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R/V Hakuho Maru "Cruise Report"
KH-18-J02C

Researches on marine ecosystem dynamics in the Tsunami affected area off Sanriku

Off Sanriku

July 1, 2018 – July 9, 2018

Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
Project: Analyses of Changes in East Japan Marine Ecosystems,
Tohoku Ecosystem-Associated Marine Sciences (TEAMS)

Contents

1. Cruise Information

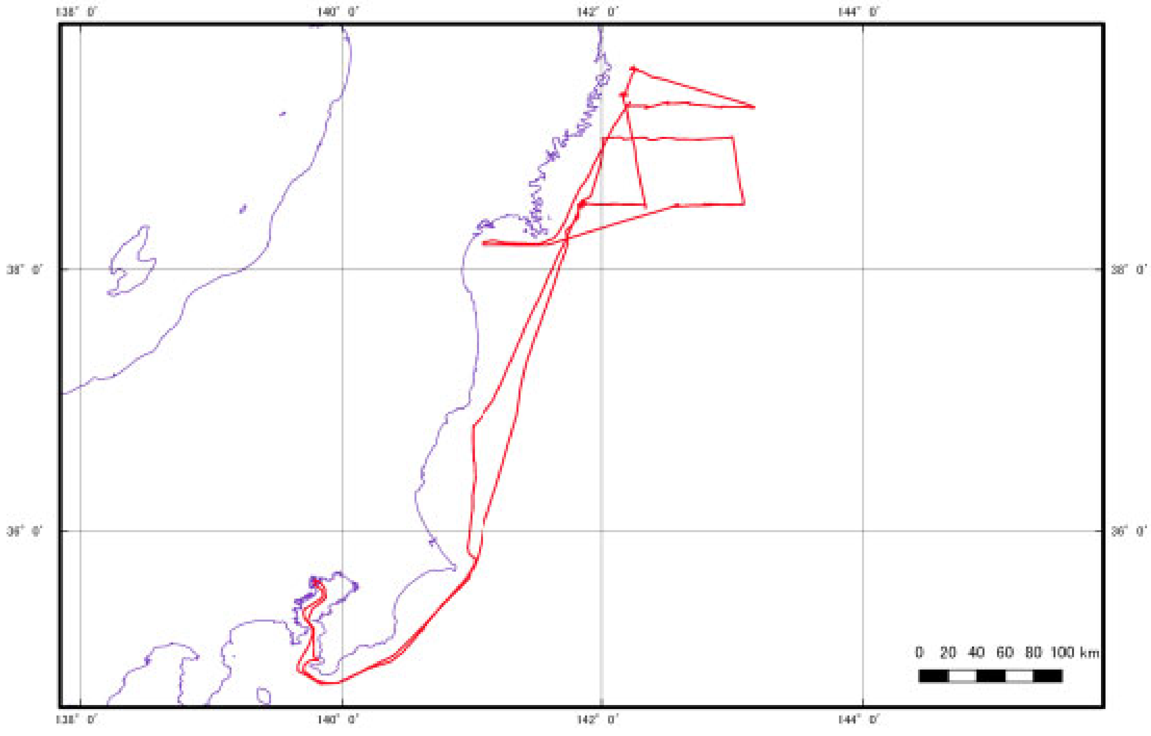
1.1 General Information

(1) Cruise ID KH-18-J02C
(2) Name of vessel R/V Hakuho Maru
(3) Title of the cruise Researches on marine ecosystem dynamics in the Tsunami affected area off Sanriku
(4) Title of proposal
Cruise Proposal Researches on marine ecosystem dynamics in the Tsunami affected area off Sanriku
Project Analyses of Changes in East Japan Marine Ecosystems, Tohoku Ecosystem-Associated Marine Sciences (TEAMS)
(5) Cruise period July 1st, 2018 ~ July 9th, 2018
(6) Ports of departure / call / arrival
Port of departure: Tokyo (July 1, 2017)
Port of arrival: Tokyo (July 9, 2017)

1.2 Research Area

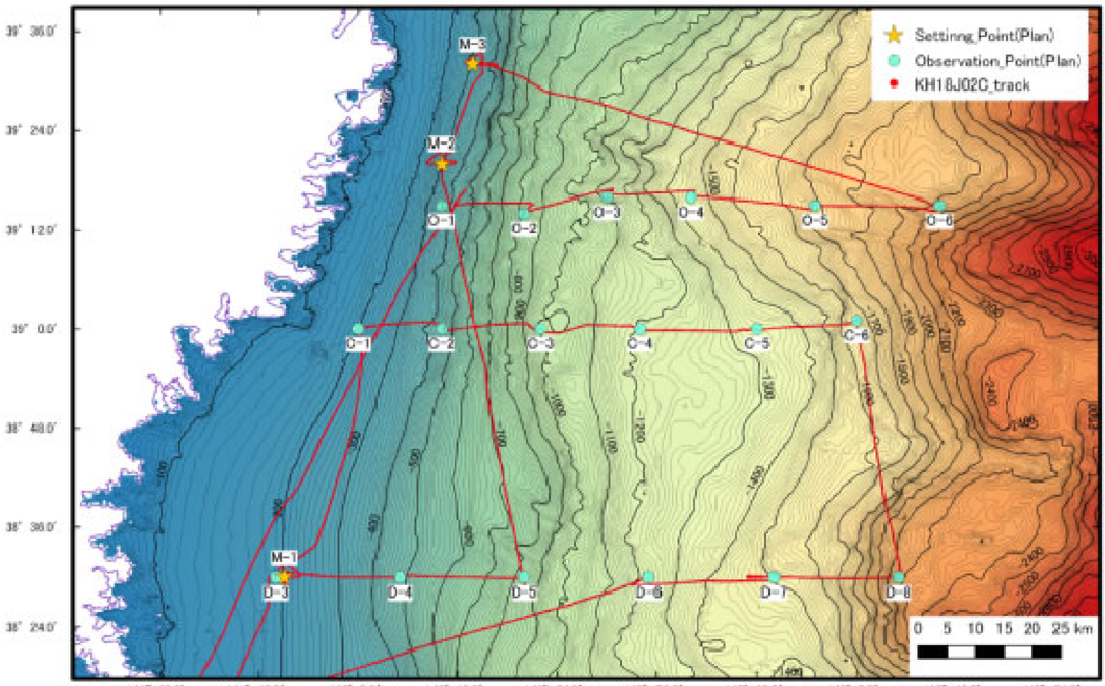
(1) Research area Off Sanriku
Research area surrounded by two latitude longitude lines, 38°00’N and 39°N, and two longitude lines,141°15’E and 144°00’E, without land.

(2) Cruise Track



[QGIS2.18.18] Datum: WGS-84, Scale: 1/2,000,000(A4) Datasource: Vessel GPS data[Copyright 2018 NME]

Fig. 1.2-1 Cruise Track of R/V Hakuho−Maru, KH−18−J02C, from 1st July, 2018 to 9th July.



[QGIS2.18.18] Datum: WGS-84, Scale: 1/350,000(A4) Datasource: Bathymetry data[Copyright 2018 NME]

Fig. 1.2-1 Research Map of R/V Hakuho−Maru, KH−18−J03C, from 20th Aug., 2018 to 29th Aug.
D-3(M-1):Hydorgraphic observation and Seasaw Mooring station
D-4~O-6: Hydorgraphic observation stations
M-2:Lander, ADCP and Seasaw Mooring and CTD observation station
M-3 :Lander Mooring station and CTD observation station

1.3 Cruise Log

Date	Local Time	Note	Position/Weather/Wind/Sea condition
01-Jul-18	14:00	Sail out, proceeding to research area from Daiba.	
	15:00	Briefing about ship's life and safety.	
	18:00	Cruise meeting with Hakuho-maru Crew.	
02-Jul-18	15:44	Arrived at off Sanriku.	7/2 12:00(UTC+9h)
	16:04 16:09	Deployed mooring SEASAW(M-1).	Southeastward of Kinkasan
	16:19 17:34	Calibration of mooring SEASAW position.	37-55.2N, 141-34.9E
	17:39 18:02	CTD cast (D-3).	Fine but Cloudy
	18:11 18:32	CTD cast (D-3).	ESE - 3 (Light air)
	19:03 19:18	Towed NORPAC net(D-3).	2 (Sea Smooth)
	20:39 21:10	CTD cast (D-4).	1 (Low Swell Short or Average)
	21:17 21:58	FRRF-RINKO observation(D-4).	Visibly: 7'
	22:08 22:26	Towed NORPAC net(D-4).	
	23:55 24:45	CTD cast (D-5).	
03-Jul-18	00:51 01:22	FRRF-RINKO observation(D-5).	7/3 12:00(UTC+9h)
	01:34 01:51	Towed NORPAC net(D-5).	Off Otsuchi
	05:35 06:08	MBES site survey(M-2 mooring deploy point).	39-32.2N, 142-13.0E
	06:35	Deployed LANDER(M-2).	Fine but Cloudy
	06:44 06:52	Deployed mooring SEASAW(M-2).	South - 5 (Fresh breeze)
	07:05 07:10	Deployed mooring ADCP(M-2).	3 (Sea Smooth)
	07:22 08:52	Calibration of mooring (SEASAW & ADCP) and LANDER position.	1 (Low Swell Short or Average)
	09:14 09:38	CTD cast (M-2).	Visibly: 4'
	09:46 10:11	FRRF-RINKO observation(M-2).	
	10:22 10:38	Towed NORPAC net(M-2).	
	11:37 12:27	MBES site survey(M-3 mooring deploy point).	
	12:54	Deployed LANDER(M-3).	
	13:05 13:49	Calibration of LANDER position.	
	14:00 14:29	CTD cast (M-3).	
	14:35 15:05	FRRF-RINKO observation (M-3).	

	15:12 15:28	Towed NORPAC net (M-3).	
	19:16 19:32	Towed NORPAC net (O-6).	
	19:04 20:30	CTD cast (O-6).	
	20:37 21:04	FRRF-RINKO observation (O-6).	
	22:16 22:41	FRRF-RINKO observation (O-5).	
	22:57 23:15	Towed NORPAC net (O-5).	
	22:48 24:02	CTD cast (O-5).	
04-Jul-18	01:26 01:44	Towed NORPAC net (O-4).	7/4 12:00(UTC+9h)
	01:17 02:27	CTD cast (O-4).	Eastward of Ofunato
	02:33 03:04	FRRF-RINKO observation (O-4).	39-05.0N, 142-05.0E
	04:10 04:39	FRRF-RINKO observation (O-3).	Overcast (Cloud 10)
	05:04 05:18	Towed NORPAC net (O-3).	SSW - 3 (Gentle breeze)
	04:50 05:45	CTD cast (O-3).	2 (Sea Smooth)
	07:04 07:20	Towed NORPAC net (O-2).	1 (Low Swell Short or Average)
	06:50 07:37	CTD cast (O-2).	Visibly: 1'
	07:47 08:10	FRRF-RINKO observation(O-2).	
	09:14 10:15	FRRF-RINKO observation(O-1).	
	09:48 10:15	CTD cast (O-1).	
	10:27 10:42	Towed NORPAC netv(O-1).	
		Com'ced proceeding to Shiogama bay because rough seastate.	
	17:17	Arrived at Shiogama bay.	
05-Jul-18	18:00	Com'ced proceeding to research area.	7/5 12:00(UTC+9h)
			Off Shiogama
			38-11.4N, 141-05.0E
			Overcast (Cloud 10)
			WSW - 4 (Moderate breeze)
			3 (Sea Smooth)
			1 (Low Swell Short or Average)
			Visibly: 7'
06-Jul-18	00:45 01:47	CTD cast (D-6).	7/6 12:00(UTC+9h)

	01:52 02:22	FRRF-RINKO observation (D-6).	Off Sanriku
	02:28 02:52	Towed NORPAC netv(D-6).	38-43.0N, 143-02.8E
	04:37 05:05	FRRF-RINKO observation (D-7).	Overcast (Cloud 10)
	05:10 05:32	Towed NORPAC netv(D-7).	ENE - 5 (Fresh breeze)
	05:44 06:52	CTD cast (D-7).	3 (Sea Smooth)
	08:36 10:05	CTD cast (D-8).	3 (Moderate Short)
	10:11 10:37	FRRF-RINKO observation (D-8).	Visibly: 6'
	13:46 14:56	CTD cast (C-6).	
	15:55 16:55	CTD cast (C-5).	
	18:02 18:58	CTD cast (C-4).	
	20:00 20:46	CTD cast (C-3).	
	21:50 22:18	CTD cast (C-2).	
	23:30 23:50	CTD cast (C-1).	
07-Jul-18	06:03 06:19	FRRF-RINKO observation (D-3).	7/7 12:00(UTC+9h)
	09:01 09:17	FRRF-RINKO observation (D-3).	Off Sanriku
	12:00 12:16	FRRF-RINKO observation (D-3).	38-30.0N, 141-50.0E
	14:59 15:15	FRRF-RINKO observation (D-3).	Fog
	18:00 18:15	FRRF-RINKO observation (D-3).	ESE - 3 (Gentle breeze)
		Finished KH-18-J02C cruise and then proceeding Keihin bay.	1 (Calm)
			1 (Low Swell Short or Average)
			Visibly: 1'
08-Jul-18		Proceeding to Keihin bay.	7/8 12:00(UTC+9h)
			Off Inubozaki
			35-45.1N, 141-01.2E
			Fine but Cloudy
			South - 3 (Gentle breeze)
			2 (Sea Smooth)
			1 (Low Swell Short or Average)
			Visibly: 6'
09-Jul-18	10:00	Arrived at Ariake pier of Keihin bay.	

2. Researchers

(1) Chief scientist

Shuichi Watanabe

Project Team for Analyses of Changes in East Japan Marine Ecosystems, JAMSTEC

(2) Representative of the science party

Chief Scientist of Cruise Proposal

Shinji Tsuchida

Project Team for Analyses of Changes in East Japan Marine Ecosystems, Tohoku Ecosystem-Associated Marine Sciences

Project

Team for Analyses of Changes in East Japan Marine Ecosystems, JAMSTEC

Project Leader

Katsunori Fujikura

Director, Project Team for Analyses of Changes in East Japan Marine Ecosystems, Tohoku Ecosystem-Associated Marine Sciences

(3) Science party

Scientists and Technicians on board

Shuichi WATANABE	(Project Team for Analyses of Changes in East Japan Marine Ecosystems, JAMSTEC)
Kazumasa OGURI	(Project Team for Analyses of Changes in East Japan Marine Ecosystems, JAMSTEC)
Yasuo FURUSHIMA	(Project Team for Analyses of Changes in East Japan Marine Ecosystems, JAMSTEC)
Mitsuteru KUNO	(Nippon Marine Enterprises, LTD.)
Tomohide NOGUCHI	(Marine Works Japan)
Rei Ito	(Marine Works Japan)
Shungo OSHITANI	(Marine Works Japan)
Yasuhiro ARII	(Marine Works Japan)
Atsushi ONO	(Marine Works Japan)
Youhei KATAYAMA	(Marine Works Japan)

Scientists on land

Masahide WAKITA	(Project Team for Analyses of Changes in East Japan Marine Ecosystems, JAMSTEC)

and

Members of Project Team for Analyses of Changes in East Japan Marine Ecosystems, Tohoku Ecosystem-Associated Marine Sciences

(4) “Hakuho-Maru” Crew member

Kazuhiko KASUGA	Captain
Naoto SAKAI	Chief Officer
Makoto SATO	1st officer
Kazuhiko ITABASHI	2nd Officer
Yutaka SHINOHARA	Jr. 2nd Officer
Yumihiko KOBAYASHI	3rd Officer
Haruhiro SHIBATA	Jr. 3rd Office
Hironori FUNATSU	Chied Engineer
Goro MIYAMOTO	1st Engineer
Ryuzou MIKAMI	Jr. 1st Engineer
Takamasa OCHIAI	2nd Engineer
Shota SAKAMOTO	Jr. 2nd Engineer

Kazuki ONO	3rd Engineer
Yohei YAMAMOTO	Chief Electronics Officer
Takumi YAMAGUCHI	Electronics Operator
Shintaro NISHIDATE	Boat Swain
Yukio KAWANA	Associate Boat Swain
Hiroyuki OGAWA	Associate Boat Swain
Yukihiro TERASAKA	Associate Boat Swain
Naoki KATO	Quarte Master
Hideaki NAKATA	Quarte Master
Daisuke YAMAMOTO	Quarte Master
Koki UCHIYAMA	Sailor
Kenji NAKAJIRI	No.1 Oiler
Minoru YOSHIDA	No.2 Oiler
Sakae YOSHIDA	No.3 Oiler
Yu ABE	No.4 Oiler
Masaki TANAKA	No.5 Oiler
Keishiro KAI	No.6 Oiler
Shogo IIBOSHI	No.7 Oiler
Hayate MAEKAWA	Machineman
Yasutaka YAMADA	Chief Steward
Takumi HAYASHI	Steward
Seiji HONDA	Steward
Yoshie HIDAKA	Steward
Koji MORI	Steward

3. Observation

3.1. Overview

The project of Tohoku Ecosystem-Associated Marine Sciences (TEAMS) aims to investigate marine ecosystems that were drastically changed by the disaster, to understand the process of recover from the damages of the Earthquake, and to help the reconstruction and sustainable development of fisheries. For achieving that projects objectives, the roles of our unit, Research Unit for Ecosystem Monitoring, is to research the basic hydrographic structure and the long-term change of marine environments, to conduct the geographical survey, and so on.

In the KH-18-J02C cruise, we moored two Landers, an ADCP and two SEA-SAW off Sanriku to obtain variation of temperature, salinity, current and others for ecosystem model. We also conducted the hydrographic observation using CTD-system to obtain the hydrographic information at 20 stations and collected zooplankton.

3.2. List of the observations and activities

(1) CTD observation.
(2) Continuous surface hydrographic observation using CT system equipped on board.
(3) Assessment of phytoplankton photosynthesis by fast repetition rate fluorometer (FRRF).
(4) Zooplankton collecting using NORPAC net.
(5) Survey of zooplankton distribution with quantitative echo sounder equipped on-board.
(6) Deploying Lander, ADCP and SEASAW off Sanriku.
(7) Bathymetric survey by Multi-narrow Beam Echo Sounding system (MBES) and SeaBeam equipped on-board around mooring sites.

3.3. Shipboard observation and survey
3.3.1 Continuous surface hydrographic observation

Shuichi WATANABE (JAMSTEC)
Masahide WAKITA (JAMSTEC)

(1) Objects

The objective of continuous surface hydrographic observation is collecting continuous hydrographic data along curies track for understanding the sea surface environment.

(2) Equipment

Data of temperature and salinity in the sea surface was collected with TC sensor, ACTW CAR of JFE Advantech Co., Ltd. on board. Surface seawater was pump up from the bottom of ship for research. Those date was collected by ship crews.

(3) Result

Variations of temperature and salinity obtained during KH-18-J02C cruise are shown in Fig. 3.3.1-1.

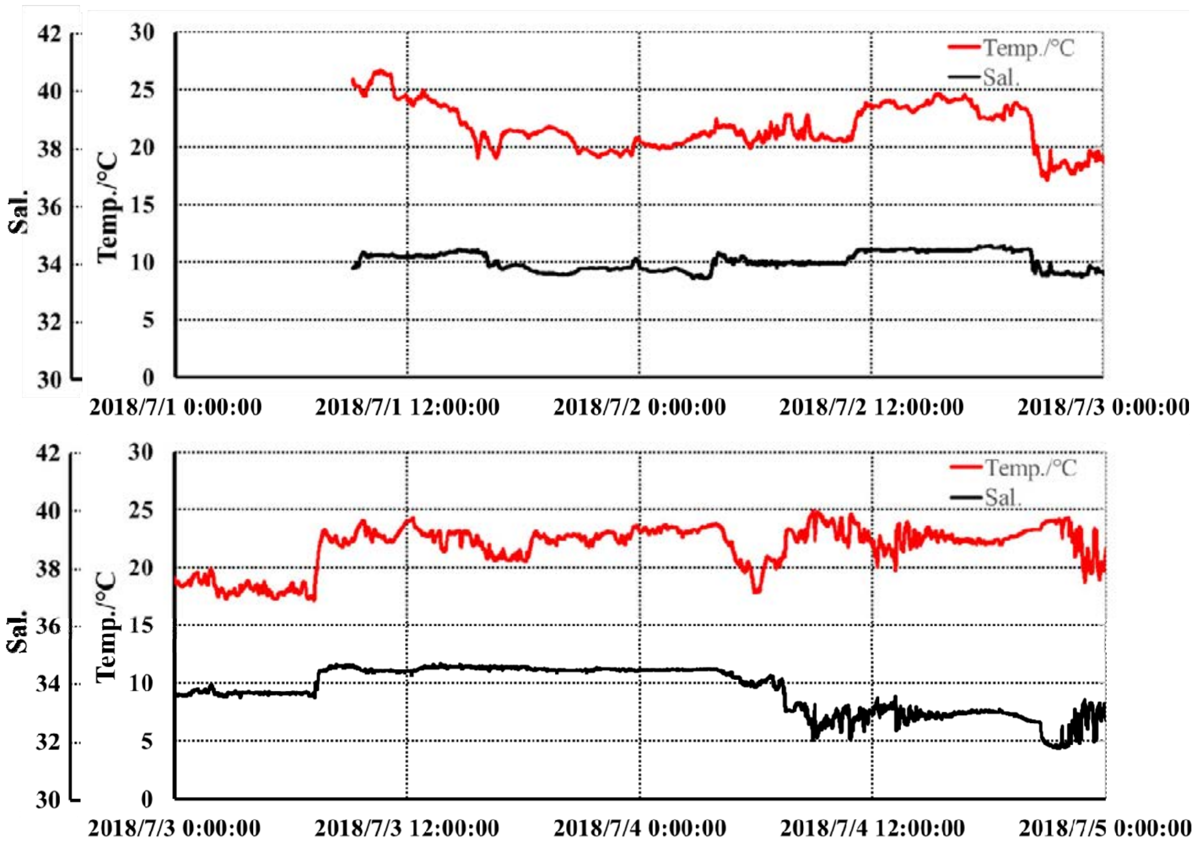


Fig. 3.3.1-1. Variations of temperature and salinity obtained during KH-18-J02C cruise

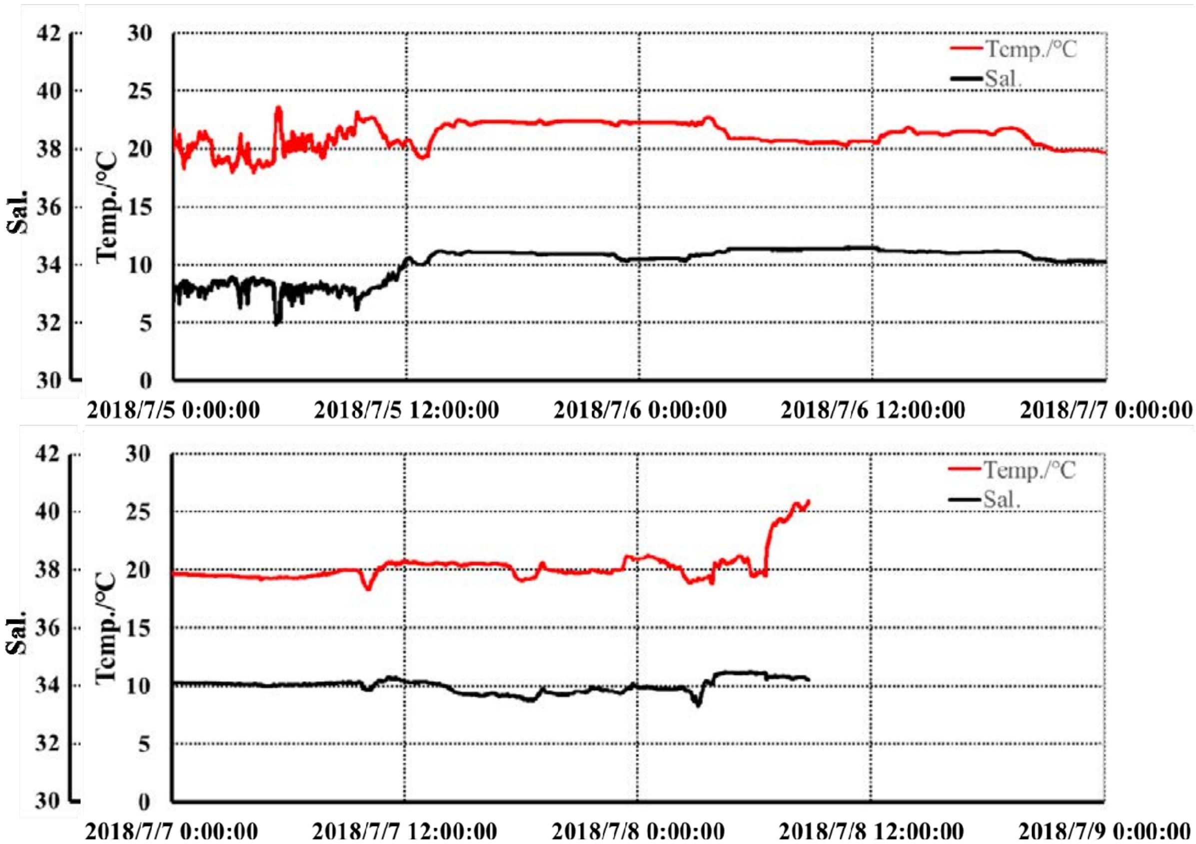


Fig. 3.3.1-1. Variations of temperature and salinity obtained during KH-18-J02C cruise (continue)

3.4. Hydrographic observations

3.4.1. CTD observation

Shuuichi WATANABE	(JAMSTEC): Principal investigator
Masahide WAKITA	(JAMSTEC)
Shungo OSHITANI	(MWJ): Operation leader
Rei Ito	(MWJ)
Tomohide NOGUCHI	(MWJ)
Yasuhiro ARII	(MWJ)
Atsushi ONO	(MWJ)
Youhei KATAYAMA	(MWJ)

(1) Objective

Investigation of oceanic structure.

(2) Parameters

Temperature
Conductivity
Pressure
Dissolved Oxygen
Dissolved Oxygen voltage
Fluorescence
Altimeter

(3) Instruments and Methods

CTD/Carousel Water Sampling System, which is a 24-position Carousel water sampler frame with Sea-Bird Electronics, Inc. CTD (SBE9plus), was used during this cruise.

The sensors attached on the CTD were temperature, conductivity, pressure, dissolved oxygen (SBE43), fluorescence and altimeter. The Practical Salinity was calculated by measured values of pressure, conductivity and temperature.

The CTD raw data were acquired on real time using the Seasave-Win32 (ver.7.23.2) provided by Sea-Bird Electronics, Inc. and stored on the hard disk of the personal computer. 21 casts of CTD measurements were conducted (Table 3.4.1-1).

Data processing procedures and used utilities of SBE Data Processing-Win32 (ver.7.23.2) and SEASOFT were as follows:

(The process in order)

DATCNV: Convert the binary raw data to engineering unit data. DATCNV also extracts bottle information where scans were marked with the bottle confirm bit during acquisition. The duration was set to 2.0 seconds, and the offset was set to 0.0 seconds.

WILDEDIT: Mark extreme outliers in the data files. The first pass of WILDEDIT obtained an accurate estimate of the true standard deviation of the data. The data were read in blocks of 1000 scans. Data greater than 10 standard deviations were flagged. The second pass computed a standard deviation over the same 1000 scans excluding the flagged values. Values greater than 20 standard deviations were marked bad. This process was applied to pressure, depth, temperature, conductivity and dissolved oxygen voltage (SBE43).

FILTER: Perform a low pass filter on pressure with a time constant of 0.15 second. In order to produce zero phase lag (no time shift) the filter runs forward first then backward

WFILTER: Perform a median filter to remove spikes in the fluorescence data. A median value was determined by 49 scans of the window.

ALIGNCTD: Convert the time-sequence of sensor outputs into the pressure sequence to ensure that all calculations were made using measurements from the same parcel of water. Dissolved oxygen data are systematically delayed with respect to depth mainly because of the long time constant of the dissolved oxygen sensor and of an additional delay from the transit time of water in the pumped pluming line. This delay was compensated by 3.0 seconds advancing dissolved oxygen sensor (SBE43) output (dissolved oxygen voltage) relative to the temperature data.

CELLTM: Remove conductivity cell thermal mass effects from the measured conductivity. Typical values used were thermal anomaly amplitude alpha = 0.03 and the time constant 1/beta = 7.0.

LOOPEDIT: Mark scans where the CTD was moving less than the minimum velocity of 0.1 m/s (traveling backwards due to ship roll).

DERIVE: Compute the Practical Salinity, sigma-theta and potential temperature.

BINAVG: Average the data into 1-dbar pressure bins.

Configuration file: kh-18-j02a.xmlcon

Specifications of the sensors are listed below.

CTD: SBE911plus CTD system

Under water unit:

SBE9plus (S/N 09P34568-0750, Sea-Bird Electronics, Inc.)

Pressure sensor: Digiquartz pressure sensor (S/N 89961)

Calibrated Date: 17 Apr 2018

Temperature sensors:

Primary: SBE03plus (S/N 03P4378, Sea-Bird Electronics, Inc.)

Calibrated Date: 08 Mar. 2017

Secondary: SBE03plus (S/N 03P5124, Sea-Bird Electronics, Inc.)

Calibrated Date: 04 Mar. 2017

Conductivity sensors:

Primary: SBE04C (S/N 042732, Sea-Bird Electronics, Inc.)

Calibrated Date: 08 Mar. 2017

Secondary: SBE04C (S/N 044045, Sea-Bird Electronics, Inc.)

Calibrated Date: 10 Mar. 2017

Dissolved Oxygen sensor:

Primary: SBE43 (S/N 430781, Sea-Bird Electronics, Inc.)

Calibrated Date: 14 Apr. 2018

Secondary: SBE43 (S/N 433304, Sea-Bird Electronics, Inc.)

Calibrated Date: 17 Jun. 2017

Fluorescence:

Chlorophyll Fluorometer (S/N 3523, Seapoint Sensors, Inc.)

Altimeter:

Benthos PSA-916T (S/N 62216, Teledyne Benthos, Inc.)

Deck unit: SBE11plus (S/N 11P12217-0386, Sea-Bird Electronics, Inc.)

(4) Preliminary Results

During this cruise, 21 casts of CTD observation were carried out. Date, time and locations of the CTD casts are listed in Table 1. During this cruise, we judged noise, spike or shift in the data of some cast. The data shifts observed are listed as follows.

M1_1 (down cast 42-59 dbar): Temperature (Primary Secondary)
(down cast 41-59 dbar): Conductivity (Primary Secondary)
(down cast 40-60 dbar): Dissolved Oxygen (Primary Secondary)

O4_1 (up cast 404-271 dbar): Conductivity (Primary)
(up cast 415-1 dbar): Conductivity (Secondary)

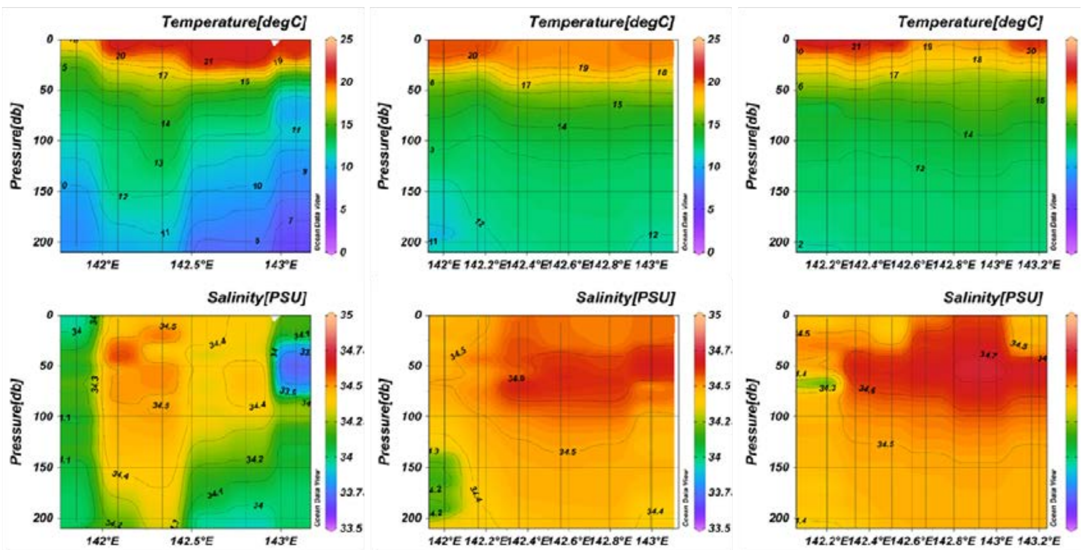
Temperature and salinity sections distributions above 300m depth along observation lines are shown in Fig. 3.4.1-1.

(5) Data archive

These data obtained in this cruise will be submitted to the Data Management Group of JAMSTEC, and will be opened to the public via “Data Research System for Whole Cruise Information in JAMSTEC (DARWIN)” in JAMSTEC web site.
<http://www.godac.jamstec.go.jp/darwin>

Table 3.4.1-1. KH-18-J02C CTD casttable

Stnnbr	Castno	Date(UTC) (mmddyy)	Time(UTC) Start	End	BottomPosition Latitude	Longitude	Depth	Wire Out	HT Above Bottom	Max Depth	Max Pressure	CTD Filename
M-1	1	070218	08:40	09:02	38-30.34N	141-51.16E	210.2	198.2	9.8	200.4	202.0	M1_1
M-1	2	070218	09:11	09:32	38-30.54N	141-51.23E	211.3	199.2	9.9	201.4	203.0	M1_2
D-4	1	070218	11:38	12:10	38-30.07N	142-05.00E	486.2	475.9	8.4	477.8	482.0	D4_1
D-5	1	070218	14:55	15:44	38-29.48N	142-20.08E	841.2	832.6	8.2	833.0	841.0	D5_1
M-2	1	070318	00:14	00:38	39-20.80N	142-10.31E	299.3	289.0	8.7	290.6	293.0	M2_1
M-3	1	070318	05:01	05:28	39-32.01N	142-15.22E	344.2	334.1	9.0	335.2	338.0	M3_1
O-6	1	070318	10:04	11:30	39-14.71N	143-09.82E	2007.2	2000.7	9.2	1998.0	2023.0	O6_1
O-5	1	070318	13:48	15:02	39-14.62N	142-54.95E	1758.8	1752.9	8.7	1750.1	1771.0	O5_1
O-4	1	070318	16:18	17:26	39-16.34N	142-40.16E	1481.3	1480.4	8.9	1472.4	1489.0	O4_1
O-3	1	070318	19:50	20:45	39-16.72N	142-30.45E	1116.7	1115.2	10.2	1106.5	1118.0	O3_1
O-2	1	070318	21:50	22:37	39-14.41N	142-20.35E	875.5	872.4	11.9	863.6	872.0	O2_1
O-1	1	070418	00:47	01:15	39-16.02N	142-12.24E	426.1	417.0	9.7	416.4	420.0	O1_1
D-6	1	070518	15:46	16:47	38-29.96N	142-34.72E	1228.2	1222.6	9.1	1219.1	1232.0	D6_1
D-7	1	070518	20:45	21:52	38-30.00N	142-47.62E	1479.1	1476.1	8.5	1470.6	1487.0	D7_1
D-8	1	070518	23:38	01:04	38-30.41N	143-05.02E	2142.1	2142.0	8.4	2133.7	2161.0	D8_1
C-6	1	070618	04:46	05:56	39-00.68N	142-59.03E	1600.4	1606.4	7.8	1592.6	1611.0	C6_1
C-5	1	070618	06:56	07:55	38-59.90N	142-46.66E	1303.9	1308.4	8.9	1295.0	1309.0	C5_1
C-4	1	070618	09:02	09:58	39-00.25N	142-33.19E	1191.1	1190.5	8.5	1182.6	1195.0	C4_1
C-3	1	070618	11:00	11:46	39-00.12N	142-21.03E	937.4	939.6	7.6	929.8	939.0	C3_1
C-2	1	070618	12:50	13:18	39-00.34N	142-09.62E	438.2	427.3	8.9	429.3	433.0	C2_1
C-1	1	070618	14:30	14:50	39-00.21N	142-00.09E	199.5	188.0	8.1	191.4	193.0	C1_1



D-line C-line O-line

Fig. 3.4.1-1. Temperature and salinity sections distributions above 300m depth along observation lines.

3.5. Vertical Fast repetition rate fluorometry (FRRF) observations

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Yasuhiro ARII (MWJ)
Atsushi ONO (MWJ)
Youhei KATAYAMA (MWJ)

(1) Objective

During the past decade, the utilization of active fluorescence techniques in biological oceanography brought significant progress in our knowledge of phytoplankton productivity in the oceans. Above all, the fast repetition rate (FRR) fluorometry reduces the primary electron acceptor (Qa) in photosystem II (PSII) by a series of subsaturating flashlets and can measure a single turnover (ST) fluorescence induction curve in PSII. The PSII parameters, such as the potential photosynthetic activity (Fv/Fm) and the functional absorption cross-section of PSII, derived from the ST fluorescence induction curve can be used to estimate gross primary productivity. In the present study, to gain a better understanding of variability in phytoplankton productivity off the Sanriku, we measured the PSII parameters and primary productivity using the FRR fluorometry.

(2) Methods

Using the FRR fluorometer (Kimoto Electric Co., Ltd., Japan), the vertical variation in PSII parameters and primary productivity were examined off the Sanriku. The FRR fluorometer attached to the RINKO profiler (JFE Advantech Co., Ltd.) was moved up and down between surface and 200 m at the rate of 0.2 m s-1 using a ship winch. The RINKO profiler can measure the vertical profiles of water temperature, salinity, pressure, dissolved oxygen, chlorophyll and turbidity. The profiling rate of the observation buoy was set to minimal to detect small scale variations (~0.5 m) in measurements.

(3) Preliminary result

The distributions of Temp., Salinity and Chl-a abundance obtained RINKO profiler are shown in Fig. 3.5-1.

(4) Data Archive

All data will be submitted to JAMSTEC Data Management Office (DMO) after data quality control.

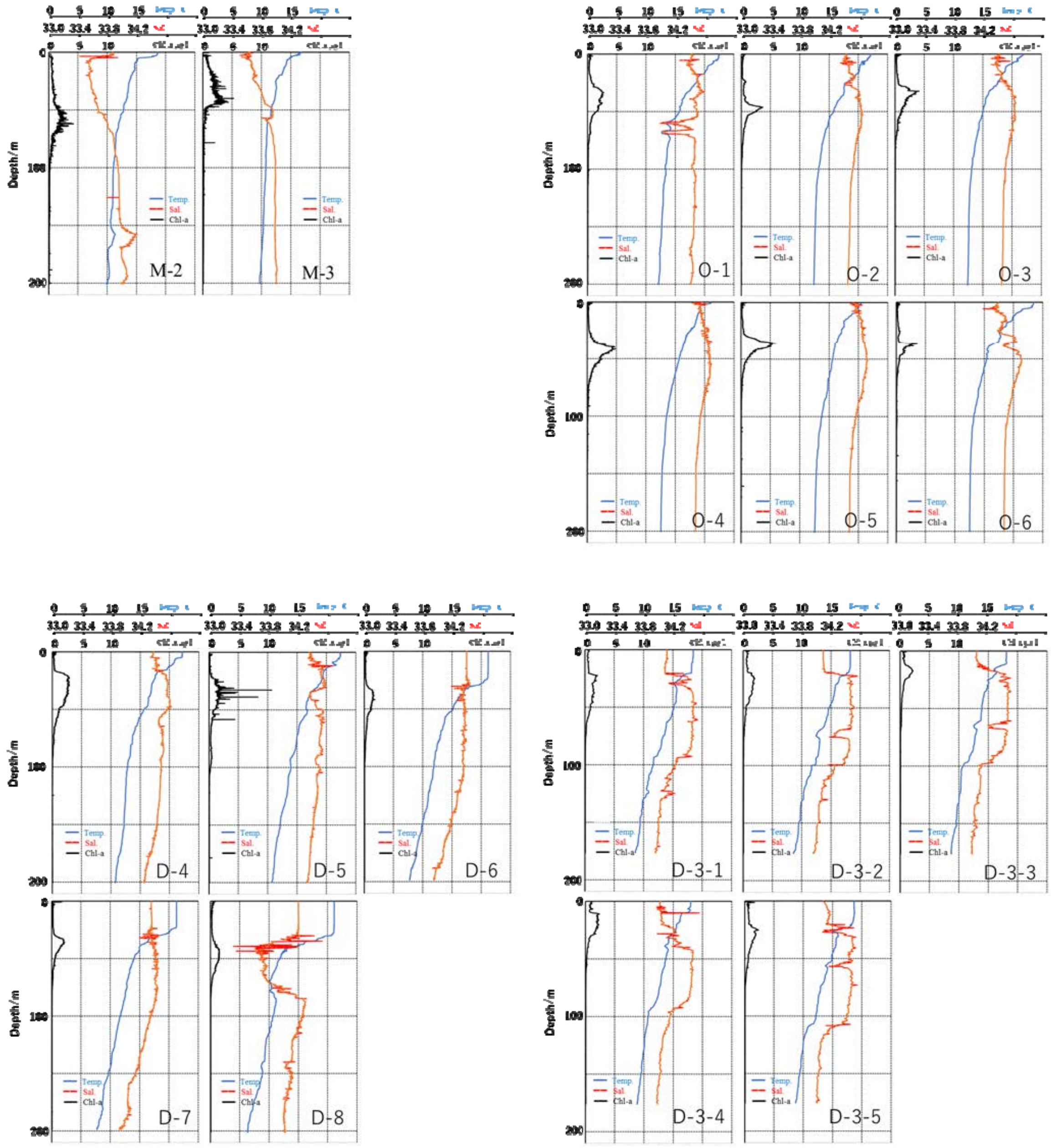

Fig.3.5-1 Vertical profiles of Temp., Salinity and Chl-a abundance obtained from RINKO profiler at Sta. M-2, M-3, and stations along D-line.

Right under profiles: Time series observation at Sta. D-3.

3.6. Zooplankton distribution by NORPAC net and quantitative echo sounder (QES)

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Shungo OSHITANI	(MWJ)
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Yasuhiro ARII	(MWJ)
Atsushi ONO	(MWJ)
Youhei KATAYAMA	(MWJ)
Mitsuteru KUNO	(Nippon Marine Enterprises, LTD.)

(1) Objectives

The objective of this study is to estimate zooplankton abundances and species richness in winter off Sanriku of the north-eastern Japan. Zooplankton abundances and species richness were measured with microscopy for large size phytoplankton and is compared against the zooplankton distribution by quantitative echo sounder (QES).

(2) Sampling by NORPAC net

Samplings were vertically hauled by using a NORPAC net (335 μm mesh, NMG52) with a cod end. Plankton samplings were carried out at all CTD-water sampling stations. Plankton sample were placed in 500 ml plastic bottle and were fixed with neutral-buffered formalin solution (10% final concentration). The microscopic measurements are scheduled after the cruise.

(3) Observation by QES

In comparison with zooplankton distribution during a part of NOPAC net samplings, we tried to operate the scientific echo sounder system equipped on board. However, we don't know how to use QES and have not obtained enough recorded data for the analysis.

(4) Preliminary result

Zooplankton sample was obtained at 11 stations (Sta. D-3, D-4, D-5, M-2, M-3, O-1, O-2, O-3, O-4, O-5, O-6). Two samples were lost doe to broken cod end bag (rubber tube) at Sta. D-6 and D-7.

No result was obtained on board. The distributions of zooplankton abundance will be determined as soon as possible after this cruise.

Images of QES at NORPAC net stations are shown in Fig. 3.6-1.

(5) Data Archive

All data will be submitted to JAMSTEC Data Management Office (DMO) after data quality control.

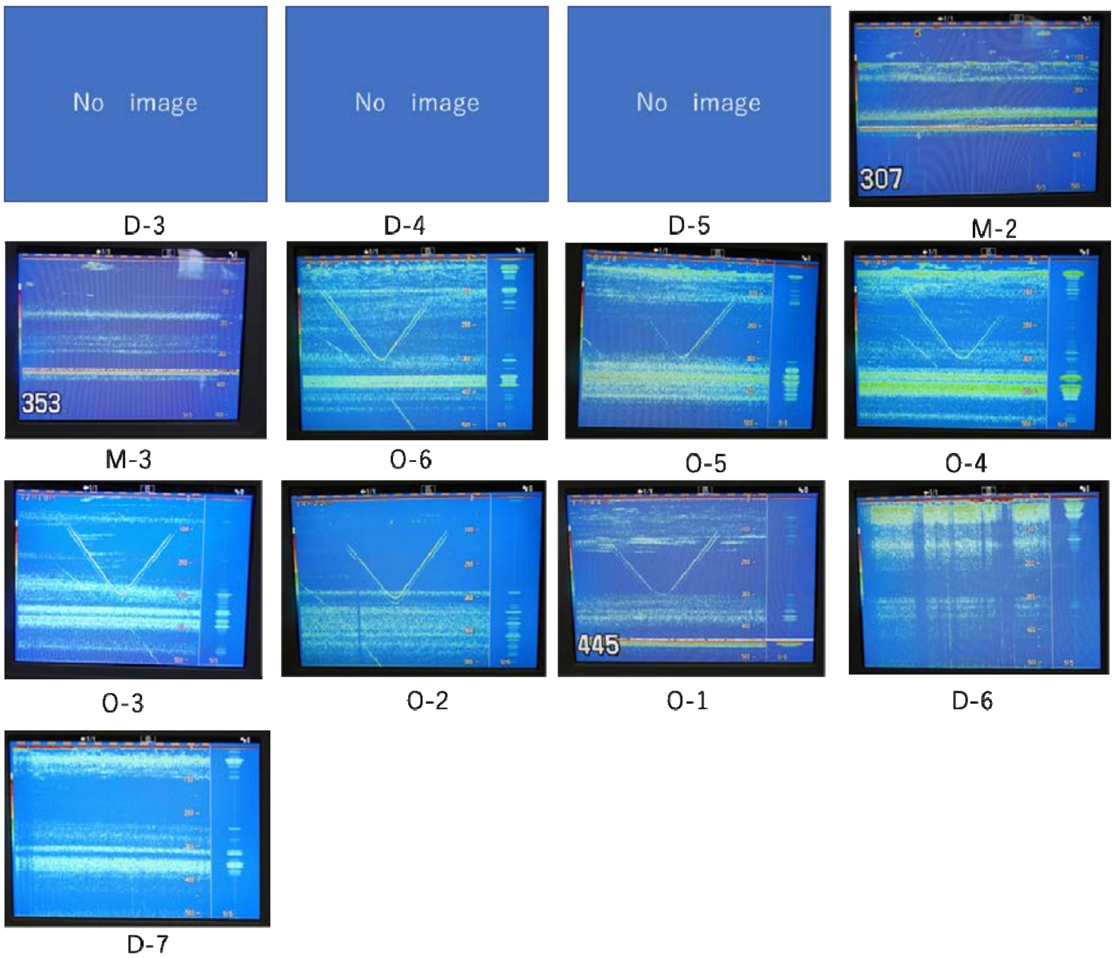

Fig. 3.6-1. Images of QES at NORPAC net stations

3.7. Deployment of mooring systems

In this cruise, we deployed two Lander systems, two SEASAW mooring systems and an ADCP mooring systems off Sanriku to understand the ocean environment in the summer. We also tested to obtain available data for fishery from deployed instruments. Each instruments and deployment information are as follow.

3.7.1. Lander

Kazumasa OGURI (JAMSTEC)

(1) Objective

To understand changes at lower continental slope influenced by marine environments changes and unexpected events such as earthquakes at sea floor, a lander system installed monitoring instruments is deployed in lower continental slope, off Otsuchi bay.

(2) The lander

The lander frame was equipped with titanium pipes to prevent electrolytic corrosion during the deployment. Glass spheres are mounted on upper part of the frame, and iron ballast was attached under an acoustic releaser (BX-1003, Kaiyo-denshi). ADCP-CTD-DO turbidity sensors (RDCP600, Xyrem) and the battery are put on the top of the frame. On the side, a HDTV camera and two LED lights (Handmade) are mounted. The electric power for the camera and the lights are supplied from Li-ion battery (14.8 V/40Ah, Handmade) placed on the payload. The lander recovery is carried out to release the ballast sending the acoustic command to the releaser. In case the releaser does not work and to identify exact location to ROV, ROV homer is attached. To identify the location when the lander is ascended on the sea surface by ballast release on schedule or any troubles, ARGOS transmitter is attached. Detailed information of the lander and the instruments are shown in tables 3.7.1-1.

Table 3.7.1-1. The lander weights.

	Weight in air with ballast (kg)	Weight in air without ballast (kg)	Weight in fresh water with ballast (kg)	Weight in fresh water without ballast (kg)
Lander 1	361.2	275.6	52.0	-23.4
Lander 2	290	210	40.4	-294

(3) The deployment and the location

Lander 1 in Sta. M-2 and Lander 2 in Sta. M-3 were deployed at 6: 35 (JST) and at 12:54 (JST) on 3rd July, respectively.

The landed location was determined by three-point survey (Table 3.7.1-2).

Table 3.7.1-2. Location of the lander.

	Latitude	Longitude	Water depth
Lander 1	39° 20.078'N	142° 10.038'E	297 m
Lander 2	39° 32.040'N	142° 14.937'E	334 m

(4) Data Archive

The data, photos and videos will be obtained after the recovery of the lander.

All data will be submitted to JAMSTEC Data Management Office (DMO)

Photo. 3.7.1-1. The lander system (Lander 1) moored at sta. M-2.

Photo. 3.7.1-2. The lander system (Lander 2) moored at sta. M-3.

3.7.2. ADCP

Yasuo FURUSHIMA (JAMSTEC)

The purpose of this research cruise was to reveal the fluctuations of the flow environment off Sanriku by ADCP, and to correlate them with the construction of the ecosystem model. An ADCP (Teledyne RD Instruments Workhorse Sentinel, 300 kHz) mooring system (Fig.3.7.2-1) was installed off Otsuchi bay (depth: 296m) at Iwate prefecture. The recovery of ADCP mooring system is going to be performed in the end of August.

The ADCP measurements used 10 min sounding intervals, and the current profiling range consisted of 60 layers with a 2 m thickness. The deepest measurement layer (depth: about 246m) in the water column was located 50m above the seafloor. The upper layer of the current profiling by the ADCP was located at 120 m above the apparatus.

The installation positions of ADCP mooring system are as follows.

Installation (calibration) position:
39°20.084'N 142°09.952’E
Input position:
39°20.126'N 142°09.967’E
Depth: 296m

Releasers ID numbers are 152 and 153.

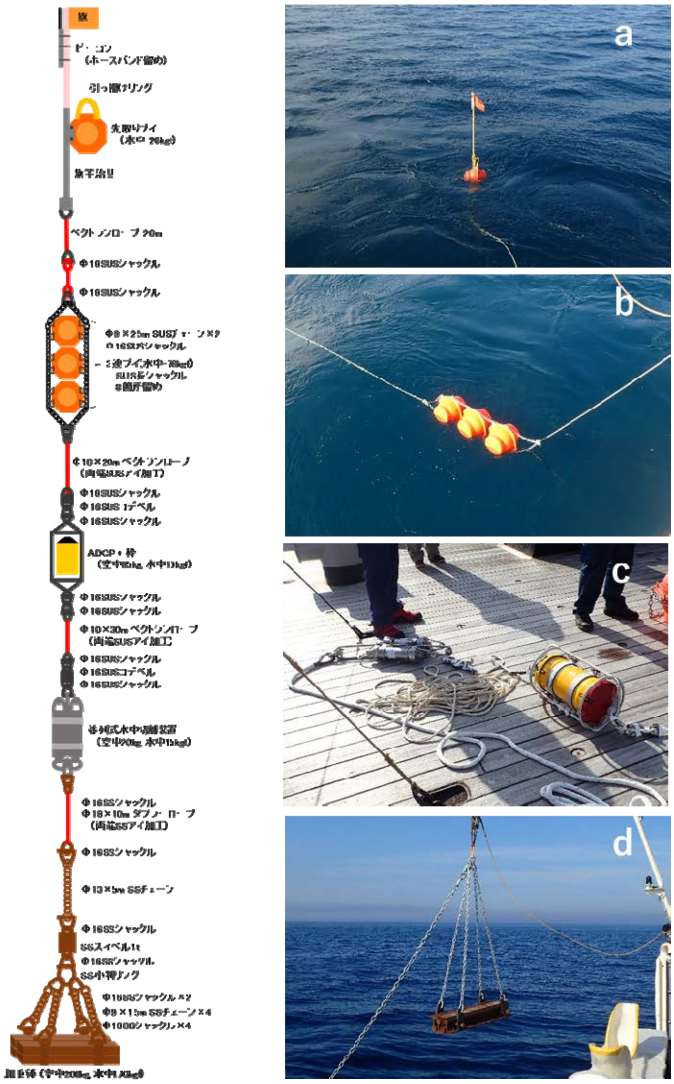

Fig. 3.7.2-1 Schematic view of ADCP mooring system (right) and photographs.
a: Top buoy with Argos beacon
b: Glass buoy
c: ADCP & releasers
d: Anchor (200kg)

3.7.3. SEASAW

Shuichi WATANABE (JAMSTEC)

(1) Objective

To understand ocean environmental variation off Sanriku and to obtain useful data for fishery, two SEASAW systems installed CT sensor were deployed off the bay of Onagawa and Otsuchi.

(2) SEASAW

The SEASAW deployed in this cruise is the self-up/down winch type buoy produced by NiGK corporation and installed CTD sensor (ACTD-RS) made by JFE Advantech Co., Ltd. (Fig. 3.7.3-1). NiGK's SEASAW is developed to observe temperature and salinity change in the coastal area. Top buoy of SEASAW is moving in seawater column. That performance on catalog as follow,

/max. working depth of water: 100m
/travel distance: total 20,000m (100profiles/100m-column)
/winch rope: high molecular weight polyethlene rope
O.D. 2.2mm, braling force 450kgf, length 150m
/installation sensor: CTD sensor (ACTD-RS) made by JFE Advantech Co., Ltd.
/interface of sensors: RS-232C, MCBH-5FS, 5, 12 or 24VDC
/Battery: EI-Li battery pack (24VDC, 60AH).

Deplyed SEASAW mooring system was shown in Fig. 3.7.3.1. We designed this system obtained temperature and salinity during 30 to 150m depth at mooring site. Top of glass spheres mounted TC and depth sensors (Fig. 3.7.3.1.b). TC and depth sensors were INFINITY CT and Def2-D made by JFE Advantech Co., Ltd., respectively.

SEASAW winch moves plan was set as follow,

/number: three times (midnight-noon-midnight） during 2 days
/start: at midnight 10th July 2018
/end: at midnight 22nd Aug. 2018
/working distance: form 30 to 150m depth.

Acoustic Releasers ID numbers (Model-SMC, NiGK corporation) are 164 and 163 in Sta. M-1 and 150 and 151 in Sta. 2.

(5) The deployment and the location

Two SEASAWs were deployed at 16:00 (JST) 2nd June and at 07:30 (JST) 3rd June.
The landed location was determined by three-point survey (Table 3.7.3-1).

Table 3.7.3-1. Location of SESAW.

	Latitude	Longitude	Water depth
SEASAW at M-1	38°30.028'N	141°50.863'E	206 m
SEASAW at M-2	39°19.977'N	142°09.972'E	297 m

(6) Data Archive

All data will be obtained after the recovery of the SEASAW.

Those data will be submitted to JAMSTEC Data Management Office (DMO) after data quality control.

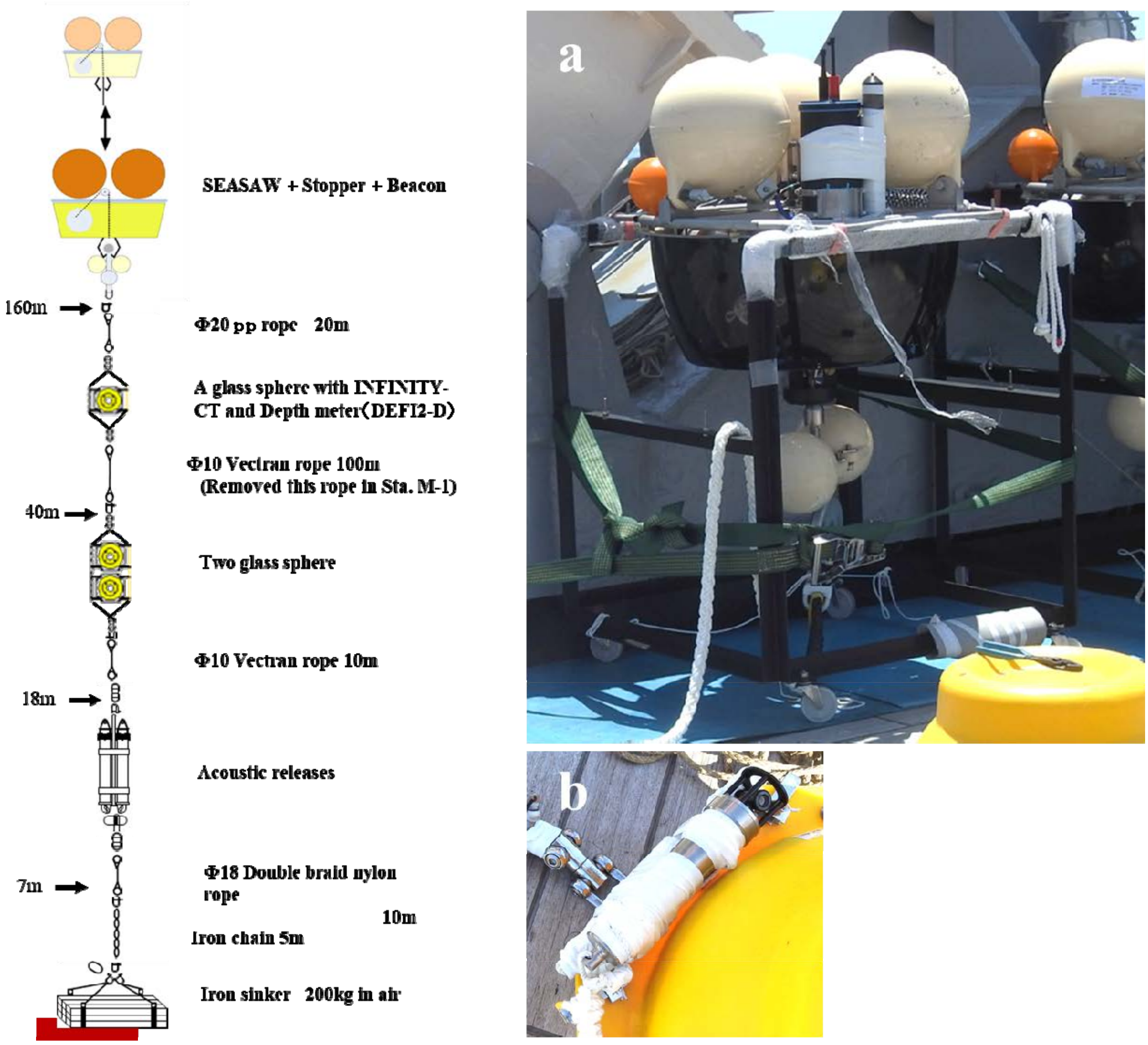

Fig. 3.7.3-1. SEASAW moring system and and photographs.
a: Deployed SEASAW
b: TC and depth sensors on glass sphere

4. 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.