態系を対象に調査を行う。具体的には、地形と瓦礫の精密マッピング、生物分布と多様性、海水化学成分、堆積物地質構造と成分分析、生物の有害物質蓄積量に関するデータとサンプル取得を主に行い、生態系ハビタットマッピングの構築情報として利用する。

### 3-2. Facilities and methods

#### 3-2-1. RV Yokosuka

R/V YOKOSUKA is designed serve as the mother vessel for SHINKAI 6500 and Autonomous Underwater Vehicle (AUV) URASHIMA. It has silent engine, an advanced acoustic navigation systems and an underwater telephone for its state of the art operations. There are 4 laboratories on Yokosuka, No.1-No.3 laboratories and No.1 Study room. No.1 Lab. has dry space. The permanent installations are an video editing system, a PC and a printer. No.2 Lab. has semi-dry and wet space. There are two freezers (-40 & -80 deg.C), a incubator, a Milli-Q, and a fumigation chamber at dry one, and wet one has a rock saw. No.3 Lab. has dry space with storage. No.1 Study room

has dry space, there are a gravity meter, a data acquisition system of gravity meter, a 3 axis fluxgate magnet meter and also a proton magnet meter, a work station for data processing, and a A0 size plotter.

The general specifications of R/V YOKOSUKA

Length overall	105.2 m
Beam overall	16.0 m
Depth	7.3 m
Draft	4.5 m
Gross tonnage	4,439 tons
Service speed	16knot
Main propulsion system Diesel engines	2,206kW x 2
Main propulsion method	Controllable pitch propeller x 2

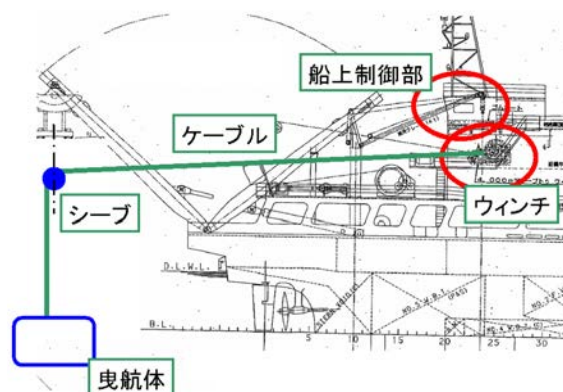
Complement

Crew	27 persons
Submersible operation staff	18 persons
Researchers	15 persons
	Total 60 persons

### 3-2-2. Deep towing TV camera system (YKDT)

Operation and specification of the 6000m-class Yokosuka Deep Tow Camera (YKDT) are following in Japanese.

本システムは、観測装置を鉄パイプ製のフレームに固定し、海中に吊り下げて海底・海中の観測を行う装置であり、曳航体、曳航ケーブル、ウインチ、シーブ、船上制御部よりなる。カラーTV映像、白黒TV映像、カラー写真（デジタルカメラ）、CTD データなどが取得できる。曳航中の測位は母船に装備されている D-GPS および音響航法装置によるハイブリッド測位により行う。なおケーブル長さの制約から、曳航体を繰り出せるのは最大 6000m である。



システム概要 （「よこすか」の船尾）

6000m まで繰り出すのでトラクションウインチ搭載

#### 曳航体

曳航体はTVカメラ、デジタルスチルカメラ、CTD等を装備し、船上制御部との間で光ファイバーを経由したシリアル通信を行っている。また、切離装置、方位計等を装備可能となっている。





Deep Tow Fish

- Size : 3,000×1,200×1,200mm (L×W×H)
- Weight : 650kg (air)、400kg (in water)
- Max. depth : 6000m
- Speed : ～1.0kt
- Towing height : 2～5m
- Dredge : 1

#### specifications

Color TV camera	SONY DXC-990, NTSC
B/W TV camera	SONY XC-ST50, NTSC
Still Camera	AquaPix SeaSnap (3.34Mpixel)
Light	500W×2 灯 250W×2 灯
CTD	Seabird SBE49
Altimeter	MESOTECH 1007 型
Transponder	Oki SB-1023(7kHz 帯)
Releaser	Inter Ocean MR5000

#### Cable

曳航ケーブルには 5200m の鉄線二重鎧装光電気複合ケーブルを用いている。これは 4 本の電力線と 4 本の光ファイバーをもっており、このうち電力線は 2 本一組 1 対として使用し、光ファイバーは常用 1 本、予備 1 本を常に使用可能な状態にし、残り 2 本は水中コネクタには接続せずに予備としている。

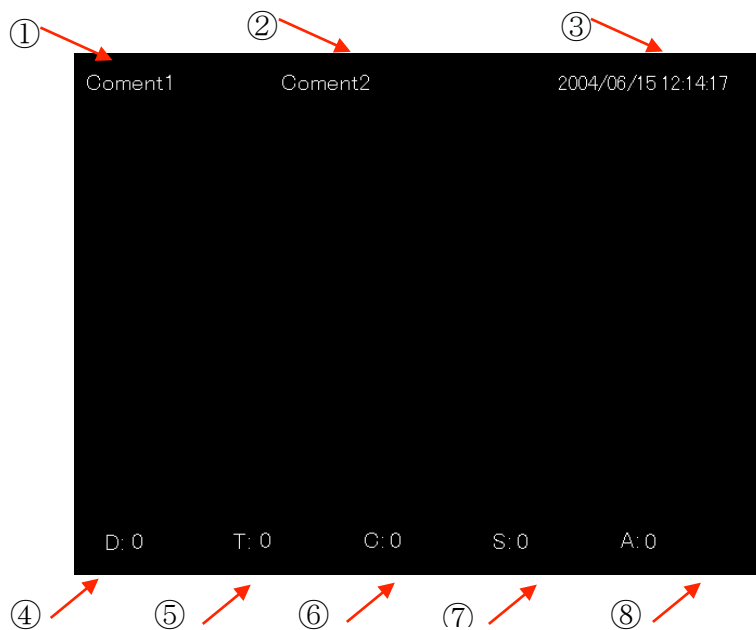
#### Winch

ウインチは光 2 系統のロータリージョイントおよび電力 4 系統のスリップリングを備えている。また線長および張力を検出する機能を持ち、これらは遠隔で表示され、ウインチのコントロールボックスと共にウインチ操作者の下に置かれる。駆動源は母船より供給される油圧を用いている。

#### Control system

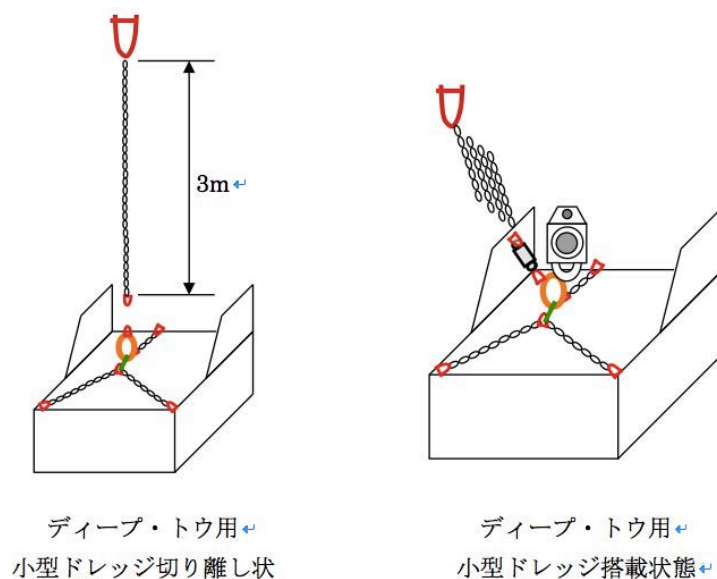
曳航体に装備されている各機器の制御は船上から行う。船上制御部は制御ソフトの入ったパソコン、TV モニタ、光伝送装置、ビデオデッキ等からなる。電源は母船より供給され、高圧給電盤を介し曳航体に送電する。

海中で取得したデータはこの船上制御部で記録され、一部のデータはカラー TV カメラ映像と共に研究者用モニタや船内共聴 (CATV) へ配信される。



TV 映像テロップ

- ① コメント 1 表示
- ② コメント 2 表示
- ③ 日時表示
- ④ 深度表示 (m) 「DEPTH」
- ⑤ 水温 (°C) 「Temperature」
- ⑥ 電気伝導度 (S/m) 「Conductivity」
- ⑦ 塩分濃度 (psu) 「Salinity」
- ⑧ 高度 (m) 「ALTITUDE」



ディープ・トウ用小型ドレッジ構成図

#### ○測位システム

調査中の曳航体位置の測位には、母船の D-GPS 及び曳航体搭載のトランスポンダによる音響航

法装置（SSBL：Super Short Base Line）を用いた。

### 3-2-3. Dissolved Oxygen Concentration and Turbidity meter: Furushima

We installed Dissolved Oxygen meter and Turbidity meter in a Deep Tow Camera system (Figure 1) and carried out environmental monitoring with CTD. The environmental data were measured every one second. We conducted similar survey of Sanriku offing cruise of last year. We made a vertical profiles with environment data before a Deep Tow system arriving at the bottom and drew up a horizontal profile with environmental data towing. We included the measurement results in each general investigation report.

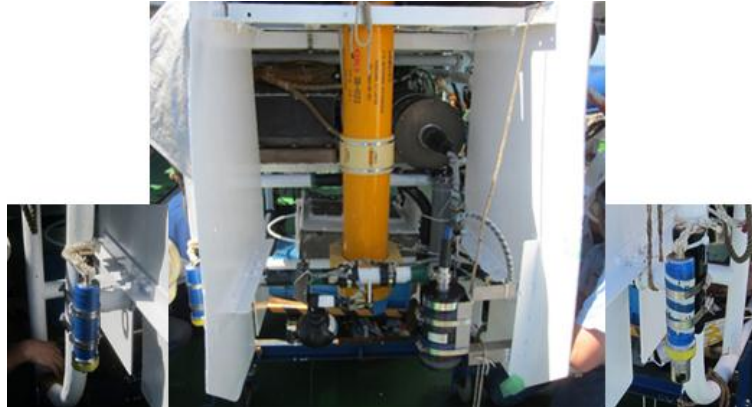


Figure 1 Dissolved Oxygen meter and Turbidity meter in a Deep Tow Camera system.

Dissolved Oxygen: Compact Optode JFE Advantech . Turbidity meter: Compact-LT(ATU6-CMP) JFE Advantech.

### 3-2-4. Seabeam 2112, Gravity & Magneto meters

YOKOSUKA is equipped with various kinds of underway geophysical equipment, a multi narrow beam echo sounder (Sea Beam 2112.004, Sea Beam Instruments, Inc.), a gravity meter (Type S-63, LaCoste & Romberg Gravity Meters Inc.), and a ship borne 3 axis magnet meter (Type SFG-1212, Tierra Technica Inc.). The specifications of these instruments are listed below.

The specifications of Seabeam

Measurement depth (m)	100 ~ 11,000
Measurement range (deg.)	90 ~ 150
Measurement frequency (kHz)	12
Measurement method	cross fan beam style
Accuracy	0.2% (center) ~ 0.5% (outer)
Beam width (deg.)	2
Beam interval (deg.)	1
Swath width (deg.)	150 (~ 300m) 120 (~ 4,500m) 100 (~ 8,000m) 90 (~ 11,000m)
Sampling rate (msec.)	1.33 or 2.67
Roll (deg.)	±20
Pitch (deg.)	±7.5

The specifications of Gravity meter

Measurement range (m Gal)	12,000
Drift	3mGal per month or less
Stabilized platform	
Platform pitch(deg.)	±22
Platform roll(deg.)	±25

Platform period(min.)	4 to 4.5
Beam interval(deg.)	1
Control system	
Recording rate(Hz)	1
Serial out put	RS-232
System performance	
Resolution (mGal)	0.01
Static repeatability (mGal)	0.05
50,000m Gal horizontal acceleration (mGal)	0.25
100,000m Gal horizontal acceleration (mGal)	0.50
100,000m Gal vertical acceleration (mGal)	0.25
Dimension (cm)	71×56×84
Weight (kg)	Meter:86, UPS:30

The specifications of 3 axis magnet meter

System	ring core fluxgate
Number of component directly	3 axes
Cable length (m)	50
Sensor dimension (mm)	φ280×130H
Measurement range (nT)	±100000
Resolution (nT)	1

### **3-2-5. Debris distribution: Haruka Shibata, Hiroshi Miyake(Kitasato University), Yasuo Furushima(JAMSTEC)**

We thought that *in-site* investigation was necessary to identify kind of floating litter and benthic litter. The aim of this cruise is to observe floating litter and deep-sea litter in situ and understand transportation of marine litter to deep-sea floor. Video recording was conducted for getting quantitative data of floating litter on day time. A video camera was set at navigation bridge deck. Deep-sea litter was observed from real time image from Deep-tow camera. Then video footages of deep-tow camera were analyzed.

### **3-2-6. Microbial diversity: Chiaki Kato & Chinatsu Zama (JAMSTEC)**

1)Purpose:

Purpose of the microbiology study in the cruise, YK12-12, was to analyze the changing of microbial diversity after Eastern Japan Pacific Earthquake (M9.0, March 11, 2011). We also try to isolate novel piezophilic bacteria and some of useful microorganisms from the deep-sea samples.

2)Experimental procedures:

#### **DNA extraction from the sediment samples.**

DNAs were directly extracted and purified from the sediment samples using the Power Soil DNA kit (MO BIO Inc.). Extracted DNAs were stored into the liquid nitrogen tank on board. Those DNAs were using for microbial diversity analyses.

#### **Piezophilic bacterial mixed-cultivation under 50MPa condition.**

Sediment samples were put into 2-ml sterilized tubes with ASW (artificial sea water), MB (Difco Marine Broth 2216), and LBN (Luria Broth with 3% NaCl), in 1:1, respectively. Those tubes were stored into the Pressure vessels at 50MPa and 4°C conditions, and start high-pressure mixed cultivation.

#### **Isolation of useful microorganisms on plates.**

We prepared the several agar plate media for isolating the useful microorganisms;

The samples (~1 g) were suspended with 1 ml ASW, and then two drops of them were spreading on the plate, each, and start the cultivation at room temperature.

#### **Storage of the sediment samples in liquid nitrogen tank.**

The remained sediment samples were stored into the storage tubes (tube only and tube with 0.5 ml 80% glycerol), and keep them in the liquid nitrogen tank.

### 3-3. Cruise log: Kaneko, J.

日付 Date	時間 Local Time	内容 Note	特記事項 Description	本船位置／気象／海象 Position/Weather/Wind/ Sea condition	内容(日本語)
30-Jul-12		<b>Sail out, proceeding to research area</b>		7/30 12:00 (UTC+9h)	移動日
	08:00	Onboard		34-52.0'N, 139-55.3'E	乗船
	09:00	let go all shore line, left YOKOSUKA(JAMSTEC)		Off NOJIMAZAKI	横須賀ジャムステック岸壁 出港
	9:30-10:00	Scientific meeting with YKDT team (1Lab.)		Fine but Cloudy	研究者、YKDT オペレーションチームミーティング
	10:30	Briefing about ship's life and safety		South-3 (Gentle breeze)	船舶乗船説明
	18:00-19:30	Scientific meeting (1Lab.)		2 (Sea smooth)	研究者ミーティング
				1 (Low swell short or Average)	
				Visibly: 8'	
31-Jul-12		<b>BACTERIA MAT site and KIRETSU site</b>		7/31 12:00 (UTC+9h)	バクテリアマットサイト、亀裂サイト
	07:45	Arrival at research area (BACTERIA MAT site)		37-43.9'N, 143-16.4'E	バクテリアマットサイト到着
	07:50	Release XBT	37-46.9070'N 143-16.1866'E	Off SANRIKU	XBT 投入、計測
	08:34	Start MBES site survey		Fine but Cloudy	マルチビーム サイトサーベイ開始
	09:18	Finish MBES site survey		South-4(Moderate breeze)	マルチビーム サイトサーベイ終了
	11:30	Launch YKDT (YKDT#147dive)		3 (Sea slight)	YKDT(147dive) 潜航開始
	12:54	YKDT Lands and start towing (3559m)	37-43.8337'N 143-16.0932'E	1 (Low swell short or Average)	YKDT 着底
	15:41	YKDT Release Dredger, Deployment #20 Marker (3450m)	37-43.9334'N 143-18.0035'E	Visibly: 8'	YKDT 採泥器投下、マーカー(#20)設置
	15:50	YKDT Leaves the bottom(3466m)	37-43.9673'N 143-18.1119'E		YKDT 離底
	17:21	YKDT On deck			YKDT 揚収
	17:41	Left at research area (BACTERIA MAT site)			バクテリアマットサイトより離脱
	18:15-19:15	Scientific meeting (1Lab.)			研究者ミーティング
	19:50	Arrival at research area (KIRETSU site)			亀裂サイト到着
	19:51	Release XBT	38-07.4282'N 143-46.8132'E		XBT 投入、計測
	20:26	Start MBES site survey			マルチビーム サイトサーベイ開始
	21:20	Finish MBES site survey			マルチビーム サイトサーベイ終了
01-Aug-12		<b>SEIBUTSU site and 39N site</b>		8/1 12:00 (UTC+9h)	生物サイト、39N サイト
	06:00	Left at research area (KIRETSU site)		39-10.1'N, 143-52.7'E	亀裂サイト離脱

	07:40	Arrival at research area (SEIBUTSU site)		Off SANRIKU	生物サイト到着
	07:44	Release XBT	38-36.4982'N 143-34.4426'E	Fine but Cloudy	XBT 投入、計測
	08:18	Start MBES site survey		South-4(Moderate breeze)	マルチビーム サイトサーベイ開始
	08:48	Finish MBES site survey		3 (Sea slight)	マルチビーム サイトサーベイ終了
	08:48	Left at research area (SEIBUTSU site)		3 (Moderate Short)	生物サイトより離脱
	10:37	Arrival at research area (39N site)		Visibly: 8'	39N サイト到着
	10:37	Release XBT	39-01.2935'N 143-52.6051'E		XBT 投入、計測
	11:05	Start MBES site survey			マルチビーム サイトサーベイ開始
	11:50	Finish MBES site survey			マルチビーム サイトサーベイ終了
	11:50	Start MBES survey			マルチビーム 広域サーベイ開始
	14:30-15:00	Scientific meeting (1Lab.)			研究者ミーティング
02-Aug-12		<b>39N site</b>		8/2 12:00 (UTC+9h)	<b>39N サイト</b>
	05:16	Finish MBES survey		39-06.7'N, 143-52.6'E	マルチビーム 広域サーベイ終了
	05:16	Left at survey area		Off SANRIKU	広域サーベイエリア離脱
	07:02	Arrival at research area (39N site)		Overcast	39N サイト到着
	07:02	Launch YKDT (YKDT#148dive)		SSW-5(Fresh breeze)	YKDT(148dive)潜航開始
	09:26	YKDT Lands and start towing (5340m)	39-06.0546'N 143-54.1824'E	3 (Sea slight)	YKDT 着底
	11:12	YKDT Finding Fisher net (5324m)	39-06.5688'N 143-53.4162'E	3 (Mooderate Short)	YKDT 漁網確認
	12:40	YKDT Release Dredger, Deployment #21 Marker (5108m)	39-06.9713'N 143-52.5945'E	Visibly: 6'	YKDT 採泥器投下、マーカー(#21)設置
	12:50	YKDT Leaves the bottom(5101m)	39-07.0226'N 143-52.5120'E		YKDT 離底
	15:09	YKDT On deck			YKDT 揚収
	15:09	Left at research area (39N site)			39N サイト離脱
	16:18	Arrival at survey area			マルチビーム 広域サーベイエリア到着
	16:18	Start MBES survey			マルチビーム 広域サーベイ開始
	16:20-17:00	Scientific meeting (1Lab.)			研究者ミーティング
	23:00	Finish MBES survey			マルチビーム 広域サーベイ終了
	23:00	Left at survey area			マルチビーム 広域サーベイエリア離脱
03-Aug-12		<b>KIRETSU site</b>		8/3 12:00 (UTC+9h)	<b>亀裂サイト</b>
	03:00	Arrival at research area (KIRETSU site)		38-12.3'N, 143-46.9'E	亀裂サイト到着
	03:00	Start drifting		Off SANRIKU	ドリフト開始
	05:00	Finish drifting		Off SANRIKU	ドリフト終了



	07:04	Launch YKDT (YKDT#149dive)		Fine but Cloudy	YKDT(148dive)潜航開始
	09:34	YKDT Lands and start towing (5800m)	38-10.8813'N 143-47.0432'E	SE-2(Light breeze)	YKDT 着底
	10:24	YKDT Finding Bacteria mat (5808m)	38-11.1764'N 143-46.9586'E	2 (Sea smooth)	YKDT バクテリアマット 確認
	10:32	YKDT Finding Calypotgena colony (5813m)	38-11.2366'N 143-46.9341'E	1 (Low swell short or Average)	YKDT 白ウリガイコロニー 確認
	11:43	YKDT Finding Fissure (5765m)	38-11.8586'N 143-46.8688'E	Visibly: 8'	YKDT 亀裂確認
	11:46	YKDT Finding Fissure (5760m)	38-11.8792'N 143-46.8586'E		YKDT 亀裂確認
	11:52	YKDT Finding Fissure (5745m)	38-11.9283'N 143-46.8367'E		YKDT 亀裂確認
	11:56	YKDT Finding Fissure (5740m)	38-11.9614'N 143-46.8589'E		YKDT 亀裂確認
	12:04	YKDT Finding Fissure (5726m)	38-12.0438'N 143-46.8503'E		YKDT 亀裂確認
	12:10	YKDT Finding Bacteria mat (5716m)	38-12.0931'N 143-46.8439'E		YKDT バクテリアマット 確認
	12:20	YKDT Finding Bacteria mat (5683m)	38-12.2163'N 143-46.8363'E		YKDT バクテリアマット 確認
	12:23	YKDT Finding Fissure (5682m)	38-12.2221'N 143-46.8296'E		YKDT 亀裂確認
	12:27	YKDT Finding Fissure (5670m)	38-12.2339'N 143-46.8393'E		YKDT 亀裂確認
	12:41	YKDT Finding Fissure (5626m)	38-12.3992'N 143-46.8421'E		YKDT 亀裂確認
	13:22	YKDT Release Dredger, Deployment #22 Marker (5552m)	38-12.8358'N 143-46.8222'E		YKDT 採泥器投下、マ ーカー(#22)設置
	13:35	YKDT Leaves the bottom(5530m)	38-12.9367'N 143-46.8322'E		YKDT 離底
	16:04	YKDT On deck			YKDT 揚収
	16:04	Left at research area (KIRETSU site)			亀裂サイト離脱
	17:30-18:00	Scientific meeting (1Lab.)			研究者ミーティング
	17:40	Arrival at survey area			マルチビーム 広域サ ーベイエリア到着
	17:40	Start MBES survey			マルチビーム 広域サ ーベイ開始
04-Aug-12		<b>SEIBUTSU site</b>		8/4 12:00 (UTC+9h)	<b>生物サイト</b>
	02:11	Finish MBES survey		38-39.5'N, 143-33.3'E	マルチビーム 広域サ ーベイ終了
	02:11	Left at survey area		Off SANRIKU	マルチビーム 広域サ ーベイエリア離脱
	03:15	Arrived at research area (SEIBUTSU site)		Cloudy	生物サイト到着
	03:15	Start drifting		SE-3 (Gentle breeze)	ドリフト開始
	05:00	Finish drifting		2 (Sea smooth)	ドリフト終了
	07:00	Launch YKDT (YKDT#150dive)		1 (Low swell short or Average)	YKDT(150dive)潜航開始
	08:29	YKDT Lands and start towing (3198m)	38-39.2443'N 143-35.6774'E	Visibly: 8'	YKDT 着底
	08:38	YKDT Finding Fissure (3202m)	38-39.2418'N 143-35.5663'E		YKDT 亀裂確認

	10:50	YKDT Release Dredger, Deployment #23 Marker (3012m)	38-39.4513'N 143-33.9213'E		YKDT 採泥器投下、マーカー(#21)設置
	11:00	YKDT Leaves the bottom(3003m)	38-39.4794'N 143-33.7653'E		YKDT 離底
	12:23	YKDT On deck			YKDT 揚収
	12:23	Left at research area (SEIBUTSU site)			生物サイト離脱
	16:40-17:00	Scientific meeting (1Lab.)			研究者ミーティング
	17:09	Arrived at survey area			マルチビーム 広域サーベイエリア到着
	17:09	Release XBT			XBT 投入、計測
	17:36	Start MBES survey			マルチビーム 広域サーベイ開始
	22:13	Finish MBES survey			マルチビーム 広域サーベイ終了
	22:51	Start drifting			ドリフト開始
05-Aug-12		<b>Submarine Canyon off MIYAKO site and 39N site</b>		8/5 12:00 (UTC+9h)	<b>宮古沖海底谷サイト、39N サイト</b>
	04:30	Finish drifting		39-26.0'N, 142-17.0'E	ドリフト終了
	06:58	Launch YKDT (YKDT#151dive)		Off SANRIKU	YKDT(151dive)潜航開始
	07:33	YKDT Lands and start towing (782m)	39-25.2684'N 142-20.9331'E	SSE-4(Moderate breeze)	YKDT 着底
	10:13	YKDT Finding Rope (699m)	39-25.6736'N 142-18.7283'E	3 (Sea slight)	YKDT ロープ確認
	10:18	YKDT Finding Rope (700m)	39-25.6664'N 142-18.6663'E	1 (Low swell short or Average)	YKDT ロープ確認
	11:28	YKDT Finding Rope (625m)	39-25.8598'N 142-17.5701'E	Visibly: 6'	YKDT ロープ確認
	11:38	YKDT Finding Rope (628m)	39-25.8881'N 142-17.4449'E		YKDT ロープ確認
	12:48	YKDT Finding Rope (562m)	39-26.0298'N 142-16.5574'E		YKDT ロープ確認
	12:53	YKDT Finding Rope (558m)	39-25.0380'N 142-16.5046'E		YKDT ロープ確認
	12:57	YKDT Finding Rope (550m)	39-26.0289'N 142-16.4477'E		YKDT ロープ確認
	13:01	YKDT Finding Rope (544m)	39-26.0313'N 142-16.4040'E		YKDT ロープ確認
	13:05	YKDT Finding Rope (531m)	39-26.0262'N 142-16.3550'E		YKDT ロープ確認
	13:31	YKDT Finding Net (514m)	39-26.0984'N 142-15.9912'E		YKDT 漁網確認
	13:35	YKDT Finding Rope (514m)	39-26.1121'N 142-15.9404'E		YKDT ロープ確認
	13:40	YKDT Finding Net (496m)	39-26.1335'N 142-15.8742'E		YKDT 漁網確認
	15:50	YKDT Release Dredger (329m)	39-26.5346'N 142-12.8655'E		YKDT 採泥器投下
	16:00	YKDT Leaves the bottom(320m)	39-26.5297'N 142-12.7224'E		YKDT 離底
	16:23	YKDT On deck			YKDT 揚収
	16:23	Left at research area (SANRIKU Line1 site)			三陸沖ライン 1 離脱

	17:30-18:00	Scientific meeting (1Lab.)			研究者ミーティング
	21:52	Arrived at research area (39N site)			39N サイト到着
	21:52	Start MBES site survey			マルチビーム サイトサーベイ開始
	22:36	Finish MBES site survey			マルチビーム サイトサーベイ終了
	23:21	Start drifting			ドリフト開始
06-Aug-12		<b>39N site</b>		8/6 12:00 (UTC+9h)	<b>39N サイト</b>
	05:00	Finish drifting		39-06.7'N, 143-52.2'E	ドリフト終了
	06:59	Launch YKDT (YKDT#152dive)		Off SANRIKU	YKDT(152dive)潜航開始
	09:20	YKDT Lands and start towing (5349m)	39-06.0139'N 143-54.1329'E	WSW-4(Moderate breeze)	YKDT 着底
	11:12	YKDT Leaves the bottom(4954m)	39-06.4932'N 143-53.2133'E	3 (Sea slight)	YKDT 離底
	13:23	YKDT On deck		1 (Low swell short or Average)	YKDT 揚収完了
	13:40	Left at research area (SANRIKU Line1 site)		Visibly: 7'	三陸ライン 1 離脱
	13:40	Proceeding to YOKOSUKA(JAMSTEC)			横須賀ジャムステック岸壁に向け回航
	14:30-15:10	Scientific meeting (1Lab.)			研究者ミーティング
07-Aug-12		<b>Proceeding to YOKOSUKA(JAMSTEC)</b>		8/7 12:00 (UTC+9h)	<b>回航 横須賀ジャムステック岸壁</b>
		Proceeding to YOKOSUKA(JAMSTEC)		34-55.1'N, 139-45.1'E	横須賀ジャムステック岸壁に向け回航
				Off SOUTH SUZAKI	
				SW-2(Light breeze)	
				2 (Sea smooth)	
				1 (Low swell short or Average)	
				Visibly: 4'	
08-Aug-12		<b>Proceeding to YOKOSUKA(JAMSTEC)</b>			<b>回航 横須賀ジャムステック岸壁、着岸</b>
	09:30	Arrived at YOKOSUKA(JAMSTEC)			横須賀ジャムステック岸壁到着、積み下ろし作業

### 3-4. General investigation results

#### 3-4-1. Deep-towing investigations including environmental measurements

##### Towing List: Tsuchida

YKDT#	Day	Area	Landing			End Point			Dredge	Marker Deployed
			Time	Point	Depth(m)	Time	Point	Depth(m)		
147	2012 7.31	Bacteria Mat Site, Japan Trench, Off Sanriku	12:35	37°43.8337' N, 143°16.0392'E	3559	15:50	37°43.9673' N, 143°18.1119'E	3446	+	YKDT#20
	2012 8.1	Canceled								
148	2012 8.2	39N Site, Japan Trench, Off Sanriku	9:26	39°06.0546' N, 143°54.1824'E	5340	12:50	39°07.0226' N, 143°52.5120'E	5101	+	YKDT#21
149	2012 8.3	Kiretsu Site, Japan Trench, Off Sanriku	9:34	38°10.8813' N, 143°47.0432'E	5800	13:35	38°10.8777' N, 143°46.9677'E	5530	+	YKDT#22
150	2012 8.4	Seibutsu Site, Japan Trench, Off Sanriku	8:29	38°39.2443' N, 143°35.6774'E	3198	13:35	38°39.4794' N, 143°33.7653'E	3003	+	YKDT#23
151	2012 8.5	Submarin Canyon Off Miyako	7:33	39°25.2684' N, 142°20.9331'E	782	16:00	39°26.5297' N, 142°12.7224'E	320	+	-
152	2012 8.6	39N Site, Japan Trench, Off Sanriku	9:20	39°06.0139' N, 143°54.1329'E	5349	11:12	39°06.4932' N, 143°53.2133'E	4954	-	-

**YKDT-147: Fujikura**

Date: 2012/7/31

Observed scientist: Katsunori Fujikura (JAMSTEC)

Survey site: ②Bacterial mat site: same as YKDT #111

Landing Point: 37°43.823'N 143°16.106'E, 3555m

Leaving Point: 37°43.9673'N 143°18.1119'E, 3464m

Summary:

The purpose of deep-towing survey is reconnaissance to safety check for YK12-13 cruise of the Shinkai 6500. We estimated safely diving at this site by Shinkai 6500 because no turbidity water and landslide were observed for this towing. Seafloor covered by mud in flat areas and outcrops and rocks were sometime found in steep slope areas. Species diversity and abundance were low. A couple of Porifera, asteroid, ophiuroid, holothurioid, galatheid crabs, macrourid fishes were occurred. No bacterial mat was found.

**YKDT-148: Furushima**

Date: 2012/08/02

Observed scientist: Yasuo Furushima (JAMSTEC)

Survey site: ①39N site: same as YKDT #98

Landing Point: 39°06.0546'N 143°54.1824'E, 5340m

Leaving Point: 39°07.0226'N 143°52.5120'E, 5101m

●Summary:

The aim of deep-towing survey in Dive\_148 was carried out as a survey of a safety check for YK12-13 cruise with Shinkai 6500. This site is the deepest survey point in a next diving survey from Aug.11th to 24th 2012. We performed visual observation about a change of the bottom topography, turbidity of turbidity of the bottom, a landslide, circumstances of obstacle. As a result, we obtained an opinion that survey of Shinkai 6500 was possible without an obstacle. Bottom sediment was covered in mud and The biodiversity was low. We were able to observe a sea cucumber and a sea anemone. etc.. There was an accident to be caught on a fishing net on the way, but there was not the serious influence to a towing survey. Furthermore, dark turbidity was observed from the bottom of 5,200m depth. Unfortunately we were not able to obtain data of turbidity by a battery trouble.

**YKDT-149:**

Date: 2012/8/3

Observed scientist: Shinji Tsuchida (JAMSTEC)

Survey site: ①Kiretsu Site

Landing Point: 38°10.8813'N 143°47.0432'E, 5800m

Leaving Point: 38°12.9367'N 143°46.8322'E, 5530m

Summary:

The purpose of deep-towing survey is reconnaissance to safety check for YK12-13 cruise of the Shinkai 6500 at the Kiretsu Site ranged from 5800 to 5530m depth. We observed lots of animals, holothurians, asteroids, ophiuroids, fishes, decapod shrimps, isopods, actinarians, gorgonians, dead shells of Calyptogena, and so on. Also, we found several lines of fissure on the slope, but no turbidity water, no landslide, or no dangerous debris at the Kiretsu Site. It should be considered safely for the Shinkai 6500 dives at this towing line.

**YKDT-150:**

Date: 2012/8/4

Observed scientist: Chiaki Kato (JAMSTEC)

Survey site: ④Animal site:

Landing Point: 38°39.2443'N 143°35.6774'E, 3198 m

Leaving Point: 38°39.4794'N 143°33.7653'E, 3003 m

Summary:

The purpose of deep-towing survey is reconnaissance to safety check for YK12-13 cruise of the Shinkai

6500. We estimated safely diving at this site by Shinkai 6500 because no turbidity water and landslide were observed for this towing. Seafloor covered by mud in flat areas and outcrops and rocks were sometime found in steep slope areas. We also identified the small fissure at the same position where we observed on last year. Species diversity and abundance were pretty high. Amount of starfishes, holothurians and snails were observed, but no microbial mat was found.

**YKDT-151: Kaneko, K.**

Date: 2012/8/5

Observed scientist: Kenji Kaneko (Tohoku University)

Survey site: YKDT Line 1(Tohoku Marine Science submarine canyon Miyako off site)

Landing Point: 39°25.3000'N 142°21.000'E, 3555m

Leaving Point: 39°26.7000'N 142°13.0000'E, 3464m

Summary:

The purpose of deep-towing survey is to examine the distribution of benthic animals, debris, environment, topography on seafloor at offshore of Sanriku coast, in project of 'Tohoku Marine Science'. Species diversity and abundance were high at submarine canyon in Line 1. Ophiuroid, asteroid, holothurioid, Majid crabs, fishes (macrourid fishes, Synphobranchid fishes, Zoarcid fishes and Scorpaenid fishes) and so on were occurred. In particularly, density of Ophiuroid is very high. A little debris (rope, can, plastic bag, wood, and so on) was found along the submarine canyon.

**YKDT-152: Nakajima, R.**

Date: 2012/8/6

Observed scientist: Ryota Nakajima (JAMSTEC)

Survey site: ③39N site: same as YKDT #148

Landing Point: 39°6.0139'N 143°54.1329'E, 5349 m

Leaving Point: 39°6.4932'N 143°53.2133'E, 4954 m

Summary:

The purpose of the deep-towing survey is reconnaissance to safety check for YK12-13 cruise of the Shinkai 6500. Although we did the deep-towing survey at the 39N site on 2nd August 2012 (YKDT #148), we carried out a resurvey due to an earthquake with a seismic intensity of 5 near the site on 3rd August. We estimated safely diving at this site by Shinkai 6500 because no turbidity water and landslide were observed for this towing. Seafloor covered by mud in flat areas and outcrops and rocks were sometime found in steep slope areas. Species diversity and abundance were low. A couple of Actiniaria, Holothurioidea, Gastropoda, Macrouridae, Annelida, and Decapoda were occurred. No bacterial mat was found.

**3-4-2. Topographic Investigations: Toizumi**

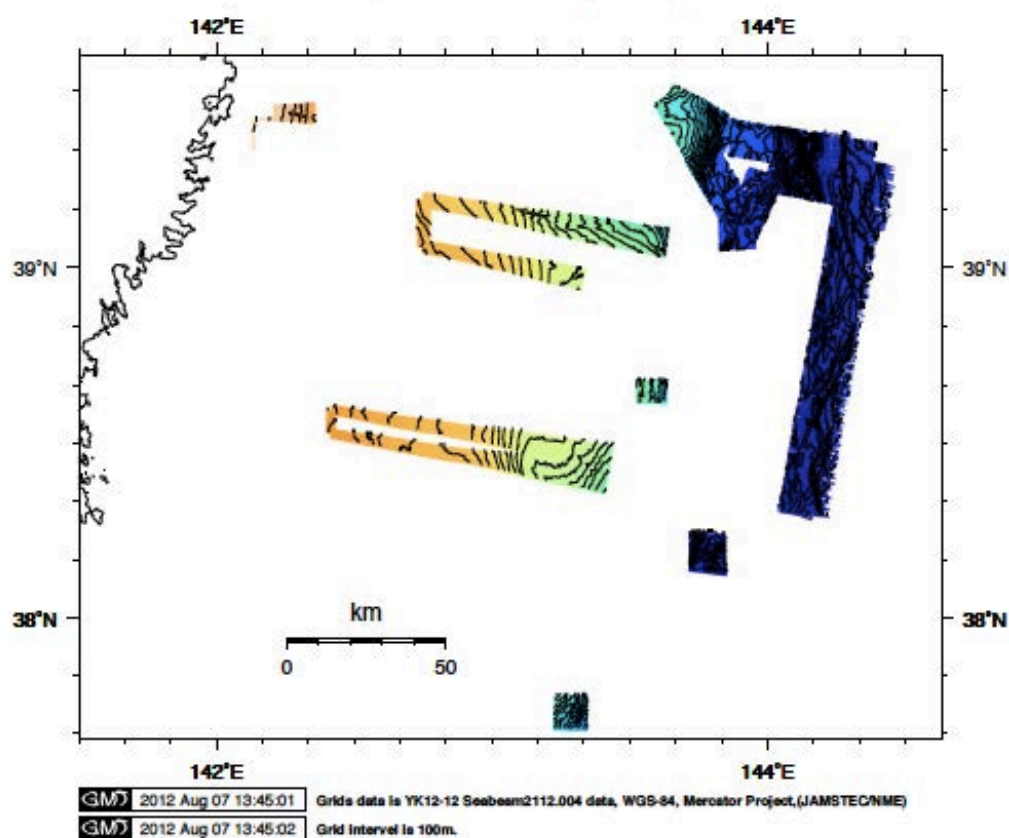
**MBES List**



# Line list

Line name	Start Time [UTC] Start point [latitude/longitude]		End Time [UTC] End point [latitude/longitude]		Length km
BACTERIA MAT site	2012/7/30	23:34	2012/7/30	00:18	
Pre site survey	37-47.0173N	143-17.0006E	37-46.9667N	143-17.0055E	0.1
KIRETSU site	2012/7/31	11:26	2012/7/31	12:20	
Pre site survey	38-07.9648N	143-46.9858E	38-15.0055N	143-46.9929E	13.0
SEIBUTSU site	2012/7/31	23:18	2012/7/31	23:47	
Pre site survey	38-37.0043N	143-34.4730E	38-41.1092N	143-34.5018E	7.6
39N site	2012/8/1	02:05	2012/8/1	02:50	
Pre site survey	39-02.9622N	143-53.5056E	39-09.0305N	143-53.4700E	11.2
Line1	2012/8/1	02:50	2012/8/1	04:45	
	39-09.0305N	143-53.4700E	39-29.0303N	143-37.9845E	43.2
Line2	2012/8/1	04:52	2012/8/1	05:57	
	39-28.9559N	143-37.9649E	39-21.9957N	143-52.1350E	24.0
Line3	2012/8/1	05:57	2012/8/1	07:55	
	39-21.9957N	143-52.1350E	39-17.9875N	144-23.1581E	45.1
Line4	2012/8/1	08:03	2012/8/1	13:08	
	39-18.0464N	144-23.0110E	38-17.9766N	144-07.9817E	113.4
Line5	2012/8/1	13:17	2012/8/1	17:48	
	38-17.9952N	144-05.9220E	39-13.0414N	144-19.0216E	103.8
Line6	2012/8/1	17:59	2012/8/1	19:13	
	39-13.0150N	144-19.0786E	39-16.0032N	143-59.9995E	27.9
Line7	2012/8/1	19:21	2012/8/1	20:16	
	39-16.0493N	144-00.0072E	39-05.9393N	143-54.1165E	20.6
Line8	2012/8/2	07:18	2012/8/2	10:44	
	39-03.9852N	143-38.1435E	39-11.5071N	142-44.9582E	77.7
Line9	2012/8/2	10:51	2012/8/2	11:32	
	39-11.6076N	142-44.9697E	39-03.5215N	142-45.0514E	15.0
Line10	2012/8/2	11:40	2012/8/2	14:00	
	39-03.4397N	142-44.9999E	38-58.0095N	143-20.0218E	51.4
Line11	2012/8/3	08:40	2012/8/3	12:38	
	38-23.9492N	143-25.2450E	38-32.0010N	142-24.9731E	88.7
Line12	2012/8/3	12:47	2012/8/3	13:06	
	38-32.9748N	142-25.0118E	38-36.0173N	142-24.9999E	5.6
Line13	2012/8/3	13:14	2012/8/3	17:11	
	38-36.0465N	142-24.9639E	38-27.9934N	143-26.0217E	89.8
Line14	2012/8/4	08:36	2012/8/4	08:53	
	39-19.9816N	142-08.2455E	39-23.0101N	142-08.1492E	5.6
Line15	2012/8/4	08:53	2012/8/4	09:04	
	39-23.0101N	142-08.1492E	39-25.1147N	142-08.1825E	3.9
Line16	2012/8/4	09:04	2012/8/4	09:21	
	39-25.1147N	142-08.1825E	39-25.0954N	142-12.4697E	6.1
Line17	2012/8/4	09:21	2012/8/4	09:55	
	39-25.0954N	142-12.4697E	39-25.0970N	142-21.5583E	13.0
Line18	2012/8/4	10:00	2012/8/4	10:34	
	39-25.4051N	142-21.5661E	39-25.3918N	142-12.4515E	13.0
Line19	2012/8/4	10:39	2012/8/4	11:13	
	39-25.6800N	142-12.4521E	39-25.7002N	142-21.5283E	13.0
Line20	2012/8/4	11:18	2012/8/4	11:52	
	39-26.1571N	142-21.5185E	39-26.1923N	142-12.4837E	12.9
Line21	2012/8/4	11:58	2012/8/4	12:32	
	39-26.6734N	142-12.4707E	39-26.7014N	142-21.5194E	13.0
Line22	2012/8/4	12:39	2012/8/4	13:13	
	39-27.2034N	142-21.5137E	39-27.2001N	142-12.4767E	12.9
Site 39N	2012/8/5	12:52	2012/8/5	13:36	
Pre site survey	39-02.9765N	143-53.5125E	39-09.0370N	143-53.4971E	11.2

### YK12-12 Bathymetric survey map with MBES



### 3-4-3. Gravity meters Investigations: Toizumi

#### Line and data list

データ名		Gravity meter / 船上 重力計		
NO.	Volume/データ容量 (Byte)	File name/ファイル名	Coment	備考
1	1,428,567	YK12-12_120730.grv	0:00[UTC]left at JAMSTEC	00:00(UTC) 海洋研究 開発機構専用岸壁出 港
2	17,452,817	YK12-12_120731.grv		
3	17,452,817	YK12-12_120801.grv		
4	17,452,817	YK12-12_120802.grv		
5	17,452,817	YK12-12_120803.grv		
6	17,452,817	YK12-12_120804.grv		
7	17,452,817	YK12-12_120805.grv		
8	17,452,817	YK12-12_120806.grv		

9	17,452,817	YK12-12_120807.grv		
10	1,428,567	YK12-12_120808.grv	00]30[UTC]Arrived at JAMSTEC	00:30(UTC) 海洋研究 開発機構専用岸壁入 港

#### 3-4-4. Debris distribution: Haruka Shibata, Hiroshi Miyake(Kitasato University), Yasuo Furushima(JAMSTEC)

We observed a lot of deep-sea litter and a little of floating litter off Sanriku. Observed floating litter was buoy, plastic bag, vinyl, etc. Figure 1 shows example of floating litter observed by this cruise. Floating litter such as a buoy (A), a buoy(B), a plastic(C) was seen. Figure 2 shows the image that captured benthic litter from an image provided in deep tow. Benthic litter such as a fishing net(A), cans(B), plastic bag, can, sunken wood, etc(C) was seen.



Fig. 1. Floating litters. A. Buoy, B. Buoy, C. Plastic



Fig. 2. Benthic litter

A. Fishing net, B. Cans, C. Plastic bag, can, sunken wood, etc

#### 3-4-5. Microbial diversity: Chiaki Kato & Chinatsu Zama (JAMSTEC)

We obtained the sediment samples as listed as follows;

YKDT#147

Sample	Sample ID	Time	Latitude	Longitude	Depth	Others
Dredge sample	YKDT#147-S01	15:41	37°43.9334'N	143°18.0035'E	3450 m	Stones washed with ASW
Dredge sample	YKDT#147-S02	15:41	37°43.9334'N	143°18.0035'E	3450 m	Stones washed with ASW

YKDT#148

Sample	Sample ID	Time	Latitude	Longitude	Depth	Others
Dredge sample	YKDT#148-S01	12:40	39°6.9713'N	143°52.5945'E	5108 m	Remained sediment with ASW

YKDT#149

Sample	Sample ID	Time	Latitude	Longitude	Depth	Others
Dredge sample (ZAMA)	YKDT#149-S01	13:22	38°12.8358'N	143°46.8222'E	5552 m	2 l pet-bottle modified by Y. Furushima, called ZAMA#1 sampler
Dredge sample (SZ)	YKDT#149-S02	13:22	38°12.8358'N	143°46.8222'E	5552 m	0.5 l pet-bottle modified by H. Shibata & C.Zama, called SZ sampler
Dredge sample (Fujikur)	YKDT#149-S03	13:22	38°12.8358'N	143°46.8222'E	5552 m	0.5 l pet-bottle modified by K. Fujikura, called Fujikur sampler
Dredge sample (Falcon)	YKDT#149-S04	13:22	38°12.8358'N	143°46.8222'E	5552 m	50 ml falcon tube modified by Y. Furushima, called Falcon sampler

#### YKDT#150

Sample	Sample ID	Time	Latitude	Longitude	Depth	Others
Dredge sample (White)	YKDT#150-S01	10:50	38°39.513'N	143°33.9213'E	3012 m	2 l pet-bottle modified by Y. Furushima, called ZAMA#2 sampler
Dredge sample (Yellow)	YKDT#150-S02	10:50	38°39.513'N	143°33.9213'E	3012 m	2 l pet-bottle modified by Y. Furushima, called ZAMA#1 sampler

#### YKDT#151

Sample	Sample ID	Time	Latitude	Longitude	Depth	Others
Dredge sample (Yellow)	YKDT#151-S01	15:50	39°26.5346'N	142°12.8655'E	329 m	2 l pet-bottle modified by Y. Furushima, called ZAMA#1 sampler
Dredge sample (White)	YKDT#151-S02	15:50	39°26.5346'N	142°12.8655'E	329 m	2 l pet-bottle modified by Y. Furushima, called ZAMA#2 sampler

The experimental results on board are as follows;

1. Microorganisms at the conditions of 50 MPa and/or 4°C are now growing.
2. A few colonies will be grown on the plates at RT.

#### 4. Future plan: All scientists

Based on cruise data and samples, we will analyse biological, ecological, chemical, geological and oceanographical studies to estimate impact by the 2011 mega-earthquake. These results not only science but also general cruise dialy will be published to various science activities, papaers, symposiums, workshops and etc, and via web pages, medias and so on. Detailed future studies are foloows.

Microbial diversity by Chiaki Kato & Chinatsu Zama)

We are going to analyze the microbial diversity for the bacterial and archeal communities using the extracted DNA. We also continue to cultivate microorganisms on the plates at atmospheric conditions, and in the liquid media under high-pressure and low temperature (50MPa and 4°C), for isolating novel piezophilic bacteria and the useful microorganisms. Then, we will conclude the changing of microbial diversity after 3.11 earthquake at Japan Trench.

TEAMS (Junji Kaneko)

From now we analyze this data (video data, picture data, biochemical data, topographical data, sediment data, etc.) biologically, biochemically, topographically, genetically,

And then we will publish research results about change of TOHOKU research area.

Especially about TOHOKU Marine Science Project data, we put this data on the web site for fisher, nation and scientist to share.

Haruka Shibata, Hiroshi Miyake(Kitasato University), Yasuo Furushima(JAMSTEC)

We would like to investigate distribution and composition of deep-sea litter from video footages that recorded by Deep-tow camera. We will discuss transportation of marine litter to deep-sea floor.

Tsuchida, Shinji:

Biodiversity and distribution patterns of benthic animals from 300 to 5800m depths Off Sanriku, Japan.

## **5. About data:**

Include any information that may be necessary for analysis and QC planning and secondary use (publications, provisions, etc.)

### **Notice on Using**

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

This cruise report is a preliminary documentation as of the end of the cruise.

This report may not be corrected even if changes on contents (i.e. taxonomic classifications) may be found after its publication. This report may also be changed without notice. Data on this cruise report may be raw or unprocessed. If you are going to use or refer to the data written on this report, please ask the Chief Scientist for latest information.

Users of data or results on this cruise report are requested to submit their results to the Data Management Group of JAMSTEC.