Preliminary Report
of
The Hakuho Maru Cruise
KH-01-1
KH-02-2
KH-04-2

KH-01-1: July 09, 2001 - July 27, 2001
(Eel Cruise IX)
KH-02-2: July 05, 2002 - Aug.15, 2002
(Eel Cruise X)
KH-04-2: May 13, 2004 - July 06, 2004
(Eel Cruise XI)

Atmosphere and Ocean Research Institute
The University of Tokyo
2012

Preliminary Report of The Hakuho Maru Cruise KH-01-1, KH-02-2, KH-04-2 (EEL IX, X, XI)

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By
The Scientific Members of the Expeditions

Edited by
Shun Watanabe, Kazuki Yokouchi
and Katsumi Tsukamoto

Contents

Reflections on the First Eel Cruise of the New Millennium

Marine science in recent years has been extending research horizons using sophisticated technologies such as satellite remote sensing for sea surface temperature or global primary production in the ocean and underwater observation by submersibles surveying deep trench and geothermal areas. Meanwhile the millennium old mystery of eel spawning has remained unsolved since the age of Aristotle. At the beginning of the previous century, the spawning area of the Atlantic eels was discovered in the Sargasso Sea, and in the Pacific Ocean it was discovered in the waters to the west of the Mariana Islands by the R/V Hakuho Maru in 1991.

In both cases however, only relatively large areas have been outlined as the spawning areas based on the distribution of leptocephali (transparent leaf-like eel larvae) in the ocean. Not a single adult eel in the spawning area or eel egg just after spawning has ever been observed or collected in the estimated spawning areas. Therefore, in the strictest sense, the exact spawning area has not been determined for any species of freshwater eels in the world. Because of this, the problem of eel spawning is an important subject for research that has remained unsolved by marine science for more than a century.

We plotted a chart of the collection data of all the *Anguilla japonica* leptocephali ever collected, and after careful discussions, we hypothesized that the Japanese eel spawns at one of three seamounts (Surga, Arakane, Pathfinder) to the west of the Mariana Islands (Seamount Hypothesis). In addition, otolith analysis of hatching dates of leptocephali collected in the estimated spawning area suggested that the eel showed a synchronized spawning at the day of new moon during their spawning season from April to November (New Moon Hypothesis).

Based on these two hypotheses, we organized the research cruise “Studies on the spawning ecology of the Japanese eel and biodiversity in tropical waters” in order to determine the spawning site of the Japanese eel by collecting their eggs near the seamounts. This study was conducted during the second leg of the Hakuho Maru Cruise KH-01-1 and was the ninth eel cruise to determine the spawning area of the Japanese eel since 1973. Furthermore, this cruise was closely linked to the research project (shin-program) ”Dynamics of Ocean Biosystems” that was organized by the Ocean Research Institute of the University of Tokyo, with the objective to study the evolution and biodiversity of marine organisms.

During the 16 day cruise that left Kagoshima on July 12, 2001 and will arrive at Tokyo on July 27, we have had fine weather and made an intensive survey at a total of 73 stations, mainly near the three seamounts, but some stations were canceled because of the development of a typhoon near Minami-Iojima Island at the end of the survey. We tried to collect eel eggs using the IKMT net before and after the new moon on July 21 and were able to collect a total of 61 probable anguilliform eggs, although we could not collect as large a number of eel eggs as previously expected. Among them were seven eggs that had similar morphological characteristics to those of Japanese eel eggs obtained through artificial maturation and fertilization. These eggs will be identified using molecular DNA analysis in the laboratory after the cruise. Using CTD and ADCP observations we also obtained physical oceanographic data such as temperature, salinity and current velocity around the estimated spawning area. Furthermore, we collected many biological samples for molecular ecological studies on fishes and crustaceans, and for ecological studies of zooplankton.

Due to the distinguished techniques and enthusiastic cooperation of the crew of the Hakuho Maru, we completely finished all observations at many stations without any accidents or skipping of stations. I greatly appreciate the captain Kiyoshi Nanba and his crew for their efforts and contribution to the cruise. It was not an easy job for everybody on board to sort out small transparent eel eggs from large plankton samples that came up every two hours from the deep sea. I also gratefully acknowledge all scientists aboard who worked silently with patience and beautiful dedicated concentration throughout more than 70 observation stations.

A total of 32 scientists participated in this cruise from eight domestic universities or institutions (Ocean Research Institute of the University of Tokyo, Graduate School of Agricultural Life Science of the University of Tokyo, Graduate School of Fisheries Science of Hokkaido University, Japan Marine Science and Technology Center, Graduate School of Oceanography of Tokai University, Faculty of Biological Resources of Mie University, Graduate School of Biosphere Science of Hiroshima University, Graduate School of Agriculture of Kyushu University) and two foreign universities (Chunnam University in Korea, Rutgers University in the USA). There were some 'old veterans' among them who have participated the Hakuho Maru eel cruises since 15 years ago. Especially, Professor Lee Tae-Won from Korea and Dr. Michael J. Miller from USA are old eel friends who have collaborated with us since 1986 and 1991, respectively. When I heard the enthusiastic discussions on eel problems in the ship laboratories or during the Seminar at Sea held between hard sampling routines, I felt that we have reached a quite different level of research than that of eel research 15 years ago. Eel research undoubtedly has been in progress, and it may not be so far in the future that we reveal the eel problem completely.

July 26, 2001
At the Chief Scientist's Cabin

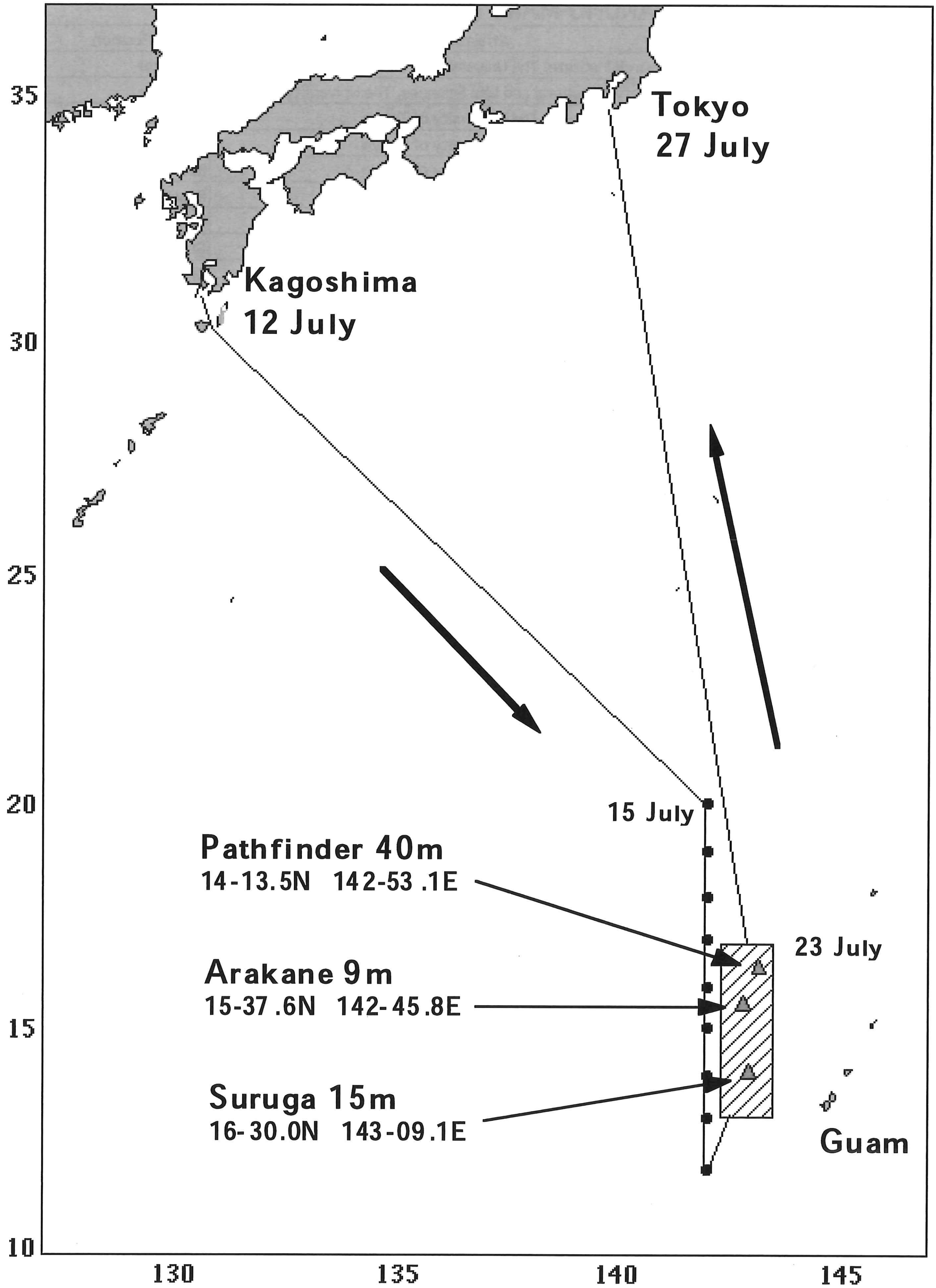
Katsumi Tsukamoto

KH-01-1 (Eel cruise IX)

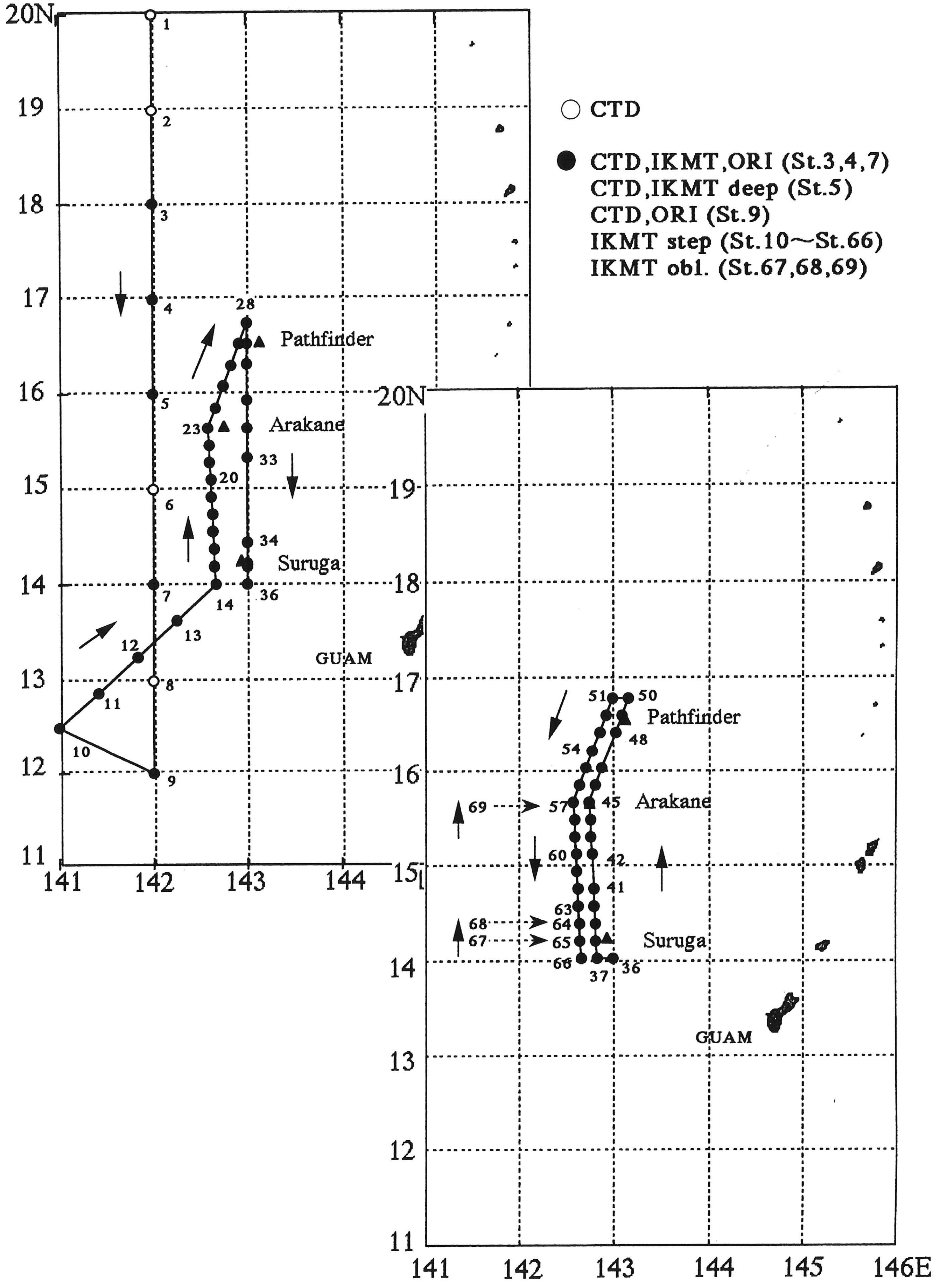
Scientists on board HAKUHO-MARU (KH-01-1)

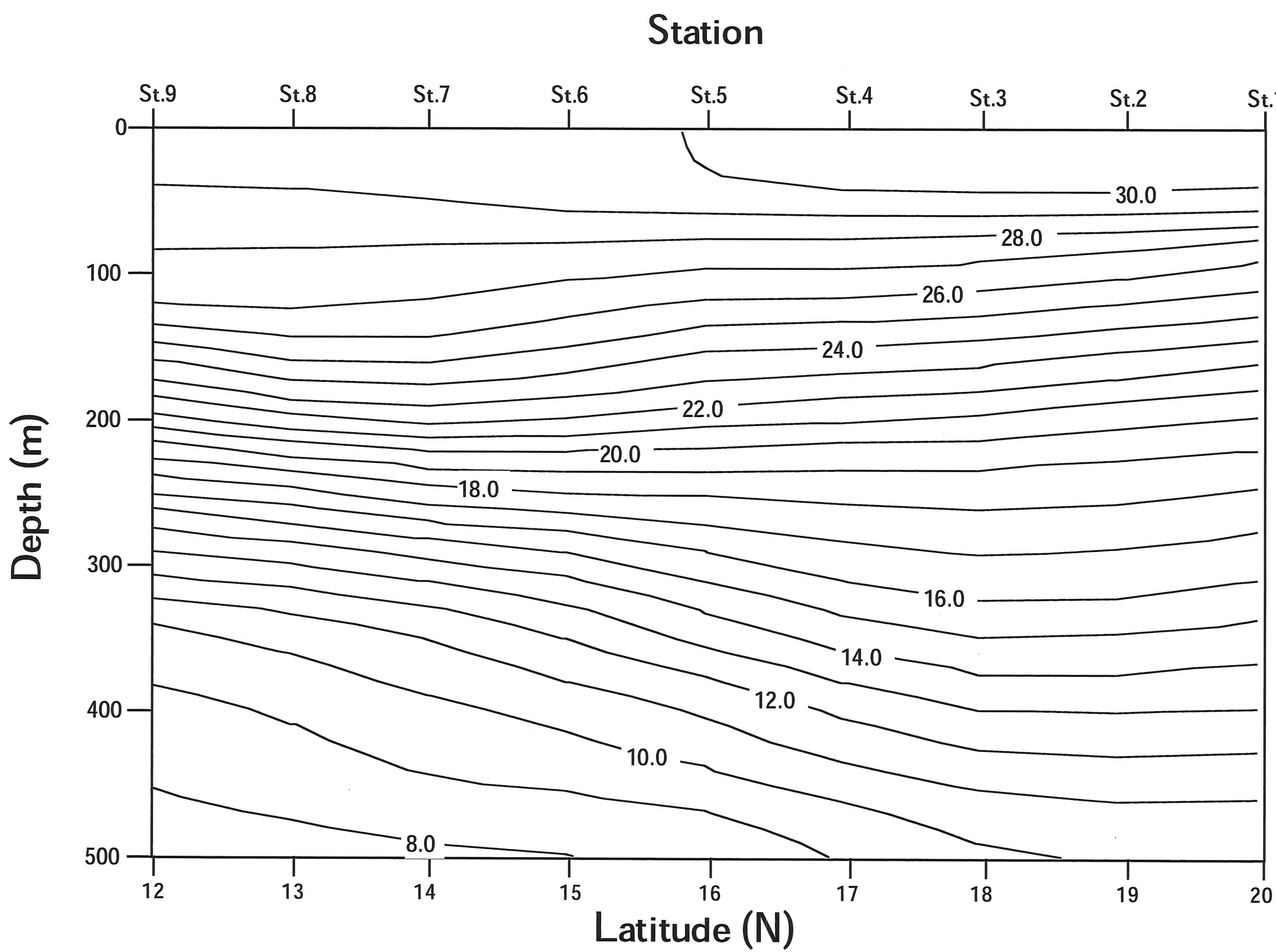
Name	Affiliation	Position
TSUKAMOTO Katsumi	Ocean Research Institute, The University of Tokyo	Proffesor
SUZUKI Yuzuru	Department of Agricultural and Life Sciences, The University of Tokyo	Proffesor
INAGAKI Tadashi	Ocean Research Institute, The University of Tokyo	Research Associate
OYA Machiko	Ocean Research Institute, The University of Tokyo	Technician
AOYAMA Jun	Ocean Research Institute, The University of Tokyo	Research Fellow
MILLER Michael J.	Ocean Research Institute, The University of Tokyo	Research Fellow
WATANABE Shun	Ocean Research Institute, The University of Tokyo	Research Fellow
MINAGAWA Gen	Ocean Research Institute, The University of Tokyo	Graduate Student
MINEGISHI Yuki	Ocean Research Institute, The University of Tokyo	Graduate Student
KOTAKE Aya	Ocean Research Institute, The University of Tokyo	Graduate Student
MA Tao	Ocean Research Institute, The University of Tokyo	Graduate Student
TSUZUKI Takuma	Ocean Research Institute, The University of Tokyo	Graduate Student
JIGE Hisaya	Ocean Research Institute, The University of Tokyo	Graduate Student
NISHIDA Mutsumi	Ocean Research Institute, The University of Tokyo	Proffesor
YAMAUCHI Mitsugu	Ocean Research Institute, The University of Tokyo	Graduate Student
YAMAGUCHI Motoomi	Ocean Research Institute, The University of Tokyo	Research Fellow
MATSUURA Hiroyuki	Ocean Research Institute, The University of Tokyo	Graduate Student
KURIYAMA Mikiko	Ocean Research Institute, The University of Tokyo	Graduate Student
MIURA Toshiaki	Ocean Research Institute, The University of Tokyo	Technician
KAWAKAMI Yutaka	Faculty of Fisheries Sciences, Hokkaido University	Research Fellow
MATUBARA Hajime	Faculty of Fisheries Sciences, Hokkaido University	Graduate Student
TSUCHIYA Takao	Graduate School of Marine Science and Technology, Tokai University	Graduate Student
OTAKE Tsuguo	Department of Bioresources, Mie University	Associate Proffesor
IKENAGA Takanori	Faculty of Applied Biological Science, Hiroshima University	Graduate Student
MOCHIOKA Noritaka	Department of Fisheries, Faculty of Agriculture, Kyushu University	Research Associate
YAMAGUCHI Hitoshi	Japan Marine Science and Technology Center	Associate Director
KOISHI Naoki	Japan Marine Science and Technology Center	Research Fellow
MATSUMOTO Asako	Japan Marine Science and Technology Center	Researcher
LEE Tae Won	Department of Oceanography, Chungnam National University, Korea	Proffesor
MUKAHIRA Yuko	Documentary Workshop, Inc.	Director
ARIYOSHI Toshinori	KSB Setonaikai Broadcasting Co., Ltd.	Camera Man
AI Shosuke		Journalist

KH-01-1 Leg2 Track Chart

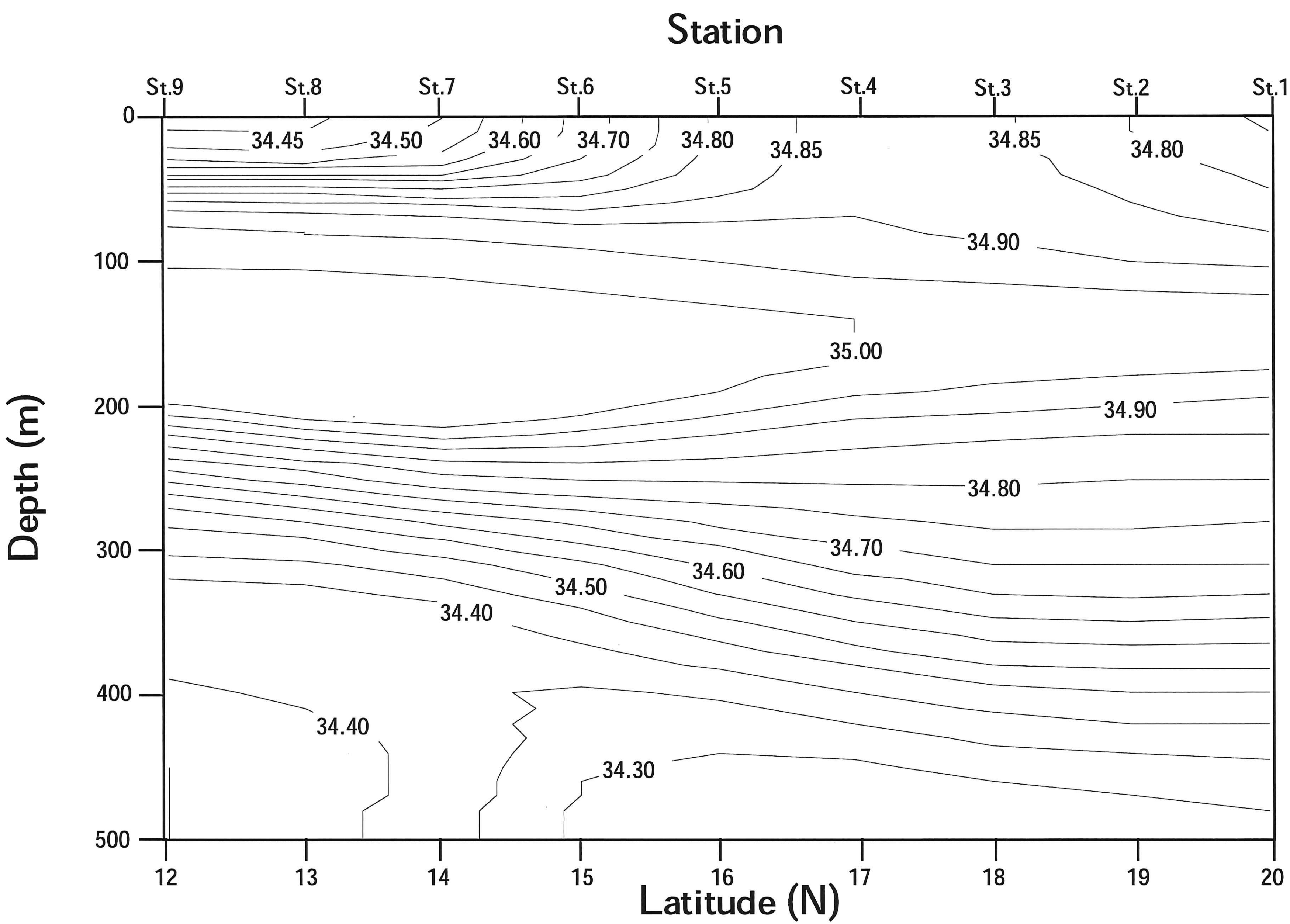


Track chart and samplimg stations

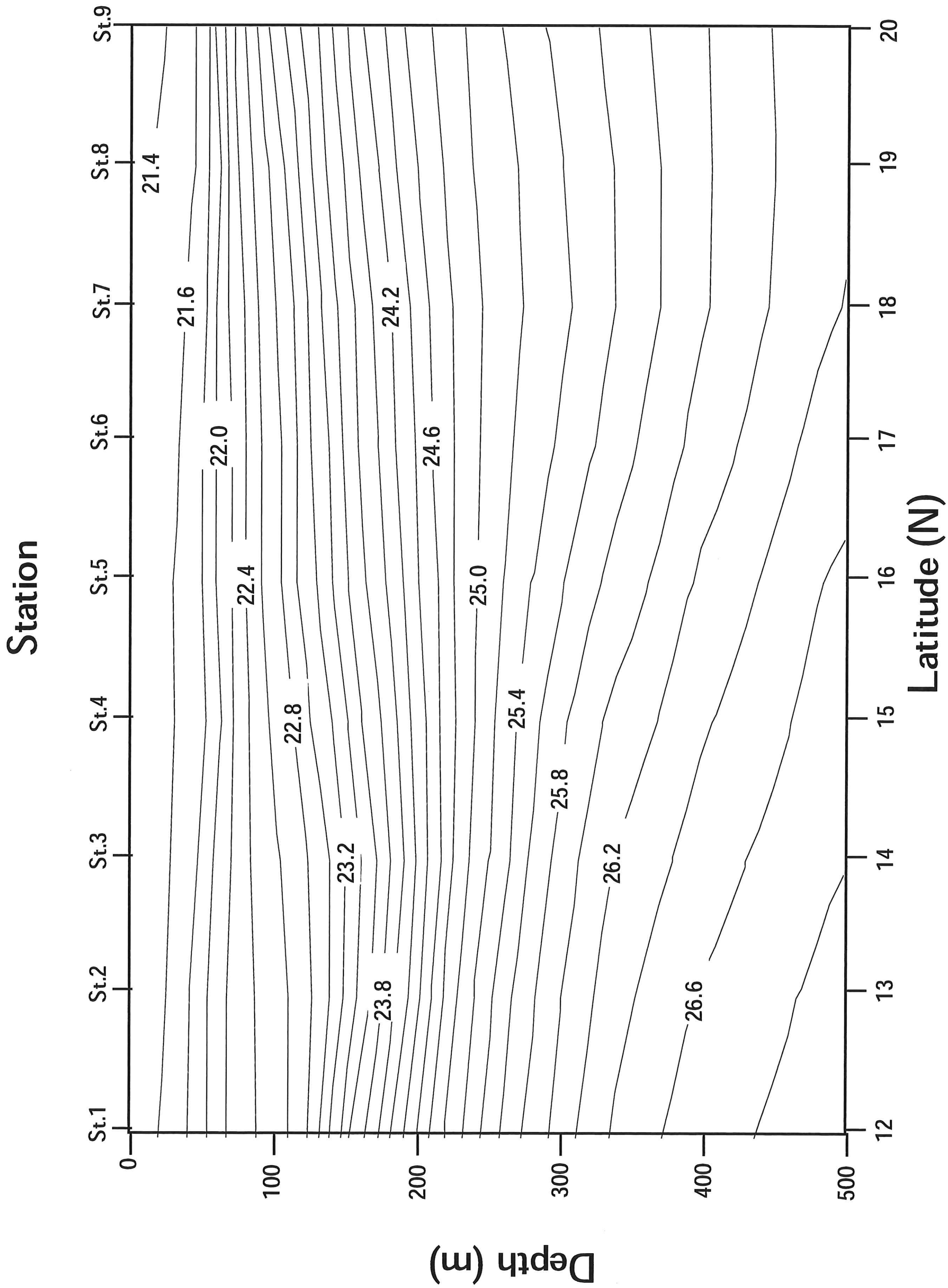




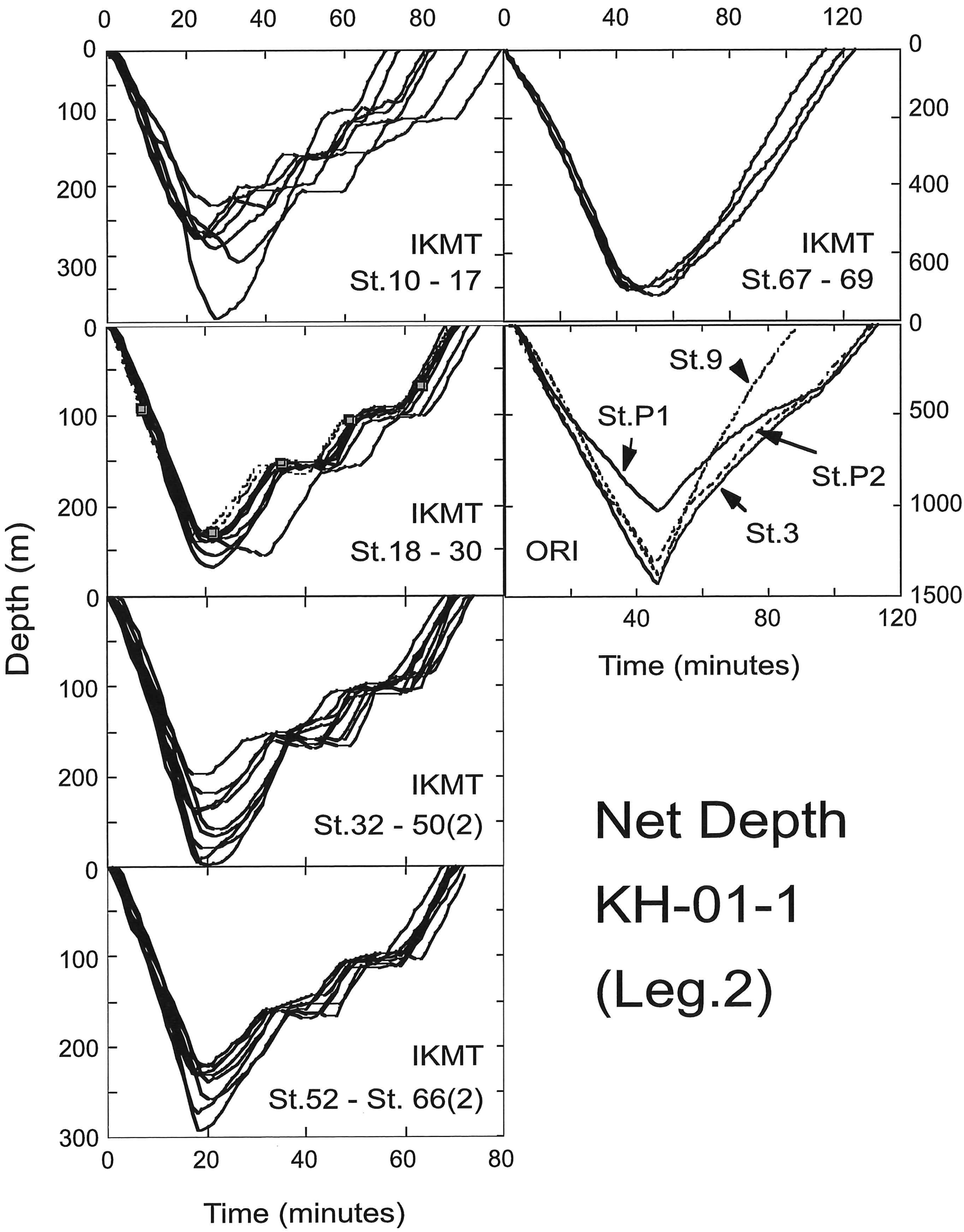
Temperature profile along 142E



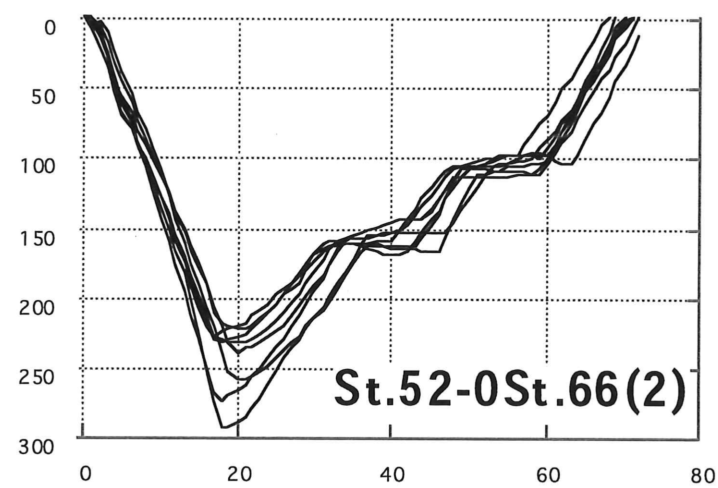
Salinity profile along 142E

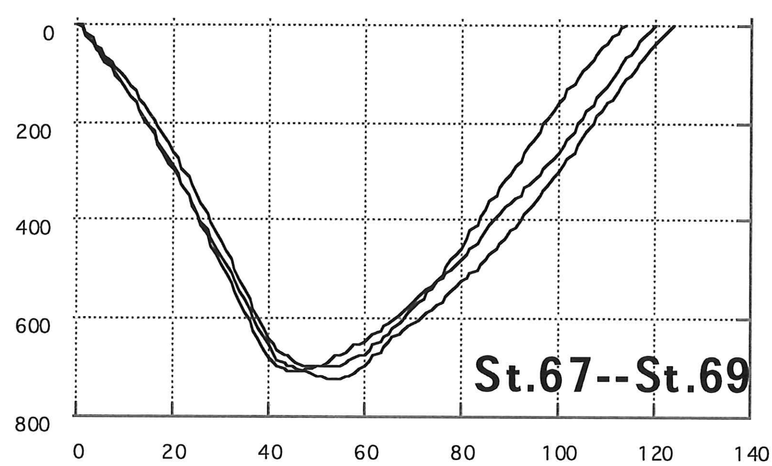


Density profile along 142E

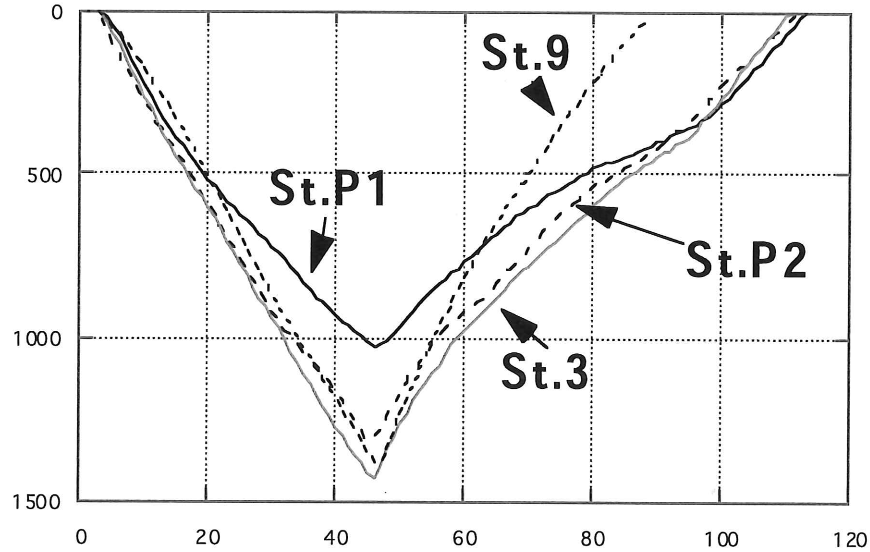


Depth (m)
Time (minutes)
IKMT
St.10 - 17
IKMT
St.67 - 69
IKMT
St.18 - 30
ORI
St.9
St.P1
St.P2
St.3
IKMT
St.32 - 50(2)
IKMT
St.52 - St. 66(2)
Net Depth
KH-01-1
(Leg.2)


St.52-0St.66(2)
0
50
100
150
200
250
300
0
20
40
60
80


St.67--St.69
0
200
400
600
800
0
20
40
60
80
100
120
140

ORI


St.9
St.P1
St.P2
St.3
0
500
1000
1500
0
20
40
60
80
100
120

Morphology and taxonomy of Anguilliform and Notacanthiform larvae

Tsuguo Otake, Noritaka Mochioka, Michael J. Miller, Gen Minagawa
and Yutaka Kawakami

A total of 233 leptocephali and 31 juveniles of at least 13 families (Table 1) were collected during the KH-01-1 cruise. These larvae were collected using the Isaacs Kidd Midwater Trawl and ORI net in oblique and step tows during both daytime and nighttime. The leptocephali of the Muraenidae (26.7%) and Congridae (25.3%) were the most abundant families, with those of the genus *Ariosoma* being collected in the greatest numbers (N = 47). Two leptocephali of Anguillidae (*Anguilla bicolor pacifica*) were collected at a station near the Suruga seamount (12°30N, 141°00E). The leptocephali of Muraenidae, Congridae, Chlopsidae that were collected were all relatively large. However, leptocephali of the Serrivomeridae, Derichthyidae, and Nemichthyidae (*Avocettina*) smaller than 15 mm TL were collected during this cruise (Figure 1), indicating that spawning by these species of eels had been occurring recently near the seamounts within the study area.

Table 1. Number and proportion (%) of larvae collected with the IKMT or the ORI net during the KH-01-1 cruise.

Taxa	Number of leptocephali	%
Anguilliformes		
Anguillidae	2	0.8
Congridae		
Ariosoma spp.	47 (2)	17.8
Congridae spp.	12	4.5
Chlopsidae	10	3.8
Derichthyidae		
Leptocephali	30	11.4
Juvenile	3	1.1
Moringuidae	3	1.1
Muraenidae	62 (1)	23.5
Nemichthyidae	23	8.7
Nettastomatidae	2	0.8
Ophichthidae	11	4.2
Serrivomeridae		
Leptocephali	19	7.2
Juvenile	28	10.6
Synaphobranchidae	5	1.9
Saccopharyngiformes		
Cyematidae	2 (1)	0.8
Notacanthiformes	4	1.5
Unidentified	1	0.4
Total catch	264 (4)	100.0

Note: parentheses indicate the number of larvae collected using the ORI net.

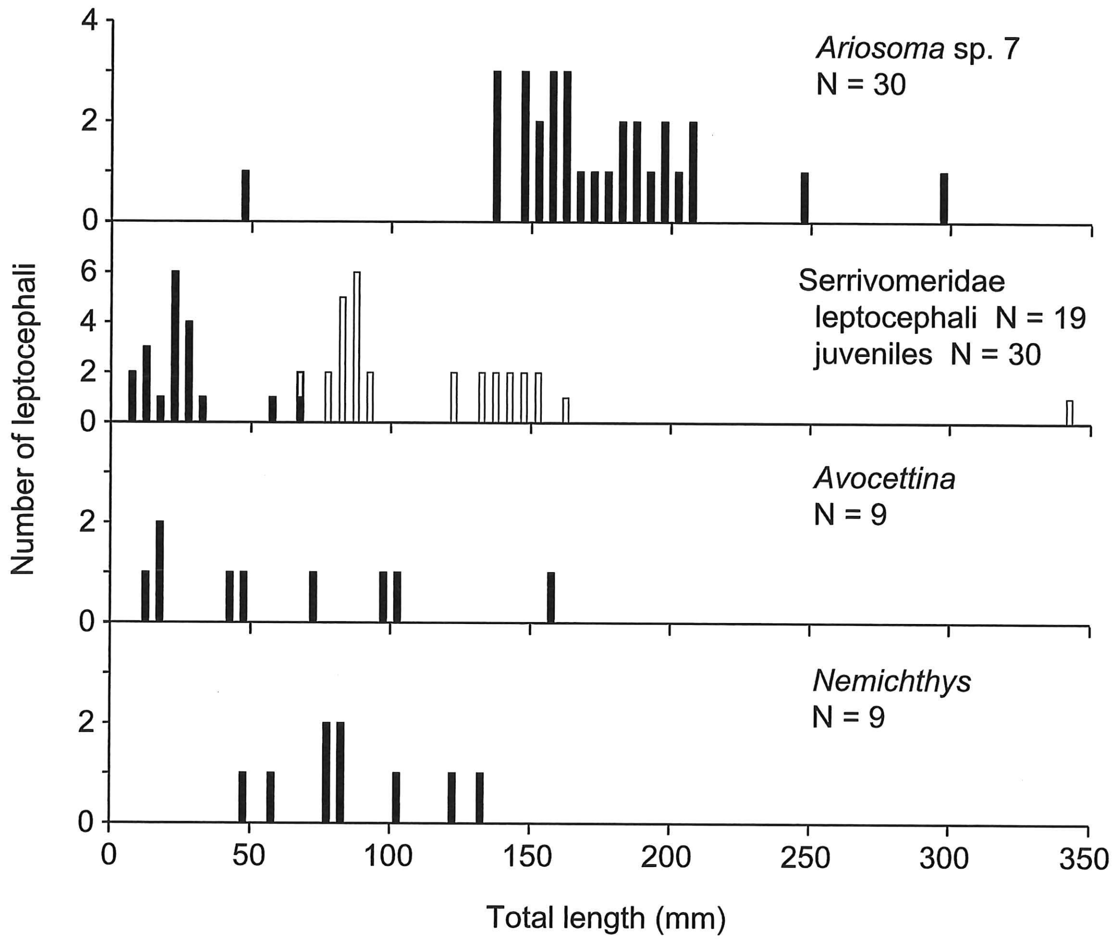


Figure 1. Length frequency distributions of the leptocephali of *Ariosoma* sp. 7 (Family Congridae), Serrivomeridae (juveniles shown with white bars), and *Avocettina* and *Nemichthys* (Family Nemichtyidae) collected in the egg sampling area to the west of the seamounts.

Genetic species Identification of eggs collected during KH-01-1

Jun Aoyama, Yuki Minegishi, Shun Watanabe, Tsuguo Otake, Noritaka Mochioka, T.W. Lee, Hitoshi Yamaguchi, Naoki Koishi, Asako Matsumoto, M. J. Miller, Gen Minagawa, Hisaya Jige, Aya Kotake, Takuma Tsuzuki, Ma Tao, Miura Toshiaki, Tadashi Inagaki, Machiko Oya, Yuzuru Suzuki, Katsumi Tsukamoto

Although the spawning areas of several anguillid species have been revealed based on their larval distributions and other information such as the patterns of ocean currents (Schmidt 1923, Kleckner and McCleave 1985, Tsukamoto 1992, Fricke and Tsukamoto 1998), their naturally spawned eggs have never been found. Then, the morphological characteristics of the anguillid eels can only be empirically inferred from eggs produced by artificially induced spawning or from those of closely related species. Furthermore, fish eggs which have much fewer representative morphological characteristics than do the larvae and adults are quite difficult to identify. Therefore, we applied molecular techniques to determine whether the eggs collected during KH-01-1 Hakuho Maru cruise were of the Japanese eel.

The total of 51 eggs examined here were collected by an Isaacs-Kidd Midwater Trawl (IKMT) with a 8.7 m2 mouth opening and 0.5 mm mesh during the KH-01-1 cruise. These eggs resembled those of the Japanese eel or other Anguilliformes. They were preserved in 95% ethanol during the cruise and transported to the laboratory. Total genomic DNA extraction from each egg was carried out following a standard protocol (Aoyama et al. 2001a). A portion of the mitochondrial 16S ribosomal RNA gene was amplified via polymerase chain reaction (PCR) using the oligonucleotide primers H2510 and H3058 (Aoyama et al. 2001a). Amplification parameters were 35 cycles of denaturation at 94°C for 30 sec, annealing at 55°C for 30 sec, and extension at 72°C for 60 sec. Double stranded DNA products from PCR were sequenced following the manufacture's protocol (Applied Biosystems Inc.) with the ABI 3100 Genetic Analyzer (Applied Biosystems Inc.). We compared these results with sequences previously determined from the 17 anguillid species.

Using the sequence data obtained from the eggs collected during KH-01-1, those from three eggs collected during KH-98-2 cruise (Aoyama et al. 2001a) and all species of the genus *Anguilla* (Aoyama et al. 2001b), a Neighbor Joining Tree was constructed based on the number of site differences (Fig.1). The constructed Neighbor Joining Tree indicated that all anguillid eels formed a clade, while all the eggs clustered in different clades, suggesting that the eggs examined here were not of the genus *Anguilla* (Fig.1). Serrivomeridae-like eggs (Aoyama et al. 2001a) were positioned with nine eggs collected during KH-01-1 (St. 65-1, 49-1, 17-1, 36-1, 33-3, 14-1, 33-1, 37-1 and 43-1). This suggested that these eggs possibly belonged to the Serrivomeridae or closely related taxa. Further, the relationship between the Serrivomeridae-like clade and the genus Anguilla suggested that all the eggs analyzed in the present study were of the Anguilliformes. There is relatively little genetic sequence data of the Anguilliform fishes deposited in DNA databases, which is not enough to identify species of the eggs examined in the present study. A greater accumulation of genetic data obtained from carefully identified adults specimens are needed to enable unknown anguilliform eggs to be genetically identified.

However, molecular techniques have greatly advanced recently and make it much easier to determine the sequence of a large number of specimens. The molecular characters determined from fully developed adults are likely to become a very powerful tool for the identification of eggs.

Reference

Aoyama J, Ishikawa S, Otake T, Mochioka N, Suzuki Y, Watanabe S, Shinoda A, Inoue J, Lokman PM, Inagaki T, Oya M, Hasumoto H, Kubokawa K, Lee TW, Fricke H, Tsukamoto K. Molecular approach for species identification of eggs with respect to determination of the spawning site of the Japanese eel *Anguilla japonica. Fishries Science*. 2001a. 67: 761-763.

Aoyama J., Nishida M., Tsukamoto, K. Molecular phylogeny and evolution of the freshwater eel, genus *Anguilla. Molecular Phylogenetics and Evolution*. 2001b. 20: 450-459.

Fricke H., Tsukamoto K. Seamounts and the mystery of eel spawning. *Naturwissenschaften* 1998. 85:290-291

Kleckner R.C., McCleave J.D. Spatial and temporal distribution of American eel larvae in relation to north Atlantic Ocean current systems. *Dana* 1985. 4:67-92

Schmidt J. The breeding places of the eel. *Phil Trans Royal Soc* 1923. 211:179-208

Tsukamoto K. Discovery of the spawning area for Japanese eel. *Nature* 1992. 356:789-791

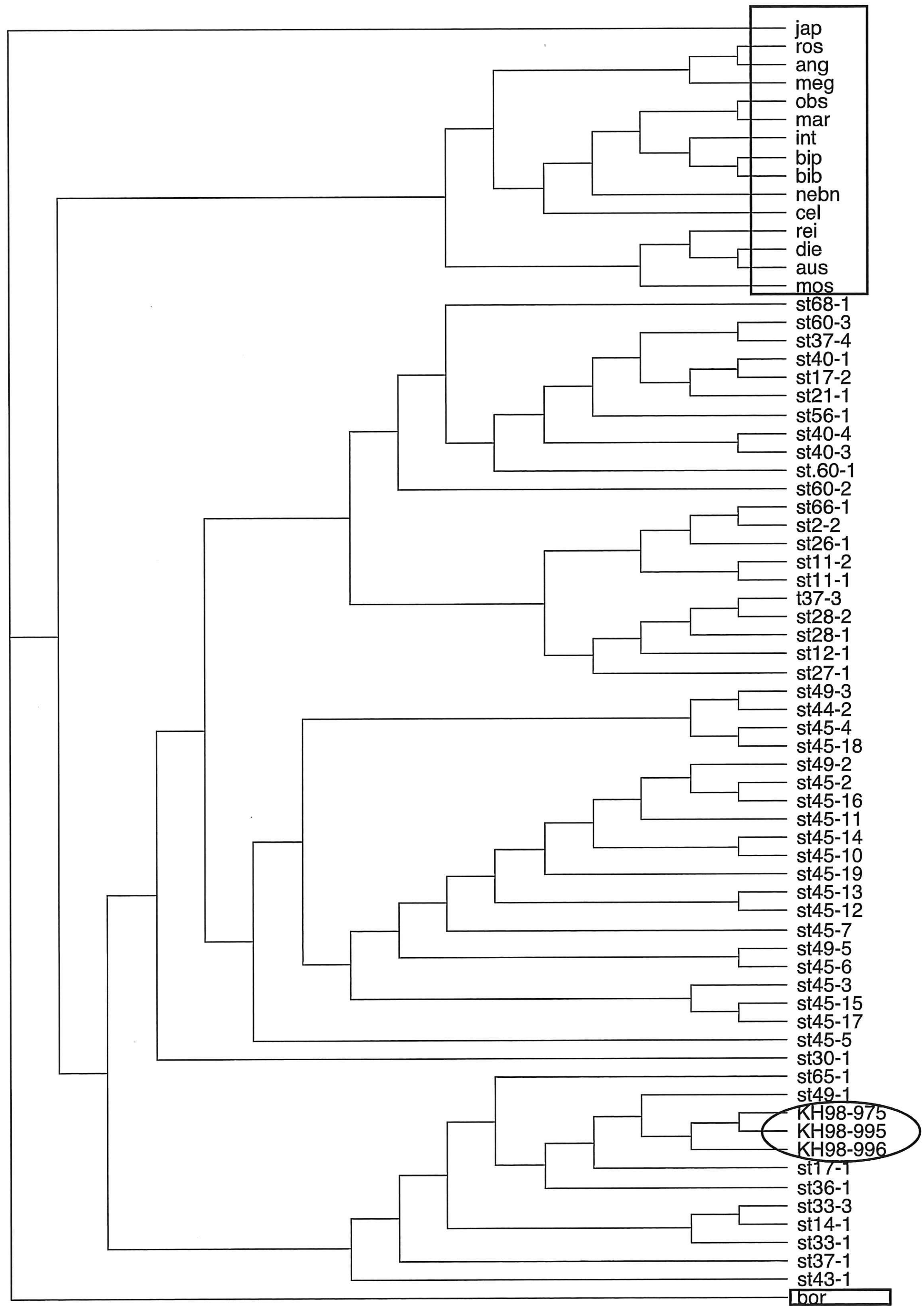


Figure 1 Neighbor Joining Tree constructed by 480 base pairs of mitochondrial 16SrRNA gene sequences from 47 eggs collected during KH-01-1 cruise, all 18 anguillid species (in squares, see Aoyama et al. 2001b) and three eggs collected by KH-98-2 cruise (in circle, see Aoyama et al. 2001a).

Net Record KH01-1 Leg.2

St.	Lat. In	Lat. Out	Long. In	Long. Out	Date	Time In	Time Out	Net Type	Mesh	Towing	Wire out	Sampling Layer	Volume
P1	25.29	25.48	136.29	136.48	010713	20:11	22:02	ORI	0.69	Obl.	2500	1028	18826
P2	24.45	24.75	136.54	136.90	010714	02:08	03:57	ORI	0.69	Obl.	2500	1312	16882
T	23.03	23.05	138.45	138.75	010714	13:05	14:01	IKMT	0.5	Step	525	113	26995
P3	21.55	21.92	139.57	139.95	010714	20:02	21:19	IKMT	0.5	Step	670	164	39199
P3	21.52	21.87	140.00	140.00	010714	21:36	22:07	IKMT	0.5	Obl.	600	122	18347
3	18.00	18.00	142.00	142.00	010715	18:57	20:47	ORI	0.69	Obl.	2500		15916
3	17.54	17.90	142.02	142.03	010715	21:16	22:01	IKMT	0.5	Step	602	146	27868
4	17.00	17.00	142.00	142.00	010716	01:40	02:40	IKMT	0.5	Step	643	155	29382
4	16.57	16.95	142.00	142.00	010716	02:48	03:19	IKMT	0.5	Obl.	600	115	17259
5	16.00	16.00	142.00	142.00	010716	09:11	13:05	IKMT	1.0	Step	6000	-	64567
7	13.59	13.98	142.00	142.00	010716	22:12	23:04	IKMT	0.5	Step	412	412	31869
7	13.56	13.93	142.40	142.67	010716	23:22	23:54	IKMT	0.5	Obl.	600		15655
7	13.54	13.90	142.00	142.00	010717	00:02	01:53	ORI	0.69	Obl.	2500		15992
9	12.01	12.02	142.00	142.00	010717	11:00	12:31	ORI	0.69	Obl.	2500	1375	10817
10	12.60	13.00	141.00	141.00	010717	16:39	18:18	IKMT	0.5	Step	575	309	50678
11	12.53	12.88	141.25	141.42	010717	20:43	22:15	IKMT	0.5	Step	1140	289	42944
12	13.15	13.25	141.50	141.83	010718	00:39	01:53	IKMT	0.5	Step	1126	394	37216
13	13.37	13.62	142.15	142.25	010718	04:21	05:47	IKMT	0.5	Step	1019	275	43021
14	14.00	14.00	142.40	142.67	010718	08:23	09:42	IKMT	0.5	Step	915	272	38077
15	14.11	14.18	142.39	142.65	010718	10:32	11:41	IKMT	0.5	Step	819	275	35664
16	14.22	14.37	142.39	142.65	010718	12:31	13:54	IKMT	0.5	Step	860	228	38203
17	14.33	14.55	142.38	142.63	010718	14:39	15:55	IKMT	0.5	Step	893	229	36880
18	14.44	14.73	142.38	142.63	010718	16:44	18:00	IKMT	0.5	Step	843	256	44960
19	14.55	14.92	142.37	142.62	010718	18:47	19:57	IKMT	0.5	Step	1000	207	49016
20	15.05	15.08	142.37	142.62	010718	20:45	21:56	IKMT	0.5	Step	1000	239	44843
21	15.16	15.27	142.36	142.60	010718	22:42	23:54	IKMT	0.5	Step	1000	255	38607
22	15.27	15.45	142.36	142.60	010719	00:41	01:54	IKMT	0.5	Step	1000	229	34943
23	15.38	15.63	142.35	142.58	010719	02:35	03:47	IKMT	0.5	Step	1000	241	34323
24	15.52	15.87	142.40	142.67	010719	04:46	05:54	IKMT	0.5	Step	1000	267	37650
25	16.05	16.08	142.45	142.75	010719	06:58	08:09	IKMT	0.5	Step	1000	242	42223
26	16.18	16.30	142.50	142.83	010719	09:20	10:32	IKMT	0.5	Step	1000	261	35429
27	16.31	16.52	142.55	142.92	010719	11:50	13:02	IKMT	0.5	Step	1000	257	41647
28	16.45	16.75	143.00	143.00	010719	14:23	15:37	IKMT	0.5	Step	1000	237	38788
29	16.32	16.53	143.00	143.00	010719	16:27	17:37	IKMT	0.5	Step	1000	233	36666
30	16.19	16.32	143.00	143.00	010719	18:24	19:34	IKMT	0.5	Step	1000	231	37553
31	15.56	15.93	143.00	143.00	010719	20:59	22:09	IKMT	0.5	Step	1000	243	32536
32	15.38	15.63	143.00	143.00	010719	23:16	24:28	IKMT	0.5	Step	1000	236	33441
33	15.20	15.33	143.00	143.00	010720	01:37	02:50	IKMT	0.5	Step	1000	221	37882

Net Record KH01-1 Leg.2

St.	Lat. In	Lat. Out	Long. In	Long. Out	Date	Time In	Time Out	Net Type	Mesh	Towing	Wire out	Sampling Layer	Volume
34	14.25	14.42	143.00	143.00	010720	06:09	07:17	IKMT	0.5	Step	1000	198	41536
35	14.12	14.20	143.00	143.00	010720	08:17	09:30	IKMT	0.5	Step	1000	237	38277
36	14.00	14.00	143.00	143.00	010720	10:20	11:33	IKMT	0.5	Step	1000	258	38510
37	14.00	14.00	142.50	142.83	010720	12:17	13:30	IKMT	0.5	Step	1000	253	31575
38	14.12	14.20	142.50	142.83	010720	14:17	15:28	IKMT	0.5	Step	1000	295	29803
39	14.22	14.37	142.49	142.82	010720	16:17	17:28	IKMT	0.5	Step	1000	273	28867
40	14.33	14.55	142.48	142.80	010720	18:12	19:22	IKMT	0.5	Step	1000	279	27914
41	14.44	14.73	142.48	142.80	010720	20:08	21:22	IKMT	0.5	Step	1000	262	33076
42	15.05	15.08	142.47	142.78	010720	22:45	23:58	IKMT	0.5	Step	1000	298	29931
43	15.16	15.27	142.46	142.77	010721	00:42	01:54	IKMT	0.5	Step	1000	276	32719
44	15.27	15.45	142.46	142.77	010721	02:35	03:47	IKMT	0.5	Step	1000	240	37995
45	15.38	15.63	142.44	142.73	010721	04:26	05:36	IKMT	0.5	Step	1000	250	34409
46	15.49	15.82	142.49	142.82	010721	06:29	07:38	IKMT	0.5	Step	1000	218	33390
47	16.02	16.03	142.53	142.88	010721	08:35	09:46	IKMT	0.5	Step	1000	223	36621
48	16.23	16.38	143.02	143.03	010721	11:08	12:20	IKMT	0.5	Step	1000	265	33974
49	16.34	16.57	143.06	143.10	010721	14:48	16:00	IKMT	0.5	Step	1000	189	41176
50	16.45	16.75	143.10	143.17	010721	16:43	17:54	IKMT	0.5	Step	1000	198	40810
51	16.45	16.75	143.01	143.02	010721	18:44	19:54	IKMT	0.5	Step	1000	251	35088
52	16.34	16.57	142.56	142.93	010721	20:50	22:01	IKMT	0.5	Step	1000	238	39699
53	16.23	16.38	142.52	142.87	010721	22:51	00:04	IKMT	0.5	Step	1000	220	41699
54	16.11	16.18	142.48	142.80	010722	00:49	00:58	IKMT	0.5	Step	1000	231	35935
55	16.03	16.05	142.43	142.72	010722	02:40	03:50	IKMT	0.5	Step	1000	263	35360
56	15.49	15.82	142.40	12.67	010722	04:48	05:58	IKMT	0.5	Step	1004	272	35285
57	15.38	15.63	142.35	142.58	010722	06:58	08:08	IKMT	0.5	Step	1001	285	38518
58	15.27	15.45	142.36	142.60	010722	09:00	10:10	IKMT	0.5	Step	1000	223	34661
59	15.06	15.10	142.36	142.60	010722	11:04	12:14	IKMT	0.5	Step	1000	210	41945
60	15.05	15.08	142.37	142.62	010722	13:19	14:32	IKMT	0.5	Step	1000	258	34429
61	15.54	15.90	142.37	142.62	010722	15:25	16:35	IKMT	0.5	Step	948	272	33605
62	14.43	14.72	142.38	142.63	010722	17:30	18:39	IKMT	0.5	Step	1000	231	33982
63	14.33	14.55	142.39	142.65	010722	19:39	20:48	IKMT	0.5	Step	1000	234	39823
64	14.22	14.37	142.39	142.65	010722	21:42	22:52	IKMT	0.5	Step	1000	293	37798
65	14.11	14.18	142.40	142.67	010722	23:31	00:43	IKMT	0.5	Step	1000	263	20474
66	14.00	14.00	142.40	142.67	010723	01:30	02:41	IKMT	0.5	Step	1000	226	37210
67	14.11	14.18	142.40	142.67	010723	03:49	05:47	IKMT	0.5	Obl.	2500	702	45438
68	14.33	14.55	142.38	142.63	010723	07:00	09:00	IKMT	0.5	Obl.	2500	708	46867
69	15.38	15.63	142.35	142.58	010723	14:06	16:11	IKMT	0.5	Obl.	2500	727	54488

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	---- 13 JULY01 (GMT) -----		
ST-PI	11:07 25°29.434N 136°04.670E	3274m	OR1 NET STARTED
ST-PI	11:56 25°27.458N 136°06.239E	3236m	OR1 NET DEEPEST (w.o.2500m)
ST-PI	13:04 25°24.807N 136°08.541E	2952m	OR1 NET FINISHED
ST-P2	17:07 24°45.106N 136°53.773E	5323m	OR1 NET STARTED
ST-P2	17:52 24°44.715N 136°55.594E	5255m	OR1 NET DEEPEST (w.o.2500m)
ST-P2	18:59 24°43.887N 136°58.646E	5285m	OR1 NET FINISHED
	---- 14 JULY01 (GMT) -----		
ST-T	04:04 23°02.643N 138°45.053E	4739m	IKMT NET STARTED
ST-T	04:14 23°02.200N 138°45.562E	4780m	IKMT NET DEEPEST (w.o.525m)
ST-T	05:02 23°00.733N 138°47.213E	4999m	IKMT NET FINISHED
ST-P3	11:00 21°55.340N 139°57.147E	4561m	IKMT NET STARTED
ST-P3	11:13 21°54.787N 139°57.660E	4283m	IKMT NET DEEPEST (w.o.670m)
ST-P3	12:21 21°52.880N 139°59.439E	4363m	IKMT NET FINISHED
ST-P3	12:30 21°52.524N 139°59.751E	4426m	IKMT NET STARTED
ST-P3	12:48 21°51.809N 140°00.419E	4443m	IKMT NET DEEPEST (w.o.600m)
ST-P3	13:09 21°51.162N 140°00.990E	4428m	IKMT NET FINISHED
ST-1	23:10 19°59.610N 142°00.170E	4059m	CTD-RMS STARTED
ST-1	23:31 19°59.401N 142°00.289E	4055m	CTD-RMS DEEPEST
ST-1	23:51 19°59.358N 142°00.455E	4057m	CTD-RMS FINISHED
	---- 15 JULY01 (GMT) -----		
ST-2	03:56 18°59.974N 141°59.946E	4227m	CTD-RMS STARTED
ST-2	04:31 18°59.643N 141°59.946E	4216m	CTD-RMS DEEPEST
ST-2	05:02 18°59.408N 141°59.909E	4216m	CTD-RMS FINISHED
ST-3	09:11 18°00.019N 142°00.055E	4474m	CTD-RMS STARTED
ST-3	09:12 18°00.011N 142°00.055E	4475m	SUNSET & TURNED ON REGULATION LIGHTS
ST-3	09:24 17°59.880N 142°00.080E	4476m	CTD-RMS DEEPEST
ST-3	09:48 17°59.764N 142°00.112E	4479m	CTD-RMS FINISHED
ST-3	09:59 17°59.438N 142°00.143E	4478m	OR1 NET STARTED
ST-3	10:42 17°57.786N 142°00.571E	4456m	OR1 NET DEEPEST (w.o.2500m)
ST-3	11:49 17°55.063N 142°01.576E	4425m	OR1 NET FINISHED
ST-3	12:09 17°53.920N 142°01.909E	4409m	IKMT NET STARTED
ST-3	12:22 17°53.095N 142°02.135E	4400m	IKMT NET DEEPEST (w.o.602m)
ST-3	12:26 17°52.866N 142°02.196E	4402m	OR1 SIDE NET STARTED
ST-3	12:38 17°52.378N 142°02.358E	4406m	OR1 SIDE NET FINISHED
ST-3	13:02 17°51.234N 142°02.710E	4414m	IKMT NET FINISHED
ST-4	16:39 16°59.978N 141°59.978E	4489m	IKMT NET STARTED
ST-4	16:52 16°59.224N 141°59.897E	4486m	IKMT NET DEEPEST (w.o.643m)
ST-4	17:41 16°57.224N 141°59.565E	4474m	IKMT NET FINISHED
ST-4	17:46 16°57.136N 141°59.533E	4475m	IKMT NET STARTED
ST-4	17:59 16°56.312N 141°59.414E	4500m	IKMT NET DEEPEST (w.o.600m)
ST-4	18:00 16°56.248N 141°59.405E	4475m	OR1 SIDE NET STARTED
ST-4	18:11 16°55.747N 141°59.328E	4476m	OR1 SIDE NET FINISHED
ST-4	18:20 16°55.389N 141°59.280E	4475m	IKMT NET FINISHED
ST-4	18:35 16°55.280N 141°59.1 80E	4478m	CTD-RMS STARTED
ST-4	18:49 16°55.234N 141°58.999E	4474m	CTD-RMS DEEPEST
ST-4	19:09 16°55.125N 141°58.941E	4477m	CTD-RMS FINISHED
ST-5	22:48 15°59.819N 142°00.017E	4413m	CTD-RMS STARTED
ST-5	23:07 15°59.789N 142°00.059E	4412m	CTD-RMS FINISHED (FAILED)
ST-5	23:19 15°59.786N 142°00.038E	4407m	CTD-RMS STARTED
ST-5	23:37 15°59.791N 141°59.988E	4407m	CTD-RMS DEEPEST
ST-5	23:56 15°59.808N 141°59.962E	4415m	CTD-RMS FINISHED
	---- 16 JULY01 (GMT) -----		
ST-5	00:09 15°59.792N 142°00.318E	4406m	IKMT NET STARTED
ST-5	01:55 15°56.072N 142°01.416E	4430m	IKMT NET DEEPEST (w.o.6000m)
ST-5	04:10 15°50.743N 142°02.313E	4396m	IKMT NET FINISHED
ST-6	07:44 15°00.187N 142°00.170E	4560m	CTD-RMS STARTED
ST-6	08:01 15°00.265N 142°00.161E	4563m	CTD-RMS DEEPEST
ST-6	08:18 15°00.258N 142°00.258E	4562m	CTD-RMS FINISHED
ST-7	12:20 13°59.975N 141°59.899E	4264m	CTD-RMS STARTED
ST-7	12:36 13°59.963N 141°59.869E	4267m	CTD-RMS DEEPEST
ST-7	12:53 13°59.956N 141°59.848E	4267m	CTD-RMS FINISHED
ST-7	13:10 13°59.257N 141°59.783E	4281m	IKMT NET STARTED
ST-7	13:20 13°58.668N 141°59.783E	4266m	IKMT NET DEEPEST (w.o.412rn)
ST-7	14:06 13°56.850N 141°59.746E	4217m	IKMT NET FINISHED
ST-7	14:21 13°56.111N 141°59.752E	4215m	IKMT NET STARTED
ST-7	14:33 13°55.413N 141°59.776E	4212m	IKMT NET DEEPEST (w.o.600m)

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	---- 13 JULY01 (GMT) -----		
ST-7	14:38 13°55.214N 141°59.779E	4203m	OR1 SIDE NET STARTED
ST-7	14:47 13°54.923N 141°59.775E	4207m	OR1 SIDE NET FINISHED
ST-7	14:55 13°54.665N 141°59.777E	4213m	IKMT NET FINISHED
ST-7	15:01 13°54.463N 141°59.776E	4215m	OR1 NET STARTED
ST-7	15:47 13°52.809N 141°59.792E	4192m	OR1 NET DEEPEST (w.o.2500m)
ST-7	16:54 13°50.223N 141°59.947E	4152m	OR1 NET FINISHED
ST-8	20:20 13°00.017N 141°59.722E	3029m	CTD-RMS STARTED
ST-8	20:37 13°00.007N 141°59.481E	3026m	CTD-RMS DEEPEST
ST-8	20:54 13°00.004N 141°59.355E	3039m	CTD-RMS FINISHED
	---- 17 JULY01 (GMT) -----		
ST-9	01:07 12°00.108N 141°59.852E	4427m	CTD-RMS STARTED
ST-9	01:23 12°00.217N 141°59.750E	4418m	CTD-RMS DEEPEST
ST-9	01:43 12°00.256N 141°59.599E	4394m	CTD-RMS FINISHED
ST-9	02:02 12°01.004N 141°59.176E	4362m	OR1 NET STARTED
ST-9	02:49 12°02.711N 141°58.381E	4214m	OR1 NET DEEPEST (w.o.2500m)
ST-9	03:32 12°04.283N 141°57.876E	3537m	OR1 NET FINISHED
ST-10	07:38 12°30.221N 140°59.867E	3169m	IKMT NET STARTED
ST-10	07:59 12°31.344N 140°59.319E	3243m	IKMT NET DEEPEST (w.o.1133m)
ST-10	09:22 12°34.282N 140°57.571E	3415m	IKMT NET FINISHED
ST-11	11:40 12°52.678N 141°25.005E	3403m	IKMT NET STARTED
ST-11	12:05 12°52.533N 141°26.287E	3190m	IKMT NET DEEPEST (w.o.1140m)
ST-11	13:17 12°52.622N 141°28.059E	3157m	IKMT NET FINISHED
ST-12	15:37 13°14.984N 141°49.913E	3488m	IKMT NET STARTED
ST-12	15:55 13°14.004N 141°49.811E	3492m	IKMT NET DEEPEST (w.o.1126m)
ST-12	16:54 13°12.308N 141°49.623E	3474m	IKMT NET FINISHED
ST-13	19:21 13°36.930N 142°14.570E	3264m	IKMT NET STARTED
ST-13	19:41 13°36.190N 142°13.586E	3282m	IKMT NET DEEPEST (w.o.1019m)
ST-13	20:47 13°34.738N 142°11.250E	3313m	IKMT NET FINISHED
ST-14	23:21 14°00.002N 142°39.944E	2525m	IKMT NET STARTED
ST-14	23:41 14°00.974N 142°39.795E	2544m	IKMT NET DEEPEST (w.o.968m)
	---- 18 JULY01 (GMT) -----		
ST-14	00:44 14°02.911N 142°39.740E	2614m	IKMT NET FINISHED
ST-15	01:30 14°11.078N 142°39.317E	2687m	IKMT NET STARTED
ST-15	01:47 14°11.805N 142°39.343E	2949m	IKMT NET DEEPEST (w.o.819m)
ST-15	02:43 14°13.397N 142°39.431E	2893m	IKMT NET FINISHED
ST-16	03:29 14°21.870N 142°38.898E	3243m	IKMT NET STARTED
ST-16	03:41 14°22.429N 142°38.859E	3254m	IKMT NET DEEPEST (w.o.860m)
ST-16	04:55 14°24.784N 142°38.713E	3251m	IKMT NET FINISHED
ST-17	05:37 14°32.694N 142°38.328E	2382m	IKMT NET STARTED
ST-17	05:54 14°33.490N 142°38.327E	2684m	IKMT NET DEEPEST (w.o.893m)
ST-17	06:56 14°35.443N 142°38.250E	3358m	IKMT NET FINISHED
ST-18	07:42 14°43.841N 142°37.795E	3953m	IKMT NET STARTED
ST-18	07:59 14°44.700N 142°37.850E	3965m	IKMT NET DEEPEST (w.o.843m)
ST-18	09:02 14°46.885N 142°37.966E	4015m	SUNSET & TURNED ON REGULATION LIGHTS
ST-18	09:03 14°46.890N 142°37.966E	4020m	IKMT NET FINISHED
ST-19	09:46 14°54.792N 142°37.238E	3989m	IKMT NET STARTED
ST-19	10:03 14°55.800N 142°37.220E	3953m	IKMT NET DEEPEST (w.o.1000m)
ST-19	11:00 14°58.177N 142.37.501E	3908m	IKMT NET FINISHED
ST-20	11:42 15°05.199N 142°36.653E	3832m	IKMT NET STARTED
ST-20	12:02 15°06.254N 142°36.663E	3715m	IKMT NET DEEPEST (w.o.1000m)
ST-20	12:57 15°08.349N 142°36.856E	3670m	IKMT NET FINISHED
ST-21	13:41 15°15.829N 142°36.055E	3964m	IKMT NET STARTED
ST-21	14:01 15°16.812N 142°35.982E	3956m	IKMT NET DEEPEST (w.o.1000m)
ST-21	14:56 15°18.457N 142°35.820E	3879m	IKMT NET FINISHED
ST-22	15:40 15°27.192N 142°35.634E	3881m	IKMT NET STARTED
ST-22	15:58 15°28.142N 142°35.609E	3883m	IKMT NET DEEPEST (w.o.1000m)
ST-22	16:53 15°29.967N 142°35.500E	3945m	IKMT NET FINISHED
ST-23	17:34 15°37.982N 142°35.066E	3928m	IKMT NET STARTED
ST-23	17:53 15°38.855N 142°35.380E	3913m	IKMT NET DEEPEST (w.o.1000m)
ST-23	18:48 15°40.398N 142°36.042E	3851m	IKMT NET FINISHED
ST-24	19:45 15°51.720N 142°39.980E	3644m	IKMT NET STARTED
ST-24	20:03 15°52.530N 142°40.230E	3649m	IKMT NET DEEPEST (w.o.1000m)
ST-24	20:57 15°53.785N 142°40.350E	3640m	IKMT NET FINISHED
ST-25	21:56 16°04.832N 142°45.124E	3410m	IKMT NET STARTED
ST-25	22:15 16°04.666N 142°46.142E	3310m	IKME NET DEEPEST (w.o.1000m)
ST-25	23:10 16°03.837N 142°48.117E	2949m	IKMT NET FINISHED
	---- 19 JULY01 (GMT) -----		
ST-26	00:18 16°17.997N 142°50.020E	2615m	IKMT NET STARTED
ST-26	00:39 16°17.244N 142°50.908E	2787m	IKMT NET DEEPEST (w.o.1000m)
ST-26	01:33 16°15.785N 142°52.404E	2931m	IKMT NET FINISHED
ST-27	02:48 16°31.473N 142°54.975E	2878m	IKMT NET STARTED

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ST-27	03:07 16°30.545N 142°55.447E	2819m	IKMT NET DEEPEST (w.o.1000m)
ST-27	04:02 16°28.710N 142°56.187E	2552m	IKMT NET FINISHED
ST-28	05:22 16°45.026N 142°59.778E	2779m	IKMT NET STARTED
ST-28	05:41 16°43.878N 142°59.456E	2787m	IKMT NET DEEPEST (w.o.1000m)
ST-28	06:38 16°41.845N 142°58.664E	2843m	IKMT NET FINISHED
ST-29	07:26 16°31.821N 142°59.888E	2722m	IKMT NET STARTED
ST-29	07:43 16°30.820N 142°59.750E	2650m	IKMT NET DEEPEST (w.o.1000m)
ST-29	08:38 16°28.438N 142°59.455E	1993m	IKMT NET FINISHED
ST-30	09:23 16°18.644N 143°00.108E	2345m	IKMT NET STARTED
ST-30	09:41 16°17.580N 143°00.120E	2345m	IKMT NET DEEPEST (w.o.1000m)
ST-30	10:36 16°15.174N 143°00.150E	2366m	IKMT NET FINISHED
ST-31	11:56 15°55.816N 143°00.083E	2748m	IKMT NET STARTED
ST-31	12:16 15°54.716N 143°00.224E	2819m	IKMT NET DEEPEST (w.o.1000m)
ST-31	13:10 15°52.879N 143°00.600E	3010m	IKMT NET FINISHED
ST-32	14:15 15°38.192N 142°59.969E	2806m	IKMT NET STARTED
ST-32	14:34 15°37.190N 142°59.934E	2755m	IKMT NET DEEPEST (w.o.1000m)
ST-32	15:29 15°35.319N 142°59.798E	2779m	IKMT NET FINISHED
ST-33	16:36 15°19.937N 143°00.061E	2608m	IKMT NET STARTED
ST-33	16:54 15°18.906N 143°00.067E	2653m	IKMT NET DEEPEST (w.o.1000m)
ST-33	17:51 15°16.791N 143°00.211E	2782m	IKMT NET FINISHED
ST-34	21:07 14°25.320N 143°00.100E	1904m	IKMT NET STARTED
ST-34	21:25 14°24.140N 143°00.162E	1851m	IKMT NET DEEPEST (w.o.1000m)
ST-34	22:19 14°21.677N 143°00.538E	1845m	IKMT NET FINISHED
ST-35	23:15 14°12.385N 143°00.013E	3406m	IKMT NET STARTED
ST-35	23:34 14°11.208N 142°59.932E	3554m	IKMT NET DEEPEST (w.o.1000m)
	-----20 JULY01 (GMT)-----		
ST-35	00:34 14°08.555N 142°59.653E	3773m	IKMT NET FINISHED
ST-36	01:18 14°00.037N 143°00.009E	4331m	IKMT NET STARTED
ST-36	01:37 14°00.787N 142°59.378E	4330m	IKMT NET DEEPEST (w.o.1000m)
ST-36	02:35 14°02.143N 142°58.082E	3849m	IKMT NET FINISHED
ST-37	03:16 13°59.946N 142°50.019E	2685m	IKMT NET STARTED
ST-37	03:34 14°00.613N 142°49.360E	2191m	IKMT NET DEEPEST (w.o.1000m)
ST-37	04:29 14°01.807N 142°48.090E	2025m	IKMT NET FINISHED
ST-38	05:15 14°10.948N 142°49.482E	945m	IKMT NET STARTED
ST-38	05:34 14°11.766N 142°49.485E	1559m	IKMT NET DEEPEST (w.o.1000m)
ST-38	06:28 14°13.211N 142°49.620E	1670m	IKMT NET FINISHED
ST-39	07:17 14°21.925N 142°48.946E	2530m	IKMT NET STARTED
ST-39	07:35 14°22.600N 142°48.940E	2634m	IKMT NET DEEPEST (w.o.1000m)
ST-39	08:30 14°24.195N 142°49.047E	2459m	IKMT NET FINISHED
ST-40	09:14 14°32.749N 142°48.333E	2951m	IKMT NET STARTED
ST-40	09:30 14°33.445N 142°48.328E	3003m	IKMT NET DEEPEST (w.o.1000m)
ST-40	10:24 14°34.939N 142°48.511E	3130m	IKMT NET FINISHED
ST-41	11:06 14°43.475N 142°47.847E	3414m	IKMT NET STARTED
ST-41	11:25 14°44.380N 142°47.890E	3444m	IKMT NET DEEPEST (w.o.1000m)
ST-41	12:20 14°46.220N 142°48.011E	3500m	IKMT NET FINISHED
ST-42	13:41 15°05.386N 142°46.664E	3222m	IKMT NET STARTED
ST-42	14:04 15°06.429N 142°46.543E	3104m	IKMT NET DEEPEST (w.o.1000m)
ST-42	15:00 15°08.141N 142°46.320E	2333m	IKMT NET FINISHED
ST-43	15:41 15°16.183N 142°46.084E	3644m	IKMT NET STARTED
ST-43	16:00 15°17.133N 142°45.950E	3710m	IKMT NET DEEPEST (w.o.l000m)
ST-43	16:55 15°19.047N 142°45.639E	3664m	IKMT NET FINISHED
ST-44	17:34 15°27.111N 142°45.565E	3327m	IKMT NET STARTED
ST-44	17:53 15°28.195N 142°45.419E	3382m	IKMT NET DEEPEST (w.o.1000m)
ST-44	18:48 15°30.457N 142°44.980E	3453m	IKMT NET FINISHED
ST-45	19:26 15°38.038N 142°43.932E	1458m	IKMT NET STARTED
ST-45	19:44 15°38.990N 142°43.710E	1886m	IKMT NET DEEPEST (w.o.1000m)
ST-45	20:38 15°40.946N 142°43.001E	2754m	IKMT NET FINISHED
ST-46	21:28 15°49.295N 142°49.304E	3318m	IKMT NET STARTED
ST-46	21:46 15°50.150N 142°49.800E	3273m	IKMT NET DEEPEST (w.o.1000m)
ST-46	22:40 15°51.608N 142°50.736E	3225m	IKMT NET FINISHED
ST-47	23:33 16°02.945N 142°53.218E	2219m	IKMT NET STARTED
ST-47	23:52 16°03.915N 142°53.633E	2258m	IKMT NET DEEPEST (w.o.1000m)
	---- 21 JULY01 (GMT) -----		
ST-47	00:47 16°05.568N 142°54.256E	2950m	IKMT NET FINISHED
ST-48	02:07 16°22.681N 143°01.754E	2324m	IKMT NET STARTED
ST-48	02:25 16°23.345N 143°02.316E	2311m	IKMT NET DEEPEST (w.o.1000m)
ST-48	03:21 16°24.908N 143°02.857E	2300m	IKMT NET FINISHED
ST-49	05:46 16°33.857N 143°05.746E	2403m	IKMT NET STARTED
ST-49	06:05 16°35.201N 143°05.750E	2242m	IKMT NET DEEPEST (w.o.1000m)
ST-49	07:00 16°37.742N 143°05.533E	2414m	IKMT NET FINISHED
ST-50	07:42 16°45.233N 143°09.732E	2231m	IKMT NET STARTED

KH-01-1 Leg.2 Working log

ST-50	08:02 16°46.380N 143°08.890E	2328m	IKMT NET DEEPEST (w.o.1000m)
ST-50	08:55 16°48.968N 143°07.526E	2046m	IKMT NET FINISHED
ST-51	09:43 16'44.675N 143"01.218E	2780m	IKMT NET STARTED
ST-51	10:00 16°43.960N 143°01.540E	2769m	IKMT NET DEEPEST (w.o.1000m)
ST-51	10:56 16°42.480N 143°02.267E	2765m	IKMT NET FINISHED
ST-52	11:48 16°33.852N 142°55.994E	2911m	IKMT NET STARTED
ST-52	12:09 16°32.774N 142°55.640E	2865m	IKMT NET DEEPEST (w.o.1000m)
ST-52	13:02 16°30.698N 142°55.046E	2837m	IKMT NET FINISHED
ST-53	13:48 16°23.095N 142°52.037E	2280m	IKMT NET STARTED
ST-53	14:09 16°21.920N 142°51.690E	2086m	IKMT NET DEEPEST (w.o.1000m)
8T-53	15:05 16°19.599N 142°50.882E	2365m	IKMT NET FINISHED
8T-54	15:48 16°11.391N 142°47.565E	3204m	IKMT NET STARTED
8T-54	16:06 16°10.378N 142°47.261E	3287m	IKMT NET DEEPEST (w.o.1000m)
8T-54	16:59 16°08.297N 142°46.405E	3379m	IKMT NET FINISHED
8T-55	17:40 16°03.017N 142°43.409E	3446m	IKMT NET STARTED
8T-55	17:58 16°02.159N 142°42.915E	3442m	IKMT NET DEEPEST (w.o.1000m)
8T-55	18:51 16°00.352N 142°41.549E	3549m	IKMT NET FINISHED
8T-56	19:47 15°49.118N 142°39.513E	3707m	IKMT NET STARTED
8T-56	20:05 15°48.790N 142°40.340E	3634m	IKMT NET DEEPEST (w.o.1004m)
ST-56	20:08 15°48.756N 142°40.450E	3634m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-56	20:59 15°48.068N 142°42.213E	3570m	IKMT NET FINISHED
ST-57	21:57 15°38.195N 142°35.362E	3918m	IKMT NET STARTED
ST-57	22:14 15°37.970N 142°36.180E	3859m	IKMT NET DEEPEST (w.o.1001rn)
ST-57	23:08 15°37.439N 142°38.0S9E	3708m	IKMT NET FINISHED
ST-58	23:58 15°27.183N 142°35.674E	3877m	IKMT NET STARTED
	---- 22 JULY01 (GMT) -----		
ST-58	00:16 15°26.852N 142°36.819E	3866m	IKMT NET DEEPEST (w.o.1000m)
ST-58	01:11 15°26.310N 142°39.462E	3798m	IKMT NET FINISHED
ST-59	02:02 15°16.155N 142°36.152E	3960m	IKMT NET STARTED
ST-59	02:21 15°15.888N 142°37.440E	3947m	IKMT NET DEEPEST (w.o.1000m)
ST-59	03:16 15°15.272N 142°40.186E	3815m	IKMT NET FINISHED
ST-60	04:18 15°05.273N 142°36.807E	3841m	IKMT NET STARTED
ST-60	04:37 15°05.013N 142°37.855E	3773m	IKMT NET DEEPEST (w.o.1000m)
ST-60	05:33 15°04.577N 142°39.835E	3688m	IKMT NET FINISHED
ST-61	06:23 14°54,424N 142°37.176E	4001m	IKMT NET STARTED
ST-61	06:42 14°54.383N 142°38.152E	3995m	IKMT NET DEEPEST (w.o.1000m)
ST-61	07:37 14°54.384N 142°39.932E	3836m	IKMT NET FINISHED
ST-62	08:28 14°43.608N 142°37.769E	3936m	IKMT NET STARTED
ST-62	08:47 14°42.940N 142°38.610E	3849m	IKMT NET DEEPEST (w.o.1000m)
ST-62	09:02 14°42.572N 142°39.021E	3803m	SUNSET & TURNED ON REGULATION LIGHTS
ST-62	09:41 14°41.571N 142°40.120E	3800m	IKMT NET FINISHED
ST-63	10:38 14°32.614N 142°38.449E	2351m	IKMT NET STARTED
ST-63	10:56 14°32.2SON 142°39.490E	2909m	IKMT NET DEEPEST (w.o.1000m)
ST-63	11:49 14°31.452N 142°41.655E	3183m	IKMT NET FINISHED
ST-64	12:39 14°21.763N 142°38.951E	3238m	IKMT NET STARTED
ST-64	13:00 14°20.600N 142°38.813E	3115m	IKMT NET DEEPEST (w.o.1000m)
ST-64	13:53 14°18.549N 142°38.386E	2727m	IKMT NET FINISHED
ST-65	14:30 14°11.178N 142°39.602E	2738m	IKMT NET STARTED
ST-65	14:49 14°10.085N 142°39.626E	2630m	IKMT NET DEEPEST (w.o.1000m)
ST-65	15:43 14°07.948N 142°39.370E	2608m	IKMT NET FINISHED
ST-66	16:28 13°59.871N 142°40.073E	2517m	IKMT NET STARTED
ST-66	16:47 13°58.940N 142°40.709E	2405m	IKMT NET DEEPEST (w.o.1000m)
ST-66	17:43 13°56.787N 142°41.808E	2235m	IKMT NET FINISHED
ST-67	18:48 14°10.912N 142°39.512E	2673m	IKMT NET STARTED
ST-67	19:30 14°13.290N 142°39.210E	2902m	IKMT NET DEEPEST (w.o.2500m)
ST-67	20:46 14°15.804N 142°38,954E	2158m	IKMT NET FINISHED
ST-68	21:59 14°32.561 N 142°38.275E	2284m	IKMT NET STARTED
ST-68	22:43 14°34.990N 142°38.220E	2404m	IKMT NET DEEPEST (w.o.2500m)
	---- 23 JULY01 (GMT) -----		
ST-68	00:02 14°37.757N 142°38.409E	3541m	IKMT NET FINISHED
ST-68	00:10 14°37.793N 142°38.434E	3543m	FLOWMETER CALIBRATION STARTED
ST-66	00:56 14°37.660N 142°38.636E	3541m	FLOWMETER CALIBRATION FINISHED
ST-69	05:05 15°37.961N 142°35.050E	3935m	IKMT NET STARTED
ST-69	05:48 15°39.639N 142°36.764E	3810m	IKMT NET DEEPEST (w.o.2500m)
ST-69	07:12 15°41.574N 142°38.859E	3580m	IKMT NET FINISHED
	---- 26 JULY01 (GMT) -----		
ST-P4			OR1 NET STARTED
ST-P4			OR1 NET DEEPEST
ST-P4			OR1 NET FINISHED

KH-02-2 (Eel cruise X)

Scientists on board HAKUHO-MARU (KH-02-2)

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MILLER Michael J.	Ocean Research Institute, The University of Tokyo	Research Fellow
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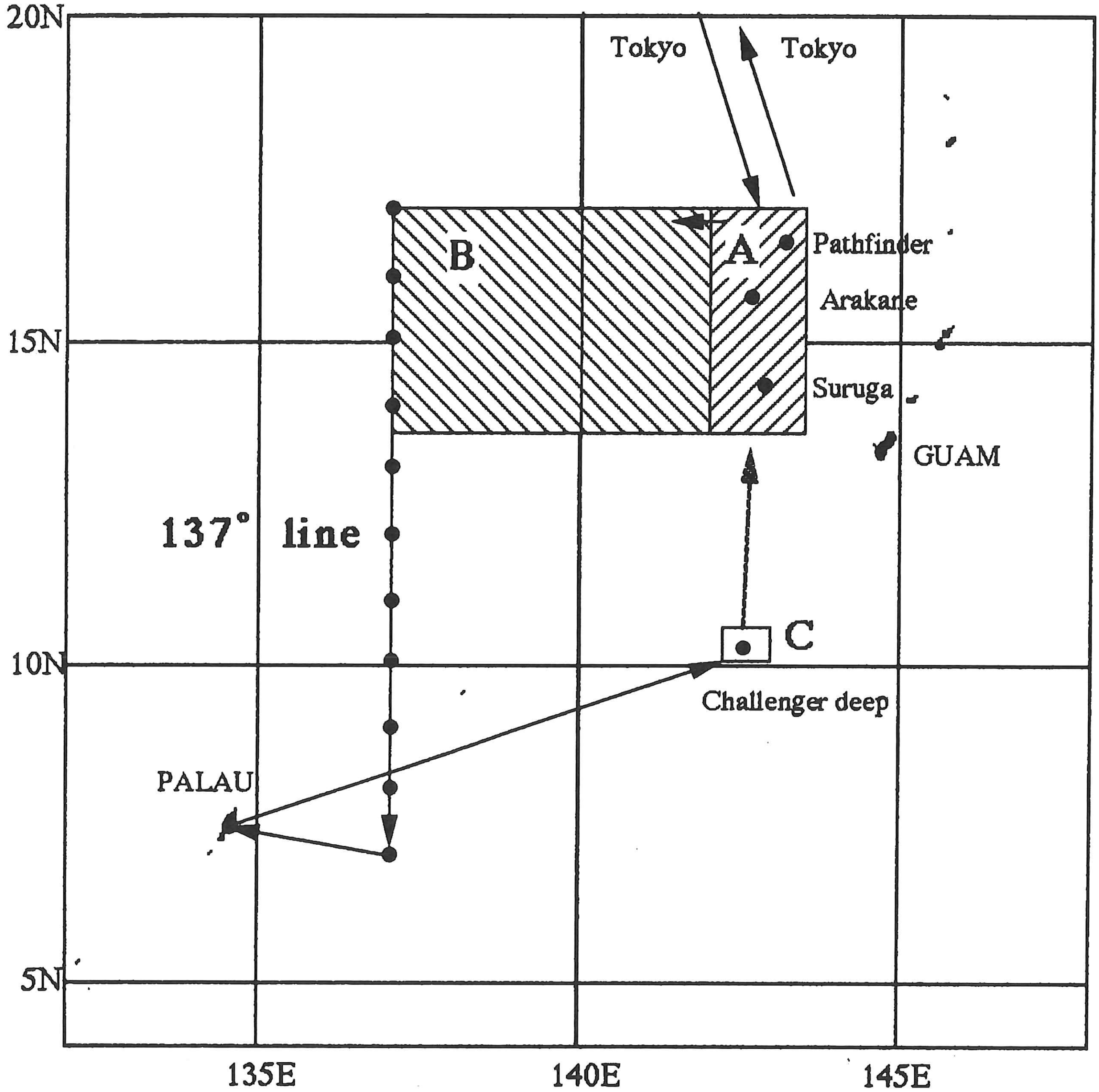
LEE Tae Won	Department of Oceanography, Chungnam National University, Korea	Proffesor
INOUE Takashi	Northwest Pacific Region Environmental Cooperation Center	
AI Shosuke		Journalist

KH-02-2 Track Chart



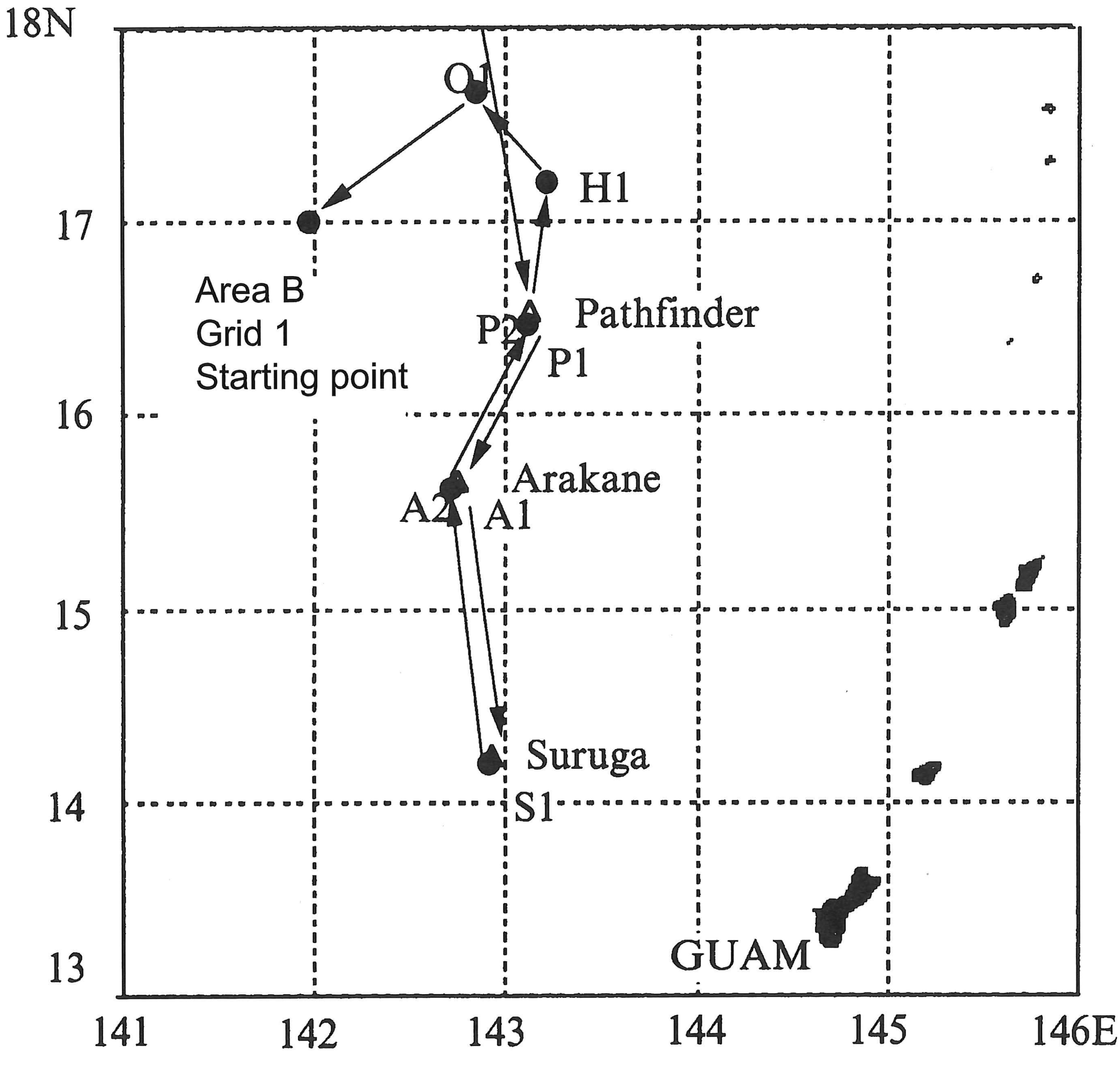
Leg1 : 05 July (Tokyo) - 26 July (Palau)

Area A (seamounts area)
Area B (grid survey)
137° line

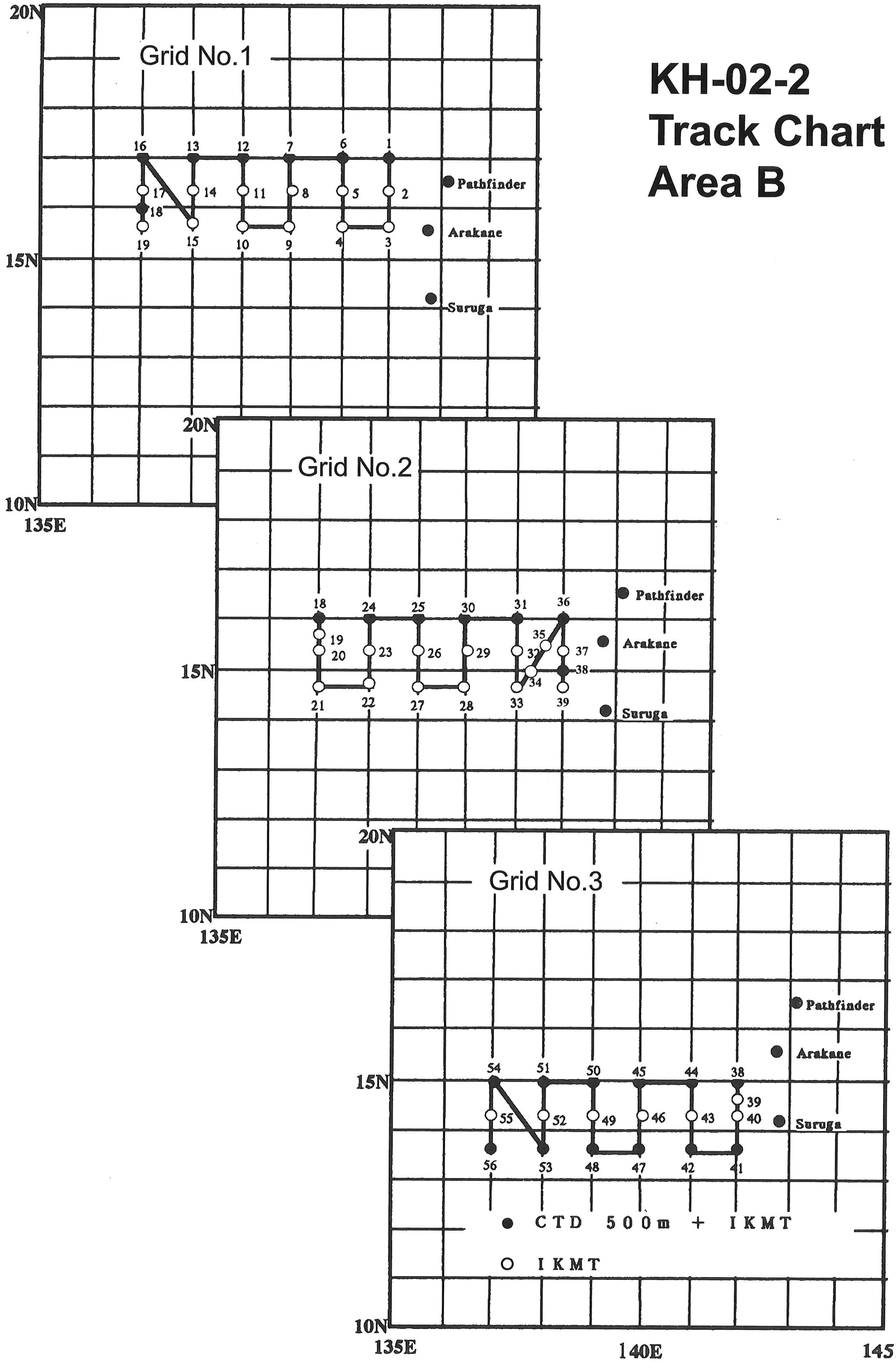
Leg2 : 01 Aug. (Palau) - 15 Aug. (Tokyo)

Palau - Challenger deep
Area C (Challenger deep)
Challenger deep - Area A
Area A

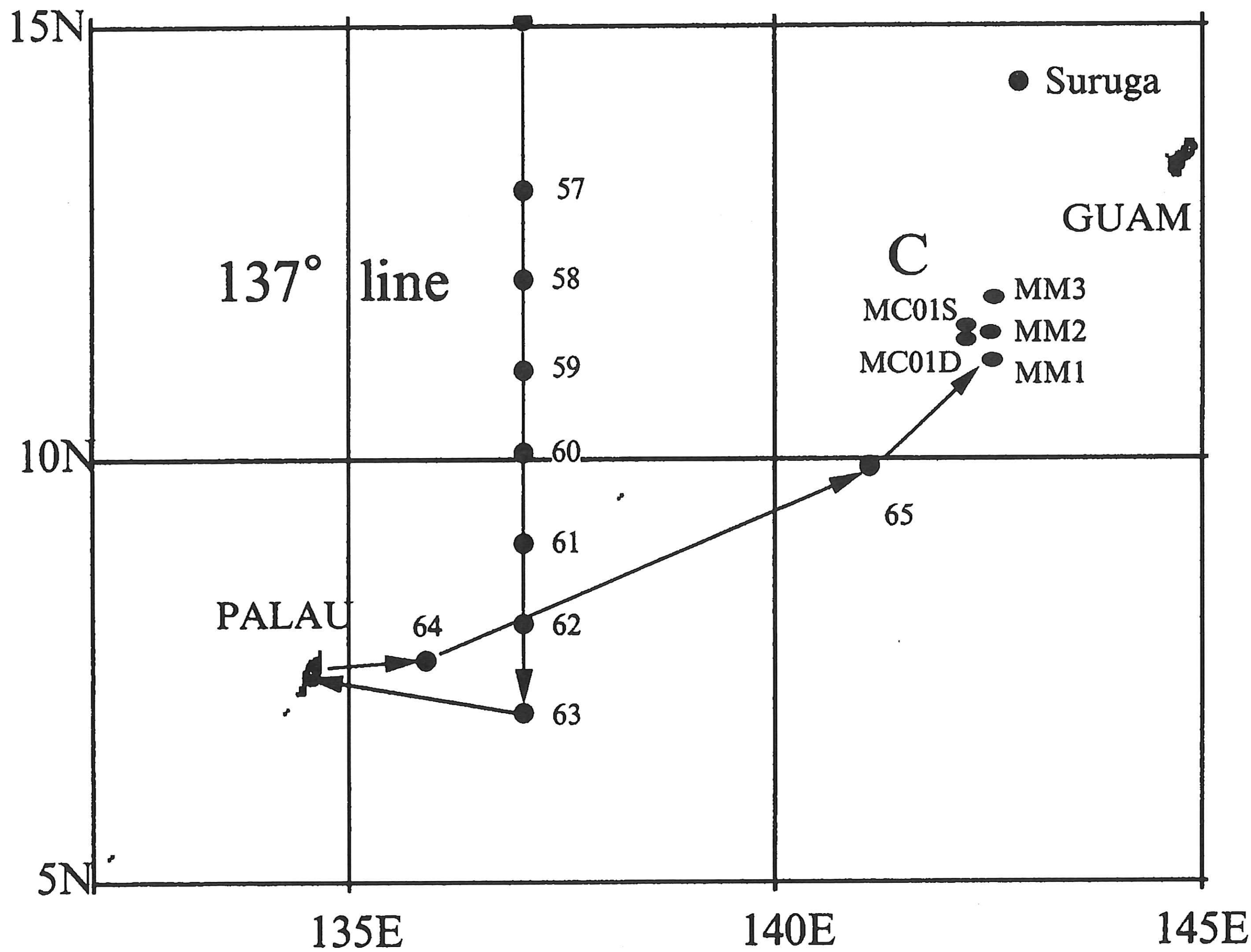
KH-02-2 Track Chart (1)
Area A Leg1



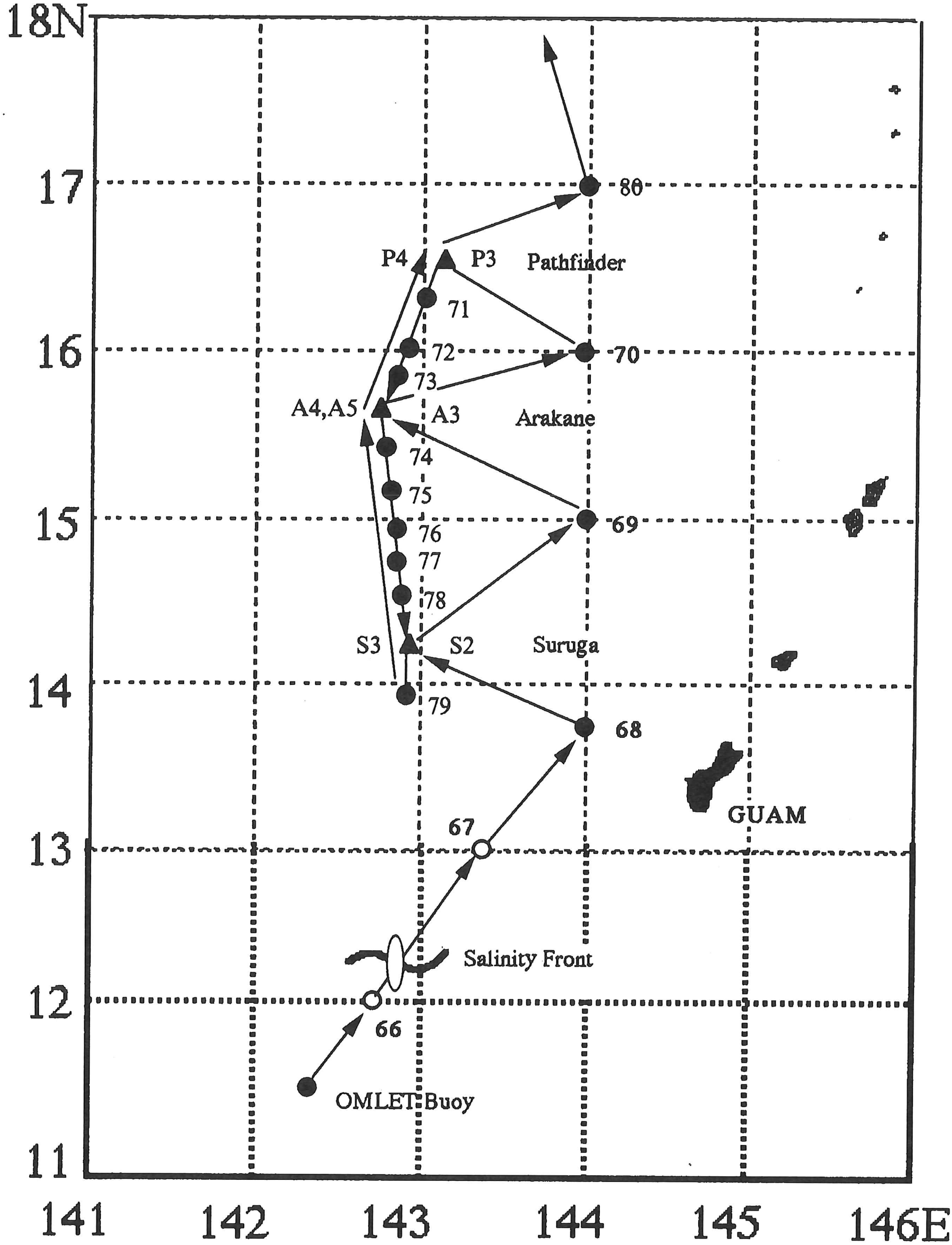
KH-02-2
Track Chart (2)
Area B



KH-02-2 Track Chart (3)
137ºE line & Area C



KH-02-2 Track Chart (4)
Challenger deep - Area A Leg 2



A trial for sampling adult eels by hooking

Jun Aoyama, Seiji Sasai, Takahiro Nishihara, Takao Tsuchiya, Tatsuki Yoshinaga, Noritaka Matsumoto and Naoki Mizuno

Introduction

During the KH-98-2 cruise, a huge and apparently high density school of fish that may have been a spawning aggregation of the Japanese eel *Anguilla japonica* was acoustically observed in Pathfinder Seamount (See Tsukamoto et al. 2003). If this huge and dense school observed by ecosounder was spawning aggregation of Japanese eel, they would have been showing a strong motivation for spawning, which is a very different behavior than its sedentary yellow eel stage. Because anguillid eels are thought to stop feeding at their sexual maturation due to the degenerative morphological changes in the alimentarly tract of sexually maturing European silver eels (see Pankhurst and Sorensen 1984), they are difficult to catch using standard methods based on food as an attractant.

Because of this likely lack of feeding motivation in spawning Japanese eels, during KH-02-2 cruise, we simply simply tried to hook the fish. This was attempted by locating the position and depth of apparent fish schools detected by ecosounder.

Methods

Commercially available fishing gears were used, and two fishing devices were prepared as follows (Fig. 1): electric reel (Miyamae Inc., CX6HP), fishing rod (2.1 m, load weight #30, Shimano Inc.), line (PE#10) with a leader of nylon (#14-30) and leader line of 2 m Nylon #10. The weight used here was #500. It is possible that some fish species actively feeding are also observed acoustically. So, additional fishing device was used with bait (Fig.1).

Acoustic observations were used to monitor the density and structure of the apparent schools of fish, and when high density targets were observed, the fishing gear was deployed to the same depth of the targets (see Inagaki et al. this volume).

Results and Discussion

Including one test casting during each leg of the cruise, a total of 20 casts were conducted, which resulted in the collection of 12 fish: 1 individual of *Caranx sexfaciatus*, *Katsuwonus pelamis*, *Paracaesio xanthurus*, *Pristipomoides auricilla*, 2 *Thunnus albacares* and 5

Promethichythys Prometheus (Table 1). Although there were no anguillid eels, these results successfully enabled us to identify the species of fish that may have been associated with the acoustically observed schools around the seamounts at depths of 100 – 300 m. In addition to these landed, a total of six fish got away during their retrieval. A more effective method to land the fish must be developed to prevent this loss of hooked fish. The conbination of echo-sounder observations and the sampling methods described here provide a new approach to determine the spawning site of the Japanese eel.

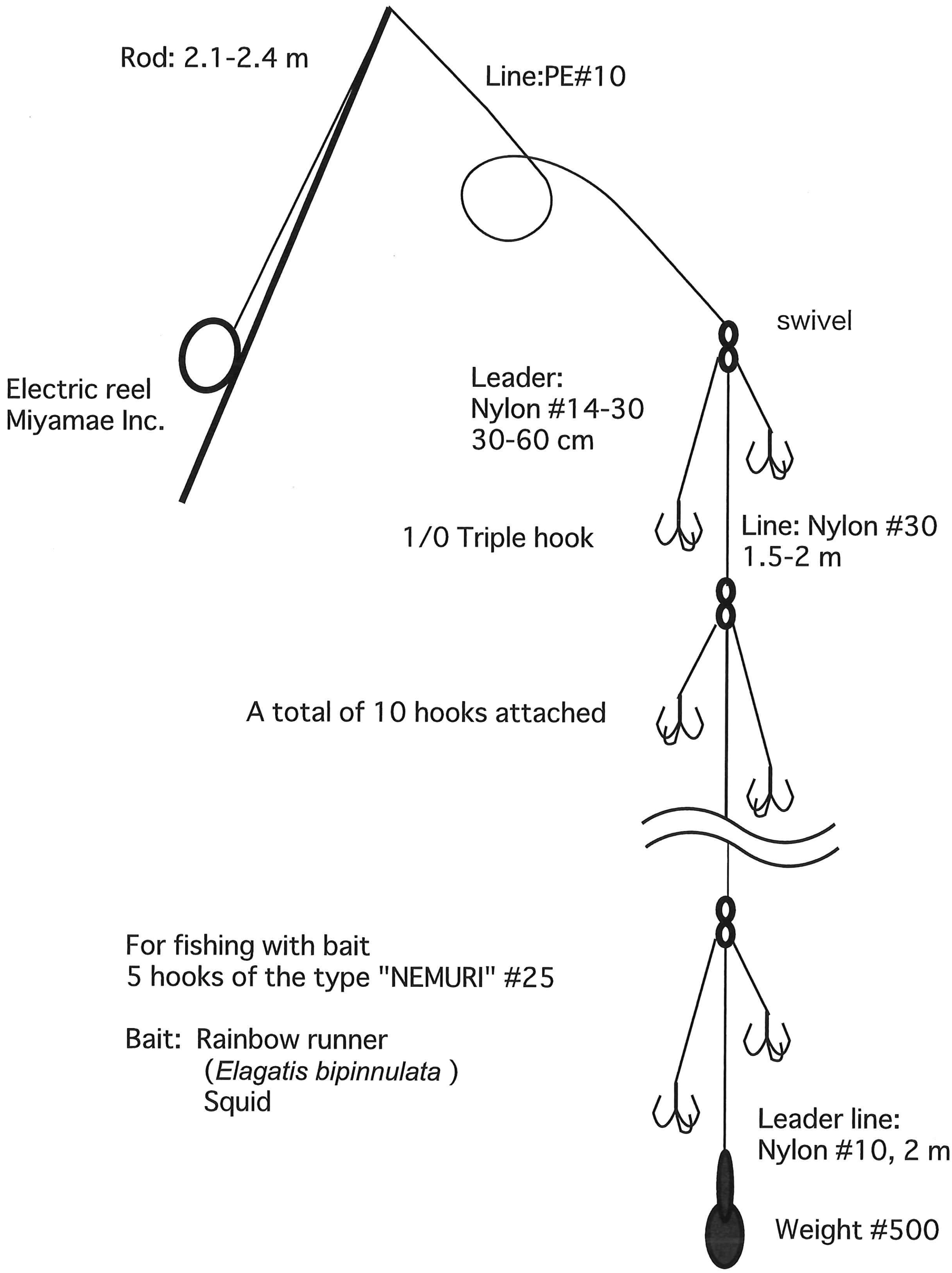
Reference

Pankhurst NW, Sorensen PW (1984) Degeneration of the alimentary-tract in sexually maturing European eel *Anguilla anguilla* (Lesueur). Can J Zool 62:1143-1149

Tsukamoto K, Otake T, Mochioka N, Lee TW, Fricke H, Inagaki T, Aoyama J, Ishikawa S, Kimura S, Miller MJ, Hasumoto H, Oya M, Suzuki Y. (2003) Seamounts, new moon and eel spawning: the search for the spawning site of the Japanese eel. Environ. Biol. Fishes. 66: 221-229

Table 1 Date, locations, target depths and catch of the samplings around the seamounts during KH02-2

Date	Station	Location Lat.	Long.	Time	Depth (m)	Target depth (m)	Devices (number)	Results (number, method)(time and depth)
20709	Suruga (Test)	14-13.0N	142-53.7E	19:51-20:10		100-300	Hooking (3)	*Caranx sexfaciatus(one by hooking)*
20710	P2	16-30.9N	143-09.1E	16:39-19:31		120	Hooking (2)	Nothing
20712	Pathfinder	16-30.1N	143-09.4E	16:30-18:33		300-320	Hooking (3)	*Katsuwonus pelamis* (one by hooking), *Thunnus albacares* (one by hooking)
20806	S2-1(Test)	14-12.8N	142-53.2E	10:35-11:00	330	250-300	Hooking (2), Bait (1), Winch No.8	Lost one fish (10:44, 230m)
20806	S2-4	14-13.3N	142-52.7E	21:40-21:48		170-180	Hooking (2), Bait (1), Winch No.8	*Promethichythys Prometheus* (two by bait) (21:42, 21:48, 180m)
20806	S2-5	14-13.2N	142-52.6E	22:05-22:12		130-160	Hooking (2), Bait (1), Winch No.8	*Promethichythys Prometheus* (one by bait) (22:10, 150m)
20807	A3-1	15-38.5N	142-45.3E	14:35-14:41	560	-	Hooking (2), Bait (1)	Nothing
20807	A3-2	15-38.4N	142-45.4E	14:53-15:12	447	360	Hooking (2), Bait (1)	Nothing
20807	A3-3	15-38.5N	142-45.3E	15:28-15:41	440	320-360	Hooking (2), Bait (1)	Nothing
20807	A3-4	15-38.5N	142-45.4E	15:57-16:57	500	290-320	Hooking (2), Bait (1)	Nothing
20807	A3-5	15-38.5N	142-45.4E	17:05-17:22	495	230-260	Hooking (2), Bait (1)	Nothing
20808	P3-1	16-30.4N	143-08.3E	15:03-15:34	420	295-380	Hooking (2), Bait (1)	Lost one fish (15:16, 250m)
20808	P3-2	16-30.8N	143-08.4E	16:14-17:10	410	375-380	Hooking (2), Bait (1)	*Thunnus albacares* (one by bait)(16:37, 320m)
208010	A5-2	15-38.4N	142-45.4E	17:10-17:55	400	200-260	Hooking (2), Bait (1)	Nothing
208010	A5-2	15-38.4N	142-45.4E	18:03-18:05	400	220-240	Hooking (2), Bait (1)	Nothing
208010	A5-3	15-38.1N	142-45.2E	19:10-19:40	380	230-260	Hooking (2), Bait (1)	Lost one fish (19:14, 260m)
								Lost one fish (19:16, 220m)
								Promethichythys Prometheus (one by bait) (19:16, 260m)
								Lost one fish (19:23, 260m)
								Revettus pretiosus (one by bait) (19:28, 310m)
								Promethichythys Prometheus (one by bait) (19:30, 220m)
20811	P4-4	16-29.9N	143-08.5E	07:10-07:23	340	290-300	Hooking (2), Bait (1)	Lost Thunnus albacares(07:13, 100m)
20811	P4-5	16-30.1N	143-09.5E	07:37-07:48	430	370-390	Hooking (2), Bait (1)	Nothing
20811	P4-6	16-30.0N	143-09.3E	08:00-08:09	360	320	Hooking (2), Bait (1)	Nothing
20811	P4-7	16-30.4N	143-09.4E	08:28-08:40	220	170-180	Hooking (2), Bait (1)	*Paracaesio xanthurus* (one by bait) (08:30, 200m with bait)
								Pristipomoides auricilla (one by bait) (08:31, 200m)


Rod: 2.1-2.4 m
Line:PE#10
Electric reel
Miyamae Inc.
swivel
Leader:
Nylon #14-30
30-60 cm
1/0 Triple hook
Line: Nylon #30
1.5-2 m
A total of 10 hooks attached
For fishing with bait
5 hooks of the type "NEMURI" #25
Bait: Rainbow runner
(*Elagatis bipinnulata*)
Squid
Leader line:
Nylon #10, 2 m
Weight #500

Report of the anguillid-like fish eggs at the Pathfinder seamount during KH-02-2

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Several attempts have been made in recent years to collect eggs or newly hatched larvae of the Japanese eel, *Anguilla japonica*, near the seamounts of the West Mariana Ridge, because these seamounts have been proposed as possible spawning sites for this species (Tsukamoto et al. in press). In this cruise concentrated sampling effort around the Pathfinder, Arakane and Suruga seamounts resulted in the collection of a total of 183 eggs that morphologically resembled those of the Japanese eel. However, the morphological characteristics of the Japanese eel egg can only be empirically inferred from eggs spawned by artificial matured adults and those of closely related species (Yamamoto and Yamauchi 1974, Yamamoto et al. 1975). Thus, we applied molecular techniques to determine whether these eggs collected during the KH-02-2 Hakuho-Maru cruise were of the Japanese eel.

The eggs examined here were collected by Isaacs-Kidd Midwater Trawl (IKMT) having a 8.7 m^2 mouth opening and 0.5 mm mesh at the St. P3-5 in the south of Pathfinder seamount on 8 August 2002. These eggs were preserved in 95% ethanol after recording their morphology using a dissecting microscope equipped with a digital imaging system. They were categorized as egg type #1750 (see Kawakami et al. this volume) and seemed to be stages just after fertilization (Fig.1A). The diameters of these eggs averaged 1.2 ± 0.05 mm, with wide perivitelline space (35.0 ± 4.83% of egg diameter), and they had a single transparent oil globule (0.17 ± 0.01 mm in diameter, Fig. 1). However, many of these eggs were severely damaged apparently by physical forces during net towing.

After going back to the laboratory, total genomic DNA extraction from 11 eggs sabsampled from these specimens were individually carried out by incubating at 95°C for 15 minutes in a 5% Chelex solution (BioRad). PCR amplification for a portion of mitochondrial 16S ribosomal RNA gene was conducted using the oligonucleotide primers, H2510 and H3058 (Aoyama et al. 2001) for subsequent sequencing procedure. Amplification parameters were 35 cycles of denaturation at 94°C for 30 sec, annealing at 55°C for 30 sec, and extension at 72°C for 60 sec.

However, the PCR amplifications were failed due probably the sample decomposition. All eggs examined here would be not fresh enough for DNA analyses. The eggs were, in general, robust against physical forces except at very early stages (Yamamoto et al. 1975). The eggs examined in the present study might be collected just after fertilization, and therefore, they may have been damaged while within the net. Further, duration of the tows in significantly high water temperature of about 20-30°C could enhance the decomposition of the specimens. DNA extraction in the mass and PCR amplification of a very short DNA fragment are now applied to identify species of the eggs.

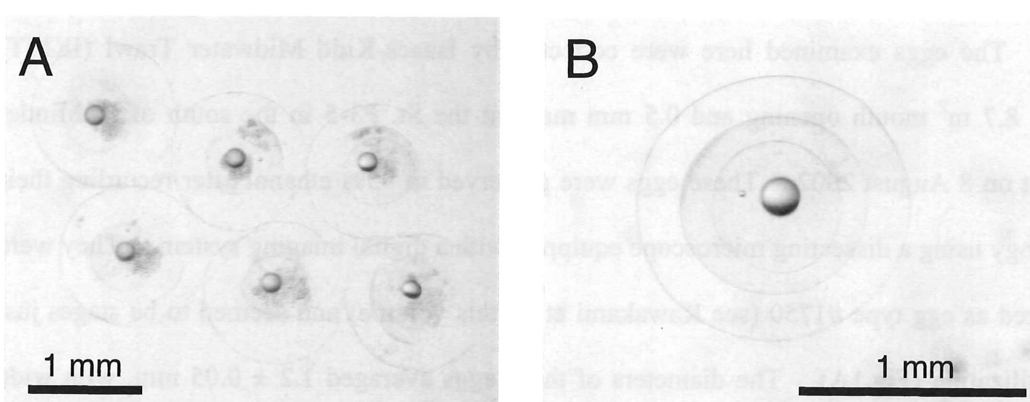

Fig. 1. Photographs showing the anguilliform egg type #1750

Reference

Aoyama J, Ishikawa S, Otake T, Mochioka N, Suzuki Y, Watanabe S, Shinoda A, Inoue J, Lokman PM, Inagaki T, Oya M, Hasumoto H, Kubokawa K, Lee TW, Fricke H, Tsukamoto K. Molecular approach for species identification of eggs with respect to determination of the spawning site of the Japanese eel *Anguilla japonica. Fishries Science.* 2001; 67: 761-763.

Kawakami T, Fukamachi T, Kuroki M, Minegishi Y, Yoshinaga T, Watanabe S, Mizuno N, Suzuki Y, Otake T, Mochioka N, Lee TW, Aoyama J and Tsukamoto K. Horizontal distribution of anguilliform eggs in the West Mariana region. This volume.

Yamamoto K, Yamauchi K. Sexual maturation of Japanese eel and production of eel larvae in the aquarium. Nature 1974; 251: 220–221.

Yamamoto K, Yamauchi K, Kasuga S. On the development of the Japanese eel, Anguilla japonica. Nippon Suisan Gakkaishi 1975; 41: 21–28.

Horizontal distribution of anguilliform eggs in the West Mariana region

Tatsuya Kawakami, Tetsuo Fukamachi, Mari Kuroki, Yuki Minegishi, Tatsuki Yoshinaga, Shun Watanabe, Naoki Mizuno, Yuzuru Suzuki, Tsuguo Otake, Noritaka Mochioka, Tae Won Lee, Jun Aoyama and Katsumi Tsukamoto

Introduction

In order to determine the spawning site of the Japanese eel, *Anguilla japonica*, collection of their eggs or newly hatched larvae has been attempted in recent years near seamounts of the West Mariana Ridge, which have been hypothesized as their possible spawning sites (Tsukamoto et al. 2003). Seamounts appear to play an important role for spawning in some anguilliform fish, because unusual schooling behavior of eels of the family Synaphobranchidae that appeared to be a spawning aggregation has been observed by submersible around the No. 2 Kasuga seamount (Fricke and Tsukamoto 1998). However, direct evidence about the spawning location of most anguilliform fishes is still lacking, so studies on the distribution of their eggs will provide valuable information for determining the spawning site of the Japanese eel and of the other species.

During the KH-02-2 cruise, we studied the distribution of fish eggs by conducting net tows at the seamounts and on their south, west and east sides. In this study, we analyzed the morphology and distribution of the anguilliform eggs that were collected in the West Mariana Ridge region.

Materials and Methods

Net sampling was carried out from 5 July to 15 August 2002. Sampling stations were located as follows: A region (around the seamounts; 14°-18°N, 142°-144°E); B region (west of the seamounts; 14°-18°N, 137°-142°E); C region (around the Challenger Deep; St. 65); 137° line (south of B region; 7°-13° N, 137° E); 144° line (east of the seamounts; 13°40'-18° N, 144° E) (for detailed information, see the cruise track and the net record). Fish eggs were collected using an Isaacs-Kidd Midwater Trawl (IKMT) with a mouth opening measuring 8.7 m^2 and 0.5 mm or 1.0 mm mesh (for detailed data, see the net record). Tows were made obliquely from the surface to a depth of 200-600 m and were generally about 60 min in duration (for detailed data, see net record). Additional tows of an ORI net with a mesh size of 0.33 mm were also made from the surface to a depth of about 300 m. The filtering volume of all tows was estimated using a flow meter attached at the mouth of the net. The actual net depth was recorded using a SCANMAR depth transmitting device or an RMD, which records the depth history of each tow. The total number of tows was 89 IKMT (0.5 mm), 32 IKMT (1.0 mm) and 2 ORI net tows.

The eggs of anguilliform fishes can be easily distinguished from other fish eggs based on their particular morphological characters such as large size, wide perivitelline space, smooth chorion and segmented yolk (Mochioka and Utsumi 2001). Based on this, anguilliform eggs were visually sorted out from the net samples, and photographed using a binocular microscope (Nikon SMZ1500) equipped with a digital imaging system (Nikon DXM1200). Then the specimens were preserved in 99% ethanol for subsequent genetic analysis.

After the cruise, the morphological characters of anguilliform eggs were observed and measured to the nearest 0.01 mm using the digital photographs to divide them into the egg groups IA-IIID following Ikeda and Mito (1988). The eggs were further grouped based on their morphological similarities when their species identifications could not be made. The abundances of these eggs were adjusted to the volume of water filtered and were expressed as the number of eggs per 10^5 m^3 of water filtered.

Results

Morphological identification

There were 123 net tows during the cruise, and a total of 276 anguilliform eggs were collected in these tows and were divided into the stages ID, IID, IIID and IC (Ikeda and Mito, 1988). Within each of these stages, the eggs were further categorized in 7, 4, 1 and 1 different types, respectively (Table 1). However, most of their identifications were at the family or ordinal level and the taxonomic status of each morphological group was not clear.

Table 1. Comparison of morphological characters of the different types of anguilliform eggs collected during the KH-02-2 cruise in the West Mariana Ridge region. Values of measurements are mean ± standard deviation.

Egg type		Ikeda and Mito grouping	Number of eggs collected	Diameter of eggs (mm)	Yolk diameter (mm)	Number of oil globules	Diameter of oil globules (mm)	Color of oil globules
#0002		II D	53	3.15 ± 0.23	1.94 ± 0.20	0	-	-
#0013		I D	8	2.56 ± 0.17	1.56 ± 0.15	1	0.34 ± 0.06	orange
#0467		II D	8	2.18 ± 0.07	1.40 ± 0.11	0	-	-
#0771	Serrivomeridae	I D	2	2.21	-	1	0.33	transparent
#0982		III D	9	2.39 ± 0.06	1.86 ± 0.09	1-6	-	transparent
#1060		I D	7	2.27 ± 0.06	1.16 ± 0.14	1	0.34 ± 0.01	transparent
#1293		I D	1	1.96	0.81	1	0.15	transparent
#1620		I D	1	1.64	0.93	1	0.21	transparent
#1750	*Anguilla* sp.?	I D	183	1.20 ± 0.05	0.78 ± 0.06	1	0.17 ± 0.01	transparent
#2570		I D	1	2.50	1.40	1	0.43	transparent
#3700		II D	1	2.58	1.65	0	-	-
#3961		I C	1	1.53	1.15	1	0.33	transparent
#5655		II D	1	1.75	0.98	0	-	-

The most abundant egg type was #1750, with a total of 183 eggs being collected (Fig. 1D). These eggs seemed to be just after fertilization and had a mean egg diameter of 1.2 ± 0.05 mm, a wide perivitelline space (25.0 - 51.2% of egg diameter) and a single transparent oil globule (0.17 ± 0.01 mm in diameter). These morphological characteristics resembled those of the eggs of the Japanese eel that were observed after artificially induced spawning (Yamamoto and Yamauchi 1974, Yamamoto et al. 1975).

An additional 53 eggs were grouped into the type #0002 (Fig. 1A). These eggs showed a large egg diameter (3.2 ± 0.23 mm), no oil globule and a wide perivitelline space (28.0-47.2%) and were similar to the Anguillida No.3 egg reported in Mito (1961).

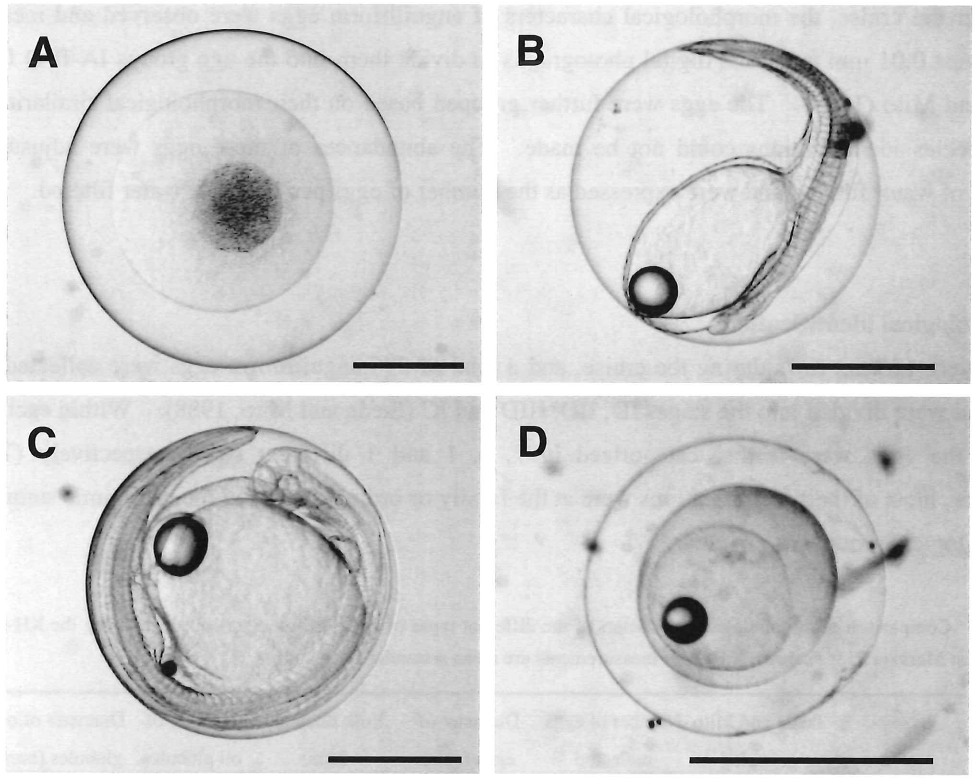

Fig. 1. Photographs showing representative types of anguilliform eggs. A: egg type #0002 collected at St. P4-1, B: egg type #0771 collected at St. 32, C: egg type #0982 collected at St. 49, D: #1750 collected in St. P3-5. Scale bars indicate 1.0 mm.

The numbers of other types of eggs was very low (<10). The type #0771 were identified as Serrivormeridae sp. (Fig. 1B), because the previous genetic identification of eggs showing similar morphological characters suggested that these eggs were relatively close to a species of the Serrivomeridae (Aoyama et al. 2001). The type #0982 had an egg diameter of 2.4 ± 0.06 mm and had single transparent oil globule (Fig. 1C) and were similar to the Ophichthidae No.1 egg reported in Mito (1961).

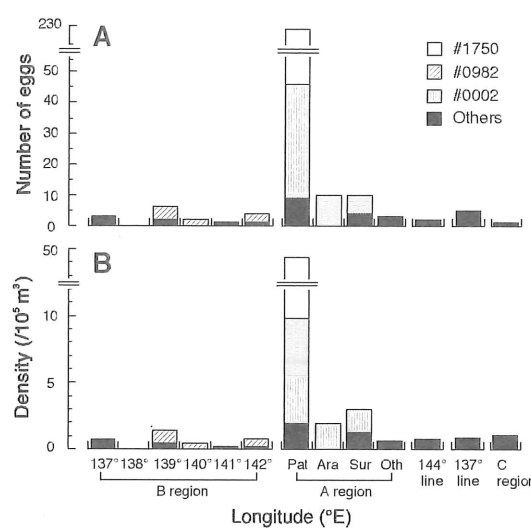

Fig. 2. The distribution of anguilliform eggs collected during KH-02-2 showing the catches of eggs combined among stations at the same longitude (°E) or near the same seamount. A: Number of eggs collected. B: Density of eggs per 10^5 m^3 of water filtered. Pat: Pathfinder, Ara: Arakane, Sur: Suruga, Oth: Other locations in the A region.

Distribution

Of the 276 anguilliform eggs, 249 (90.2%) were collected at the stations located around the seamounts (Fig. 2A). The densities of eggs were also clearly higher around the seamounts than in the open ocean (Fig. 2B). The number of egg types was highest at the Pathfinder seamount, where eight types were found. The egg type #1750 showed a restricted distribution around the Pathfinder seamount with 182 (99.5%) being collected in one tow near this seamount (P3-5). The egg type #0002 also showed a restricted distribution near the seamounts, with 37 being collected near the Pathfinder seamount, 10 near the Arakane seamount and 6 near the Suruga seamount. In contrast, the egg type #0982 was collected only in the B region from 139° to 142°E and was not found in the A region or east of the seamounts (144° line). The numbers of eggs of the other types was too small to discuss their distributions. However, the egg type #0013 was mainly collected in the A region and the egg type #1060 seemed to be distributed throughout the sampling area.

Discussion

The distribution of the egg types #0002 and #1750 were restricted to the areas around the seamounts and their abundances were higher than the egg types that were collected in the B region (Table 1, Fig. 2). These results suggested that some anguilliform fishes spawn in the limited area on or around the seamounts. However, the egg types #0982 and #1060 were found throughout the sampling area. The distribution and timing of occurrence of eggs is considered to be a useful approach to identifying the spawning areas and learning about the reproductive ecology of fishes (Aoyama et al. 2001). In the present study, it was found that the distribution of anguilliform eggs were divided into two groups that were either distributed in an area restricted to the seamounts, or had a wide-spread distribution. These observations strongly suggested that some anguilliform fishes use these seamounts as their spawning sites while others may spawn in the open ocean.

Unfortunately, none of these eggs could be identified to family, genus or species level, so for further research, a greater ability for family or species identification using molecular techniques will be required to learn about the spawning ecology of anguilliform fishes based on the distribution of their eggs.

References

Aoyama J, Ishikawa S, Otake T, Mochioka N, Suzuki Y, Watanabe S, Shinoda A, Inoue J, Lokman PM, Inagaki T, Oya M, Hasumoto H, Kubokawa K, Lee TW, Fricke H, Tsukamoto K (2001) Molecular approach to species identification of eggs with respect to determination of the spawning site of the Japanese eel *Anguilla japonica*. Fisheries Sci 67: 761-763

Fricke H, Tsukamoto K (1998) Seamounts and the mystery of eel spawning. Naturwissenschaften 85: 290-291

Ikeda T, Mito S (1988) Keys to the fish eggs and hatched larvae. In: Okiyama M (ed) An atlas of the early stage fishes in Japan. Tokai University Press, Tokyo, pp 999-1083 (In Japanese)

Mito S (1961) Pelagic fish eggs from Japanese waters-I. Clupeina, Chanina, Stomiatina, Myctophida, Anguillida, Belonida and Syngnathida. Sci Bull Fac Agr Kyusyu Univ 18: 285-310 (In Japanese)

Mochioka N, Utsumi R (2001) Morphology and relationships of anguilliform eggs and larvae. Monthly Kaiyo 33: 137-141 (in Japanese)

Tsukamoto K, Otake T, Mochioka N, Lee TW, Fricke H, Inagaki T, Aoyama J, Ishikawa S, Kimura S, Miller MJ, Hasumoto H, Oya M, Suzuki Y (2003) Seamounts, new moon and eel spawning:

The search for the spawning area of the Japanese eel. Env Biol Fish 66: 221-229.
Yamamoto K, Yamauchi K (1974) Sexual maturation of Japanese eel and production of eel larvae in the aquarium. Nature 251: 220-221
Yamamoto K, Yamauchi K, Kasuga S (1975) On the development of the Japanese eel, *Anguilla japonica*. Nippon Suisan Gakkaishi 41: 21-28

Sampling bias in the collection of pelagic fish eggs caused by different mesh size

Tatsuya Kawakami, Jun Aoyama, Tadashi Inagaki and Katsumi Tsukamoto

Introduction

During the KH-02-2 cruise, a total of 123 tows of the Isaacs-Kidd Midwater Trawl (IKMT) were made and a large quantity of fish eggs, larvae and juveniles were collected in West Mariana region. However, these tows of the IKMT were conducted with two different sizes of mesh, which were 0.5 mm and 1.0 mm pore-sized mesh. Thus, some bias caused by the difference in mesh size would be expected. Here we compare the densities and diameters of eggs sampled by the different mesh sizes to determine the most effective method for sampling eggs in the future.

Materials and Methods

Net sampling was conducted from 5 July to 15 August 2002, as described by Kawakami et al. (2003). The density and diameter of eggs collected by the IKMT in tows made in the B region were compared between 16 tows with 1.0 mm mesh and 40 tows with 0.5 mm mesh. The abundances of eggs were adjusted to the volume of water filtered and were expressed as the number of eggs per 10^5 m^3 of water filtered.

Results

The range of densities of fish eggs collected by the IKMT with 1.0 mm mesh was 9.3 - 21.2 per $10^5 m^3$ of water filtered, which was considerably lower than was collected with the 0.5 mm mesh (20.9 - 87.3 per $10^5 m^3$ of water filtered, Table 1). The egg sizes collected with the 0.5 mm mesh ranged from 0.65 - 2.99 mm in diameter, but 45.7% of eggs were smaller than 1.0 mm (Table 2, Fig. 1). The egg size collected with the 1.0 mm mesh ranged from 1.16 - 2.88 mm, and no eggs under 1.0 mm were collected (Table 2, Fig. 1). The diameters of eggs collected by the 1.0 mm and 0.5 mm mesh were significantly different (Table 2; Mann-Whitney *U* test, $P < 0.0001$).

Table 1. Comparisons of density of eggs (per 10^5 m^3 of water) in IKMT tows with 0.5 mm mesh and IKMT tows with 1.0 mm mesh in the B region. Results were combined among stations along the same longitude.

	Longitude (°E)							
Net type	137°	138°	139°	140°	141°	142°	Total number of eggs collected	Catch density of eggs (per 10^5 m^3 of water filtered)
IKMT (0.5 mm)	87.3	26.8	20.9	25.1	21.3	24.7	600	32.4
IKMT (1.0 mm)	14.1	9.3	12.0	21.2	17.4	13.4	121	14.5

Table 2. Comparisons of egg size between the two different mesh sizes used for IKMT sampling in the B region.

	Egg diameter		
Net type	Range (mm)	Mean ± SD (mm)	Median (mm)
IKMT (0.5 mm)	0.65 – 2.99	1.31 ± 0.53	1.03
IKMT (1.0 mm)	1.16 – 2.88	1.75 ± 0.45	1.67

Discussion

The results of this analysis suggested that the mesh size of the IKMT net significantly influenced differences in the catch and size composition of pelagic fish eggs, and it probably resulted in differences in the taxonomic composition of the eggs that were collected. Anguilliform eggs have been suggested to be generally 1.6 - 5.5 mm in diameter, and those of the genus *Anguilla*, 1.2 - 1.8 mm (Mochioka and Utsumi 2001). If this information is accurate, the IKMT net with 1.0 mm mesh must be reasonable for collecting Japanese eel eggs to determine their spawning site. However, most pelagic fish eggs are less than 1.0 mm in diameter (Ahlstrom and Moser 1980), and it is possible that the Japanese eel eggs naturally spawned are smaller than those obtained from artificially induced spawning. More quantitative trials to precisely describe mesh size selection of the IKMT and other sampling nets used for collecting fish eggs are needed.

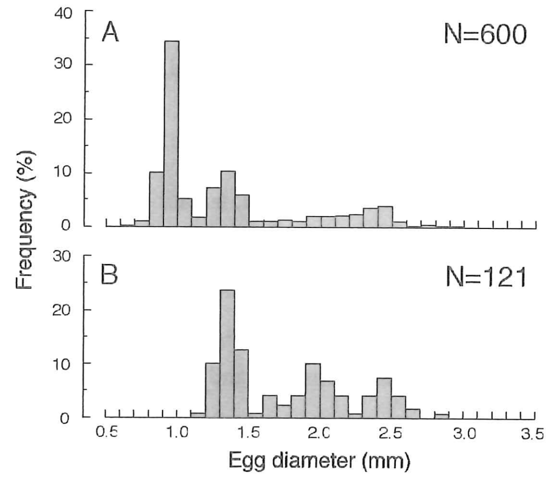

Fig. 1. Comparison of the size frequencies of fish eggs collected by an IKMT with 0.5 mm mesh size (A) and an IKMT with 1.0 mm mesh size (B) in the B region.

References

Ahlstrom EH, Moser HG (1980) Characters useful in idetification of pelagic marine fish eggs. Cal Coop Ocean Fish Invest Rep 21: 121-131

Kawakami T, Fukamachi T, Kuroki M, Minegishi Y, Yoshinaga T, Watanabe S, Mizuno N, Suzuki Y, Otake T, Mochioka N, Lee TW, Aoyama J and Tsukamoto K (2003) Horizontal distribution of anguilliform eggs in the West Mariana region. Preliminary Report of the Hakuho Maru Cruise KH-02-2

Mochioka N, Utsumi R (2001) Morphology and relationships of anguilliform eggs and larvae. Monthly Kaiyo 33: 137-141 (in Japanese)

Anguilliform, Saccopharyngiform and Notacantiform Leptocephali

Gen Minagawa, Michael J. Miller, Masakazu Takahashi, Tsuguo Otake, Noritaka Mochioka
and Katsumi Tsukamoto

A total of 294 leptocephali of various taxa were collected with gear types including IKMT and ORI nets. The results are summarized in Table 1. Most leptocephali belonged to the order of Anguilliformes, the remnants referable to Saccopharyngiforms (three specimens) and Notacantiformes (three specimens). The dominant families were Serrivomeridae (86 specimens, 29.3%), Congridae (59 specimens, 20.1%), Muraenidae (46 specimens, 15.6%), Anguillidae (37 specimens, 12.6%), Derichthyidae (19 specimens, 6.5%), Nemichthyidae (14 specimens, 4.8%) and Chlopsidae (9 specimens, 3.1%). 80% of Congridae leptocephali was belonged to *Ariosoma* spp. *Ariosoma* and Muraenidae leptocephali were composed of larger size specimens, suggesting that those leptocephali may metamorphose and settle in the area around the seamounts. Serrivomeridae, Derichthyidae and Nemichthyidae leptocephali included various sizes from less than 20mm to over 100mm in TL with some post metamorphosis juveniles, which suggests that those families may spawn in the seamounts area and the larvae metamorphose there.

Table 1. Number of leptocephali collected during the KH-02-2 cruise.

Taxa	Number of leptocephali		%
Anguilliformes			
Anguillidae	37		12.6
Chlopsidae	9		3.1
Congridae			
Ariosoma spp.	47		16.0
Conrinae spp.	12	(2)	4.1
Derichthyidae	19	(1)	6.5
Moringuidae	1		0.3
Muraenidae	46		15.6
Nemichthyidae	14		4.8
Nettastomatidae	3		1.0
Ophichthidae	6		2.0
Serrivomeridae	86	(8)	29.3
Synaphobranchidae	7		2.4
Saccopharyngiformes			
Cyematidae	2		0.7
Saccopharyngidae	1		0.3
Notacanthiformes	3		1.0
Unidentified	1		0.4
Total catch	294	(11)	100.0

Numbers in parentheses show catch of juveniles.

Larval transport and its hydrographic condition

Shingo KIMURA, Takashi KITAGAWA and Takashi INOUE

Spawning area of the Japanese eel (*Anguilla japonica*) is located in the North Equatorial Current (NEC), west of the Mariana Islands, where is 3000 kilometers far from their nursery rivers in East Asia. The 2002 expedition of research cruise clarified that the larval distribution is related to a salinity front generated by two distinct water masses; high salinity water by excessive evaporation (less than 34.2 psu) and low salinity water by high precipitation (greater than 34.8 psu).

The low salinity water spreads into the NEC from fresh pool located at 6-8°N in the Northern Hemisphere and 30-year averaged location of the salinity front is around 15°N. According to historical data, many leptocephali distribute near the salinity front. However, latitude of the salinity front is significantly dependent on El Niño. During El Niño, area covered with fresher water in the western equatorial Pacific shrinks because of low precipitation and the salinity front moves southward largely in this region. If the spawning area of the Japanese eel moves southward associated with movement of the salinity front, leptocephali have to be transported by southern side of the NEC and possibility to be transported into the Mindanao Current region where the Japanese eel cannot survive becomes high. Statistically accurate database of glass eel catch in Japan indicates that the catch decreases during El Niño. This coincidence between the low catch and El Niño proposed a hypothesis that the salinity front functions as landmark of spawning ground for the Japanese eel.

To confirm roles of the salinity front in El Niño year, this research cruise was designed to extend to 7°N. Large numbers of smaller leptocephali in this cruise were collected at 12°N just south of the salinity front lying between 12°N and 13°N. At this station, averaged total length of collected 10 individuals was 9.6 mm (8.5-11.1 mm). This is a record of the smallest average at one station in all last research cruises for 30 years. Age for 9.6 mm leptocephali is estimated to be a few weeks, which means the larvae spawned quite close to this station. Since averaged total length at 13°N was 21.9 (20.0-24.3 mm) and there was a tendency that larger size leptocephali were distributed in the northern stations, the significant difference of total length in the north and south of the salinity front was clearly indicated. In 2002 summer, the salinity front moved southward associated with El Niño event while the front was located around 16°N in last spring before starting El Niño. Since the salinity front in last 10 years is located around 17°N which is further north than last 30-year average, 4-degree southward movement in latitude is extremely large. Usually, leptocephali smaller than 10 mm are seldom found in such southern area. Therefore, these results indicate movement of the salinity front is related to spawning behavior of the

Japanese eel and larger leptocephali distributed in the north of the salinity front were diffused from the south.

According to buoy trajectories and current velocity estimated as geostrophic flows in this research cruise, the highest current velocity was recognized 11-12°N and the larval transport condition was largely different in the north and south of the salinity front. Buoys deployed south of the salinity front were taken into the Mindanao Current region rapidly and this result indicates that most of the larvae would be transported into this region. Buoys deployed north of the salinity front moved quite slowly and this speed does not satisfy timing for upstream migration into nursery rivers in Japan. It means that hydrographic condition in El Niño year in either location north or south of the salinity front satisfy appropriate larval transport.

Here we show that this larval distribution associated with movement of the salinity front and El Niño event strongly proves that the difference of the water masses represented by the salinity front is related with the spawning behavior and the salinity front functions as the landmark of spawning for the Japanese eel.

Giant ophidiid larva (Ophidiiformes) collected by the Hakuho Maru Cruise KH-02-2

Atsushi Fukui, Takao Tsuchiya, and Hiroyuki Kuroda

A giant ophidiid larva was collected at the western Mariana waters (st. 48) by IKMT net. The specimen has the following characters (Figure 1). Body elongate, ratio of body depth to body length (BL) 12.3% at origin of anal fin. Head small, ratio of head length to BL 10.9%. Intestine covered by thin membrane with many slender branches remarkably elongate outward body and abdominal appendage developed. Masses of melanophores present on abdominal appendage and midlateral line of body. Former distinct and large, and latter indistinct and small. Also, many masses of melanophores present in body muscle at midlateral line. Ventral process of coracoid long. Meristic counts are shown as Table1.

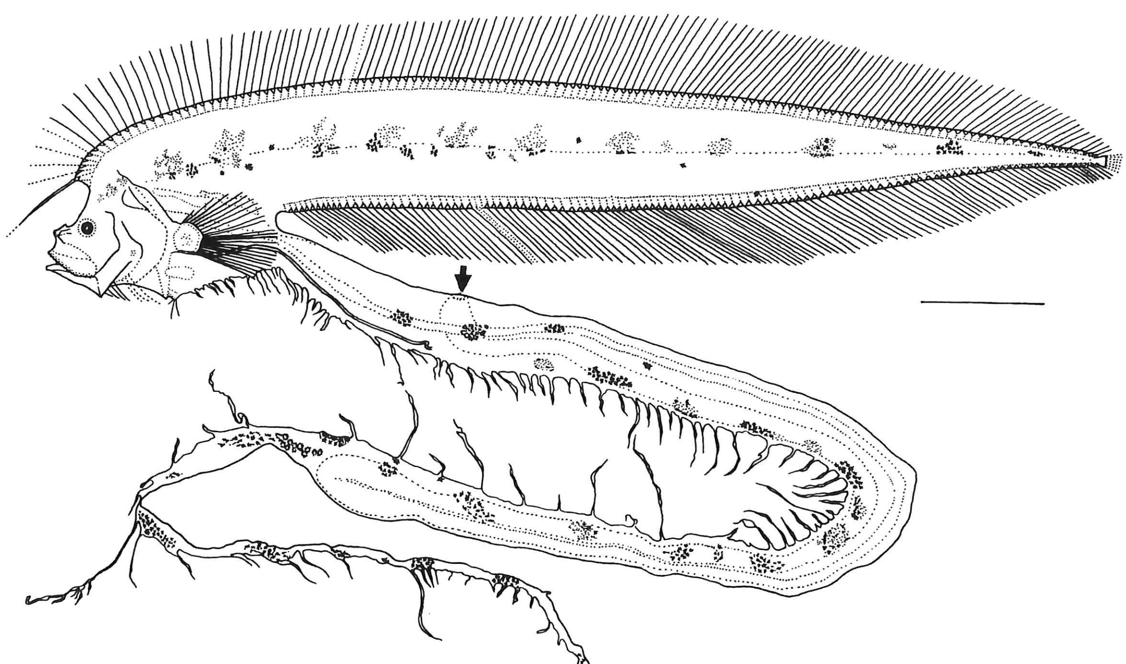

Figure 1. A giant ophidiid larva, 113.3mm BL

Arrow and bar indicate anal opening and 10mm, respectively.

Our specimen is closely similar to an exterilium larva illustrated by Fraser and Smith (1974) (currently ascribed to Neobythitinae, Lamprogrammus) from South Africa in having elongated body and developed abdominal appendage. However, it is different from that in having larger body size (113.3mm vs 70mm BL) and many masses of melanophores on abdominal appendage (about 24 vs about 16 parts). After this, we will identify this specimen, on the basis of double staining and comparison to adults in meristic counts.

Table 1. Meristic counts of a giant ophidiid larva

	D	A	P1	P2	V
Present specimen	135	115	23	3	73?
Exterilium larva*	132	108	22	3	71

D, A, P1, P2, and V indicate numbers of dorsal-fin rays, anal-fin rays, pectoral fin rays, pelvic fin rays, and vertebrae, respectively. *from Fraser and Smith (1974).

References

Fraser TH, Smith MM (1974) An exterilium larval fish from South Africa with comments on its classification. Copeia 1974: 886-892

Fahay MP, Nielsen JG (2001) Identity of exterilium and rubaniform larvae and their potential for suggesting relationships in the Ophidiidae. Abstract of 81st Annual Meeting of the Amer Soc of Ichthyol and Herpetol. State College PA USA

Gordon DJ, Markle DF, Olney JE (1984) Ophidiiformes: development and relationships. In: Moser HG, Richards WJ, Cohen DM, Fahay MP, Kendall AW Jr, Richardson SL (eds) Ontogeny and systematics of fishes. Special Publication 1. American Society of Ichthyologists and Herpetologists, Lawrence, KS, pp 308-319

Moser HG (1981) Morphological and functional aspects of marine fish larvae. In: Lasker R (ed) Marine fish larvae, pp 89-131. Washington Sea Grant Program, Seatle

Nielsen JG (1963) Description of two large unmetamorphosed flatfish larvae (Heterosomata). Vidensk Mdd Dan Naturh Foren Kbh (125): 401-406

Nielsen JG, Cohen DM, Markle DF, Robins CR (1999) FAO species catalogue 18, Ophidiiform fishes of the world. Food and Agriculture Organization of the United Nations, Rome, 178 pp

Okiyama M (1988) Ophidiiformes. In: Okiyama M (ed) An atlas of early stage fishes in Japan, pp 333-341. Tokai University Press, Tokyo. (In Japanese)

Okiyama M, Kato H (2002) Larval development of Brotulotaenia nielseni (Ophidiiformes, Ophidiidae, Brotulotaeniinae), with notes on relationships. Bull Natn Sci Mus Tokyo Ser A **28**: 159-170

Collection of an amphioxus larva in Mariana Sea

Kaoru Kubokawa

A pelagic larva of amphioxus was collected with the IKMT net at St. 16 (17°00N, 137°00E) in depth of 4890 m during Leg 1 cruse of KH-02-2 (Fig. 1). The net was towed to depth between 0 and 232 m. The larva was 12.0 mm long and had a little more than 32 gill slits. The larva lacked a part of its head which had contained some gill slits, endostyle, right side of velum and preoral pit, presumably due to damage at the time of the collection. The ratio of the body length and the number of gill slits, and the existence of secondary gill slits demonstrate the larva is "giant larva". In addition, morphological features of the larva coincided with mostly the following characteristics of a giant larva except for the first one:

1) Mouth on the left side and without any cirrus
2) Dorsal fin only in the posterior part of body
3) Fan-shaped dorsal fin
4) Dorsal fin-ray chambers only in the posterior part of body
5) No preanal fin-ray chambers

While no data of larvae of the genus, Epigonichthys, which is one of the two genera of amphioxus, the collected larva had most of the morphometric characteristics of the giant larva of *Branchiostoma* that were described previously by Nishikawa (1981) (Table 1). However, there are no information for morphological identification of the genus and the species in the larva and no clue to a birth place of the larva.

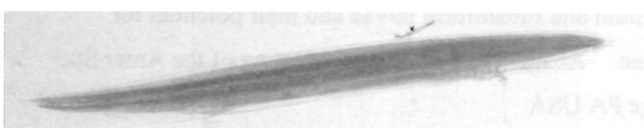

Fig. 1 Giant larva of amphioxus collected in Mariana Sea.

Table 1. Morphometric characters of giant larvae.

	1	2	3	4	5	*6*
Present specimen	315	61	8	69	12	*32*
*Reported Specimens**	*300-336*	*56-67*	*11-17*	*67-84*	*7.0-10.3*	*24-30*

1, number of dorsal fin-ray chambers; 2, number of myotomes from the anterior end to anus; 3, number of myotomes posterior to anus; 4, total number of myotomes; 5, body length (mm); 6, number of gill slits. *by Nishikawa (1981)

Acknowledgement

I thank to Mr. H. Jige for finding the amphioxus larva and to Prof. K. Tsukamoto for his recognition of the value of the larva and preserving the specimen.

References

Nishikawa, T. (1981) Considerations on the taxonomic status of the lancelets of the genus *Branchiostoma* from the Japanese waters. Publ. Seto Mar. Biol. Lab., XXVI, 135-156.

Sampling record of *Amphionides reynaudii* (Crustacea: Amphionidacea)

Mitsugu M. Yamauchi, and Shozo Nakamura

In the cruise of KH02-2, we collected three adults of *Amphionides reynaudii* (Fig. 1) by oblique tow using a IKMT to depth of approximately 1000–2000 m (wire out 6000 m) at st.70 (15°55'N, 143°51'E) on August 2, 2002. These samples preserved in 99.5% ethanol in order to extract total genomic DNA for phylogenetic studies based on mitochondrial DNA sequencing data. Voucher specimens were deposited in the Natural History Museum and Institute, Chiba (CBM-ZC 6595).

The order Amphionidacea is consisted of a single species *A. reynaudii*, which is small to modest-size pelagic forms (35 mm) with very thin carapace (Williamson, 1973; Bowman and Abele, 1982; Schram, 1986). It seems that the Amphionidacea is phylogenetically related to the Decapoda as a sister-group (Christoffersen, 1988; Schram, 1984). Although a number of larvae of *A. reynaudii* have been found worldwide between 35°N to 35°S in about 2000-m or more depth (Schram, 1986), the only 26 adult individuals have been collected to date. The sampling record of adult *A. reynaudii* in this cruise is of importance not only for biogeographic studies, but also for ecological studies.

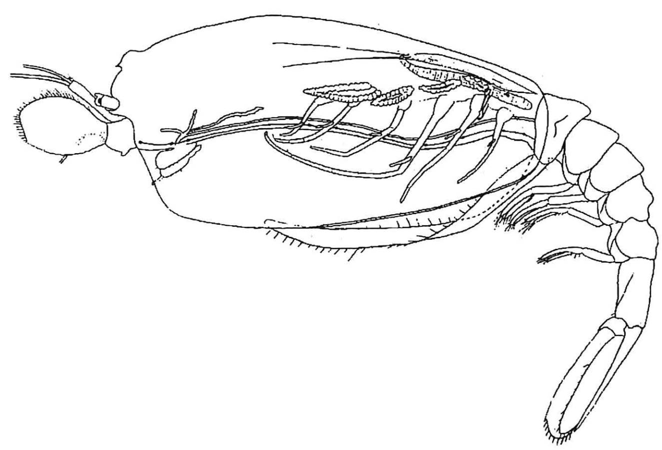

Fig. 1. *Amphionides reynaudii*. Adult female, lateral view (from Williamson, 1973).

References

Bowman, T.E., and Abele, L.G. (1982). Classification of the recent Crustacea. In: The biology of Crustacea, Vol. 1: systematics, the fossil record, and biogeography. Abele, L.G. (ed.). Academic Press, New York.

Christoffersen, M.L. (1988). Phylogenetic systematics of the Eucarida (Crustacea, Malacostraca). Revta Bras. Zool. 5: 325-351.

Schram, F.R. (1984). Relationships within eumalacostracan Crustacea. Trans. San Diego Soc. Nat. Hist. 20: 301-312.

Schram, F. R. (1986) Crustacea. Oxford Univ. Press, New York. p.606.

Williamson, D.I. (1973). Amphionides reynaudii (H. Milne Edwards), representative of a proposed new order of eucaridean Malacostraca. Crustaceana 25: 35-50.

Direct measurement and hydrographic observation of the deep and bottom currents in the Mariana Trench

Daigo Yanagimoto and Keisuke Taira

1. Introduction

Characteristic currents have been observed in deep trenches in the Pacific Ocean, such as the Aleutian Trench (Warren and Owens, 1988), the Kermadec Trench (Whitworth et al, 1999), the Izu-Ogasawara Trench (Fujio et al, 2000), the Japan Trench (observed by the ocean circulation group of ORI). A common pattern in these deep trenches has a pair of opposite mean currents across the axis of a trench. The flow takes the shallow to the right (left) hand above the bottom slope of the trenches in the northern (southern) hemisphere. The deep and bottom currents in the Mariana Trench, which has the deepest part in the world, are also interested. No current observation in the trench had ever been made until we made the first deployment of current meters in KH-95-2 cruise by R/V Hakuho-Maru in the summer of 1995. Unfortunately sufficient data were not recovered at that time due to mechanical trouble of the current meters. Another current measurement was challenged from 2001 to 2002. Three mooring systems were deployed in KH-01-1 cruise in the summer of 2001 and recovered in KH-02-2 cruise in the summer of 2002, at which time hydrographic observation was also carried out. We will report the preliminary results of the observation.

2. Observation and data

Three mooring systems, MM1, MM2 and MM3, were deployed in the Mariana Trench in the first leg of KH-01-1 cruise of R/V Hakuho-Maru on 23 and 25 June 2001. As shown in Fig.1, MM1 was deployed at 11-01.98N, 142-34.57E on the south slope, MM2 was deployed at 11-22.17N, 142-36.17E on the deepest part (the Challenger Depth) and MM3 deployed at 11-41.96N, 142-34.75E on the north slope. MM1 was recovered on 2 August 2002, MM2 recovered on 3 August and MM3 recovered on 4 August in the second leg of KH-02-2 cruise. All of the current meters were rotor-type current meters with titanium frames manufactured by Union Engineering, a domestic company. Data acquisition conditions of each current meter moored on each system are summarized in Table. 1. Current speed and direction were obtained every one hour for about 13 months although three curret meters (C732, C727 and C730) recorded for shorter periods than the full length of observation periods. The three current meters began recording normally 5 to 7 days later of the deployments. The one of them, C732, ended 4 days before the recovery, but the other two, C727 and C739, ended underwater recording just before the recovery time. The clocks of C727 and C739 would not be wrong while the clock of C732 would have become slow during the measuring. The reason of starting underwater recording a few days after the deployment is not clear yet. More than a half of speed data was beyond 1.5 cm/s, which is the restriction of these rotor-type current meters for weak flows. Current speed smaller than 1.5 cm/s is recorded as 1.5 cm/s and will be used in analysis as it is. Current directions were corrected with the geomagnetic declination from the geographic north at the sea surface at the observation points. The geomagnetic field lines declined by 1°42' to 1°32' at MM1 to MM3 in the late June 2001 according to the International Geomagnetic Reference Field (e.g., http://www.ngdc.noaa.gov/seg/potfld/magmodel.shtml).

Two CTD/O_2 casts, MC01 and MC02, were carried out in full depth in the trench in the second leg of KH-02-2 cruise. A Sea-Bird Electronics instrument (SBE9) for 10500m were operated with sensors for pressure (SBE12), temperature (SBE3), conductivity (SBE4) and oxygen (SBE13) and with 12-liter Niskin bottles mounted at 36 places on a Sea-Bird Electronics Carousel water sampler (SBE32). Conductivity of sampled seawater was measured on board with a Guildline salinometer (Autosal 8400) standardized by IAPSO Standard Seawater Batch P139 (K=0.99993) under the bath temperature of 27°C and the room temperature of 27.1 to 27.4°C. Conductivity from CTD/O_2 will be calibrated with water samples. Also nutrients and ^{14}C of sampled seawater will be analyzed in Mutsu Establishment, Japan Atomic Energy Research Institute. The MC01 cast was carried out at 11-20.05N, 142-25.98E from 17:16 (UTC) to 23:43 on 4 August and the MC02 cast was carried out at 11-20.58N, 141-59.13E from 09:28 to 14:52 on 4 August. The CTD/O_2 system reached 30m height above the bottom (measured with a pinger) and observed 10644db pressure at MC01, and reached 47m height above the bottom and observed 9200db at MC02. Seawater was sampled at 30 layers at MC01 and 31 layers at MC02 including bucket sample from the surface (Table 2). Bottle #6 was not closed at MC01.

3. Results

Spectral analysis of current meter data reveals apparent tidal components even in the deepest part of the trench. Fig.2 shows the rotary spectra at two layers under 10000m depth, for example. Both of the diurnal and semidiurnal tides have enough large peaks in the spectra. The other data not shown here also have large peaks of the both tides. A high frequency band including the diurnal and semidiurnal tides are removed with a low-pass filter as shown after because the tides are well-known phenomena except that they are clear even in such an extreme depth. As shown as "E-loss" in Table. 2, the kinetic energy loss due to the low-pass filter for making daily mean currents is very large in the whole eddy kinetic energy from any raw data.

The inertial oscillation is not apparent in any data. The inertial period is 62.70 hours at 11-01.98N (MM1), 60.87 hours at 11-22.17N (MM2) and 59.18 hours at 11-41.96N (MM3). Fig.2 (a) shows that the clockwise rotary spectrum has a significant broad peak around 2-day period at 10110 depth at MM2. This broad peak is seen in spectra at the other points except for near the bottom at MM2 (Fig.2(b)). It would be an evidence of the strong inertio-gravity waves due to the steep bottom topography.

Daily mean current data were subsampled every 24 hours after filtered with a low-pass filter, "24gauss" (Thompson, 1983). The low-pass filter removes the large tides above though the inertio-gravity waves remain. The time series of daily current velocity at each point is shown by stick diagram in Fig. 3 to Fig. 5. The statistic values are listed in Table 3. Data from C732, C727 and C730 were used here as they are with neglecting the shortening of the record lengths.

Any time series of current velocity shows large variability. At each station of MM1 and MM3, stick diagrams obtained at three layers within 400m above the bottom resemble each other vertically (Fig. 3 and Fig. 5). Zonal variation of the current direction is dominant and it is reflected by large standard deviations of eastward velocity components (Table 3). Although westward flows are dominant at MM3 through the observation, the westward flows became very strong during three months from October 2001 to January 2002 at the both stations. Current at 4450m depth at MM2 is rather different from the both neighboring sites and shows one clockwise rotation of current velocity during those three months. The clockwise rotation is seen also below 10000m depth at MM2. Though the current speed is very large at 4450m depth, the variation pattern seems common through the observation depth at MM2.

The mean flows presented in Table 3 are plotted on the topography map in Fig. 6. Westward mean flow is significantly dominant at MM3 on the northern slope of the trench. Though the standard errors are comparable to the mean flows, westward mean flow is shown also at MM1. MM1 was located on the southern slope where eastward flow was expected according to the previous results on deep currents in other trenches. Mean flow at MM3 is strange. Mean current velocity rotates anticlockwisely from the eastward flow near the bottom to the westward flow at 1200m height above the bottom. Moreover, the mean flow directs southwestward at 4450m depth. Because the geomagnetism in the deep trench was doubtful, the rotary coherence were examined. However, phases for significant coherences are almost within 30° between the current vectors at the bottom and those at 400 height above the bottom though their mean current directions have difference by 100°. The vertical profile of potential density referred to 4000db (σ_4) from CTD/O_2 observations shows almost homogeneous below 6000db and has no large gradient from the station MC01 to MC02 (Fig. 8). Although the detail analysis of CTD data is necessary, the geostrophic flow between MC01 and MC02 would not be able to explain the anticlockwise spiral from the bottom to the upper. The vertical profile of dissoved oxygen from CTD/O_2 has large noises which must be removed, but oxygen is apparently richer below 6000db at MC02 than at MC01. There would be local distribution of water properties and currents even in the narrow and deep trench.

4. Conclusions

13-month current records and deep profiles of water properties were obtained in the Mariana Trench. Some interesting features are seen in the observed currents and water properties as the following.

i. Westward mean flows are dominant both on the north slope and on the south slope across the trench.
ii. Mean currents spirals up anticlockwisely from the bottom (westward) to 1200m height above the bottom (eastward) in the deepest part of the trench.
iii. Dissolved oxygen is richer in the western part than in the central part.

More detail should be examined by analysis of the current data recovered in KH-02-2 cruise and hydrographic data collected in KH-01-1 cruise (not shown here) and KH-02-2 cruise.

References

British Oceanographic Data Centre, *The GEBCO Digital Atlas*, Merseyside, England, U.K., 1994.

Fujio, S., D. Yanagimoto, and K. Taira, Deep current structure above the Izu-Ogasawara Trench, *J. Geophys. Res.*, *105*, 6377-6386, 2000.

Thompson, R. O. R. Y., Low-pass filters to suppress inertial and tidal frequencies, *J. Phys. Oceanogr.*, *13*, 1077-1083, 1983.

Warren, B. A., and W. B. Owens, Deep currents in the central subarctic Pacific Ocean, *J. Phys. Oceanogr.*, *18*, 529-551, 1988.

Whitworth, T. III., B. A. Warren, W. D. Nowlin, Jr., S. B. Rutz, R. D. Pillsbury, and M. I. Moore, On the deep western-boundary current in the Southwest Pacific Basin, *Prog. Oceanogr.*, *43*, 1-54, 1999.

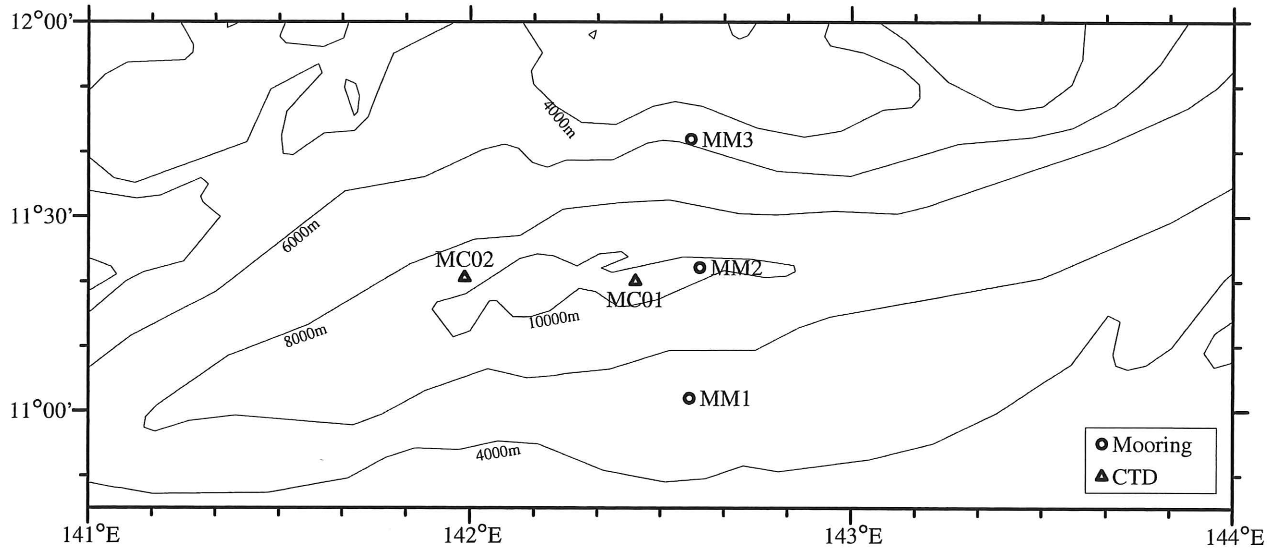

Fig.1. Location of direct current measurement and hydrographic observation in the Mariana Trench. Recover of mooring systems and hydrographic observation were carried out in KH-02-2 cruise of R/V Hakuho-Maru in the summer of 2002. Open circles and triangles show position of mooring systems and CTD casts. Isobaths of 4000m, 6000m, 8000m and 10000m are drawn (British Oceanographic Data Centre, 1994).

Current meter	Depth	Start (UTC)	End (UTC)	Interval	Total amount	Sufficient speed (> 1.5cm/s)	Insufficient speed (< 1.5cm/s)
MM1 11-01.98N, 142-34.57E, 6665m							
C732	6240m	2001/07/03 05:00	2002/07/29 22:00	1hour	9399	7267 (77.32%)	2132 (22.68%)
C727	6440m	2001/06/30 06:00	2002/08/02 21:00	1hour	9556	6335 (66.29%)	3221 (33.71%)
C728	6640m	2001/06/25 04:00	2002/08/02 21:00	1hour	9690	7574 (78.16%)	2116 (21.84%)
MM2 11-22.17N, 142-36.17E, 10533m							
C726	4450m	2001/06/23 06:00	2002/08/03 01:00	1hour	9737	8800 (90.38%)	937 (9.62%)
C735	9310m	2001/06/23 05:00	2002/08/03 01:00	1hour	9741	5621 (57.70%)	4120 (42.30%)
C729	10110m	2001/06/23 05:00	2002/08/03 01:00	1hour	9741	6330 (64.98%)	3411 (35.02%)
C734	10310m	2001/06/23 05:00	2002/08/03 01:00	1hour	9738	6121 (62.86%)	3617 (37.14%)
C736	10510m	2001/06/23 05:00	2002/08/03 01:00	1hour	9741	6497 (66.70%)	3244 (33.30%)
MM3 11-41.96N, 142-34.75E, 5517m							
C739	5100m	2001/06/25 08:00	2002/08/04 04:00	1hour	9717	7424 (76.40%)	2293 (23.60%)
C730	5300m	2001/07/01 21:00	2002/08/04 04:00	1hour	9557	8420 (88.10%)	1137 (11.90%)
C731	5500m	2001/06/25 08:00	2002/08/04 04:00	1hour	9713	7618 (78.43%)	2095 (21.57%)

Table 1. Summary of data acquisition from each current meter. Start and end mean the start and end time of valid data. These rotor-type current meters cannot resolve weak current within 1.5cm/s due to the mechanical restriction. Data amount is shown by counts and itemized by the observed speeds (numbers in parentheses mean the percentages in the total data amount).

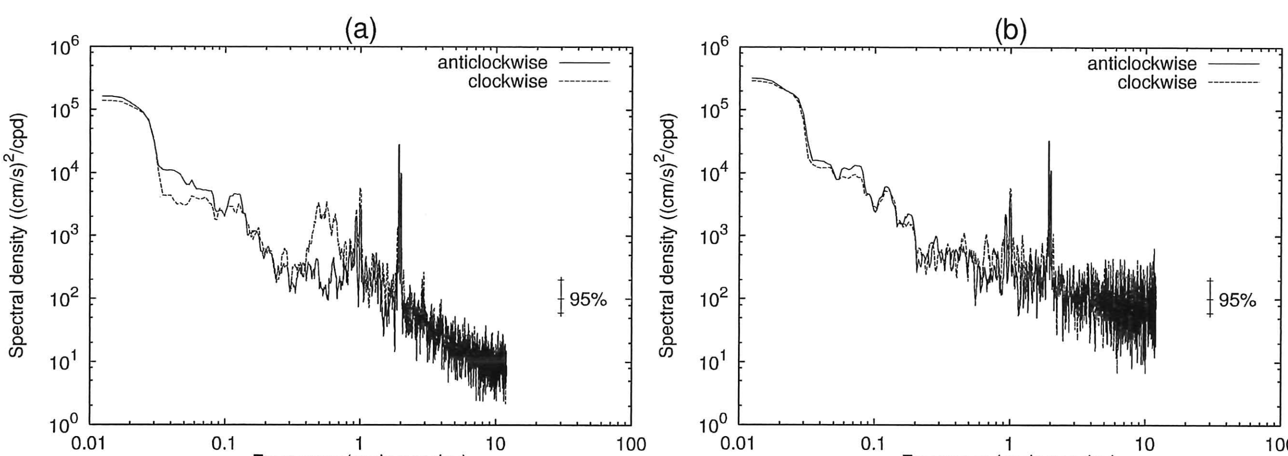

Fig.2. Rotary spectra of currents at 10110m depth (a) and 10510m depth (b) at MM2 with 95% confidence level.

Station **MC01**					
11-20.05N, 142-25.98E, 9998m(PDR)					
4 Aug 2002 17:16(BE)-20:26(BO)-23:43(EN)					
Btl.	CTD P (decibar)	CTD T (T090)	CTD O (ml/l)	CTD S (PSU)	SMP S (PSU)
1	10643.758	2.3497	3.77632	34.7005	34.6991
2	9999.292	2.2285	3.64587	34.6988	34.6987
3	9499.716	2.1370	3.56083	34.6979	34.6971
4	8999.396	2.0481	3.57978	34.6972	34.6979
5	8499.412	1.9621	3.51126	34.6968	34.6983
7	7499.140	1.7981	3.50076	34.6962	34.6979
8	6999.199	1.7208	3.48896	34.6961	34.6853
9	6499.033	1.6471	3.47207	34.6960	34.6963
10	5999.309	1.5780	3.44174	34.6959	34.6971
11	5499.258	1.5194	3.45398	34.6954	34.6963
12	4999.632	1.4925	3.31663	34.6926	34.6928
13	3999.095	1.4958	3.05941	34.6827	34.6833
14	2998.713	1.5452	2.81112	34.6724	34.6672
15	2498.834	1.7561	2.53859	34.6563	34.6589
16	1998.612	2.1993	2.23354	34.6262	34.6282
17	1748.804	2.4942	2.08250	34.6096	34.6113
18	1498.743	3.0053	1.75599	34.5880	34.5901
19	1248.902	3.7258	1.58604	34.5619	34.5641
20	998.750	4.6138	1.34881	34.5369	34.5393
21	748.679	5.8284	1.17931	34.5136	34.5177
22	498.619	7.3412	1.05456	34.5109	34.5130
23	398.872	8.4128	0.91768	34.5392	34.5409
24	298.544	10.2483	2.09675	34.3519	34.3632
25	235.985	12.9298	3.37059	34.4143	34.4143
26	199.021	15.3845	3.44708	34.5897	34.4080
27	148.762	20.4925	3.47944	35.0069	35.0095
28	99.185	25.2314	3.83125	35.0101	35.0197
29	49.413	28.8212	3.80144	34.1019	34.1307
30	19.152	29.0410	3.80704	34.0646	34.0655
Bkt					33.9678

Station **MC02**					
11-20.58N, 141-59.13E, 8699m(PDR)					
4 Aug 2002 09:28(BE)-12:09(BO)-14:52(EN)					
Btl.	CTD P (decibar)	CTD T (T090)	CTD O (ml/l)	CTD S (PSU)	SMP S (PSU)
1	9200.170	2.0836	5.08351	34.6969	34.7002
2	8998.387	2.0481	4.20676	34.6967	34.6995
3	8499.238	1.9619	4.31219	34.6965	34.6995
4	7998.694	1.8783	3.78761	34.6963	34.6987
5	7498.654	1.7977	3.77112	34.6963	34.6983
6	6998.508	1.7202	3.71352	34.6964	34.6983
7	6493.772	1.6458	3.66362	34.6963	34.6967
8	5998.692	1.5781	3.63562	34.6961	34.6987
9	5498.571	1.5170	3.56656	34.6956	34.6967
10	4998.775	1.4673	3.57285	34.6945	34.5570
11	4498.650	1.4486	3.47674	34.6912	34.6747
12	3998.479	1.4786	3.27537	34.6845	34.5657
13	3498.766	1.5179	3.08147	34.6770	34.6778
14	2999.094	1.5982	2.88059	34.6686	34.6629
15	2499.244	1.7166	2.77034	34.6571	34.6589
16	1999.382	2.0925	2.50164	34.6300	34.6219
17	1749.230	2.4286	2.33313	34.6109	34.6117
18	1499.429	2.9097	2.14888	34.5891	34.5901
19	1249.727	3.6057	1.82244	34.5659	34.5661
20	999.648	4.4285	1.67849	34.5367	34.5385
21	749.388	5.6562	1.51451	34.5115	34.5145
22	499.262	7.3930	1.29761	34.5078	34.5102
23	399.789	8.6263	1.13893	34.5337	34.5358
24	299.582	10.0189	1.81023	34.4056	34.4111
25	248.403	11.8024	3.20899	34.3478	34.3526
26	199.807	15.8177	3.47543	34.6214	34.6263
27	149.037	20.7254	3.51974	35.0225	35.0311
28	100.043	25.5238	3.84545	35.0246	35.0315
29	49.821	28.4695	3.88841	34.5740	34.5704
30	19.790	28.8082	3.84849	34.1193	34.1786
Bkt					34.0993

Table 2. Water sample layers. CTD data is shown as CTD P (pressure), CTD T (in situ temperature), CTD O (dissolved oxygen) and CTD S (salinity). SMP S means salinity of sampled water measured with a salinometer. Btl stands for sampling number corresponding to Niskin bottle number and Bkt stands for bucket sample of the surface water.

Current Meter	Depth m	T days	U cm/s	V cm/s	S cm/s	θ °T	u' cm/s	v' cm/s	u'v' (cm/s)^2	I_u days	e_u cm/s	I_v days	e_v cm/s	E.loss
MM1														
C732	6240	389	-0.21	0.35	0.41	329	1.61	1.01	-0.04	7.3	0.31	1.2	0.08	61.6%
C727	6440	396	-0.31	0.03	0.31	276	1.61	1.02	0.33	7.0	0.30	1.1	0.08	65.3%
C728	6640	401	-0.82	0.04	0.82	273	2.00	1.26	0.55	6.5	0.36	1.1	0.09	61.4%
MM2														
C726	4450	403	-0.47	-0.51	0.69	223	3.31	3.65	3.34	7.9	0.66	9.6	0.80	22.0%
C735	9310	404	-0.34	0.01	0.34	272	1.44	0.75	-0.13	4.6	0.22	2.9	0.09	56.8%
C729	10110	404	-0.04	0.33	0.33	353	2.15	0.43	0.21	8.8	0.45	2.7	0.05	41.8%
C734	10310	403	0.22	0.22	0.31	405	2.38	0.54	1.01	9.4	0.51	5.7	0.09	38.1%
C736	10510	404	0.55	-0.04	0.55	454	2.83	1.19	2.65	9.5	0.62	8.6	0.25	31.1%
MM3														
C739	5100	403	-0.86	0.00	0.86	270	2.56	0.70	-0.98	16.2	0.73	10.4	0.16	47.6%
C730	5300	397	-0.94	0.09	0.94	275	2.37	0.60	-0.67	16.2	0.68	3.6	0.08	57.3%
C731	5500	403	-1.30	-0.14	1.31	264	1.75	0.58	-0.45	9.1	0.37	2.3	0.06	70.8%

Table 3. Statistics of daily current velocity filtered with 24gaus low pass filter (Thompson, 1983). T is a full length of record. U (V), u' (v'), I_u (I_v) are an average, a standard variation and an integral time scale of eastward (northward) velocity component, respectively. u'v' is a covariance between eastward and northward components. e_u (e_v) is a standard error for the mean current, U (V), defined as $u'(2I_u/T)^{1/2}$, $v'(2I_v/T)^{1/2}$. S and θ are speed and direction of a mean velocity. Energy loss due to the low-pass filter is shown in E.loss as percentage to the eddy kinetic energy in raw data.

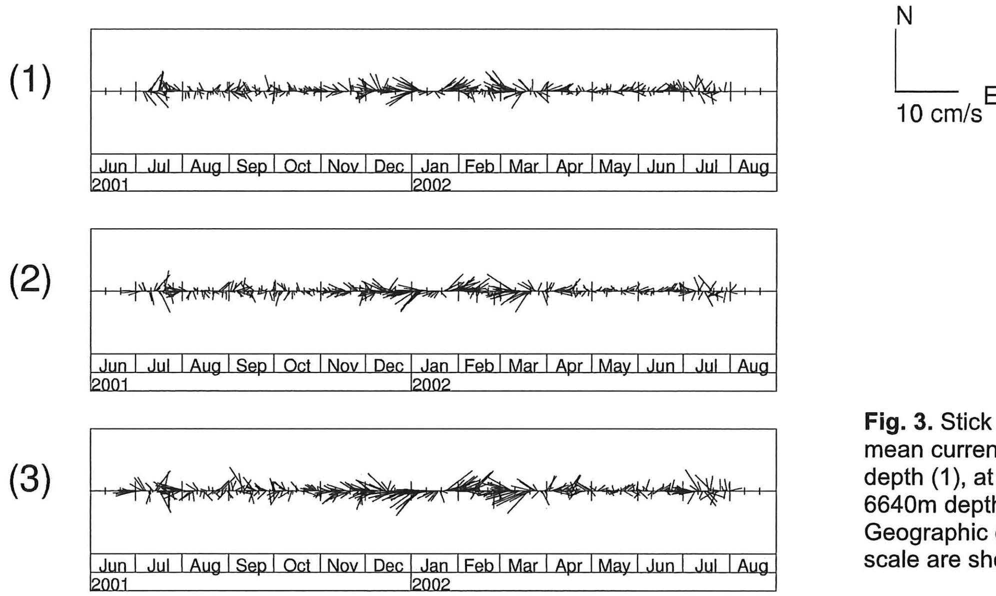

Fig. 3. Stick diagram of the daily mean current vectors at 6240m depth (1), at 6440m depth (2) and at 6640m depth (3) at MM1. Geographic direction and speed scale are shown at the upper right.

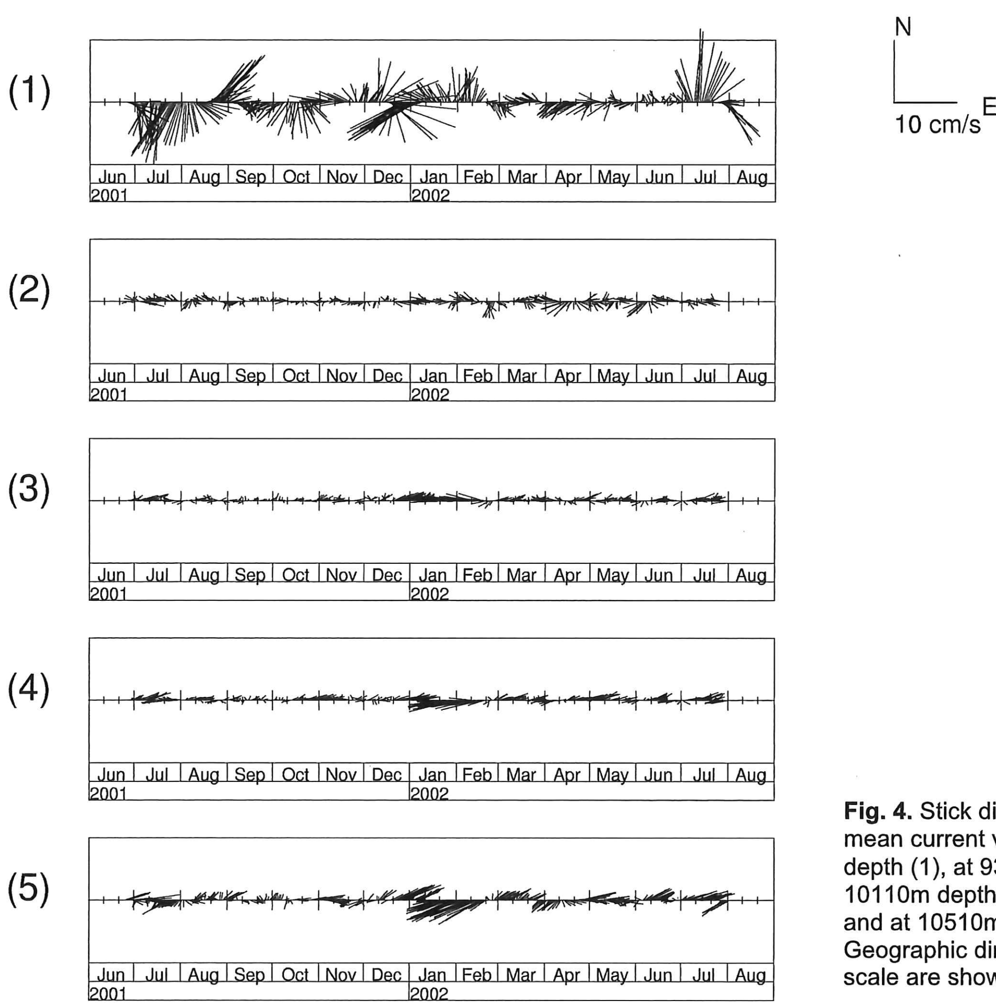

Fig. 4. Stick diagram of the daily mean current vectors at 4450m depth (1), at 9310m depth (2), at 10110m depth (3), 10310m depth (4) and at 10510m depth (5) at MM2. Geographic direction and speed scale are shown at the upper right.

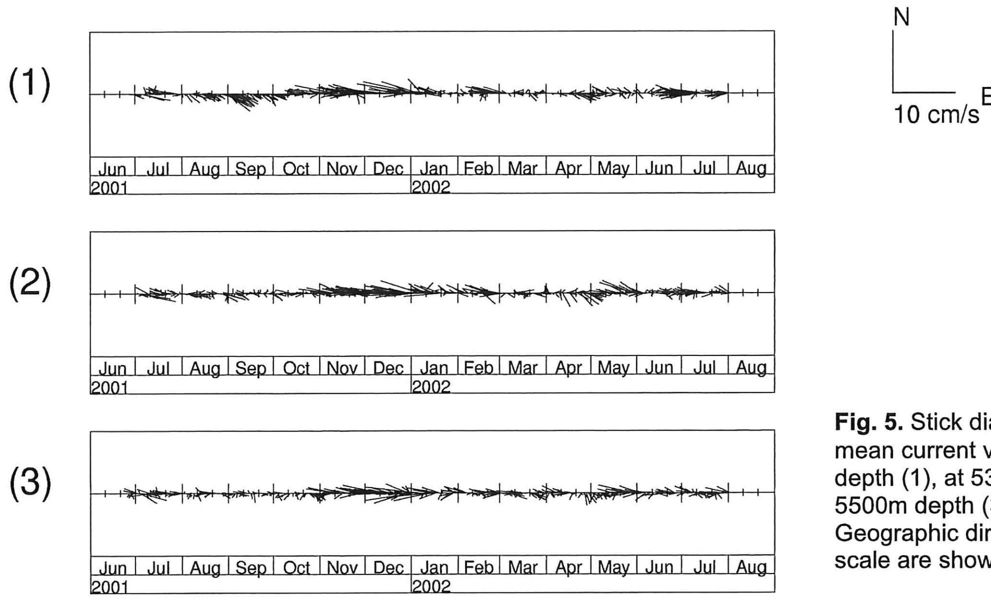

Fig. 5. Stick diagram of the daily mean current vectors at 5100m depth (1), at 5300m depth (2) and at 5500m depth (3) at MM3. Geographic direction and speed scale are shown at the upper right.

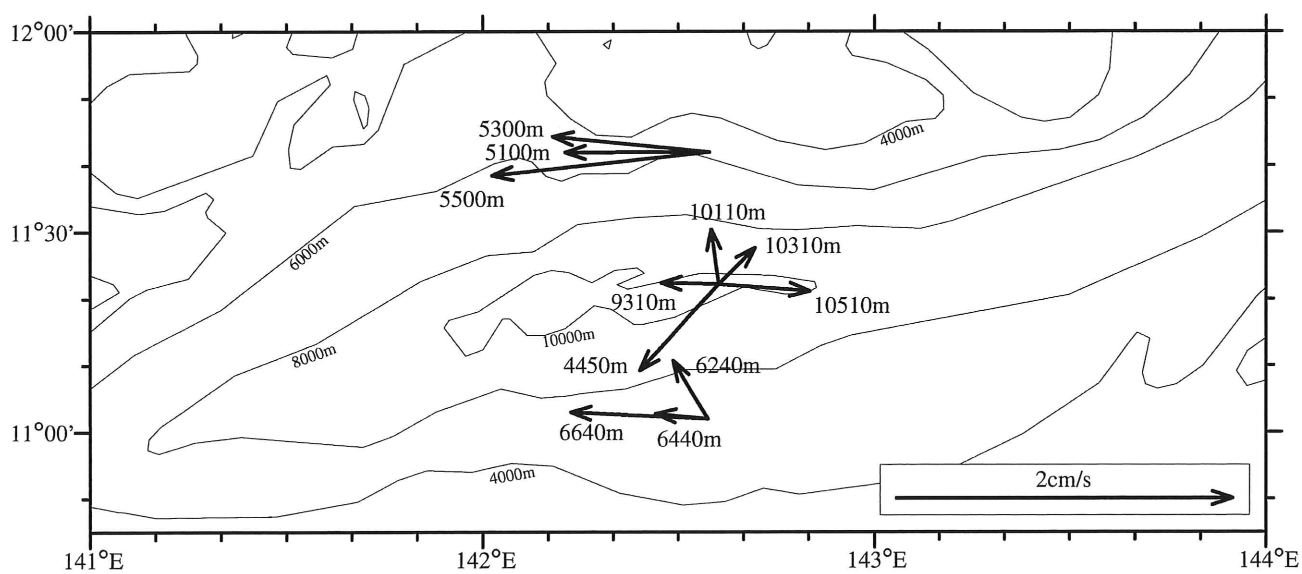

Fig. 6. Spatial distribution of mean currents on the bottom topography map. The start points of the mean vectors are on the mooring system position. The scale of 2cm/s speed is shown in the lower right corner. The observation depth is shown near the end point of each vector. The bottom topography is the same as in Fig. 1.

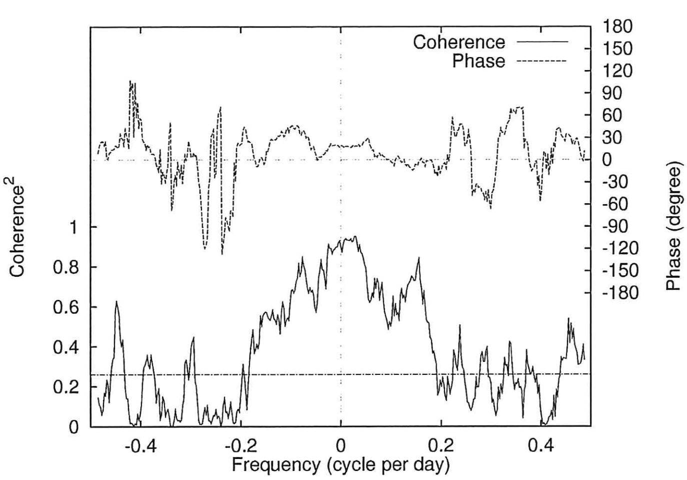

Fig. 7. Inner rotary coherence and phase for daily current velocity from two layers of 10510m and 10110m depths at MM2 with 90% confidence level. Minus (plus) frequency is for anticlockwise (clockwise) rotation.

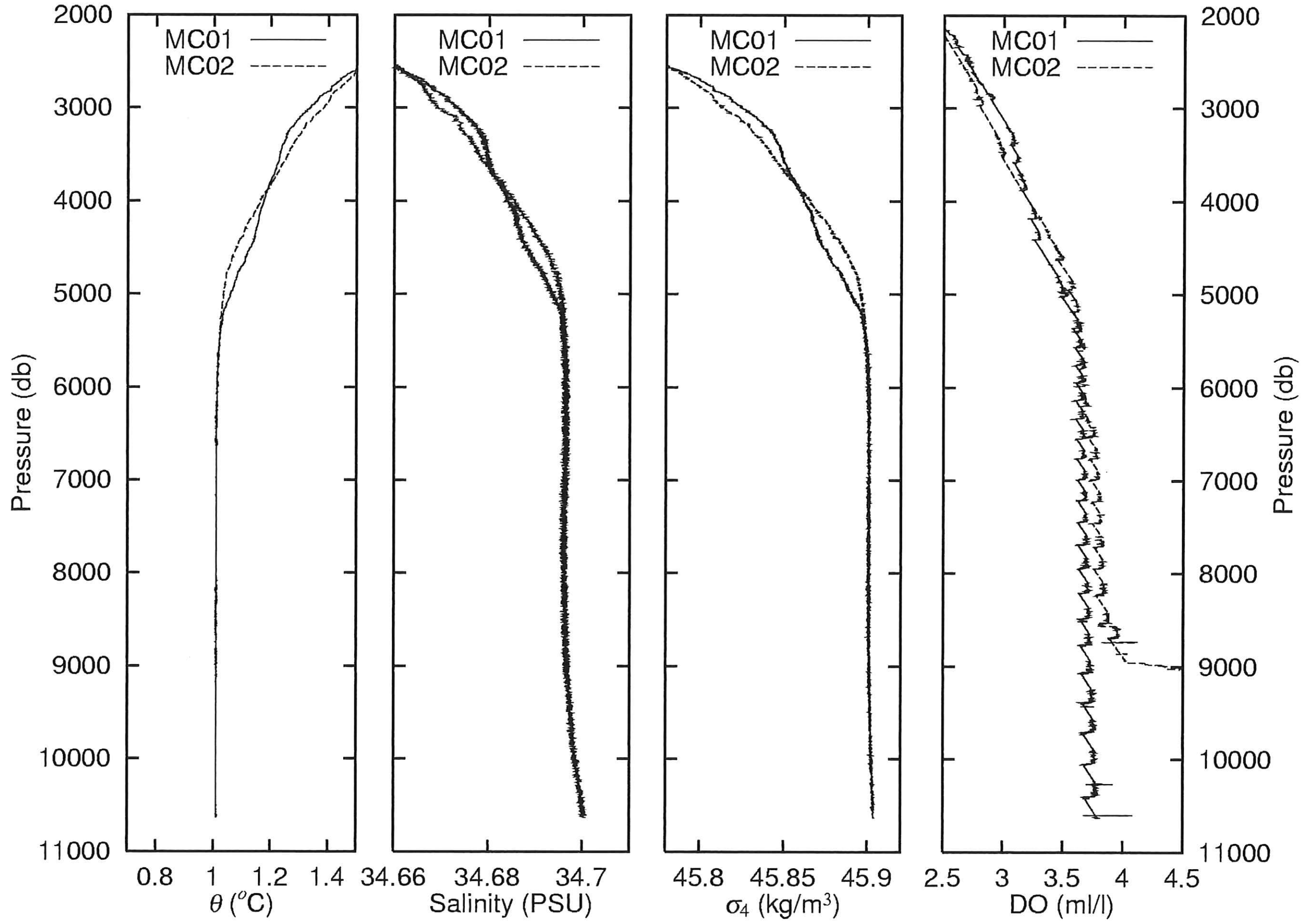

Fig. 8. Vertical profile below 2000db of potential temperature (θ), salinity, potential density (σ_4) and dissolved oxygen (DO) collected from CTD/O_2 at station MC01 (solid line) and MC02 (broken line). Downcast CTD/O_2 data is used and raw data is plotted for salinity and oxygen in this profile.

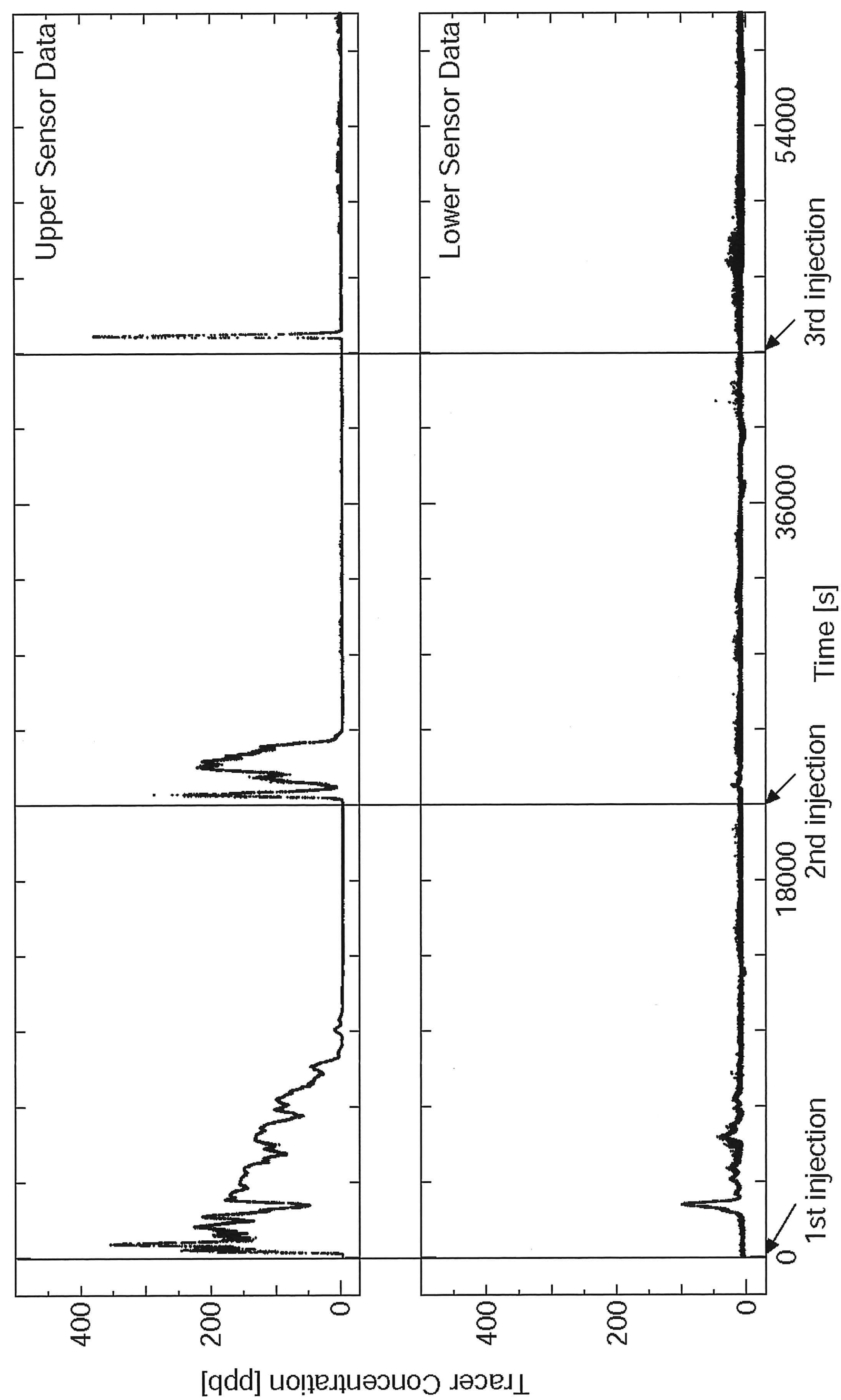

Fig. 4 Time variation of tracer concentration measured by the upper and lower sensors

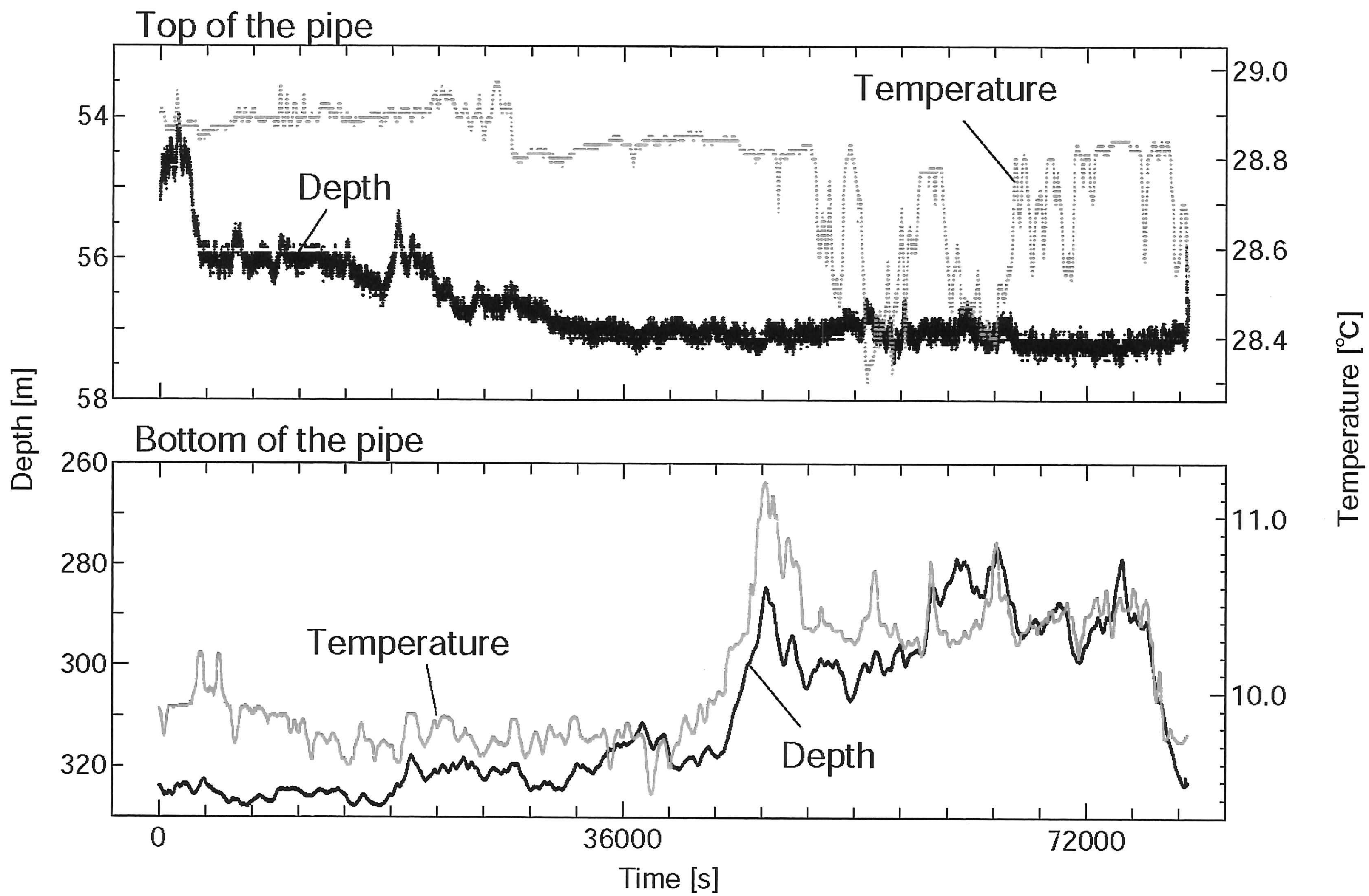

Fig. 5 Time variation of temperature and depth at the top and bottom of the pipe

Experimental estimation of upwelling flow in a pipe induced by "perpetual salt fountain"

Koutaro Tsubaki, Kentaro Mori, Ryuta Ibuki, Shintaro Tanaka, Keisuke Taira, Daigo Yanagimoto

Objective

In this experiment, we have measured the upwelling flow in a pipe induced by "perpetual salt fountain". Though, the "perpetual salt fountain" was proposed by Stommel et al. in 1956, no one has succeeded to measure the upwelling velocity. If the upwelling due to the "perpetual salt fountain" were to be verified, it is possible to draw up deep seawater with no additional external energy source except the initial input.

Apparatus

A soft plastic pipe of 280 m in length and 0.3 m in diameter was employed for the experiment. The experimental setup is schematically shown in Fig. 1. Steel rings, with a diameter of 5mm were inserted at 0.25m intervals. Further, 10 glass buoys were connected to both sides of the pipe, such that the total buoyancy force was almost equal to the pipe weight in water (approximately 300 kg). In order to maintain the apparatus straight and upright against the sea current, a 100 kg weight was hung from the pipe. Two ropes were set along the pipe to hold the total weight. A main buoy and 12 small buoys held all the apparatus at the sea surface. In the main buoy, a Global Positioning System (GPS) was installed to chase the floating apparatus. Temperature and depth measuring devices were placed at the top and bottom of the pipe. A velocity measuring system was installed inside of the pipe at the 70m depth. The tracer RhodamineWT was chosen to measure the upwelling flow. Two fluorescent sensors were set 2m above and below the tracer injector, which detected advection and diffusion of the tracer.

Method

The experiment was conducted around the area of longitude 142°24' E and latitude 11°25' N. The experimental procedure is noted in Table 1. Deep seawater was initially drawn up by a pump with holding the top of the pipe above the sea surface. The pumping at a flowrate of 1.5 L/s, was continued for 12 hours. After pumping up the deep seawater, vertical distributions of temperature and salinity of deep seawater inside and outside of the pipe were compared from the surface to the 130 m depth (see Fig. 2). It was observed that the salinity inside of the pipe was lower than that of the outside, whereas the temperature was almost the same, hence the buoyancy force occurred inside of the pipe. After the apparatus was detached from the ship and floated, the measuring system automatically started recording the data. Then, the vertical distributions of temperature and salinity of seawater around the experimental area were again measured from the surface to the 500m depth (Fig. 3).

Result

In order to measure the upwelling velocity, the tracer was injected three times at 1, 7 and 13 hours after detaching the apparatus from the ship. Figure 4 shows the relation between the elapsed time from the first injection and the tracer concentration. This data was estimated by making a comparison with one-dimensional numerical simulation for the diffusion of the tracer. It is difficult to estimate the upwelling velocity from the first and the second injection data, because the effect of advection was relatively small compared to the effect of diffusion. However, from the third injection data, the upwelling velocity was estimated to be 2.5 mm/s and a diffusivity of 1×10^{-5} m^2/s. The results indicted that the upwelling velocity became faster with the elapsed time, as shown by the narrowing of the diffusion time (Fig. 4). Figure 5 shows the time variations of temperature with depth at the top and bottom of the pipe.

Conclusion

We have succeeded to perform experiments for measuring the upwelling velocity of the pipe flow induced by the "perpetual salt fountain".

Table 1 Experimental Procedure

Aug. 2nd	Preparation of the experimental apparatus
Aug. 3rd	Mooring the apparatus to the ship, and pumping up the deep seawater
Aug. 4th	Installation of the measuring system, detaching the apparatus from the ship and floating, and measuring the upwelling velocity
Aug. 5th	Recovering the apparatus from the ocean

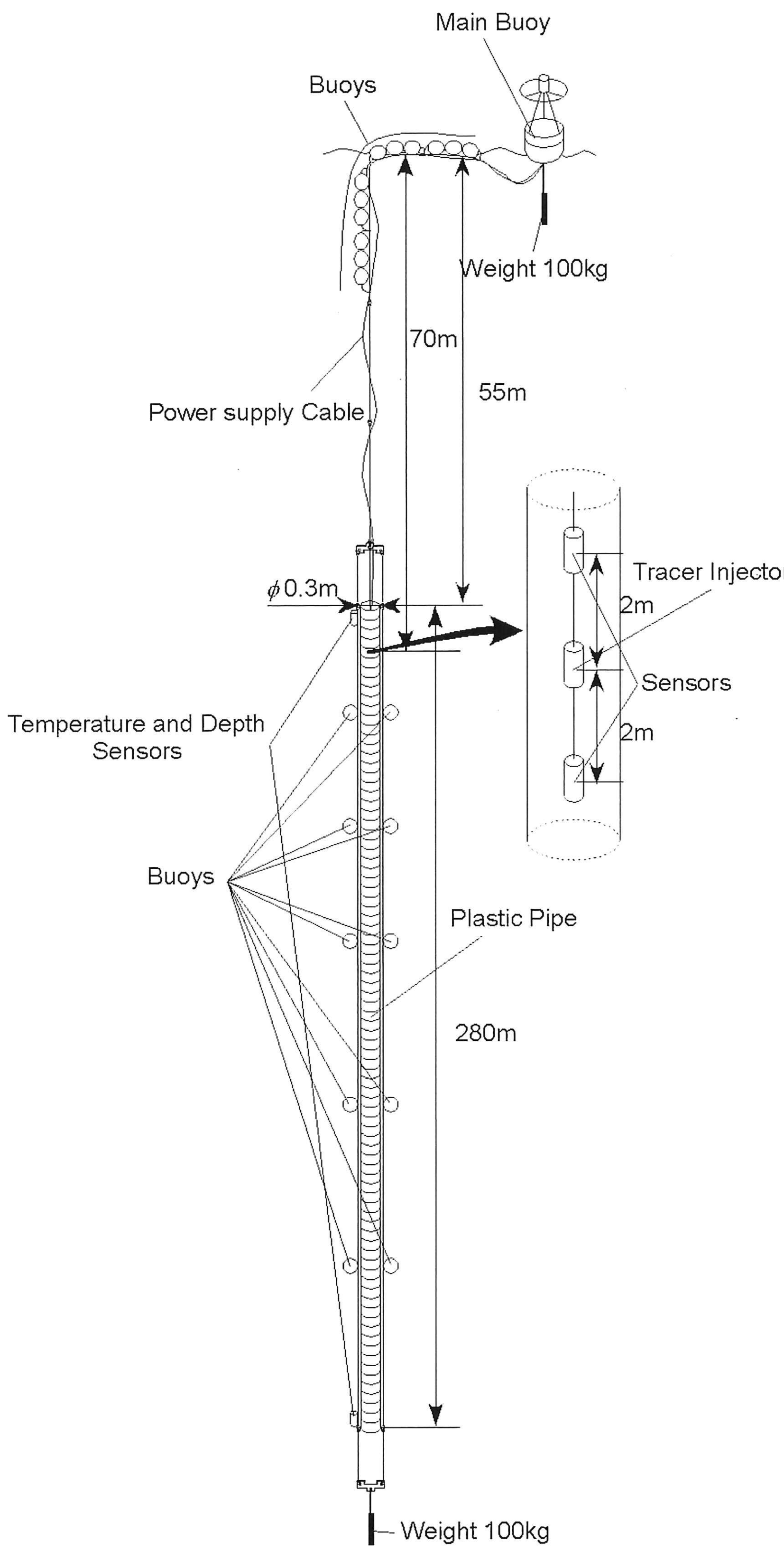

Fig. 1 Experimental Setup

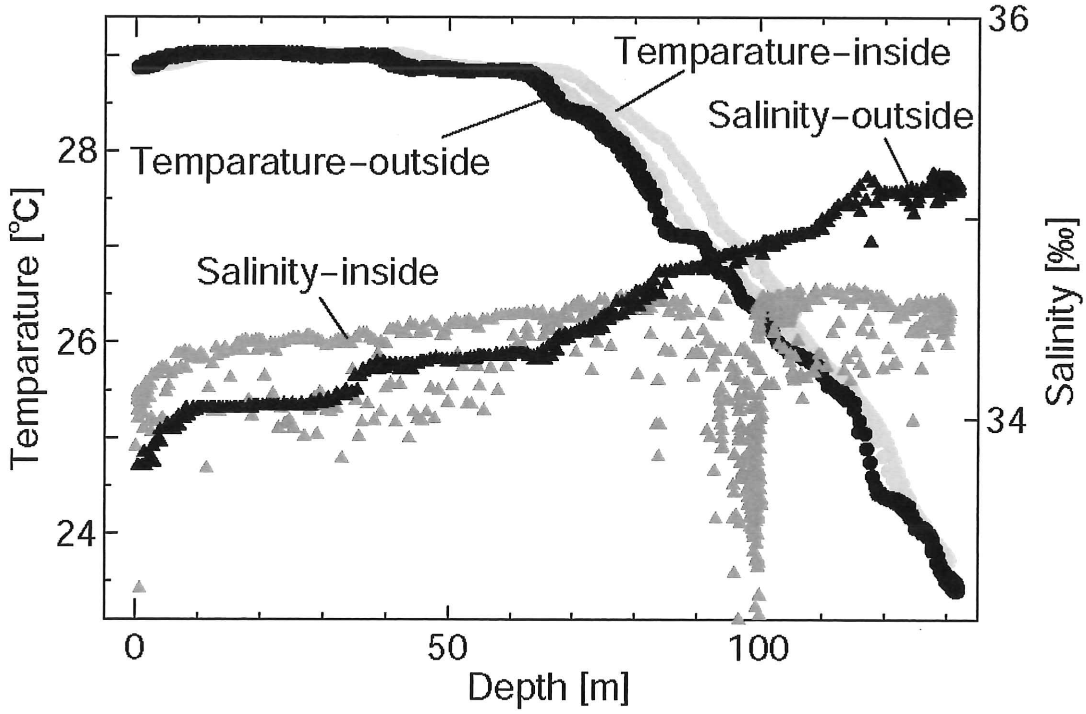

Fig. 2 Distribution of temperature and salinity of deep seawater at the inside and outside of the pipe

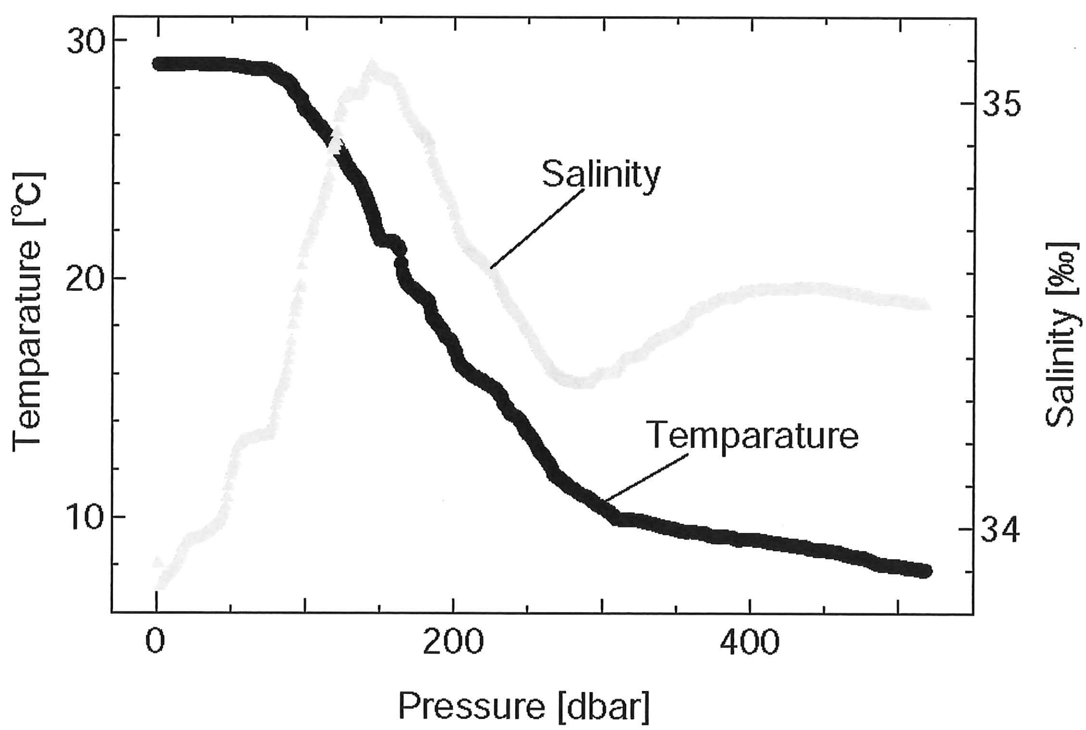

Fig. 3 Distribution of temperature and salinity of deep seawater around the experimental area

KH-02-2 Net Record

St.	Location Net in	Location Net out	Date	Time Net in	Time Net out	Net Type	Mesh size (mm)	Towing Method	Wire out (m)	Sampl. layer (m)	Reel. speed (m/s)	Ship speed (kt)	Filt. volume (m^3)	Flow-meter Revol.	Flow-meter No.	Sea Depth (m)
P1-1	N 16-30.3 E140-09.9	N 16-28.8 E143-06.6	020708	22:57	23:58	IKMT	0.5	Obl.	1221	0-253	1.0~0.5	3.0~2.0	51210	58860	2734	912
P1-2	N 16-30.6 E143-08.1	N 16-28.7 E143-09.0	020709	00:36	01:39	IKMT	0.5	Obl.	1217	0-283	1.0~0.5	3.0~2.0	47690	54820	2734	575
P1-3	N 16-30.7 E143-07.9	N 16-30.8 E143-08.4	020709	02:08	02:43	IKMT	0.5	Obl.	603	0-309	1.0~0.5	2.5~2.0	14770	16980	2734	678
P1-4	N 16-31.4 E143-09.5	N 16-29.5 E143-09.6	020709	03:06	03:55	IKMT	0.5	Obl.	910	0-236	1.0~0.5	2.5~2.0	35930	41300	2734	-
A1-1	N 15-38.7 E142-46.5	N 15-36.5 E142-44.9	020709	09:22	10:16	IKMT	0.5	Obl.	1120	0-228	1.0~0.5	2.5~2.0	47170	54215	2734	-
A1-2	N 15-36.9 E142-46.1	N 15-38.4 E142-44.8	020709	10:50	11:39	IKMT	0.5	Obl.	953	0-331	1.0~0.5	2.5~2.0	27390	31480	2734	449
A1-3	N 15-38.4 E142-45.0	N 15-38.7 E142-46.0	020709	11:48	12:30	IKMT	0.5	Obl.	824	0-384	1.0~0.5	2.5~2.0	41890	48150	2734	424
S1-1	N 14-14.5 E142-54.0	N 14-12.6 E142-53.5	020709	21:25	22:15	IKMT	0.5	Obl.	911	0-276	1.0~0.5	2.5~2.0	31900	36670	2734	462
S1-2	N 14-12.4 E142-53.4	N 14-13.7 E142-52.1	020709	22:24	23:19	IKMT	0.5	Obl.	1035	0-382	1.0~0.5	2.5~2.0	32530	37390	2734	463
S1-3	N 14-14.4 E142-51.9	N 14-14.1 E142-54.4	020709	23:34	25:27	IKMT	0.5	Obl.	1037	0-262	1.0~0.5	2.5~2.0	35770	41110	2734	408
A2-1	N 15-38.7 E142-46.5	N 15-37.8 E142-46.1	020710	07:01	07:37	IKMT	0.5	Obl.	700	0-314*	1.0~0.5	2.5~2.0	15840	18205	2734	475
A2-2	N 15-37.0 E142-46.0	N 15-38.2 E142-44.6	020710	08:03	08:56	IKMT	0.5	Obl.	1040	0-284*	1.0~0.5	2.5~2.0	28050	32237	2734	406
A2-3	N 15-38.4 E142-45.2	N 15-39.1 E142-48.5	020710	09:08	10:18	IKMT	0.5	Obl.	1336	0-243*	1.0~0.5	2.5~2.0	57600	66205	2734	785
P2-1	N 16-30.8 E143-08.0	N 16-29.7 E143-08.8	020710	15:09	15:56	IKMT	0.5	Obl.	843	0-843*	1.0~0.5	2.5~2.0	25200	28960	2734	355
P2-2	N 16-30.7 E143-07.9	N 16-30.9 E143-09.4	020710	16:22	17:09	IKMT	0.5	Obl.	859	0-323*	1.0~0.5	2.5~2.0	23170	26630	2734	486

KH-02-2 Net Record

St.	Location Net in	Location Net out	Date	Time Net in	Time Net out	Net Type	Mesh size (mm)	Towing Method	Wire out (m)	Sampl. layer (m)	Reel. speed (m/s)	Ship speed (kt)	Filt. volume (m³)	Flow-meter Revol.	Flow-meter No.	Sea Depth (m)
P2-3	N 16-30.7 E143-07.8	N 16-30.9 E143-09.2	020710	19:55	20:35	IKMT	0.5	Obl.	765	0-309*	1.0~0.5	2.5~2.0	22110	25410	2734	523
H-1	N 17-11.4 E143-15.8	N 17-11.3 E143-17.1	020711	02:30	03:15	IKMT	0.5	Obl.	824	0-340*	1.0~0.5	2.5~2.0	23390	26890	2734	1644
Y-1	N 17-19.3 E143-24.9	N 17-15.9 E143-36.7	020711	04:36	09:50	IKMT	1.0	Obl.	6198	-	1.0~0.5	2.5~2.0	100090	115050	2734	3767
1	N 16-59.7 E141-59.6	N 16-55.8 E141-59.3	020713	00:23	01:37	IKMT	1.0	Obl.	900	0-286	1.0~0.5	3.5~2.0	61370	70540	1147	4428
2	N 16-20.1 E141-51.5	N 16-18.4 E141-57.4	020713	04:37	05:28	IKMT	1.0	Obl.	900	0-248	1.0~0.5	3.5~2.5	48530	55780	1147	4284
3	N 15-39.8 E141-59.7	N 15-38.5 E141-57.6	020713	08:26	09:15	IKMT	1.0	Obl.	900	0-223	1.0~0.5	3.5~2.5	46640	53610	1147	4425
4	N 15-40.1 E141-00.2	N 15-40.7 E140-56.7	020713	12:53	13:59	IKMT	1.0	Obl.	1200	0-351	1.0~0.5	3.0~2.0	60630	69690	1147	4788
5	N 16-18.8 E140-59.4	N 16-18.3 E140-55.8	020713	16:37	17:43	IKMT	1.0	Obl.	1200	-	1.0~0.5	3.0~2.0	50820	58410	1147	4680
6	N 17-00.0 E140-59.7	N 16-58.8 E140-56.4	020713	21:25	22:37	IKMT	1.0	Obl.	1200	-	1.0~0.5	3.0~1.1	49110	56450	1147	4749
7	N 17-00.5 E139-59.9	N 17-00.2 E140-02.3	020714	03:27	04:41	IKMT	1.0	Obl.	1200	-	1.0~0.5	2.5~1.5	52050	59830	1147	4498
8	N 16-20.8 E139-59.4	N 16-19.5 E139-57.4	020714	07:37	08:37	IKMT	1.0	Obl.	1000	-	1.0~0.5	2.5~2.0	35060	40300	1147	4643
9	N 15-39.7 E140-00.0	N 15-38.2 E139-59.3	020714	11:22	12:16	IKMT	1.0	Obl.	1000	-	1.0~0.5	3.0~2.0	40350	46380	1147	4931
10	N 15-40.0 E139-00.2	N 15-39.9 E138-57.8	020714	16:40	17:47	IKMT	0.5	Obl.	1200	0-608	1.0~0.5	2.5~2.0	35530	40840	1147	5024
11	N 16-19.9 E138-60.0	N 16-18.4 E138-57.6	020714	20:35	21:42	IKMT	0.5	Obl.	1016	0-397	0.5	3.0~2.0	39530	45440	1147	5121
12	N 16-59.8 E138-59.4	N 16-59.4 E138-57.2	020715	01:18	02:16	IKMT	0.5	Obl.	1000	0-395	1.0~0.5	2.5~2.0	38000	43675	1147	3743

KH-02-2 Net Record

St.	Location Net in	Location Net out	Date	Time Net in	Time Net out	Net Type	Mesh size (mm)	Towing Method	Wire out (m)	Sampl. layer (m)	Reel. speed (m/s)	Ship speed (kt)	Filt. volume (m³)	Flow-meter Revol.	Flow-meter No.	Sea Depth (m)
13	N 16-59.4 E137-59.5	N 16-58.7 E137-57.2	020715	07:00	07:58	IKMT	0.5	Obl.	1000	0-472	0.9~0.5	2.5~2.0	34570	39730	1147	5338
14	N 16-19.8 E137-59.7	N 16-18.5 E137-56.6	020715	10:29	11:28	IKMT	0.5	Obl.	1000	0-323	1.0~0.5	2.5~2.0	50200	57700	1147	4484
15	N 15-40.0 E137-59.5	N 15-40.4 E137-55.9	020715	14:02	15:01	IKMT	0.5	Obl.	1000	0-309	1.0~0.5	2.5~1.5	50410	57940	1147	4514
16	N 16-59.5 E136-58.0	N 16-57.9 E136-54.4	020715	22:02	22:58	IKMT	0.5	Obl.	1000	0-232	1.0~0.5	2.5~2.0	58500	67240	1147	4906
17	N 16-20.0 E136-59.9	N 16-21.9 E136-59.7	020716	01:41	02:46	IKMT	0.5	Obl.	1000	0-516	1.0~0.4	2.5	36040	41424	1147	5209
18	N 16-00.5 E136-59.5	N 16-03.8 E136-57.2	020716	04:40	05:34	IKMT	0.5	Obl.	1000	0-238	1.0~0.5	2.5~2.0	54010	62078	1147	4868
19	N 15-40.1 E137-00.0	N 15-40.8 E137-01.8	020716	08:24	09:24	IKMT	0.5	Obl.	1000	0-392	1.0~0.5	3.0~2.0	35500	40800	1147	4840
20	N 15-20.2 E136-60.0	N 15-18.6 E136-59.2	020716	11:03	12:02	IKMT	0.5	Obl.	1000	-	1.0~0.5	2.5~2.0	32360	37195	1147	4882
21	N 14-40.1 E137-00.2	N 14-41.1 E137-02.1	020716	14:47	15:42	IKMT	0.5	Obl.	1000	-	1.0~0.5	2.5~2.0	40290	46310	1147	4859
22	N 14-40.2 E138-00.2	N 14-41.3 E138-01.8	020716	19:26	20:21	IKMT	0.5	Obl.	1000	-	1.0~0.5	2.5~2.0	51960	59720	1147	5166
23	N 15-20.0 E137-60.0	N 15-20.7 E138-01.1	020716	22:57	23:49	IKMT	0.5	Obl.	1000	-	1.0~0.5	2.5~2.0	41830	48075	1147	5197
24	N 15-59.9 E137-59.4	N 16-01.3 E137-58.9	020717	03:12	04:07	IKMT	0.5	Obl.	1000	-	1.0~0.5	2.5~2.0	28250	32470	1147	4972
25	N 15-59.6 E138-59.1	N 15-56.9 E138-57.8	020717	08:56	10:02	IKMT	0.5	Obl.	1200	0-429	1.0~0.5	2.5~2.0	51200	58850	1147	4266
26	N 15-19.7 E138-59.9	N 15-17.2 E138-58.5	020717	12:29	13:32	IKMT	0.5	Obl.	1200	0-391	1.0~0.5	3.0~1.7	49240	56600	1147	4639
27	N 14-40.4 E138-59.8	N 14-43.0 E138-58.2	020717	16:04	17:07	IKMT	0.5	Obl.	1200	0-328	1.0~0.5	2.5~2.0	52250	60060	1147	4693

KH-02-2 Net Record

St.	Location		Date	Time		Net	Mesh	Towing	Wire	Sampl.	Reel.	Ship	Filt.	Flow-	Flow-	Sea
	Net in	Net out		Net in	Net out	Type	size (mm)	Method	out (m)	layer (m)	speed (m/s)	speed (kt)	volume (m³)	meter Revol.	meter No.	Depth (m)
28	N 14-39.9 E139-59.9	N 14-42.8 E139-59.1	020717	21:17	22:23	IKMT	0.5	Obl.	1200	0-351	1.0~0.5	2.5~2.0	55220	63470	1147	4628
29	N 15-20.1 E140-00.2	N 15-21.1 E140-02.0	020718	00:51	01:58	IKMT	0.5	Obl.	1200	0-359	1.0~0.5	2.5~2.0	56040	64410	1147	4852
30	N 15-59.6 E139-59.4	N 15-57.0 E139-60.0	020718	05:13	06:14	IKMT	0.5	Obl.	1100	0-399	1.0~0.5	2.5~2.0	43680	50210	1147	5095
31	N 15-59.9 E141-00.0	N 15-57.8 E141-00.7	020718	10:49	11:48	IKMT	0.5	Obl.	1100	0-419	1.0~0.5	2.5~2.0	39960	45930	1147	4658
32	N 15-19.8 E141-00.1	N 15-17.4 E141-01.0	020718	14:20	15:18	IKMT	0.5	Obl.	1100	0-291	1.0~0.5	3.2~1.6	50310	57830	1147	4723
33	N 14-40.2 E140-59.7	N 14-41.6 E140-57.6	020718	17:48	18:53	IKMT	0.5	Obl.	1200	0-534	1.0~0.5	2.5~2.0	40400	46439	1147	4808
34	N 15-07.0 E141-20.2	N 15-08.5 E141-21.2	020718	21:16	22:25	IKMT	0.5	Obl.	1200	0-617	1.0~0.5	2.5~2.0	37880	43540	1147	4664
35	N 15-33.0 E141-39.8	N 15-34.7 E141-41.9	020719	00:34	01:42	IKMT	0.5	Obl.	1200	0-410	1.0~0.5	3.5~2.0	48150	55340	1147	4528
36	N 15-59.5 E142-00.0	N 15-56.8 E142-00.8	020719	04:32	05:38	IKMT	0.5	Obl.	1200	0-442	1.0~0.5	2.5~1.5	47080	54110	1147	4370
37	N 15-19.8 E141-59.7	N 15-17.9 E141-56.8	020719	08:07	09:12	IKMT	0.5	Obl.	1200	0-377	1.0~0.5	2.5~2.0	52870	60767	1147	4345
38	N 15-00.2 E141-59.1	N 14-58.9 E141-56.8	020719	11:17	12:21	IKMT	0.5	Obl.	1100	0-462	1.0~0.5	2.5~2.0	41250	47416	1147	4501
39	N 14-40.0 E141-59.8	N 14-39.2 E141-57.0	020719	14:10	15:13	IKMT	0.5	Obl.	1200	0-436	1.0~0.5	2.5~2.0	44870	51579	1147	4359
40	N 14-20.0 E141-59.8	N 14-18.8 E141-57.4	020719	16:43	17:46	IKMT	0.5	Obl.	1200	0-481	1.0~0.5	2.5~2.0	49990	57460	1147	4298
41	N 13-40.0 E141-59.8	N 13-39.4 E141-55.9	020719	21:06	22:18	IKMT	0.5	Obl.	1200	0-416	0.7~0.5	2.5~2.0	55380	63650	1147	3920
42	N 13-40.4 E141-00.4	N 13-38.7 E141-02.5	020720	02:55	04:06	IKMT	0.5	Obl.	1200	0-415	1.0~0.5	2.5	51920	59680	1147	4713

KH-02-2 Net Record

St.	Location Net in	Location Net out	Date	Time Net in	Time Net out	Net Type	Mesh size (mm)	Towing Method	Wire out (m)	Sampl. layer (m)	Reel. speed (m/s)	Ship speed (kt)	Filt. volume (m³)	Flow-meter Revol.	Flow-meter No.	Sea Depth (m)
43	N 14-20.3 E141-00.0	N 14-19.7 E140-57.8	020720	06:58	08:08	IKMT	0.5	Obl.	1200	0-533	1.0~0.5	2.5~2.0	40470	46512	1147	4810
44	N 14-59.9 E140-59.8	N 14-59.3 E140-56.0	020720	11:35	12:52	IKMT	0.5	Obl.	1200	0-471	1.0~0.5	2.5~2.0	48350	55580	1147	4776
45	N 14-59.8 E140-00.3	N 14-59.6 E139-57.8	020720	17:37	18:50	IKMT	0.5	Obl.	1200	-	0.8~0.5	2.5~2.0	42530	48890	1147	4864
46	N 14-19.9 E139-60.0	N 14-18.6 E139-56.8	020720	21:36	22:49	IKMT	0.5	Obl.	1200	-	1.0~0.5	3.0~2.0	47090	54130	1147	4814
47	N 13-38.7 E139-59.7	N 13-36.5 E139-56.6	020720	02:15	03:27	IKMT	0.5	Obl.	1200	-	0.5~0.1	2.5~1.5	57880	66530	1147	4888
48	N 13-40.9 E138-59.7	N 13-39.9 E138-55.9	020721	10:02	11:17	IKMT	0.5	Obl.	1200	-	0.5	2.5~1.5	53450	61440	1147	4092
49	N 14-20.0 E138-58.3	N 14-20.2 E138-53.6	020721	14:50	16:25	IKMT	1.0	Obl.	1200	-	0.1~0.5	3.2~1.0	67610	77710	1147	5396
50	N 15-00.3 E138-58.7	N 15-00.0 E138-55.2	020722	01:25	02:43	IKMT	1.0	Obl.	1200	-	0.4~0.5	2.9~1.3	50140	57630	1147	4428
51	N 14-60.0 E137-59.8	N 14-57.8 E137-56.7	020722	08:07	09:29	IKMT	1.0	Obl.	1200	-	0.4~0.5	2.4~1.7	60960	70070	1147	4892
52	N 14-18.6 E137-57.8	N 14-17.4 E137-54.2	020722	14:33	16:01	IKMT	1.0	Obl.	1200	-	0.7~0.5	3.1~1.1	62540	71890	1147	4887
53	N 13-39.7 E138-00.3	N 13-37.7 E137-58.0	020722	19:00	20:16	IKMT	1.0	Obl.	1200	-	1.0~0.5	2.8~1.6	58600	67356	1147	4747
54	N 14-59.7 E136-59.2	N 14-58.5 E136-56.0	020722	04:54	06:04	IKMT	1.0	Obl.	1200	-	0.8~0.5	2.5~1.2	49220	56580	1147	5418
55	N 14-20.0 E137-00.4	N 14-18.2 E136-57.1	020723	09:06	10:30	IKMT	1.0	Obl.	1200	-	0.4~0.5	2.8~1.4	59500	68390	1147	5094
56	N 13-39.1 E137-00.5	N 13-37.0 E136-58.0	020723	14:16	15:45	IKMT	1.0	Obl.	1200	-	0.4~0.5	2.4~2.0	47510	54608	1147	5217
57	N 12-59.2 E137-00.5	N 12-56.9 E136-58.4	020723	19:23	20:35	IKMT	1.0	Obl.	1200	-	0.6~0.5	2.5~2.0	47890	55050	1147	4701

KH-02-2 Net Record

St.	Location		Date	Time		Net	Mesh	Towing	Wire	Sampl.	Reel.	Ship	Filt.	Flow-	Flow-	Sea
	Net in	Net out		Net in	Net out	Type	size (mm)	Method	out (m)	layer (m)	speed (m/s)	speed (kt)	volume (㎥)	meter Revol.	meter No.	Depth (m)
57	N 12-56.6 E136-58.2	N 12-54.1 E136-55.6	020723	20:43	21:57	IKMT	1.0	Obl.	700	-	0.5~0.2~0.5	2.5~2.0	53720	61750	1147	4956
58	N 11-59.7 E136-59.6	N 11-57.5 E136-57.2	020724	01:51	03:00	IKMT	1.0	Obl.	700	-	0.7~0.2~0.5	2.8~2.5	46950	53960	1147	4987
58	N 11-57.2 E136-56.9	N 11-54.3 E136-53.5	020724	03:09	04:48	IKMT	1.0	Obl.	924	-	0.7~0.2~0.5	2.8~2.2	60940	70050	1147	5390
58	N 11-54.1 E136-53.3	N 11-52.9 E136-50.2	020724	04:56	06:12	IKMT	1.0	Obl.	1200	-	0.4~0.5	2.5~2.0	47850	55000	1147	4886
59	N 10-59.5 E136-59.8	N 10-57.7 E136-56.7	020724	13:09	14:25	IKMT	1.0	Obl.	1200	-	0.6~0.5	2.5~2.0	49430	56820	1147	5033
60	N 10-00.2 E136-59.8	N 09-58.5 E136-57.7	020724	19:19	20:28	IKMT	1.0	Obl.	1200	-	0.8~0.5	2.5~2.0	45120	51858	1147	4795
61	N 08-59.7 E136-59.6	N 08-58.2 E136-57.0	020725	01:20	02:25	IKMT	1.0	Obl.	1200	-	1.0~0.5	2.5~2.0	50620	58180	1147	3377
62	N 07-59.6 E136-59.9	N 07-58.2 E136-57.8	020725	07:12	08:17	IKMT	1.0	Obl.	1200	-	1.0~0.5	2.5~2.0	42770	49160	1147	2823
63	N 07-00.1 E136-59.7	N 06-59.6 E136-57.2	020725	13:06	14:12	IKMT	1.0	Obl.	1200	-	1.0~0.5	2.5~2.0	40350	46380	1147	4200
64	N 07-35.3 E135-55.3	N 07-35.5 E135-57.9	020801	20:12	21:18	IKMT	1.0	Obl.	1200	0-461	1.0~0.5	2.5~2.0	48520	55770	1147	2841
64	N 07-35.5 E135-58.1	N 07-36.0 E136-00.3	020801	21:25	22:30	IKMT	1.0	Obl.	700	0-279	1.0~0.2~0.5	2.5~2.0	52070	59850	1147	2321
65	N 09-54.6 E141-04.9	N 09-55.0 E141-07.4	020802	20:05	21:08	IKMT	1.0	Obl.	1200	0-428	1.0~0.5	2.5~2.0	48160	55360	1147	3161
65	N 09-55.0 E141-07.7	N 09-54.4 E141-09.9	020802	21:25	22:18	IKMT	1.0	Obl.	700	0-250	1.0~0.2~0.5	2.5~2.0	44660	51330	1147	3158
68	N 13-39.6 E143-59.1	N 13-38.7 E143-55.9	020806	03:17	04:20	IKMT	0.5	Obl.	1200	0-410	1.0~0.5	2.5~2.0	52040	59820	1147	3365
S2-2	N 14-12.6 E142-52.6	N 14-15.2 E142-50.9	020806	14:37	15:48	IKMT	0.5	Obl.	1200	0-474	0.7~0.5	2.5~2.0	52700	60577	1147	751

KH-02-2 Net Record

St.	Location Net in	Location Net out	Date	Time Net in	Time Net out	Net Type	Mesh size (mm)	Towing Method	Wire out (m)	Sampl. layer (m)	Reel. speed (m/s)	Ship speed (kt)	Filt. volume (m³)	Flow-meter Revol.	Flow-meter No.	Sea Depth (m)
S2-3	N 14-12.6 E142-51.6	N 14-12.3 E142-54.0	020806	19:26	20:36	IKMT	0.5	Obl.	1200	0-512	1.0~0.5	3.0~2.0	43500	49995	1147	700
S2-6	N 14-14.7 E142-52.0	N 14-14.9 E142-54.1	020806	23:07	24:14	IKMT	0.5	Obl.	1200	0-485	1.0~0.5	2.8~2.0	43580	50090	1147	718
69	N 15-00.1 E144-00.0	N 15-00.3 E144-03.0	020807	06:52	08:00	IKMT	0.5	Obl.	1200	0-444	0.9~0.5	2.7~2.1	48840	56140	1147	4084
A3-6	N 15-38.1 E142-46.4	N 15-35.7 E142-45.4	020807	17:55	19:10	IKMT	0.5	Obl.	1200	0-564	0.8~0.5	2.7~2.2	45690	52520	1147	779
A3-8	N 15-38.8 E142-45.1	N 15-36.4 E142-44.0	020807	21:33	22:40	IKMT	0.5	Obl.	1200	0-468	1.0~0.5	2.5~2.0	44130	50725	1147	702
A3-9	N 15-38.5 E142-45.4	N 15-38.8 E142-46.4	020807	23:11	23:48	ORI	0.33	Step	400	0-311	0.5	1.0	2454	12270	1740	478
70	N 15-60.0 E143-59.9	N 15-58.6 E143-57.0	020808	05:04	06:11	IKMT	0.5	Obl.	1200	0-452	0.9~0.5	2.5~2.0	47420	54510	1147	3766
70	N 15-58.0 E143-56.2	N 15-55.8 E143-48.1	020808	06:58	10:23	IKMT	1.0	Obl.	6000	-	1	2.0	60160	69152	1147	3484
P3-3	N 16-29.6 E143-08.4	N 16-30.9 E143-08.3	020808	19:31	20:11	ORI	0.33	Step	450	0-293	0.5	1.0	4044	20220	1740	373
P3-4	N 16-31.5 E143-08.0	N 16-29.7 E143-08.0	020808	20:29	21:35	IKMT	0.5	Obl.	1200	0-526	1.0~0.5	2.5~2.0	39170	45020	1147	753
P3-5	N 16-29.4 E143-08.0	N 16-30.0 E143-10.9	020808	21:51	22:55	IKMT	0.5	Obl.	1205	0-486	1.0~0.5	2.5~2.0	44100	50690	1147	759
P3-6	N 16-30.9 E143-09.6	N 16-30.6 E143-08.0	020808	23:23	24:08	IKMT	0.5	Obl.	587	0-262	1.0~0.5	2.5~2.0	26770	30767	1147	219
71	N 16-14.4 E143-02.1	N 16-13.0 E143-01.0	020809	02:02	03:06	IKMT	0.5	Obl.	1200	0-609	1.0~0.5	2.5~2.0	33100	38050	1147	2677
72	N 16-02.9 E142-57.0	N 16-01.1 E142-55.8	020809	04:00	05:08	IKMT	0.5	Obl.	1199	0-566	0.8~0.5	2.5~2.0	49130	56470	1147	2673
73	N 15-49.7 E142-51.0	N 15-47.4 E142-49.8	020809	06:05	07:12	IKMT	0.5	Obl.	1200	0-458	0.9~0.5	2.5~2.0	46430	53364	1147	3282

KH-02-2 Net Record

St.	Location Net in	Location Net out	Date	Time Net in	Time Net out	Net Type	Mesh size (mm)	Towing Method	Wire out (m)	Sampl. layer (m)	Reel. speed (m/s)	Ship speed (kt)	Filt. volume (㎥)	Flow-meter Revol.	Flow-meter No.	Sea Depth (m)
A4-1	N 15-39.2 E142-47.1	N 15-37.2 E142-46.2	020809	08:08	09:12	IKMT	0.5	Obl.	1200	0-516	1.0~0.5	2.5~2.0	39980	45950	1147	(864)
A4-2	N 15-36.3 E142-46.0	N 15-37.9 E142-44.5	020809	09:29	10:32	IKMT	0.5	Obl.	1200	0-502	1.0~0.5	2.5~2.0	41610	47825	1147	778
A4-3	N 15-38.0 E142-44.2	N 15-39.5 E142-46.7	020809	10:43	11:45	IKMT	0.5	Obl.	1200	0-407	1.0~0.5	2.5~2.0	46120	53010	1147	736
74	N 15-25.4 E142-47.7	N 15-22.9 E142-47.3	020809	15:02	16:07	IKMT	0.5	Obl.	1200	0-468	1.0~0.5	2.5~2.0	43160	49612	1147	3324
75	N 15-10.4 E142-48.6	N 15-07.8 E142-48.2	020809	17:04	18:11	IKMT	0.5	Obl.	1200	0-505	0.8~0.5	2.5~2.0	42450	48793	1147	2600
76	N 14-57.4 E142-49.5	N 14-54.6 E142-50.0	020809	19:03	20:10	IKMT	0.5	Obl.	1200	0-468	0.8~0.5	2.4~2.0	45080	51815	1147	2673
77	N 14-43.5 E142-50.4	N 14-41.1 E142-51.6	020809	21:02	22:09	IKMT	0.5	Obl.	1200	0-479	1.0~0.5	2.5~2.0	(-8330)	(9570)	1147	3049
78	N 14-29.7 E142-51.9	N 14-27.5 E142-53.3	020809	23:01	24:01	IKMT	0.5	Obl.	1200	0-427	1.0~0.5	2.5~2.0	44680	51355	1147	2138
S3-1	N 14-14.6 E142-51.7	N 14-12.3 E142-52.5	020810	01:20	02:26	IKMT	0.5	Obl.	1200	0-544	1.0~0.5	2.5~2.0	40660	46730	1147	664
S3-2	N 14-12.6 E142-51.8	N 14-13.1 E142-54.2	020810	02:49	03:56	IKMT	0.5	Obl.	1200	0-474	1.0~0.5	2.5~2.0	48550	55800	1147	700
79	N 13-57.7 E142-53.4	N 14-00.3 E142-52.8	020810	07:06	08:12	IKMT	0.5	Obl.	1200	0-463	1.0~0.5	2.5~2.0	44830	51530	1147	3737
A5-1	N 15-36.6 E142-45.9	N 15-39.0 E142-44.1	020810	14:30	15:32	IKMT	0.5	Obl.	1200	0-409	1.0~0.5	2.5~2.0	48290	55501	1147	661
A5-4	N 15-37.8 E142-45.0	N 15-39.3 E142-45.9	020810	19:56	20:36	IKMT	0.5	Obl.	700	0-234	0.9~0.5	2.5~2.0	29250	33620	1147	498
P4-1	N 16-30.8 E143-08.7	N 16-30.8 E143-08.4	020811	01:10	01:41	IKMT	0.5	Obl.	500	0-169	1.0~0.5	2.5~2.0	23210	26674	1147	376
P4-2	N 16-30.4 E143-09.7	N 16-31.1 E143-09.6	020811	03:05	03:20	IKMT	0.5	Obl.	200	0-56	1.0~0.3	2.5~2.0	10770	12377	1147	451

KH-02-2 Net Record

St.	Location Net in	Location Net out	Date	Time Net in	Time Net out	Net Type	Mesh size (mm)	Towing Method	Wire out (m)	Sampl. layer (m)	Reel. speed (m/s)	Ship speed (kt)	Filt. volume (m³)	Flow-meter Revol.	Flow-meter No.	Sea Depth (m)
P4-3	N 16-29.6 E143-08.2	N 16-32.8 E143-07.5	020811	04:53	06:03	IKMT	0.5	Obl.	1200	0-450	1.0~0.5	2.5~2.0	49090	56420	1147	912
P4-8	N 16-29.9 E143-08.1	N 16-31.7 E143-12.0	020811	09:09	10:14	IKMT	0.5	Obl.	1200	0-451	1.0~0.5	2.5~2.0	50160	57650	1147	844
80	N 17-00.1 E144-00.4	N 17-00.5 E144-03.6	020811	15:34	16:43	IKMT	0.5	Obl.	1200	0-528	1.0~0.5	2.5~2.0	47880	55039	1147	3615

*：スキャンマーによる

St. P1				Depth	1004 m
Date	02.07.08		Lat.	16	30.64 N
Time	13:06– 13:39		Long.	143	10.55 E

LAY data Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml・l⁻¹	
3	29.379	34.567	2.91	*5.340*
10	29.376	34.567	2.99	*8.356*
20	29.343	34.558	3.08	*5.289*
30	29.200	34.536	3.12	*7.371*
40	29.152	34.549	3.16	*6.231*
50	29.103	34.565	3.19	*4.404*
60	29.000	34.589	3.25	*7.729*
70	28.869	34.627	3.28	*2.943*
80	28.571	34.699	3.32	*2.782*
90	27.966	34.821	3.40	*5.770*
100	27.541	34.845	3.43	*2.229*
125	26.689	34.953	3.39	*6.163*
150	25.305	35.055	3.29	*7.573*
200	22.006	35.049	3.19	*6.192*
250	18.576	34.838	3.35	*6.401*
300	16.252	34.679	3.47	*6.446*
400	11.715	34.376	3.11	*0.803*
500	8.300	34.251	2.02	*0.089*
504	8.280	34.250	2.00	*3.514*

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
Sur.	0		29.4	****	****

St. A1				Depth	877 m
Date	02.07.08–09		Lat.	15	38.14 N
Time	23:30– 00:00		Long.	142	46.69 E

LAY data Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml・l⁻¹	
4	28.685	34.622	3.31	*3.621*
10	28.697	34.620	3.34	*1.239*
20	28.473	34.707	3.40	*1.412*
30	28.454	34.709	3.41	*1.827*
40	28.420	34.720	3.42	*5.565*
50	28.388	34.721	3.43	*1.669*
60	28.323	34.721	3.44	*3.150*
70	28.223	34.728	3.44	*1.147*
80	28.158	34.726	3.44	*0.671*
90	28.014	34.743	3.45	*2.291*
100	27.930	34.745	3.46	*2.216*
125	27.199	34.876	3.48	*1.312*
150	25.008	34.995	3.61	*-0.011*
200	20.968	34.983	3.39	*3.213*
250	17.487	34.755	3.59	*0.110*
300	14.811	34.583	3.69	*3.912*
400	10.739	34.301	3.25	*2.708*
500	7.813	34.268	1.86	*0.272*
503	7.660	34.264	1.83	*2.755*

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
Sur.	0		28.9	****	****

St. S1				Depth	1222 m
Date	02.07.09		Lat.	14	13.15 N
Time	11:24– 11:56		Long.	142	54.80 E

LAY data Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml・l⁻¹	
1	29.171	34.684	4.37	0.021
10	29.041	34.679	4.38	0.029
20	28.928	34.675	4.38	0.036
30	28.915	34.674	4.37	0.040
40	28.898	34.675	4.38	0.044
50	28.879	34.680	4.36	0.041
60	28.793	34.694	4.38	0.047
70	28.322	34.797	4.43	0.052
80	28.109	34.838	4.42	0.053
90	27.619	34.929	4.46	0.068
100	27.516	34.930	4.44	0.087
125	26.530	35.038	4.33	0.161
150	24.777	35.162	4.21	0.122
200	20.603	35.025	4.03	0.035
250	17.369	34.774	4.28	0.021
300	13.174	34.464	4.54	0.010
400	9.590	34.322	2.88	0.024
500	7.664	34.345	1.90	0.024
507	7.636	34.350	1.81	0.025

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
Sur.	0		29.1	****	****

St. H1		Depth	1622	m
Date	02.07.10	Lat.	17 11.21	N
Time	16:30– 17:09	Long.	143 15.65	E

LAY data

Pres. db	Temp. ℃	Sal. (psu)	DO ml･l⁻¹	FIC
2	29.553	34.702	4.28	0.022
10	29.558	34.702	4.29	0.024
20	29.567	34.702	4.21	0.026
30	29.324	34.712	4.26	0.029
40	29.294	34.719	4.25	0.024
50	29.163	34.756	4.28	0.033
60	28.916	34.773	4.32	0.038
70	28.310	34.825	4.40	0.049
80	27.904	34.874	4.43	0.057
90	27.327	34.954	4.45	0.067
100	26.766	35.023	4.41	0.092
125	25.422	35.037	4.42	0.159
150	23.899	35.040	4.35	0.083
200	21.517	34.974	4.76	0.026
250	18.623	34.791	5.03	0.014
300	17.394	34.749	4.79	0.010
400	12.947	34.444	*0.53*	0.012
500	8.982	34.224	*0.31*	0.016
505	8.917	34.221	*0.75*	0.025

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml･l⁻¹
Sur.	0		29.5	****	****

St. O1		Depth	828	m
Date	02.07.11	Lat.	17 43.21	N
Time	06:28– 07:10	Long.	142 52.59	E

LAY data

Pres. db	Temp. ℃	Sal. (psu)	DO ml･l⁻¹	FIC
3	29.761	34.724	4.29	0.021
10	29.759	34.725	4.28	0.018
20	29.758	34.726	4.27	0.020
30	29.719	34.729	4.25	0.022
40	29.575	34.735	4.27	0.031
50	29.490	34.739	4.27	0.033
60	28.441	34.836	4.48	0.049
70	27.572	34.910	4.59	0.061
80	27.374	34.929	4.61	0.063
90	26.193	34.996	4.64	0.093
100	25.995	35.002	4.67	0.094
125	24.688	35.018	4.55	0.156
150	22.735	34.995	4.55	0.073
200	20.806	34.942	4.37	0.034
250	18.753	34.822	4.56	0.022
300	17.206	34.748	4.63	0.017
400	11.779	34.390	*5.54*	0.016
500	9.527	34.266	*3.23*	0.024
508	9.297	34.260	*3.20*	0.021

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml･l⁻¹
Sur.	0		29.9	****	****

St. 01		Depth	4444	m
Date	02.07.12	Lat.	16 59.94	N
Time	14:17– 15:03	Long.	142 0.06	E

LAY data

Pres. db	Temp. ℃	Sal. (psu)	DO ml･l⁻¹	FIC
3	29.212	34.688	4.33	0.024
10	29.213	34.688	4.30	0.027
20	29.216	34.688	4.27	0.035
30	29.216	34.690	4.27	0.030
40	29.219	34.689	4.26	0.033
50	29.224	34.689	4.25	0.031
60	29.223	34.689	4.25	0.029
70	29.132	34.703	4.27	0.035
80	28.775	34.737	4.35	0.045
90	28.161	34.788	4.41	0.061
100	27.689	34.824	4.44	0.067
125	26.334	34.968	4.40	0.125
150	24.946	34.984	4.40	0.136
200	21.119	34.917	4.63	0.038
250	18.571	34.793	4.77	0.028
300	16.991	34.741	4.77	0.014
400	13.291	34.475	*0.31*	0.016
500	9.627	34.263	*4.03*	0.024
508	9.448	34.258	*3.68*	0.024

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml･l⁻¹	
Sur.	0		29.3	****	****	
13	50	*50*	*29.227*	*34.685*	*4.10*	Not closed
1	48	49	29.225	34.686	4.10	

St. 06			Depth	4740 m
Date	02.07.13	Lat.	17	0.10 N
Time	11:45– 12:15	Long.	140	59.82 E

LAY data

Pres. (db)	Temp. (℃)	Sal. (psu)	DO (ml・l⁻¹)	FIC
3	29.208	34.701	3.26	0.023
10	29.211	34.702	3.34	0.025
20	29.200	34.700	3.37	0.024
30	29.134	34.697	3.39	0.026
40	29.131	34.698	3.39	0.029
50	29.126	34.698	3.39	0.031
60	29.125	34.698	3.38	0.030
70	29.126	34.698	3.39	0.037
80	29.119	34.703	3.39	0.041
90	28.829	34.735	3.42	0.062
100	27.794	34.829	3.56	0.086
125	26.072	35.001	3.70	0.110
150	24.519	34.978	3.54	0.149
200	22.058	34.908	3.61	0.069
250	19.261	34.856	3.65	0.021
300	17.582	34.761	3.79	0.013
400	14.422	34.576	3.73	0.014
500	10.313	34.284	3.01	0.017
505	10.133	34.279	2.91	0.018

BTL data

BTL No.	Depth (m)	Pres. (db)	Temp. (℃)	Sal. (psu)	DO (ml・l⁻¹)
Sur.	0		29.3	****	****
13	49	50	29.124	34.694	3.38
1	50	50	29.123	34.694	3.38

St. 07			Depth	4441 m
Date	02.07.13	Lat.	17	0.30 N
Time	17:20– 18:04	Long.	139	59.80 E

LAY data

Pres. (db)	Temp. (℃)	Sal. (psu)	DO (ml・l⁻¹)	FIC
2	28.807	34.727	3.37	0.030
10	28.814	34.729	3.44	0.031
20	28.812	34.728	3.45	0.032
30	28.813	34.729	3.45	0.031
40	28.814	34.729	3.44	0.034
50	28.820	34.729	3.44	0.035
60	28.823	34.729	3.44	0.034
70	28.825	34.729	3.43	0.037
80	28.828	34.729	3.41	0.036
90	28.795	34.730	3.42	0.046
100	28.421	34.760	3.46	0.070
125	26.801	34.915	3.52	0.122
150	25.543	35.009	3.47	0.149
200	22.077	34.947	3.49	0.049
250	19.165	34.826	3.75	0.029
300	17.827	34.780	3.69	0.015
400	14.295	34.552	3.77	0.016
500	9.976	34.267	3.08	0.016
509	9.448	34.254	2.92	0.016

BTL data

BTL No.	Depth (m)	Pres. (db)	Temp. (℃)	Sal. (psu)	DO (ml・l⁻¹)
Sur.	0		28.9	****	****
13	54	54	28.828	34.725	3.39
1	54	54	28.828	34.725	3.40

St. 12			Depth	4487 m
Date	02.07.14	Lat.	16	59.94 N
Time	15:36– 16:07	Long.	138	59.91 E

LAY data

Pres. (db)	Temp. (℃)	Sal. (psu)	DO (ml・l⁻¹)	FIC
1	28.647	34.689	3.55	0.022
10	28.678	34.689	3.53	0.020
20	28.584	34.688	3.53	0.020
30	28.446	34.688	3.51	0.025
40	28.436	34.693	3.50	0.028
50	28.400	34.707	3.48	0.039
60	28.378	34.724	3.47	0.038
70	28.320	34.746	3.46	0.048
80	28.125	34.773	3.46	0.064
90	27.926	34.813	3.46	0.101
100	27.886	34.819	3.46	0.099
125	26.319	34.927	3.51	0.112
150	24.747	34.986	3.53	0.085
200	21.855	35.003	3.44	0.027
250	18.900	34.804	3.82	0.010
300	17.227	34.746	3.78	0.018
400	12.923	34.447	3.67	0.016
500	8.928	34.263	2.66	0.019
502	8.832	34.261	2.60	0.023

BTL data

BTL No.	Depth (m)	Pres. (db)	Temp. (℃)	Sal. (psu)	DO (ml・l⁻¹)
Sur.	0		28.6	****	****
13	50	50	28.393	34.708	3.42
1	50	50	28.393	34.707	3.40

St. 13 — Depth 5342 m

Date 02.07.14 — Lat. 16 59.62 N

Time 21:19– 21:48 — Long. 137 59.95 E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml·l⁻¹	
1	28.645	34.580	3.56	0.029
10	28.644	34.581	3.57	0.030
20	28.542	34.577	3.58	0.032
30	28.533	34.577	3.56	0.032
40	28.534	34.579	3.54	0.030
50	28.527	34.579	3.53	0.036
60	28.523	34.580	3.52	0.035
70	28.495	34.585	3.50	0.042
80	28.473	34.591	3.50	0.057
90	28.451	34.606	3.50	0.069
100	28.396	34.631	3.49	0.078
125	27.732	34.816	3.53	0.102
150	26.471	34.972	3.56	0.068
200	24.220	35.063	3.50	0.045
250	19.952	34.918	3.54	0.025
300	17.325	34.757	3.70	0.017
400	12.800	34.434	3.49	0.011
500	9.597	34.305	2.62	0.022
504	9.398	34.295	2.57	0.020

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml·l⁻¹
Sur.	0		28.8	****	****
13	50	51	28.523	34.576	3.47
1	50	50	28.522	34.576	3.46

St. 16 — Depth 4663 m

Date 02.07.15 — Lat. 16 59.80 N

Time 12:12– 12:50 — Long. 136 59.07 E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml·l⁻¹	
2	28.580	34.648	3.59	0.029
10	28.574	34.648	3.58	0.026
20	28.163	34.650	3.59	0.032
30	28.139	34.650	3.57	0.030
40	28.053	34.650	3.57	0.037
50	28.041	34.651	3.56	0.037
60	28.020	34.651	3.57	0.039
70	28.008	34.650	3.56	0.045
80	27.997	34.649	3.55	0.045
90	27.996	34.649	3.55	0.047
100	27.989	34.653	3.56	0.058
125	27.843	34.699	3.54	0.114
150	26.649	34.951	3.52	0.071
200	24.308	35.059	3.47	0.045
250	21.150	35.002	3.45	0.025
300	17.549	34.782	3.56	0.012
400	12.343	34.405	3.48	0.015
500	8.926	34.216	2.86	0.013
503	8.882	34.211	2.85	0.017

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml·l⁻¹
Sur.	0		28.7	****	****
15	49	50	28.039	34.649	3.55
3	49	50	28.040	34.649	3.54
14	99	100	27.986	34.650	3.55
2	100	100	27.986	34.651	3.55
13	195	196	23.894	35.040	3.41
1	197	199	23.799	35.040	3.40

St. 18 — Depth 5322 m

Date 02.07.15 — Lat. 16 4.48 N

Time 20:44– 21:18 — Long. 136 56.43 E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml·l⁻¹	
2	28.427	34.602	3.68	0.025
10	28.430	34.602	3.69	0.023
20	28.412	34.599	3.69	0.026
30	28.370	34.599	3.70	0.032
40	28.300	34.606	3.69	0.028
50	28.192	34.625	3.71	0.029
60	28.117	34.637	3.70	0.047
70	28.083	34.641	3.69	0.047
80	28.064	34.643	3.70	0.057
90	27.879	34.662	3.71	0.078
100	27.667	34.690	3.70	0.098
125	27.046	34.796	3.65	0.109
150	24.622	35.077	3.56	0.053
200	21.476	35.059	3.40	0.029
250	17.818	34.797	3.66	0.013
300	15.054	34.599	3.68	0.016
400	10.643	34.317	3.08	0.017
500	7.269	34.198	2.24	0.023
504	7.254	34.199	2.19	0.019

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml·l⁻¹
Sur.	0		28.5	****	****
15	50	50	28.245	34.611	3.69
3	50	50	28.240	34.612	3.70
14	100	100	27.700	34.679	3.70
2	100	101	27.699	34.679	3.70
13	198	199	21.569	35.052	3.35
1	198	200	21.560	35.051	3.34

St. 24			Depth	4845	m
Date	02.07.16	Lat.	15	59.80	N
Time	17:28– 18:02	Long.	137	59.67	E

LAY data	Pres.	Temp.	Sal.	DO	FIC
	db	℃	(psu)	$ml \cdot l^{-1}$	
	2	28.708	34.689	3.69	0.022
	10	28.716	34.689	3.69	0.024
	20	28.646	34.689	3.69	0.022
	30	28.391	34.681	3.71	0.028
	40	28.356	34.682	3.72	0.038
	50	28.352	34.687	3.71	0.040
	60	28.337	34.685	3.71	0.038
	70	28.320	34.690	3.71	0.046
	80	28.295	34.691	3.71	0.054
	90	28.213	34.694	3.71	0.075
	100	28.116	34.715	3.70	0.094
	125	27.716	34.789	3.71	0.145
	150	26.361	34.980	3.72	0.158
	200	21.692	34.963	3.78	0.026
	250	19.236	34.876	3.76	0.018
	300	16.715	34.722	3.71	0.017
	400	12.049	34.410	3.14	0.020
	500	8.825	34.321	2.12	0.026
	502	8.792	34.320	2.08	0.016

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	$ml \cdot l^{-1}$
Sur.	0		28.8	****	****
15	50	51	28.352	34.683	3.70
14	50	50	28.352	34.682	3.70
13	50	50	28.352	34.682	3.70
3	50	51	28.352	34.682	3.71
2	50	50	28.352	34.682	3.71
1	50	50	28.352	34.682	3.71

St. 25			Depth	4249	m
Date	02.07.16	Lat.	15	59.95	N
Time	23:08– 23:42	Long.	138	59.60	E

LAY data	Pres.	Temp.	Sal.	DO	FIC
	db	℃	(psu)	$ml \cdot l^{-1}$	
	1	28.500	34.676	3.72	0.020
	10	28.467	34.694	3.72	0.019
	20	28.256	34.745	3.75	0.025
	30	28.132	34.747	3.76	0.027
	40	28.094	34.751	3.75	0.034
	50	28.089	34.754	3.74	0.032
	60	28.079	34.756	3.75	0.039
	70	28.074	34.757	3.75	0.046
	80	28.039	34.763	3.74	0.062
	90	27.987	34.790	3.74	0.068
	100	27.917	34.803	3.74	0.085
	125	26.316	34.981	3.77	0.164
	150	23.560	35.066	3.73	0.066
	200	21.005	34.965	3.70	0.031
	250	18.176	34.799	3.92	0.013
	300	16.036	34.684	3.91	0.010
	400	11.924	34.368	3.52	0.015
	500	8.440	34.239	2.43	0.020
	505	8.285	34.227	2.36	0.018

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	$ml \cdot l^{-1}$
Sur.	0		28.8	****	****
15	50	50	28.089	34.754	3.76
3	50	50	28.089	34.753	3.77
14	50	50	28.089	34.753	3.77
2	50	50	28.089	34.753	3.77
13	50	50	28.089	34.753	3.77
1	50	50	28.088	34.753	3.77

St. 30			Depth	5001	m
Date	02.07.17	Lat.	15	59.99	N
Time	19:29– 20:00	Long.	139	59.63	E

LAY data	Pres.	Temp.	Sal.	DO	FIC
	db	℃	(psu)	$ml \cdot l^{-1}$	
	1	28.932	34.689	3.64	0.022
	10	28.933	34.688	3.66	0.021
	20	28.800	34.707	3.68	0.026
	30	28.635	34.730	3.69	0.032
	40	28.541	34.719	3.69	0.027
	50	28.544	34.723	3.69	0.031
	60	28.268	34.744	3.71	0.037
	70	28.249	34.769	3.70	0.048
	80	27.707	34.823	3.73	0.067
	90	26.862	34.934	3.73	0.094
	100	25.333	35.016	3.80	0.124
	125	23.907	35.012	3.85	0.136
	150	22.482	34.974	3.82	0.045
	200	19.364	34.874	3.79	0.024
	250	17.111	34.741	4.05	0.013
	300	15.090	34.613	3.96	0.011
	400	11.920	34.375	3.75	0.013
	500	8.651	34.270	2.43	0.025
	505	8.541	34.280	2.27	0.023

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	$ml \cdot l^{-1}$
Sur.	0		29.0	****	****
15	50	50	28.550	34.721	3.71
3	50	50	28.537	34.716	3.72
14	50	50	28.541	34.717	3.71
2	49	50	28.544	34.719	3.71
13	50	50	28.540	34.717	3.71
1	50	50	28.541	34.718	3.71

St. 31			Depth	4670	m
Date	02.07.18	Lat.	16	0.12	N
Time	01:07- 01:40	Long.	141	0.03	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml・l⁻¹	
1	29.032	34.594	3.67	0.017
10	28.989	34.593	3.69	0.013
20	28.755	34.639	3.71	0.017
30	28.717	34.654	3.71	0.023
40	28.695	34.661	3.71	0.028
50	28.658	34.666	3.72	0.027
60	28.560	34.667	3.71	0.031
70	28.470	34.675	3.73	0.042
80	28.364	34.693	3.72	0.044
90	27.929	34.769	3.77	0.082
100	26.716	34.950	3.87	0.111
125	24.979	35.017	3.78	0.167
150	23.314	34.998	3.88	0.057
200	19.917	34.913	3.80	0.019
250	17.444	34.757	4.05	0.015
300	16.136	34.688	4.04	0.009
400	11.929	34.381	3.79	0.018
500	8.747	34.279	2.32	0.024
502	8.696	34.277	2.26	0.022

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	ml・l⁻¹
Sur.	0		29.3	****	****
15	50	50	28.656	34.663	3.76
3	50	50	28.655	34.663	3.75
14	50	50	28.655	34.663	3.76
2	50	50	28.657	34.662	3.76
13	50	50	28.653	34.663	3.75
1	50	50	28.654	34.663	3.75

St. 36			Depth	4368	m
Date	02.07.18	Lat.	15	59.79	N
Time	18:56- 19:23	Long.	141	59.99	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml・l⁻¹	
1	28.968	34.704	3.50	0.019
10	28.848	34.715	3.51	0.015
20	28.400	34.718	3.55	0.019
30	28.357	34.717	3.55	0.019
40	28.328	34.735	3.53	0.026
50	28.282	34.739	3.51	0.037
60	28.269	34.742	3.49	0.043
70	28.248	34.747	3.50	0.050
80	28.221	34.750	3.49	0.042
90	28.174	34.763	3.48	0.062
100	28.157	34.773	3.48	0.067
125	26.818	34.951	3.51	0.162
150	25.205	35.061	3.46	0.119
200	23.242	35.070	3.39	0.051
250	18.806	34.849	3.60	0.016
300	16.364	34.703	3.75	0.015
400	12.222	34.397	3.62	0.017
500	8.973	34.251	2.70	0.020
501	8.958	34.249	2.66	0.021

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	ml・l⁻¹
Sur.	0		29.1	****	****
15	49	49	28.282	34.736	3.50
3	49	49	28.281	34.736	3.50
14	49	49	28.281	34.735	3.50
2	49	50	28.281	34.735	3.49
13	49	49	28.282	34.735	3.49
1	49	49	28.281	34.736	3.49

St. 38			Depth	4512	m
Date	02.07.19	Lat.	15	0.22	N
Time	01:42- 02:08	Long.	141	59.50	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml・l⁻¹	
1	29.181	34.697	3.54	0.011
10	29.155	34.694	3.54	0.012
20	29.086	34.764	3.56	0.009
30	28.909	34.738	3.58	0.018
40	28.852	34.742	3.58	0.021
50	28.806	34.735	3.59	0.025
60	28.754	34.738	3.58	0.024
70	28.671	34.736	3.59	0.027
80	28.648	34.759	3.59	0.033
90	28.636	34.765	3.60	0.034
100	28.355	34.795	3.62	0.044
125	27.379	34.965	3.64	0.097
150	25.592	35.106	3.61	0.146
200	22.041	35.098	3.46	0.039
250	17.587	34.786	3.74	0.012
300	15.511	34.639	3.75	0.013
400	11.153	34.347	3.30	0.012
500	8.181	34.332	2.01	0.028
502	8.160	34.332	1.92	0.026

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO	
No.	m	db	℃	(psu)	ml・l⁻¹	
Sur.	0		29.4	****	****	
15	*49*	*50*	*28.817*	*34.730*	*3.61*	SET MISS
3	*49*	*50*	*28.815*	*34.729*	*3.62*	SET MISS
14	*50*	*50*	*28.815*	*34.730*	*3.62*	SET MISS
2	*49*	*50*	*28.816*	*34.730*	*3.62*	SET MISS
13	*49*	*50*	*28.816*	*34.730*	*3.61*	SET MISS
1	*49*	*50*	*28.819*	*34.730*	*3.61*	SET MISS

St. 38-2

St. 38-2			Depth	4493	m
Date	02.07.19	Lat.	14	58.82	N
Time	03:29– 03:39	Long.	141	56.22	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	$ml \cdot l^{-1}$	
1	29.450	34.710	3.61	0.010
10	29.267	34.720	3.64	0.011
20	29.135	34.713	3.65	0.012
30	28.893	34.689	3.66	0.021
40	28.645	34.647	3.68	0.017
50	28.627	34.664	3.69	0.020

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO $ml \cdot l^{-1}$
Sur.	0		29.5	****	****
15	50	50	28.627	34.665	3.67
3	50	50	28.628	34.665	3.68
14	50	50	28.628	34.666	3.68
13	50	50	28.628	34.668	3.68
1	50	50	28.628	34.666	3.68

St. 41

St. 41			Depth	3828	m
Date	02.07.19	Lat.	13	40.06	N
Time	11:23– 11:54	Long.	142	0.05	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	$ml \cdot l^{-1}$	
1	29.142	34.624	3.66	0.015
10	29.142	34.624	3.67	0.019
20	28.714	34.611	3.70	0.022
30	28.499	34.621	3.73	0.024
40	28.464	34.628	3.74	0.029
50	28.388	34.650	3.74	0.036
60	28.273	34.689	3.74	0.044
70	28.125	34.731	3.75	0.062
80	28.080	34.743	3.76	0.065
90	27.918	34.793	3.76	0.072
100	27.759	34.835	3.77	0.091
125	27.261	34.939	3.76	0.131
150	24.775	35.141	3.60	0.128
200	20.852	35.033	3.48	0.035
250	16.773	34.731	3.40	0.022
300	13.289	34.484	3.00	0.017
400	10.077	34.445	1.77	0.028
500	8.172	34.419	1.58	0.028
505	8.077	34.417	1.58	0.025

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO $ml \cdot l^{-1}$
Sur.	0		29.2	****	****
15	50	50	28.383	34.646	3.78
3	50	51	28.383	34.646	3.78
14	50	50	28.383	34.646	3.77
2	50	50	28.381	34.646	3.78
13	50	51	28.381	34.647	3.78
1	50	50	28.384	34.646	3.77

St. 42

St. 42			Depth	4764	m
Date	02.07.19	Lat.	13	40.56	N
Time	16:52– 17:39	Long.	140	59.88	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	$ml \cdot l^{-1}$	
2	28.700	34.630	3.74	0.018
10	28.700	34.629	3.75	0.016
20	28.367	34.638	3.79	0.024
30	28.223	34.661	3.81	0.022
40	28.198	34.672	3.80	0.023
50	28.188	34.707	3.80	0.031
60	28.158	34.734	3.81	0.035
70	28.127	34.746	3.80	0.045
80	27.919	34.778	3.79	0.063
90	27.858	34.783	3.79	0.063
100	27.692	34.799	3.79	0.085
125	27.289	34.840	3.77	0.122
150	24.914	35.050	3.73	0.167
200	20.625	35.030	3.48	0.046
250	15.472	34.625	3.41	0.015
300	13.016	34.456	3.00	0.020
400	9.582	34.312	2.42	0.028
500	7.545	34.385	1.50	0.026
503	7.505	34.381	1.48	0.025

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO $ml \cdot l^{-1}$
Sur.	0		28.6	****	****
15	49	49	28.184	34.698	3.83
3	49	49	28.184	34.698	3.83
14	48	49	28.183	34.699	3.82
2	48	49	28.182	34.699	3.82
13	48	49	28.182	34.699	3.83
1	49	49	28.178	34.700	3.82

St. 44 — Depth 4732 m

Date	02.07.20		Lat.	14	59.98 N
Time	01:55– 02:28		Long.	140	59.97 E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml・l⁻¹	
1	28.989	34.633	3.72	0.004
10	28.987	34.634	3.72	0.012
20	28.827	34.633	3.75	0.015
30	28.764	34.629	3.76	0.020
40	28.656	34.622	3.77	0.022
50	28.614	34.655	3.77	0.027
60	28.473	34.648	3.78	0.033
70	28.286	34.654	3.78	0.045
80	28.063	34.713	3.79	0.053
90	27.865	34.756	3.78	0.070
100	27.727	34.800	3.77	0.081
125	26.041	35.068	3.71	0.181
150	24.792	35.144	3.62	0.100
200	21.495	35.090	3.50	0.039
250	16.791	34.729	3.62	0.016
300	14.997	34.598	3.89	0.015
400	10.215	34.284	3.12	0.019
500	8.164	34.332	1.83	0.022
502	8.164	34.334	1.76	0.023

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
Sur.	0		29.2	****	****
15	51	52	28.491	34.646	3.79
3	51	51	28.497	34.645	3.80
14	51	51	28.500	34.642	3.81
2	51	51	28.507	34.643	3.81
13	51	51	28.523	34.644	3.81
1	50	50	28.533	34.646	3.82

St. 45 — Depth 4867 m

Date	02.07.20		Lat.	14	59.78 N
Time	07:49– 08:24		Long.	140	0.41 E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml・l⁻¹	
1	28.706	34.686	3.72	0.024
10	28.691	34.685	3.74	0.021
20	28.690	34.685	3.74	0.021
30	28.587	34.684	3.76	0.020
40	28.426	34.686	3.77	0.027
50	28.279	34.688	3.78	0.026
60	*0.000*	*0.000*	*0.00*	*0.000*
70	*0.000*	*0.000*	*0.00*	*0.000*
80	*0.000*	*0.000*	*0.00*	*0.000*
90	*0.000*	*0.000*	*0.00*	*0.000*
100	*0.000*	*0.000*	*0.00*	*0.000*
125	*0.000*	*0.000*	*0.00*	*0.000*
150	*0.000*	*0.000*	*0.00*	*0.000*
200	*0.000*	*0.000*	*0.00*	*0.000*
250	*0.000*	*0.000*	*0.00*	*0.000*
300	*0.000*	*0.000*	*0.00*	*0.000*
400	*0.000*	*0.000*	*0.00*	*0.000*
500	*0.000*	*0.000*	*0.00*	*0.000*

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
Sur.	0		28.8	****	****
15	49	49	28.284	34.683	3.84
3	49	49	28.283	34.683	3.84
2	50	50	28.282	34.683	3.84
14	50	50	28.282	34.683	3.83
13	50	50	28.282	34.683	3.84
1	49	49	28.284	34.683	3.84

St. 47 — Depth 4882 m

Date	02.07.20		Lat.	13	39.36 N
Time	16:29– 17:00		Long.	139	59.89 E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml・l⁻¹	
2	28.956	34.635	3.71	0.022
10	28.956	34.636	3.73	0.020
20	28.947	34.635	3.73	0.026
30	28.671	34.629	3.77	0.026
40	28.306	34.616	3.81	0.028
50	28.223	34.660	3.81	0.038
60	28.212	34.664	3.82	0.037
70	28.165	34.675	3.80	0.039
80	28.078	34.706	3.81	0.062
90	27.917	34.734	3.80	0.082
100	27.694	34.774	3.81	0.085
125	26.780	34.872	3.80	0.155
150	24.671	35.129	3.71	0.131
200	20.534	35.018	3.50	0.033
250	16.071	34.675	3.44	0.021
300	12.240	34.397	3.59	0.014
400	9.039	34.318	2.30	0.026
500	7.226	34.359	1.41	0.028
501	7.174	34.356	1.41	0.025

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹	
Sur.	0		28.9	****	****	
15	50	50	28.234	34.654	3.79	Bottle
3	50	*50*	*28.234*	*34.654*	*3.80*	broken
14	50	50	28.235	34.653	3.79	Bottle
2	50	*50*	*28.234*	*34.654*	*3.79*	broken
13	49	49	28.236	34.652	3.80	Bottle
1	50	*50*	*28.235*	*34.653*	*3.80*	broken

St. 48			Depth	4949	m
Date	02.07.20	Lat.	13	40.04	N
Time	22:57– 23:37	Long.	138	59.78	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	$ml \cdot l^{-1}$	
3	28.486	34.592	3.59	0.025
10	28.494	34.594	3.62	0.026
20	28.498	34.594	3.61	0.025
30	28.501	34.601	3.61	0.027
40	28.505	34.601	3.59	0.030
50	28.472	34.609	3.60	0.028
60	28.377	34.626	3.61	0.033
70	28.284	34.648	3.60	0.035
80	28.217	34.670	3.61	0.042
90	28.011	34.734	3.60	0.057
100	27.747	34.784	3.59	0.089
125	26.813	34.947	3.59	0.149
150	25.490	35.089	3.55	0.183
200	19.996	34.990	3.38	0.024
250	15.112	34.603	3.62	0.015
300	11.869	34.377	3.43	0.015
400	8.809	34.333	2.03	0.026
500	7.267	34.394	1.45	0.033
504	7.252	34.396	1.45	0.026

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	$ml \cdot l^{-1}$
Sur.	0		29.0	****	****
13	50	50	28.419	34.625	3.62
1	50	50	28.426	34.624	3.62

St. 50			Depth	4605	m
Date	02.07.21	Lat.	15	0.02	N
Time	18:00– 18:35	Long.	138	55.13	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	$ml \cdot l^{-1}$	
4	28.498	34.589	3.65	0.032
10	28.501	34.590	3.65	0.033
20	28.489	34.612	3.64	0.034
30	28.373	34.717	3.65	0.044
40	28.171	34.711	3.69	0.063
50	28.096	34.728	3.66	0.072
60	28.057	34.737	3.66	0.080
70	28.037	34.741	3.65	0.081
80	27.994	34.745	3.64	0.088
90	27.926	34.750	3.64	0.103
100	27.841	34.760	3.64	0.123
125	26.324	34.980	3.60	0.097
150	25.315	35.039	3.56	0.074
200	19.418	34.919	3.56	0.021
250	16.422	34.700	3.91	0.016
300	13.794	34.508	3.81	0.014
400	9.911	34.379	2.29	0.021
500	7.181	34.317	1.60	0.028
505	7.160	34.319	1.58	0.024

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	$ml \cdot l^{-1}$
Sur.	0		28.6	****	****
13	50	50	28.100	34.724	3.69
1	51	51	28.098	34.724	3.69

St. 51			Depth	5064	m
Date	02.07.22	Lat.	14	57.55	N
Time	01:07– 01:44	Long.	137	56.81	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	$ml \cdot l^{-1}$	
5	28.436	34.584	3.71	0.037
10	28.445	34.588	3.71	0.040
20	28.448	34.589	3.72	0.043
30	28.426	34.642	3.71	0.045
40	28.338	34.692	3.72	0.050
50	28.235	34.720	3.73	0.047
60	28.094	34.743	3.74	0.056
70	28.021	34.753	3.74	0.057
80	27.945	34.764	3.74	0.071
90	27.924	34.770	3.73	0.077
100	27.855	34.777	3.73	0.097
125	27.430	34.828	3.69	0.115
150	25.597	34.996	3.63	0.051
200	21.813	35.091	3.49	0.029
250	18.017	34.796	3.88	0.017
300	15.080	34.604	3.87	0.015
400	10.742	34.315	3.10	0.015
500	7.957	34.320	1.79	0.027
505	7.917	34.324	1.74	0.031

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	$ml \cdot l^{-1}$
Sur.	0		28.5	****	****
13	51	51	28.207	34.721	3.76
1	50	51	28.209	34.720	3.76

St. 53			Depth	4722	m
Date	02.07.22	Lat.	13	37.50	N
Time	11:30– 12:07	Long.	137	58.45	E

LAY data Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml・l⁻¹	
4	28.579	34.355	3.80	0.032
10	28.582	34.359	3.82	0.030
20	28.584	34.357	3.82	0.030
30	28.583	34.354	3.82	0.033
40	28.599	34.365	3.82	0.031
50	28.635	34.396	3.81	0.036
60	28.646	34.410	3.82	0.039
70	28.287	34.591	3.87	0.053
80	27.689	34.776	3.89	0.071
90	27.186	34.883	3.90	0.105
100	27.097	35.003	3.88	0.130
125	26.118	35.055	3.84	0.205
150	24.525	35.134	3.71	0.095
200	19.681	34.945	3.55	0.020
250	16.129	34.669	3.64	0.012
300	12.438	34.441	2.98	0.017
400	9.217	34.406	1.79	0.024
500	7.229	34.392	1.45	0.027
502	7.222	34.392	1.45	0.025

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
Sur.	0		28.6	****	****
13	49	49	28.636	34.395	3.92
1	49	49	28.637	34.396	3.93

St. 54			Depth	5064	m
Date	02.07.22	Lat.	14	59.89	N
Time	18:53– 19:30	Long.	136	59.79	E

LAY data Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml・l⁻¹	
5	28.175	34.670	3.84	0.042
10	28.177	34.670	3.85	0.041
20	28.182	34.670	3.86	0.044
30	28.183	34.672	3.86	0.045
40	28.179	34.675	3.86	0.050
50	28.032	34.731	3.88	0.064
60	27.981	34.738	3.88	0.071
70	27.929	34.743	3.88	0.081
80	27.888	34.749	3.87	0.089
90	27.847	34.754	3.86	0.103
100	27.725	34.776	3.85	0.124
125	26.740	34.892	3.79	0.081
150	25.410	35.023	3.71	0.054
200	20.618	34.978	3.65	0.020
250	17.316	34.752	3.85	0.018
300	14.379	34.542	3.63	0.014
400	10.724	34.317	3.18	0.018
500	8.378	34.250	2.25	0.024
502	8.313	34.251	2.23	0.021

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
Sur.	0		28.3	****	****
15	50	50	28.026	34.731	3.92
3	49	49	28.030	34.730	3.92
14	99	99	27.733	34.773	3.94
2	100	100	27.730	34.773	3.94
13	198	200	20.494	34.964	3.76
1	199	200	20.319	34.952	3.78

St. 56			Depth	4956	m
Date	02.07.23	Lat.	13	39.49	N
Time	04:31– 05:14	Long.	137	0.40	E

LAY data Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	ml・l⁻¹	
6	28.628	34.478	3.81	0.028
10	28.637	34.478	3.82	0.035
20	28.640	34.478	3.81	0.036
30	28.632	34.478	3.82	0.042
40	28.625	34.478	3.81	0.040
50	28.613	34.478	3.82	0.048
60	28.593	34.481	3.82	0.050
70	28.562	34.500	3.82	0.059
80	28.394	34.594	3.85	0.084
90	27.871	34.744	3.87	0.120
100	27.542	34.813	3.86	0.137
125	26.502	34.957	3.81	0.144
150	24.329	35.062	3.74	0.082
200	19.417	34.915	3.60	0.017
250	14.945	34.591	3.34	0.019
300	12.167	34.427	2.91	0.019
400	9.143	34.351	2.00	0.029
500	7.604	34.370	1.52	0.026
502	7.571	34.365	1.52	0.029

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
Sur.	0		28.8	****	****
15	50	50	28.601	34.478	3.89
3	50	51	28.598	34.478	3.89
14	100	100	27.376	34.807	3.96
2	99	100	27.389	34.806	3.96
13	201	202	19.268	34.899	3.67
1	200	201	19.344	34.902	3.66

St. 57			Depth	4870	m
Date	02.07.23	Lat.	12	59.57	N
Time	09:35– 10:15	Long.	137	0.44	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	$ml \cdot l^{-1}$	
4	28.793	34.460	3.79	0.038
10	28.793	34.460	3.79	0.032
20	28.797	34.460	3.79	0.038
30	28.800	34.459	3.78	0.044
40	28.798	34.459	3.79	0.038
50	28.800	34.460	3.79	0.035
60	28.792	34.463	3.78	0.049
70	28.791	34.467	3.79	0.049
80	28.802	34.481	3.79	0.059
90	28.339	34.732	3.87	0.112
100	27.754	34.871	3.89	0.159
125	27.081	34.917	3.83	0.149
150	24.938	35.031	3.80	0.071
200	20.909	35.007	3.58	0.023
250	15.652	34.636	3.27	0.021
300	12.964	34.478	2.82	0.023
400	9.481	34.327	2.25	0.023
500	7.324	34.355	1.41	0.025

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	$ml \cdot l^{-1}$
Sur.	0		28.8	****	****
15	50	50	28.801	34.460	3.86
3	51	51	28.801	34.460	3.86
14	99	100	27.724	34.872	4.00
2	100	100	27.727	34.873	4.00
13	200	201	20.881	34.997	3.65
1	199	200	20.916	34.996	3.64

St. 58			Depth	4952	m
Date	02.07.23	Lat.	11	59.70	N
Time	22:15– 23:00	Long.	136	59.81	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	$ml \cdot l^{-1}$	
4	28.627	34.221	3.79	0.031
10	28.624	34.222	3.79	0.027
20	28.630	34.223	3.81	0.032
30	28.645	34.235	3.81	0.030
40	28.655	34.246	3.81	0.030
50	28.675	34.297	3.81	0.035
60	28.674	34.427	3.83	0.051
70	28.588	34.497	3.85	0.054
80	28.214	34.699	3.90	0.069
90	27.509	34.976	3.91	0.109
100	27.259	34.994	3.89	0.119
125	26.971	35.011	3.86	0.145
150	25.177	35.089	3.73	0.114
200	20.760	35.000	3.54	0.030
250	14.773	34.570	3.18	0.026
300	11.580	34.384	2.99	0.019
400	9.038	34.474	1.71	0.030
500	7.324	34.455	1.59	0.027
504	7.293	34.458	1.60	0.019

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	$ml \cdot l^{-1}$
Sur.	0		28.6	****	****
15	49	49	28.672	34.283	3.86
3	49	49	28.672	34.283	3.86
14	99	100	27.341	34.987	3.99
2	99	100	27.343	34.986	4.00
13	199	200	20.691	34.991	3.63
1	199	200	20.688	34.991	3.63

St. 59			Depth	4870	m
Date	02.07.24	Lat.	10	59.83	N
Time	03:16– 03:55	Long.	137	0.00	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	$ml \cdot l^{-1}$	
6	28.670	34.144	3.81	0.019
10	28.667	34.144	3.79	0.019
20	28.671	34.144	3.81	0.019
30	28.650	34.142	3.81	0.021
40	28.638	34.141	3.81	0.026
50	28.633	34.142	3.81	0.034
60	28.633	34.143	3.81	0.033
70	28.388	34.451	3.90	0.048
80	27.694	34.865	3.99	0.057
90	27.398	34.951	3.99	0.083
100	27.192	34.956	3.96	0.112
125	25.416	34.967	3.81	0.240
150	22.409	35.065	3.57	0.104
200	15.963	34.649	3.21	0.024
250	12.406	34.444	2.77	0.022
300	10.569	34.381	2.41	0.017
400	8.319	34.474	1.40	0.023
500	7.312	34.501	1.45	0.029
501	7.311	34.501	1.45	0.027

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO	
No.	m	db	℃	(psu)	$ml \cdot l^{-1}$	
Sur.	0		28.8	****	****	
15	50	50	28.637	34.140	3.90	
3	50	51	28.638	34.140	3.91	
14	100	100	27.112	34.948	4.09	
2	100	100	27.132	34.949	4.09	
13	199	200	15.293	34.596	3.25	
1	199	*200*	*15.306*	*34.595*	*3.24*	Not closed

St. 60		Depth	4732	m
Date	02.07.24	Lat.	10 0.32	N
Time	09:29– 10:03	Long.	137 0.02	E

LAY data	Pres.	Temp.	Sal.	DO	FIC
	db	℃	(psu)	ml・l⁻¹	
	3	28.809	34.136	3.77	0.024
	10	28.811	34.129	3.78	0.025
	20	28.818	34.137	3.79	0.024
	30	28.819	34.137	3.80	0.025
	40	28.805	34.140	3.79	0.027
	50	28.776	34.146	3.79	0.035
	60	28.393	34.260	3.82	0.054
	70	27.539	34.542	3.86	0.104
	80	26.538	34.633	3.80	0.251
	90	25.847	34.717	3.75	0.247
	100	24.561	34.852	3.67	0.260
	125	21.898	34.846	3.25	0.151
	150	20.131	34.820	3.10	0.101
	200	15.700	34.640	3.11	0.040
	250	11.175	34.454	2.31	0.020
	300	9.667	34.434	1.73	0.022
	400	8.005	34.495	1.28	0.030
	500	7.009	34.501	1.45	0.025
	502	6.998	34.499	1.45	0.025

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	ml・l⁻¹
Sur.	0		28.8	****	****
15	50	50	28.768	34.146	3.89
3	50	50	28.769	34.146	3.89
14	100	100	23.361	34.844	3.52
2	99	100	23.368	34.843	3.52
13	200	202	15.890	34.643	3.16
1	200	202	15.905	34.643	3.15

St. 61		Depth	4952	m
Date	02.07.24	Lat.	8 59.94	N
Time	15:36– 16:06	Long.	136 59.85	E

LAY data	Pres.	Temp.	Sal.	DO	FIC
	db	℃	(psu)	ml・l⁻¹	
	5	28.917	34.084	3.73	0.026
	10	28.917	34.085	3.77	0.023
	20	28.919	34.085	3.78	0.028
	30	28.922	34.085	3.79	0.025
	40	28.926	34.085	3.78	0.028
	50	28.924	34.093	3.78	0.029
	60	28.788	34.158	3.81	0.040
	70	27.896	34.483	3.88	0.065
	80	27.700	34.540	3.90	0.067
	90	26.101	34.790	3.85	0.155
	100	25.193	34.809	3.74	0.300
	125	22.502	34.943	3.42	0.215
	150	18.381	34.787	3.13	0.089
	200	13.171	34.531	2.61	0.033
	250	10.327	34.488	1.86	0.024
	300	9.420	34.541	1.58	0.027
	400	7.987	34.494	1.76	0.026
	500	7.128	34.494	1.92	0.024
	503	7.031	34.493	1.94	0.024

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	ml・l⁻¹
Sur.	0		28.9	****	****
15	50	50	28.914	34.099	3.88
3	50	50	28.910	34.100	3.89
14	100	100	25.074	34.822	3.86
2	100	100	25.073	34.819	3.86
13	199	200	13.121	34.522	2.58
1	199	200	13.133	34.521	2.57

St. 62		Depth	2863	m
Date	02.07.24	Lat.	7 59.93	N
Time	21:24– 21:56	Long.	137 0.03	E

LAY data	Pres.	Temp.	Sal.	DO	FIC
	db	℃	(psu)	ml・l⁻¹	
	2	28.836	34.139	3.75	0.031
	10	28.838	34.139	3.77	0.027
	20	28.837	34.139	3.79	0.029
	30	28.839	34.139	3.78	0.031
	40	28.843	34.139	3.78	0.024
	50	28.841	34.140	3.78	0.031
	60	27.970	34.375	3.82	0.050
	70	27.011	34.774	3.90	0.066
	80	25.366	34.916	3.83	0.186
	90	23.962	34.950	3.59	0.261
	100	23.161	34.936	3.55	0.215
	125	20.304	34.853	3.13	0.109
	150	18.323	34.818	3.03	0.065
	200	11.371	34.511	2.06	0.026
	250	10.142	34.542	1.59	0.029
	300	9.258	34.560	1.46	0.031
	400	8.245	34.539	1.76	0.024
	500	7.572	34.528	1.84	0.026
	503	7.571	34.528	1.85	0.025

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	ml・l⁻¹
Sur.	0		28.9	****	****
15	50	50	28.833	34.139	3.88
3	50	50	28.839	34.137	3.88
14	99	100	22.964	34.920	3.52
2	99	100	22.988	34.921	3.54
13	199	200	11.617	34.506	2.15
1	199	200	11.740	34.511	2.15

St. 63			Depth	4212	m
Date	02.07.25	Lat.	7	0.11	N
Time	03:20– 03:54	Long.	136	59.93	E

LAY data

Pres.	Temp.	Sal.	DO	FIC
db	℃	(psu)	$ml \cdot l^{-1}$	
5	29.208	34.016	3.74	0.019
10	29.208	34.016	3.75	0.016
20	29.146	34.017	3.76	0.019
30	29.130	34.018	3.76	0.023
40	29.128	34.020	3.76	0.031
50	29.123	34.020	3.76	0.034
60	28.973	34.066	3.78	0.046
70	27.394	34.417	3.81	0.073
80	27.018	34.601	3.81	0.101
90	23.613	34.856	3.58	0.330
100	20.957	34.880	3.27	0.206
125	18.299	34.857	3.05	0.082
150	17.406	34.893	2.98	0.038
200	13.651	34.575	2.68	0.020
250	10.344	34.544	1.68	0.027
300	9.581	34.571	1.35	0.029
400	8.225	34.538	1.69	0.028
500	7.363	34.531	1.89	0.024
502	7.332	34.530	1.89	0.023

BTL data

BTL	Depth	Pres.	Temp.	Sal.	DO
No.	m	db	℃	(psu)	$ml \cdot l^{-1}$
Sur.	0		29.4	****	****
15	50	51	29.124	34.016	3.88
3	50	50	29.123	34.016	3.88
14	99	100	22.155	34.882	3.41
2	100	100	22.001	34.884	3.43
13	199	200	14.311	34.602	2.78
1	199	200	14.324	34.603	2.78

St. 66			Depth	4288	m
Date	02.08.05	Lat.	11	59.98	N
Time	05:36- 06:02	Long.	142	38.88	E

LAY data Pres.	Temp.	Sal.	DO
db	℃	(psu)	ml・l⁻¹
5	29.534	34.238	3.91
10	29.127	34.270	3.92
20	29.099	34.354	3.95
30	29.091	34.379	3.95
40	28.870	34.374	3.96
50	28.876	34.434	3.96
60	28.974	34.632	3.95
70	28.906	34.644	3.92
80	28.750	34.716	4.02
90	27.834	34.844	4.12
100	27.645	35.064	4.11
125	27.179	35.032	4.07
150	25.158	35.108	3.96
200	19.095	34.935	3.72
250	13.652	34.485	3.87
300	11.022	34.352	3.20
400	8.805	34.446	1.75
499	7.426	34.469	1.66

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
Sur.	0		29.5	****	****

St. 67			Depth	3306	m
Date	02.08.05	Lat.	12	59.98	N
Time	13:31- 13:57	Long.	143	27.44	E

LAY data Pres.	Temp.	Sal.	DO
db	℃	(psu)	ml・l⁻¹
4	29.318	34.570	3.93
10	29.322	34.575	3.88
20	29.215	34.653	3.93
30	29.188	34.653	3.91
40	29.166	34.655	3.94
50	29.135	34.661	3.92
60	29.059	34.684	3.94
70	28.950	34.742	4.00
80	28.609	34.842	4.04
90	28.113	34.935	4.06
100	27.995	34.949	4.08
125	26.878	34.991	4.00
150	25.276	35.086	3.87
200	19.726	34.948	3.75
250	16.147	34.679	3.67
300	12.588	34.429	3.53
400	9.072	34.378	2.05
500	7.569	34.431	1.59
501	7.549	34.431	1.59

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
Sur.	0		29.4	****	****

St. 68			Depth	3788	m
Date	02.08.05	Lat.	13	39.71	N
Time	17:28- 17:55	Long.	143	59.68	E

LAY data Pres.	Temp.	Sal.	DO
db	℃	(psu)	ml・l⁻¹
4	29.082	34.581	3.93
10	29.098	34.589	3.88
20	29.137	34.639	3.94
30	29.116	34.637	3.92
40	29.139	34.656	3.94
50	29.126	34.658	3.93
60	29.163	34.724	3.92
70	29.177	34.757	3.94
80	28.748	34.787	4.02
90	28.559	34.871	4.06
100	27.734	34.977	4.08
125	26.838	35.041	3.98
150	25.366	35.132	3.81
200	20.209	35.000	3.63
250	17.014	34.748	3.71
300	12.799	34.457	3.26
400	9.701	34.396	2.11
500	7.598	34.394	1.35
503	7.584	34.394	1.35

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
Sur.	0		29.1	****	****

St. 69				Depth	4059	m
Date	02.08.06		Lat.	15	0.08	N
Time	21:13– 21:44		Long.	144	0.04	E

LAY data	Pres.	Temp.	Sal.	DO
	db	℃	(psu)	$ml \cdot l^{-1}$
	4	29.140	34.601	3.86
	10	29.141	34.601	3.88
	20	29.151	34.600	3.89
	30	29.154	34.600	3.85
	40	29.158	34.601	3.87
	50	29.157	34.602	3.87
	60	29.159	34.603	3.86
	70	29.157	34.607	3.84
	80	29.057	34.702	3.91
	90	28.421	34.786	4.01
	100	27.813	34.858	4.05
	125	26.642	34.953	4.04
	150	25.739	35.052	3.82
	200	21.592	35.033	3.74
	250	17.797	34.789	4.02
	300	15.097	34.603	4.04
	400	10.884	34.317	3.60
	500	8.378	34.364	1.72
	501	8.344	34.362	1.72

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO $ml \cdot l^{-1}$
Sur.	0		29.3	****	****

St. 70				Depth	3958	m
Date	02.08.07		Lat.	15	58.31	N
Time	21:19– 21:46		Long.	143	56.66	E

LAY data	Pres.	Temp.	Sal.	DO
	db	℃	(psu)	$ml \cdot l^{-1}$
	5	28.993	34.516	3.88
	10	28.993	34.516	3.86
	20	28.992	34.514	3.90
	30	29.018	34.555	3.86
	40	28.993	34.582	3.88
	50	29.017	34.624	3.86
	60	28.955	34.612	3.88
	70	28.864	34.654	3.95
	80	28.319	34.769	3.99
	90	27.635	34.878	4.02
	100	27.221	34.912	4.05
	125	25.373	35.023	3.98
	150	23.506	35.047	4.01
	200	20.613	34.921	4.25
	250	18.801	34.807	4.38
	300	16.689	34.720	4.27
	400	12.469	34.409	4.03
	500	8.610	34.224	2.79
	503	8.549	34.221	2.72

BTL data

BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO $ml \cdot l^{-1}$
Sur.	0		29.1	****	****

St. 80		Date	02.08.11		Lat. 17		0.09 N		Depth	3588m
		Time	05:06– 05:55		Long. 144		0.05 E			
BTL DATA							LAY DATA			
BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO $ml \cdot l^{-1}$		Pres. db	Temp. ℃	Sal. (psu)	DO $ml \cdot l^{-1}$
Sur.	0		29.1	****	****		4	28.875	34.553	3.83
30	199	201	19.122	34.839	4.08		10	28.931	34.553	3.87
29	199	200	19.124	34.839	4.08		20	28.927	34.554	3.86
28	200	201	19.106	34.838	4.08		30	28.877	34.555	3.87
27	200	201	19.117	34.839	4.05		40	28.788	34.589	3.88
26	200	201	19.121	34.839	4.09		50	28.648	34.618	3.90
25	200	201	19.127	34.840	4.07		60	28.583	34.627	3.86
24	200	201	19.115	34.839	4.07		70	28.330	34.742	3.93
23	200	201	19.120	34.839	4.07		80	27.676	34.889	4.06
22	200	201	19.119	34.839	4.06		90	26.678	34.942	4.04
21	200	201	19.123	34.839	4.08		100	26.022	34.992	3.97
20	200	201	19.117	34.839	4.07		125	24.131	35.045	3.85
19	200	201	19.137	34.840	4.09		150	22.587	35.064	3.73
18	200	201	19.125	34.839	4.06		200	19.140	34.849	4.03
17	200	201	19.116	34.839	4.07		250	17.585	34.766	4.10
16	200	201	19.116	34.838	4.07		300	16.138	34.687	4.19
15	200	201	19.107	34.838	4.08		400	12.009	34.374	3.89
14	199	201	19.113	34.838	4.07		500	8.326	34.246	2.52
13	200	201	19.103	34.837	4.07		507	8.225	34.243	2.40
12	200	201	19.102	34.837	4.09					
11	200	201	19.105	34.837	4.07					
10	200	201	19.098	34.837	4.07					
9	200	201	19.099	34.837	4.05					
8	200	201	19.102	34.837	4.07					
7	200	201	19.103	34.837	4.07					
6	200	201	19.103	34.837	4.08					
5	199	201	19.105	34.838	4.07					
4	200	201	19.098	34.837	4.07					
3	199	201	19.100	34.837	4.08					
2	199	200	19.097	34.837	4.08					
1	199	201	19.103	34.837	4.06					

St. MC01S		Date	02.08.04		Lat. 11		0.00 N		Depth	5280m
		Time	06:30– 07:30		Long. 147		59.32 E			
BTL DATA							LAY DATA			
BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹		Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
Sur.	0		29.3	****	****					
36	0									
35	0									
34	0									
33	0									
32	0									
31	0									
30	0									
29	0									
28	0									
27	0									
26	0									
25	0									
24	0									
23	0									
22	0									
21	0									
20	0									
19	0									
18	0									
17	0									
16	0									
15	0									
14	0									
13	0									
12	0									
11	0									
10	0									
9	0									
8	0									
7	0									
6	0									
5	0									
4	0									
3	0									
2	0									
1	0									

St. MC01S		Date	02.08.04		Lat. 11		0.00 N		Depth	5280m
		Time	06:30– 07:30		Long. 147		59.32 E			
BTL DATA							LAY DATA			
BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹		Pres. db	Temp. ℃	Sal. (psu)	DO ml・l⁻¹
0	0		10.0	****	****					
36	0									
35	0									
34	0									
33	0									
32	0									
31	0									
30	0									
29	0									
28	0									
27	0									
26	0									
25	0									
24	0									
23	0									
22	0									
21	0									
20	0									
19	0									
18	0									
17	0									
16	0									
15	0									
14	0									
13	0									
12	0									
11	0									
10	0									
9	0									
8	0									
7	0									
6	0									
5	0									
4	0									
3	0									
2	0									
1	0									

St. MC01S	Date	02.08.04		Lat.	11	25.16	N	Depth	9548m	
	Time	02:25– 02:57		Long.	142	24.94	E			
BTL DATA							LAY DATA			
BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml•l⁻¹		Pres. db	Temp. ℃	Sal. (psu)	DO ml•l⁻¹
Sur.	0		????	****	****		3	28.997	33.810	3.80
36	128	129	24.391	35.009	3.56		10	28.987	33.829	3.77
35	140	141	23.001	35.073	3.39		20	29.030	33.950	3.74
34	148	148	21.666	35.046	3.38		30	29.021	33.969	3.73
33	158	159	21.507	35.035	3.35		40	29.009	33.999	3.73
32	171	172	19.571	34.946	3.33		50	28.972	34.063	3.73
31	208	209	16.036	34.645	3.35		60	28.906	34.208	3.73
30	227	228	15.245	34.572	3.34		70	28.825	34.211	3.76
29	237	239	14.273	34.501	3.35		80	28.741	34.222	3.74
28	247	249	13.522	34.452	3.36		90	28.407	34.341	3.78
27	258	259	12.636	34.394	3.20		100	27.273	34.634	3.87
26	268	269	11.723	34.348	3.02		125	25.415	34.999	3.84
25	277	279	11.256	34.331	2.82		150	21.660	35.074	3.62
24	287	289	10.897	34.329	2.60		200	17.359	34.780	3.52
23	298	299	10.496	34.352	2.20		250	13.532	34.479	3.58
22	317	319	9.914	34.391	1.73		300	10.333	34.368	2.65
21	327	329	9.819	34.411	1.51		400	9.087	34.557	1.12
20	335	337	9.712	34.432	1.39		500	7.961	34.535	1.08
19	346	348	9.541	34.453	1.26		507	7.895	34.531	1.07
18	354	357	9.410	34.473	1.11					
17	362	365	9.371	34.508	1.05					
16	376	378	9.195	34.530	0.99					
15	385	388	9.158	34.534	0.95					
14	401	404	9.069	34.551	0.92					
13	411	414	8.950	34.553	0.93					
12	421	424	8.858	34.553	0.93					
11	432	435	8.772	34.557	0.93					
10	441	444	8.650	34.557	0.93					
9	452	455	8.578	34.553	0.95					
8	464	467	8.391	34.545	0.98					
7	476	479	8.251	34.538	0.99					
6	492	*496*	*7.968*	*34.530*	*1.01*	SET MISS				
5	514	517	7.804	34.524	1.02					
4	513	517	7.810	34.524	1.03					
3	513	517	7.807	34.524	1.03					
2	513	*517*	*7.816*	*34.524*	*1.03*	SET MISS				
1	513	516	7.814	34.524	1.03					

St. MC02	Date	02.08.04		Lat.	11	20.58	N	Depth	8699m	
	Time	09:28– 14:52		Long.	141	59.13	E	B-P	47m	
BTL DATA							LAY DATA			
BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO ml•l⁻¹		Pres. db	Temp. ℃	Sal. (psu)	DO ml•l⁻¹
0	0		28.9	****	****		4	28.840	34.060	3.90
36	20	20	28.808	34.119	3.85		10	28.840	34.060	3.89
35	50	50	28.470	34.574	3.89		20	28.865	34.072	3.86
34	99	100	25.524	35.025	3.85		30	28.787	34.164	3.84
33	148	149	20.725	35.023	3.52		40	28.637	34.251	3.86
32	199	200	15.818	34.621	3.48		50	28.579	34.355	3.87
31	247	248	11.802	34.348	3.21		60	28.418	34.527	3.92
30	298	300	10.019	34.406	1.81		70	28.123	34.641	3.92
29	397	400	8.626	34.534	1.14		80	27.733	34.818	3.96
28	496	499	7.393	34.508	1.30		90	27.420	34.933	3.96
27	744	749	5.656	34.512	1.51		100	26.525	35.050	3.92
26	992	1000	4.429	34.537	1.68		125	24.463	35.034	3.85
25	1239	1250	3.606	34.566	1.82		150	21.588	35.054	3.60
24	1486	1499	2.910	34.589	2.15		200	17.588	34.797	3.57
23	1732	1749	2.429	34.611	2.33		250	12.741	34.422	3.48
22	1979	1999	2.093	34.630	2.50		300	10.426	34.346	2.65
21	2470	2499	1.717	34.657	2.77		400	8.636	34.547	1.08
20	2961	2999	1.598	34.669	2.88		500	7.339	34.514	1.20
19	3450	3499	1.518	34.677	3.08		600	6.501	34.513	1.31
18	3939	3998	1.479	34.685	3.28		700	6.002	34.517	1.28
17	4426	4499	1.449	34.691	3.48		800	5.490	34.521	1.39
16	4913	4999	1.467	34.695	3.57		900	5.014	34.531	1.42
15	5398	5499	1.517	34.696	3.57		1000	4.612	34.540	1.52
14	5883	5999	1.578	34.696	3.64		1250	3.551	34.571	1.71
13	6361	6494	1.646	34.696	3.66		1500	2.878	34.593	2.03
12	6848	6999	1.720	34.696	3.71		2000	2.073	34.633	2.37
11	7330	7499	1.798	34.696	3.77		2500	1.734	34.658	2.64
10	7810	7999	1.878	34.696	3.79		3000	1.605	34.669	2.81
9	8290	8499	1.962	34.697	4.31		4000	1.480	34.686	3.21
8	8768	8998	2.048	34.697	4.21		4500	1.453	34.692	3.45
7	8961	9200	2.084	34.697	4.90		5000	1.468	34.695	3.57
6	8961	9200	2.084	34.697	4.78		6000	1.578	34.696	3.63
5	8961	9200	2.084	34.697	4.79		7000	1.721	34.696	3.73
4	8961	9200	2.084	34.697	4.63		8000	1.879	34.696	3.79
3	8961	9200	2.084	34.697	4.48		9000	2.048	34.697	4.35
2	8961	9200	2.084	34.697	4.40		9180	2.080	34.696	5.24
1	8961	9200	2.084	34.697	5.08					

St. MC01D	Date	02.08.04		Lat.	11	20.05 N		Depth	9998m
	Time	17:16- 23:43		Long.	142	25.98 E		B-P	30m

BTL DATA							LAY DATA			
BTL No.	Depth m	Pres. db	Temp. ℃	Sal. (psu)	DO $ml \cdot l^{-1}$		Pres. db	Temp. ℃	Sal. (psu)	DO $ml \cdot l^{-1}$
Sur.	0		29.0	****	****		3	28.916	33.878	3.85
30	19	19	29.041	34.065	3.81		10	28.952	33.913	3.89
29	49	49	28.821	34.102	3.80		20	29.101	34.083	3.91
28	99	99	25.231	35.010	3.83		30	29.093	34.120	3.94
27	148	149	20.493	35.007	3.48		40	29.034	34.116	3.90
26	198	199	15.385	34.590	3.45		50	28.935	34.126	3.94
25	235	236	12.930	34.414	3.37		60	28.897	34.145	3.95
24	297	299	10.248	34.352	2.10		70	28.580	34.261	3.97
23	396	399	8.413	34.539	0.92		80	28.338	34.360	4.02
22	495	499	7.341	34.511	1.05		90	27.293	34.639	4.02
21	743	749	5.828	34.514	1.18		100	26.676	34.726	4.03
20	991	999	4.614	34.537	1.35		125	24.119	35.034	3.96
19	1238	1249	3.726	34.562	1.59		150	21.383	35.047	3.71
18	1485	1499	3.005	34.588	1.76		200	16.097	34.672	3.74
17	1732	1749	2.494	34.610	2.08		250	12.255	34.400	3.66
16	1978	1999	2.199	34.626	2.23		300	10.362	34.353	2.72
15	2470	2499	1.756	34.656	2.54		400	8.622	34.537	1.24
14	2961	2999	1.545	34.672	2.81		500	7.489	34.525	1.20
13	3939	3999	1.496	34.683	3.06		600	6.810	34.517	1.33
12	4914	5000	1.493	34.693	3.32		700	6.102	34.515	1.43
11	5399	5499	1.519	34.695	3.45		800	5.508	34.527	1.35
10	5883	5999	1.578	34.696	3.44		900	4.949	34.535	1.49
9	6366	6499	1.647	34.696	3.47		1000	4.485	34.541	1.67
8	6849	6999	1.721	34.696	3.49		1250	3.583	34.570	1.80
7	7330	7499	1.798	34.696	3.50		1500	2.915	34.594	1.97
6	7811	*7999*	*1.879*	*34.696*	*3.52*		2000	2.150	34.630	2.43
5	8290	8499	1.962	34.697	3.51		2500	1.744	34.659	2.70
4	8769	8999	2.048	34.697	3.58		3000	1.557	34.673	2.94
3	9247	9500	2.137	34.698	3.56		4000	1.495	34.684	3.21
2	9723	9999	2.229	34.699	3.65		4500	1.505	34.688	3.30
35	10258	10562	2.334	34.700	3.76		5000	1.493	34.694	3.52
34	10271	10575	2.337	34.700	3.76		6000	1.577	34.697	3.63
33	10283	*10588*	*2.339*	*34.700*	*3.77*		7000	1.720	34.696	3.62
32	10295	10601	2.342	34.700	3.77		8000	1.879	34.696	3.66
31	10314	10621	2.346	34.700	3.78		9000	2.048	34.697	3.73
1	10336	10644	2.350	34.701	3.78		10000	2.229	34.699	3.77
							10642	2.349	34.701	*0.00*

#6,33 Not closed

KH-02-2 working log

Leg1

		----- 05 JULY02 (GMT) -----			
	19:36	32°00.165N	140°10.691E	1703m	SUNRISE & TURNED OFF REGULATION LIGHTS
		----- 06 JULY02 (GMT) -----			
	19:44	26°01.931N	142°19.581E	2518m	SUNRISE & TURNED OFF REGULATION LIGHTS
		----- 07 JULY02 (GMT) -----			
	09:20	22°52.537N	142°50.709E	2473m	SUNSET & TURNED ON REGULATION LIGHTS
	19:52	20°21.941N	143°10.793E	4117m	SUNRISE & TURNED OFF REGULATION LIGHTS
		----- 08 JULY02 (GMT) -----			
	09:09	17°03.750N	143°05.165E	2563m	SUNSET & TURNED ON REGULATION LIGHTS
ST-P1	13:05	16°30.703N	143°10.457E	981m	CTD STARTED
ST-P1	13:27	16°30.627N	143°10.547E	1007m	CTD DEEPEST
ST-P1	13:39	16°30.662N	143°10.575E	1005m	CTD FINISHED
ST-P1	13:56	16°30.314N	143°09.921E	724m	IKMT-NET STARTED
ST-P1	14:18	16°29.308N	143°08.626E	909m	IKMT-NET DEEPEST (W.O.1221m)
ST-P1	15:00	16°28.796N	143°06.513E	0m	IKMT-NET FINISHED
ST-P1	15:34	16°30.712N	143°08.088E	751m	IKMT-NET STARTED
ST-P1	15:58	16°29.598N	143°08.501E	526m	IKMT-NET DEEPEST (W.O.1217m)
ST-P1	16:42	16°28.646N	143°09.061E	1200m	IKMT-NET FINISHED
ST-P1	17:05	16°30.703N	143°07.835E	836m	IKMT-NET STARTED
ST-P1	17:23	16°30.766N	143°08.159E	678m	IKMT-NET DEEPEST (W.O. 603m)
ST-P1	17:46	16°30.793N	143°08.428E	516m	IKMT-NET FINISHED
ST-P1	18:03	16°31.545N	143°09.582E	1036m	IKMT-NET STARTED
ST-P1	18:24	16°30.603N	143°09.608E	0m	IKMT-NET DEEPEST (W.O. 910m)
ST-P1	18:57	16°29.415N	143°09.524E	911m	IKMT-NET FINISHED
	20:02	16°15.962N	143°02.373E	2473m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-A1	23:30	15°38.255N	142°46.793E	932m	CTD STARTED
ST-A1	23:49	15°38.140N	142°46.686E	877m	CTD DEEPEST
		----- 09 JULY02 (GMT) -----			
ST-A1	00:00	15°38.071N	142°46.725E	924m	CTD FINISHED
ST-A1	00:21	15°38.701N	142°46.559E	676m	IKMT-NET STARTED
ST-A1	00:40	15°37.792N	142°46.011E	0m	IKMT-NET DEEPEST (W.O.1120m)
ST-A1	01:18	15°36.457N	142°44.811E	1488m	IKMT-NET FINISHED
ST-A1	01:48	15°36.896N	142°46.071E	860m	IKMT-NET STARTED
ST-A1	02:06	15°37.410N	142°45.473E	449m	IKMT-NET DEEPEST (W.O. 953m)
ST-A1	02:38	15°38.306N	142°44.849E	722m	IKMT-NET FINISHED
ST-A1	02:46	15°38.405N	142°44.882E	769m	IKMT-NET STARTED
ST-A1	03:04	15°38.524N	142°45.504E	424m	IKMT-NET DEEPEST (W.O. 824m)
ST-A1	03:33	15°38.713N	142°46.043E	453m	IKMT-NET FINISHED
	09:03	14°19.267N	142°51.785E	2014m	SUNSET & TURNED ON REGULATION LIGHTS
	10:51	14°13.470N	142°53.765E	449m	STARTED ANGLING
	11:10	14°13.382N	142°54.039E	725m	FINISHED ANGLING
ST-S1	11:25	14°13.118N	142°54.545E	1110m	CTD STARTED
ST-S1	11:44	14°13.151N	142°54.795E	1220m	CTD DEEPEST
ST-S1	11:56	14°13.164N	142°54.960E	1269m	CTD FINISHED
ST-S1	12:23	14°14.573N	142°53.983E	1003m	IKMT-NET STARTED
ST-S1	12:43	14°13.682N	142°53.808E	462m	IKMT-NET DEEPEST (W.O. 911m)
ST-S1	13:16	14°12.538N	142°53.520E	6m	IKMT-NET FINISHED
ST-S1	13:22	14°12.406N	142°53.438E	797m	IKMT-NET STARTED
ST-S1	13:43	14°12.860N	142°52.859E	463m	IKMT-NET DEEPEST (W.O.1035m)
ST-S1	14:19	14°13.693N	142°52.129E	5m	IKMT-NET FINISHED
ST-S1	14:32	14°14.425N	142°51.837E	634m	IKMT-NET STARTED
ST-S1	14:53	14°14.470N	142°52.955E	389m	IKMT-NET DEEPEST (W.O.1037m)
ST-S1	15:30	14°14.058N	142°54.472E	912m	IKMT-NET FINISHED
	20:05	15°23.673N	142°46.961E	3359m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-A2	22:00	15°38.741N	142°46.532E	639m	IKMT-NET STARTED
ST-A2	22:14	15°38.295N	142°46.298E	483m	IKMT-NET DEEPEST (W.O. 700m)
ST-A2	22:39	15°37.715N	142°46.113E	558m	IKMT-NET FINISHED
ST-A2	22:59	15°36.940N	142°46.133E	854m	IKMT-NET STARTED
ST-A2	23:20	15°37.425N	142°45.455E	421m	IKMT-NET DEEPEST (W.O.1040m)
ST-A2	23:57	15°38.235N	142°44.617E	949m	IKMT-NET FINISHED
		----- 10 JULY02 (GMT) -----			
ST-A2	00:06	15°38.387N	142°45.124E	620m	IKMT-NET STARTED
ST-A2	00:33	15°38.802N	142°46.520E	716m	IKMT-NET DEEPEST (W.O.1336m)
ST-A2	01:19	15°39.080N	142°48.594E	2422m	IKMT-NET FINISHED
ST-P2	06:07	16°30.863N	143°08.009E	829m	IKMT-NET STARTED

ST-P2	06:27	16°30.263N	143°08.328E	0m	IKMT-NET DEEPEST (W.O. 843m)
ST-P2	06:57	16°29.651N	143°08.805E	526m	IKMT-NET FINISHED
ST-P2	07:20	16°30.683N	143°07.822E	853m	IKMT-NET STARTED
ST-P2	07:39	16°30.806N	143°08.499E	486m	IKMT-NET DEEPEST (W.O. 859m)
ST-P2	08:11	16°30.937N	143°09.397E	446m	IKMT-NET FINISHED
ST-P2	08:34	16°30.898N	143°09.070E	412m	STARTED ANGLING
	09:05	16°30.946N	143°08.971E	503m	SUNSET & TURNED ON REGULATION LIGHTS
ST-P2	09:30	16°30.859N	143°09.207E	367m	FINISHED ANGLING
ST-P2	10:13	16°30.954N	143°09.197E	462m	STARTED ANGLING
ST-P2	10:31	16°31.044N	143°09.019E	580m	FINISHED ANGLING
ST-P2	10:53	16°30.668N	143°07.770E	863m	IKMT-NET STARTED
ST-P2	11:09	16°30.780N	143°08.398E	530m	IKMT-NET DEEPEST (W.O. 765m)
ST-P2	11:36	16°30.893N	143°09.271E	393m	IKMT-NET FINISHED
ST-H1	16:24	17°10.849N	143°15.845E	4m	CTD STARTED
ST-H1	16:54	17°11.212N	143°15.663E	1618m	CTD DEEPEST
ST-H1	17:11	17°11.409N	143°15.659E	1644m	CTD FINISHED
ST-H1	17:27	17°11.481N	143°15.675E	1649m	IKMT-NET STARTED
ST-H1	17:47	17°11.375N	143°16.354E	1641m	IKMT-NET DEEPEST (W.O. 824m)
ST-H1	18:18	17°11.320N	143°17.176E	1694m	IKMT-NET FINISHED
ST-H1	19:35	17°19.280N	143°24.902E	3589m	IKMT-NET STARTED
	19:58	17°19.145N	143°25.950E	3869m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-H1	21:31	17°18.274N	143°30.119E	6m	IKMT-NET DEEPEST (W.O.6198m)
		----- 11 JULY02 (GMT) -----			
ST-H1	00:51	17°15.887N	143°36.747E	2781m	IKMT-NET FINISHED
ST-O1	06:31	17°42.946N	142°52.590E	1128m	CTD STARTED
ST-O1	06:56	17°43.211N	142°52.608E	6m	CTD DEEPEST
ST-O1	07:10	17°43.226N	142°52.592E	737m	CTD FINISHED
ST-O1	07:23	17°43.022N	142°52.858E	1152m	IKMT-NET STARTED
ST-O1	07:47	17°42.286N	142°53.668E	3m	IKMT-NET DEEPEST (W.O.1057m)
ST-O1	08:21	17°41.355N	142°54.617E	5m	IKMT-NET FINISHED
	19:52	16°41.874N	143°07.325E	3m	SUNRISE & TURNED OFF REGULATION LIGHTS
		----- 12 JULY02 (GMT) -----			
	07:33	16°30.025N	143°09.409E	0m	STARTED ANGLING
	09:33	16°29.818N	143°08.932E	327m	FINISHED ANGLING
ST-01	14:14	16°59.857N	142°00.155E	0m	CTD-CMS STARTED
ST-01	14:44	16°59.930N	142°00.067E	4446m	CTD-CMS DEEPEST
ST-01	15:04	16°59.992N	142°00.040E	0m	CTD-CMS FINISHED
ST-01	15:20	16°59.891N	141°59.712E	4448m	IKMT-NET STARTED
ST-01	15:58	16°57.639N	141°59.623E	4428m	IKMT-NET DEEPEST (W.O. 900m)
ST-01	16:41	16°55.608N	141°59.279E	4432m	IKMT-NET FINISHED
ST-02	19:34	16°20.170N	141°59.620E	4310m	IKMT-NET STARTED
ST-02	19:56	16°19.298N	141°58.613E	4284m	IKMT-NET DEEPEST (W.O. 900m)
	20:05	16°19.000N	141°58.213E	4322m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-02	20:30	16°18.361N	141°57.316E	4355m	IKMT-NET FINISHED
ST-03	23:26	15°39.835N	141°59.753E	4388m	IKMT-NET STARTED
ST-03	23:43	15°39.105N	141°58.938E	4422m	IKMT-NET DEEPEST (W.O. 900m)
		----- 13 JULY02 (GMT) -----			
ST-03	00:16	15°38.452N	141°57.614E	4419m	IKMT-NET FINISHED
ST-04	03:50	15°40.108N	141°00.305E	4818m	IKMT-NET STARTED
ST-04	04:18	15°40.541N	140°58.468E	4780m	IKMT-NET DEEPEST (W.O.1200m)
ST-04	05:01	15°40.701N	140°56.603E	4762m	IKMT-NET FINISHED
ST-05	07:35	16°18.837N	140°59.557E	4682m	IKMT-NET STARTED
ST-05	08:02	16°18.525N	140°57.799E	4683m	IKMT-NET DEEPEST (W.O.1200m)
ST-05	08:45	16°18.261N	140°55.688E	4669m	IKMT-NET FINISHED
ST-06	11:42	17°00.135N	140°59.900E	4739m	CTD-CMS STARTED
ST-06	12:01	17°00.105N	140°59.828E	4740m	CTD-CMS DEEPEST
ST-06	12:15	17°00.049N	140°59.792E	4742m	CTD-CMS FINISHED
ST-06	12:23	17°00.066N	140°59.812E	4741m	IKMT-NET STARTED
ST-06	12:56	16°59.343N	140°57.986E	4748m	IKMT-NET DEEPEST (W.O.1200m)
ST-06	13:38	16°58.821N	140°56.345E	4763m	IKMT-NET FINISHED
ST-07	17:20	16°59.998N	140°00.032E	4475m	CTD-CMS STARTED
ST-07	17:48	17°00.315N	139°59.806E	4440m	CTD-CMS DEEPEST
ST-07	18:06	17°00.516N	139°59.626E	4404m	CTD-CMS FINISHED
ST-07	18:24	17°00.539N	139°59.831E	4432m	IKMT-NET STARTED
ST-07	18:59	17°00.305N	140°01.027E	4494m	IKMT-NET DEEPEST (W.O.1200m)
ST-07	19:42	17°00.248N	140°02.302E	4556m	IKMT-NET FINISHED
ST-08	22:34	16°20.892N	139°59.493E	4829m	IKMT-NET STARTED
ST-08	23:02	16°20.179N	139°58.400E	4655m	IKMT-NET DEEPEST (W.O.1000m)

ST-08	23:37	16°19.460N	139°57.295E	4579m	IKMT-NET FINISHED
		----- 14 JULY02 (GMT) -----			
ST-09	02:19	15°39.813N	140°00.112E	5001m	IKMT-NET STARTED
ST-09	02:42	15°38.949N	139°59.515E	4934m	IKMT-NET DEEPEST (W.O.1000m)
ST-09	03:17	15°38.141N	139°59.259E	4857m	IKMT-NET FINISHED
ST-10	07:38	15°40.036N	139°00.220E	5019m	IKMT-NET STARTED
ST-10	08:06	15°39.963N	138°59.102E	5024m	IKMT-NET DEEPEST (W.O.1200m)
ST-10	08:49	15°39.846N	138°57.800E	4953m	IKMT-NET FINISHED
	09:19	15°46.057N	138°58.805E	4823m	SUNSET & TURNED ON REGULATION LIGHTS
ST-11	11:32	16°19.967N	139°00.040E	5116m	IKMT-NET STARTED
ST-11	12:07	16°19.138N	138°58.578E	5039m	IKMT-NET DEEPEST (W.O.1016m)
ST-11	12:43	16°18.320N	138°57.587E	5016m	IKMT-NET FINISHED
ST-12	15:36	16°59.984N	138°59.982E	4519m	CTD-CMS STARTED
ST-12	15:54	16°59.944N	138°59.915E	4462m	CTD-CMS DEEPEST
ST-12	16:07	16°59.904N	138°59.846E	4441m	CTD-CMS FINISHED
ST-12	16:15	16°59.875N	138°59.734E	4346m	IKMT-NET STARTED
ST-12	16:42	16°59.745N	138°58.409E	3751m	IKMT-NET DEEPEST (W.O.1000m)
ST-12	17:17	16°59.322N	138°57.188E	3923m	IKMT-NET FINISHED
	20:23	16°59.910N	138°11.851E	4346m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-13	21:14	16°59.857N	138°00.083E	5340m	CTD-CMS STARTED
ST-13	21:32	16°59.634N	137°59.983E	5343m	CTD-CMS DEEPEST
ST-13	21:48	16°59.541N	137°59.882E	5346m	CTD-CMS FINISHED
ST-13	21:58	16°59.425N	137°59.627E	5384m	IKMT-NET STARTED
ST-13	22:23	16°59.131N	137°58.499E	5337m	IKMT-NET DEEPEST (W.O.1000m)
ST-13	22:59	16°58.641N	137°57.210E	5319m	IKMT-NET FINISHED
		----- 15 JULY02 (GMT) -----			
ST-14	01:27	16°19.863N	137°59.834E	4471m	IKMT-NET STARTED
ST-14	01:52	16°19.612N	137°58.287E	4470m	IKMT-NET DEEPEST (W.O.1000m)
ST-14	02:28	16°18.479N	137°56.578E	4547m	IKMT-NET FINISHED
ST-15	04:59	15°40.033N	137°59.661E	4704m	IKMT-NET STARTED
ST-15	05:27	15°40.205N	137°57.739E	4529m	IKMT-NET DEEPEST (W.O.1000m)
ST-15	06:03	15°40.384N	137°55.799E	4667m	IKMT-NET FINISHED
	09:27	16°25.964N	137°25.442E	4008m	SUNSET & TURNED ON REGULATION LIGHTS
ST-16	12:10	16°59.947N	136°59.629E	4431m	CTD-CMS STARTED
ST-16	12:29	16°59.802N	136°59.090E	4384m	CTD-CMS DEEPEST
ST-16	12:50	16°59.764N	136°58.599E	4578m	CTD-CMS FINISHED
ST-16	13:02	16°59.540N	136°58.001E	4649m	IKMT-NET STARTED
ST-16	13:24	16°58.777N	136°56.466E	4890m	IKMT-NET DEEPEST (W.O.1000m)
ST-16	13:59	16°57.866N	136°54.359E	5028m	IKMT-NET FINISHED
ST-17	16:38	16°20.018N	136°59.893E	5279m	IKMT-NET STARTED
ST-17	17:10	16°20.872N	136°59.753E	5210m	IKMT-NET DEEPEST (W.O.1000m)
ST-17	17:48	16°21.944N	136°59.661E	5257m	IKMT-NET FINISHED
ST-18	19:36	16°00.270N	136°59.659E	5200m	IKMT-NET STARTED
ST-18	20:00	16°01.888N	136°58.629E	4868m	IKMT-NET DEEPEST (W.O.1000m)
ST-18	20:35	16°03.847N	136°57.144E	5029m	IKMT-NET FINISHED
ST-18	20:43	16°04.070N	136°56.868E	5218m	CTD-CMS STARTED
ST-18	21:02	16°04.487N	136°56.440E	5308m	CTD-CMS DEEPEST
ST-18	21:19	16°04.748N	136°56.112E	5403m	CTD-CMS FINISHED
ST-19	23:19	15°40.014N	136°59.872E	4696m	IKMT-NET STARTED
ST-19	23:50	15°40.395N	137°00.982E	4834m	IKMT-NET DEEPEST (W.O.1000m)
		----- 16 JULY02 (GMT) -----			
ST-19	00:24	15°40.778N	137°01.776E	4980m	IKMT-NET FINISHED
ST-20	02:01	15°20.056N	136°59.995E	4902m	IKMT-NET STARTED
ST-20	02:28	15°19.208N	136°59.643E	4879m	IKMT-NET DEEPEST (W.O.1000m)
ST-20	03:04	15°18.529N	136°59.140E	4873m	IKMT-NET FINISHED
ST-21	05:42	14°40.021N	137°00.033E	4844m	IKMT-NET STARTED
ST-21	06:08	14°40.560N	137°01.021E	4855m	IKMT-NET DEEPEST (W.O.1000m)
ST-21	06:43	14°41.143N	137°02.133E	4759m	IKMT-NET FINISHED
	09:22	14°39.989N	137°44.062E	4986m	SUNSET & TURNED ON REGULATION LIGHTS
ST-22	10:25	14°40.120N	138°00.135E	5063m	IKMT-NET STARTED
ST-22	10:46	14°40.621N	138°00.894E	5166m	IKMT-NET DEEPEST (W.O.1000m)
ST-22	11:22	14°41.286N	138°01.786E	5006m	IKMT-NET FINISHED
ST-23	13:55	15°19.910N	137°59.880E	5218m	IKMT-NET STARTED
ST-23	14:17	15°20.347N	138°00.569E	5196m	IKMT-NET DEEPEST (W.O.1000m)
ST-23	14:49	15°20.729N	138°01.080E	5332m	IKMT-NET FINISHED
ST-24	17:28	15°59.948N	137°59.931E	4865m	CTD-CMS STARTED
ST-24	17:45	15°59.805N	137°59.690E	4846m	CTD-CMS DEEPEST
ST-24	18:03	15°59.765N	137°59.438E	4855m	CTD-CMS FINISHED

ST-24	18:09	15°59.766N	137°59.362E	4866m	IKMT-NET STARTED
ST-24	18:32	16°00.545N	137°59.250E	4973m	IKMT-NET DEEPEST (W.O.1000m)
ST-24	19:08	16°01.351N	137°58.882E	4976m	IKMT-NET FINISHED
	20:23	15°59.919N	138°16.571E	4472m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-25	23:09	15°59.917N	138°59.957E	4266m	CTD-CMS STARTED
ST-25	23:28	15°59.959N	138°59.615E	4230m	CTD-CMS DEEPEST
ST-25	23:42	15°59.951N	138°59.350E	4235m	CTD-CMS FINISHED
ST-25	23:54	15°59.631N	138°59.106E	4226m	IKMT-NET STARTED
		----- 17 JULY02 (GMT) -----			
ST-25	00:18	15°58.543N	138°58.625E	4295m	IKMT-NET DEEPEST (W.O.1200m)
ST-25	01:02	15°56.886N	138°57.743E	4564m	IKMT-NET FINISHED
ST-26	03:26	15°19.887N	138°59.960E	4196m	IKMT-NET STARTED
ST-26	03:51	15°18.579N	138°59.498E	4492m	IKMT-NET DEEPEST (W.O.1200m)
ST-26	04:34	15°17.158N	138°58.485E	4184m	IKMT-NET FINISHED
ST-27	07:02	14°40.266N	138°59.857E	4864m	IKMT-NET STARTED
ST-27	07:26	14°41.593N	138°59.139E	4703m	IKMT-NET DEEPEST (W.O.1200m)
ST-27	08:08	14°43.063N	138°58.193E	5061m	IKMT-NET FINISHED
	09:16	14°40.328N	139°13.887E	5214m	SUNSET & TURNED ON REGULATION LIGHTS
ST-28	12:15	14°39.803N	139°59.978E	4886m	IKMT-NET STARTED
ST-28	12:43	14°41.201N	139°59.646E	4630m	IKMT-NET DEEPEST (W.O.1200m)
ST-28	13:25	14°42.854N	139°59.098E	4589m	IKMT-NET FINISHED
ST-29	15:49	15°20.024N	140°00.158E	4858m	IKMT-NET STARTED
ST-29	16:16	15°21.115N	140°01.118E	4853m	IKMT-NET DEEPEST (W.O.1200m)
ST-29	16:59	15°22.821N	140°02.047E	4945m	IKMT-NET FINISHED
ST-30	19:30	16°00.048N	139°59.904E	5081m	CTD-CMS STARTED
ST-30	19:47	16°00.003N	139°59.644E	5002m	CTD-CMS DEEPEST
ST-30	20:01	15°59.944N	139°59.470E	4988m	CTD-CMS FINISHED
ST-30	20:11	15°59.686N	139°59.396E	4989m	IKMT-NET STARTED
	20:18	15°59.368N	139°59.458E	5041m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-30	20:37	15°58.466N	139°59.647E	5099m	IKMT-NET DEEPEST (W.O.1100m)
ST-30	21:15	15°56.972N	139°59.977E	5008m	IKMT-NET FINISHED
		----- 18 JULY02 (GMT) -----			
ST-31	01:07	16°00.126N	141°00.051E	4670m	CTD-CMS STARTED
ST-31	01:24	16°00.119N	141°00.027E	4670m	CTD-CMS DEEPEST
ST-31	01:39	16°00.099N	141°00.013E	4669m	CTD-CMS FINISHED
ST-31	01:47	15°59.950N	141°00.011E	4666m	IKMT-NET STARTED
ST-31	02:12	15°58.926N	141°00.290E	4658m	IKMT-NET DEEPEST (W.O.1100m)
ST-31	02:48	15°57.751N	141°00.667E	4663m	IKMT-NET FINISHED
ST-32	05:18	15°19.956N	141°00.046E	4728m	IKMT-NET STARTED
ST-32	05:41	15°18.696N	141°00.402E	4724m	IKMT-NET DEEPEST (W.O.1100m)
ST-32	06:20	15°17.331N	141°01.089E	4723m	IKMT-NET FINISHED
ST-33	08:44	14°40.092N	140°59.847E	4812m	IKMT-NET STARTED
	09:08	14°40.717N	140°58.998E	4812m	SUNSET & TURNED ON REGULATION LIGHTS
ST-33	09:13	14°40.875N	140°58.787E	4808m	IKMT-NET DEEPEST (W.O.1200m)
ST-33	09:55	14°41.609N	140°57.608E	4813m	IKMT-NET FINISHED
ST-34	12:14	15°06.966N	141°20.127E	4576m	IKMT-NET STARTED
ST-34	12:44	15°07.726N	141°20.698E	4664m	IKMT-NET DEEPEST (W.O.1200m)
ST-34	13:26	15°08.552N	141°21.229E	4658m	IKMT-NET FINISHED
ST-35	15:31	15°32.947N	141°39.746E	4522m	IKMT-NET STARTED
ST-35	16:01	15°33.881N	141°40.764E	4528m	IKMT-NET DEEPEST (W.O.1200m)
ST-35	16:44	15°34.723N	141°41.963E	4523m	IKMT-NET FINISHED
ST-36	18:52	15°59.880N	141°59.989E	4367m	CTD-CMS STARTED
ST-36	19:09	15°59.793N	141°59.992E	4368m	CTD-CMS DEEPEST
ST-36	19:24	15°59.754N	141°59.977E	4369m	CTD-CMS FINISHED
ST-36	19:32	15°59.506N	142°00.026E	4371m	IKMT-NET STARTED
ST-36	19:57	15°58.336N	142°00.327E	4370m	IKMT-NET DEEPEST (W.O.1200m)
	20:10	15°57.852N	142°00.446E	4371m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-36	20:39	15°56.748N	142°00.769E	4367m	IKMT-NET FINISHED
ST-37	23:05	15°19.879N	141°59.825E	4344m	IKMT-NET STARTED
ST-37	23:31	15°18.987N	141°58.529E	4345m	IKMT-NET DEEPEST (W.O.1200m)
		----- 19 JULY02 (GMT) -----			
ST-37	00:14	15°17.848N	141°56.769E	4337m	IKMT-NET FINISHED
ST-38	01:38	15°00.145N	141°59.873E	4514m	CTD-CMS STARTED
ST-38	01:53	15°00.231N	141°59.534E	4512m	CTD-CMS DEEPEST
ST-38	02:10	15°00.290N	141°59.218E	4501m	CTD-CMS FINISHED
ST-38	02:17	15°00.234N	141°59.071E	4498m	IKMT-NET STARTED
ST-38	02:41	14°59.599N	141°57.911E	4500m	IKMT-NET DEEPEST (W.O.1100m)
ST-38	03:22	14°58.844N	141°56.411E	4494m	IKMT-NET FINISHED

ST-38	03:28	14°58.820N	141°56.306E	4494m	CTD-CMS STARTED
ST-38	03:34	14°58.815N	141°56.217E	4492m	CTD-CMS DEEPEST
ST-38	03:39	14°58.881N	141°56.207E	4494m	CTD-CMS FINISHED
ST-39	05:08	14°40.004N	141°59.868E	4266m	IKMT-NET STARTED
ST-39	05:33	14°39.738N	141°58.627E	4323m	IKMT-NET DEEPEST (W.O.1200m)
ST-39	06:16	14°39.192N	141°56.910E	4368m	IKMT-NET FINISHED
ST-40	07:42	14°19.975N	141°59.816E	4276m	IKMT-NET STARTED
ST-40	08:05	14°19.464N	141°58.806E	4300m	IKMT-NET DEEPEST (W.O.1200m)
ST-40	08:47	14°18.728N	141°57.368E	4362m	IKMT-NET FINISHED
	09:03	14°15.767N	141°57.816E	4376m	SUNSET & TURNED ON REGULATION LIGHTS
ST-41	11:23	13°40.027N	142°00.051E	3827m	CTD-CMS STARTED
ST-41	11:40	13°40.062N	142°00.046E	3828m	CTD-CMS DEEPEST
ST-41	11:54	13°39.983N	142°00.000E	3826m	CTD-CMS FINISHED
ST-41	12:03	13°40.043N	141°59.873E	3811m	IKMT-NET STARTED
ST-41	12:37	13°39.664N	141°57.996E	3920m	IKMT-NET DEEPEST (W.O.1200m)
ST-41	13:19	13°39.386N	141°55.896E	4006m	IKMT-NET FINISHED
ST-42	16:50	13°40.129N	140°59.965E	4753m	CTD-CMS STARTED
ST-42	17:25	13°40.558N	140°59.883E	4762m	CTD-CMS DEEPEST
ST-42	17:41	13°40.689N	141°00.015E	4769m	CTD-CMS FINISHED
ST-42	17:52	13°40.490N	141°00.294E	4765m	IKMT-NET STARTED
ST-42	18:25	13°39.376N	141°01.185E	4714m	IKMT-NET DEEPEST (W.O.1200m)
ST-42	19:10	13°38.669N	141°02.526E	4698m	IKMT-NET FINISHED
	20:17	13°54.697N	141°00.100E	4823m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-43	21:56	14°20.084N	141°00.063E	4842m	IKMT-NET STARTED
ST-43	22:28	14°19.784N	140°58.867E	4812m	IKMT-NET DEEPEST (W.O.1200m)
ST-43	23:10	14°19.659N	140°57.778E	4828m	IKMT-NET FINISHED
		----- 20 JULY02 (GMT) -----			
ST-44	01:54	15°00.002N	141°00.026E	4731m	CTD-CMS STARTED
ST-44	02:11	14°59.984N	140°59.970E	4730m	CTD-CMS DEEPEST
ST-44	02:28	14°59.956N	140°59.895E	4731m	CTD-CMS FINISHED
ST-44	02:35	14°59.944N	140°59.803E	4733m	IKMT-NET STARTED
ST-44	03:10	14°59.640N	140°57.914E	4775m	IKMT-NET DEEPEST (W.O.1200m)
ST-44	03:52	14°59.328N	140°55.997E	4780m	IKMT-NET FINISHED
ST-45	07:49	14°59.929N	140°00.260E	4876m	CTD-CMS STARTED
ST-45	08:09	14°59.782N	140°00.411E	4868m	CTD-CMS DEEPEST
ST-45	08:25	14°59.809N	140°00.390E	4869m	CTD-CMS FINISHED
ST-45	08:35	14°59.800N	140°00.398E	4868m	IKMT-NET STARTED
ST-45	09:09	14°59.677N	139°59.046E	4771m	IKMT-NET DEEPEST (W.O.1200m)
ST-45	09:51	14°59.543N	139°57.776E	4777m	IKMT-NET FINISHED
ST-46	12:33	14°19.932N	140°00.104E	4836m	IKMT-NET STARTED
ST-46	13:08	14°19.312N	139°58.386E	4816m	IKMT-NET DEEPEST (W.O.1200m)
ST-46	13:50	14°18.628N	139°56.798E	4765m	IKMT-NET FINISHED
ST-47	16:24	13°39.873N	140°00.011E	4883m	CTD-CMS STARTED
ST-47	16:45	13°39.393N	139°59.902E	4879m	CTD-CMS DEEPEST
ST-47	17:01	13°39.116N	139°59.938E	4881m	CTD-CMS FINISHED
ST-47	17:12	13°38.870N	139°59.857E	4884m	IKMT-NET STARTED
ST-47	17:43	13°37.752N	139°58.241E	4882m	IKMT-NET DEEPEST (W.O.1200m)
ST-47	18:29	13°36.484N	139°56.579E	4894m	IKMT-NET FINISHED
ST-48	22:56	13°39.979N	138°59.924E	0m	CTD-CMS STARTED
ST-48	23:18	13°40.040N	138°59.782E	0m	CTD-CMS DEEPEST
ST-48	23:37	13°40.105N	138°59.703E	0m	CTD-CMS FINISHED
		----- 21 JULY02 (GMT) -----			
ST-48	01:00	13°40.923N	138°59.805E	4736m	IKMT-NET STARTED
ST-48	01:35	13°40.401N	138°57.734E	4213m	IKMT-NET DEEPEST (W.O.1200m)
ST-48	02:18	13°39.846N	138°55.801E	3712m	IKMT-NET FINISHED
ST-49	05:47	14°19.985N	138°58.370E	0m	IKMT-NET STARTED
ST-49	06:44	14°20.418N	138°55.440E	5392m	IKMT-NET DEEPEST (W.O.1200m)
ST-49	07:27	14°20.227N	138°53.579E	4548m	IKMT-NET FINISHED
ST-50	16:22	15°00.287N	138°58.894E	4565m	IKMT-NET STARTED
ST-50	17:03	15°00.119N	138°56.835E	4428m	IKMT-NET DEEPEST (W.O.1200m)
ST-50	17:45	15°00.049N	138°55.153E	4603m	IKMT-NET FINISHED
ST-50	17:58	15°00.114N	138°55.075E	4589m	CTD-CMS STARTED
ST-50	18:21	15°00.022N	138°55.127E	4724m	CTD-CMS DEEPEST
ST-50	18:37	15°00.001N	138°55.044E	4600m	CTD-CMS FINISHED
	20:26	15°00.033N	138°33.949E	4422m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-51	23:05	15°00.006N	137°59.884E	4679m	IKMT-NET STARTED
ST-51	23:46	14°58.889N	137°58.069E	4898m	IKMT-NET DEEPEST (W.O.1200m)
		----- 22 JULY02 (GMT) -----			

ST-51	00:29	14°57.795N	137°56.695E	5088m	IKMT-NET FINISHED
ST-51	01:07	14°57.587N	137°56.632E	0m	CTD-CMS STARTED
ST-51	01:30	14°57.544N	137°56.813E	4980m	CTD-CMS DEEPEST
ST-51	01:43	14°57.478N	137°56.974E	0m	CTD-CMS FINISHED
ST-52	05:31	14°18.561N	137°58.058E	4978m	IKMT-NET STARTED
ST-52	06:21	14°18.101N	137°55.590E	4888m	IKMT-NET DEEPEST (W.O.1200m)
ST-52	07:03	14°17.453N	137°54.110E	4922m	IKMT-NET FINISHED
	09:19	13°45.089N	138°01.235E	4624m	SUNSET & TURNED ON REGULATION LIGHTS
ST-53	09:58	13°39.769N	138°00.337E	4602m	IKMT-NET STARTED
ST-53	10:35	13°38.658N	137°59.058E	4748m	IKMT-NET DEEPEST (W.O.1200m)
ST-53	11:16	13°37.694N	137°57.955E	4747m	IKMT-NET FINISHED
ST-53	11:31	13°37.647N	137°58.184E	0m	CTD-CMS STARTED
ST-53	11:53	13°37.506N	137°58.452E	4722m	CTD-CMS DEEPEST
ST-53	12:08	13°37.375N	137°58.579E	4724m	CTD-CMS FINISHED
ST-54	18:53	14°59.941N	136°59.887E	0m	CTD-CMS STARTED
ST-54	19:12	14°59.889N	136°59.791E	5105m	CTD-CMS DEEPEST
ST-54	19:32	14°59.808N	136°59.659E	5110m	CTD-CMS FINISHED
ST-54	19:52	14°59.688N	136°59.228E	5272m	IKMT-NET STARTED
ST-54	20:24	14°59.039N	136°57.536E	5418m	IKMT-NET DEEPEST (W.O.1200m)
ST-54	21:05	14°58.506N	136°55.982E	4700m	IKMT-NET FINISHED
ST-54	21:11	14°58.444N	136°55.816E	4719m	RELEASEED ARGOS BUOY 75m
ST-54	21:20	14°58.351N	136°55.526E	0m	RELEASEED ARGOS BUOY 150m
		----- 23 JULY02 (GMT) -----			
ST-55	00:03	14°20.073N	137°00.511E	4950m	IKMT-NET STARTED
ST-55	00:47	14°19.085N	136°58.630E	5091m	IKMT-NET DEEPEST (W.O.1200m)
ST-55	01:30	14°18.217N	136°57.090E	4828m	IKMT-NET FINISHED
ST-56	04:23	13°39.905N	137°00.164E	4346m	CTD-CMS STARTED
ST-56	04:50	13°39.491N	137°00.398E	4956m	CTD-CMS DEEPEST
ST-56	05:08	13°39.263N	137°00.547E	4998m	CTD-CMS FINISHED
ST-56	05:14	13°39.137N	137°00.532E	5014m	IKMT-NET STARTED
ST-56	06:01	13°37.858N	136°59.130E	5216m	IKMT-NET DEEPEST (W.O.1200m)
ST-56	06:45	13°37.009N	136°57.996E	4885m	IKMT-NET FINISHED
ST-56	06:52	13°36.889N	136°57.834E	4909m	RELEASED ARGOS BUOY 75m
ST-56	06:58	13°36.778N	136°57.702E	4953m	RELEASED ARGOS BUOY 150m
	09:17	13°02.168N	137°00.861E	4686m	SUNSET & TURNED ON REGULATION LIGHTS
ST-57	09:34	12°59.907N	137°00.258E	4877m	CTD-CMS STARTED
ST-57	09:59	12°59.578N	137°00.439E	4872m	CTD-CMS DEEPEST
ST-57	10:16	12°59.371N	137°00.539E	4857m	CTD-CMS FINISHED
ST-57	10:22	12°59.250N	137°00.525E	4856m	IKMT-NET STARTED
ST-57	10:54	12°58.040N	136°59.492E	4723m	IKMT-NET DEEPEST (W.O.1200m)
ST-57	11:35	12°56.847N	136°58.412E	4770m	IKMT-NET FINISHED
ST-57	11:40	12°56.730N	136°58.334E	4774m	IKMT-NET STARTED
ST-57	12:07	12°55.749N	136°57.362E	4984m	IKMT-NET DEEPEST (W.O. 700m)
ST-57	12:57	12°54.084N	136°55.571E	5080m	IKMT-NET FINISHED
ST-58	16:48	11°59.775N	136°59.661E	4938m	IKMT-NET STARTED
ST-58	17:12	11°58.969N	136°58.767E	4987m	IKMT-NET DEEPEST (W.O. 700m)
ST-58	18:02	11°57.427N	136°57.094E	5598m	IKMT-NET FINISHED
ST-58	18:06	11°57.302N	136°56.952E	5571m	IKMT-NET STARTED
ST-58	18:39	11°56.239N	136°55.836E	5392m	IKMT-NET DEEPEST (W.O. 924m)
ST-58	19:50	11°54.280N	136°53.479E	4635m	IKMT-NET FINISHED
ST-58	19:54	11°54.174N	136°53.332E	4661m	IKMT-NET STARTED
ST-58	20:31	11°53.453N	136°51.617E	4885m	IKMT-NET DEEPEST (W.O.1200m)
	20:36	11°53.370N	136°51.396E	4970m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-58	21:13	11°52.855N	136°50.149E	4625m	IKMT-NET FINISHED
ST-58	22:20	11°59.877N	136°59.793E	4940m	CTD-CMS STARTED
ST-58	22:43	11°59.703N	136°59.803E	4954m	CTD-CMS DEEPEST
ST-58	23:01	11°59.547N	136°59.869E	4957m	CTD-CMS FINISHED
ST-58	23:07	11°59.496N	136°59.918E	5166m	RELEASED ARGOS BUOY 75m
ST-58	23:14	11°59.364N	136°59.779E	4973m	RELEASED ARGOS BUOY 150m
		----- 24 JULY02 (GMT) -----			
ST-59	03:14	11°00.022N	137°00.083E	4915m	CTD-CMS STARTED
ST-59	03:39	10°59.833N	136°59.999E	4858m	CTD-CMS DEEPEST
ST-59	03:57	10°59.669N	136°59.984E	4855m	CTD-CMS FINISHED
ST-59	04:07	10°59.559N	136°59.918E	4868m	IKMT-NET STARTED
ST-59	04:43	10°58.491N	136°58.166E	5037m	IKMT-NET DEEPEST (W.O.1200m)
ST-59	05:26	10°57.621N	136°56.581E	5286m	IKMT-NET FINISHED
	09:17	10°00.890N	137°00.054E	4678m	SUNSET & TURNED ON REGULATION LIGHTS
ST-60	09:26	10°00.326N	136°59.973E	4739m	CTD-CMS STARTED

ST-60	09:46	10°00.322N	137°00.015E	4732m	CTD-CMS DEEPEST
ST-60	10:04	10°00.292N	137°00.028E	4738m	CTD-CMS FINISHED
ST-60	10:18	10°00.190N	136°59.802E	4833m	IKMT-NET STARTED
ST-60	10:47	09°59.466N	136°58.660E	4817m	IKMT-NET DEEPEST (W.O.1200m)
ST-60	11:29	09°58.517N	136°57.637E	4933m	IKMT-NET FINISHED
ST-60	11:42	09°58.362N	136°57.602E	4873m	RELEASED ARGOS BUOY 150m
ST-61	15:33	09°00.053N	136°59.927E	3452m	CTD-CMS STARTED
ST-61	15:50	08°59.943N	136°59.841E	3566m	CTD-CMS DEEPEST
ST-61	16:09	08°59.887N	136°59.906E	3540m	CTD-CMS FINISHED
ST-61	16:18	08°59.777N	136°59.730E	3655m	IKMT-NET STARTED
ST-61	16:45	08°59.133N	136°58.495E	3416m	IKMT-NET DEEPEST (W.O.1200m)
ST-61	17:27	08°58.167N	136°56.916E	3865m	IKMT-NET FINISHED
ST-62	21:20	07°59.992N	136°59.995E	2961m	CTD-CMS STARTED
ST-62	21:39	07°59.937N	137°00.028E	2864m	CTD-CMS DEEPEST
ST-62	21:57	07°59.834N	137°00.088E	2854m	CTD-CMS FINISHED
ST-62	22:08	07°59.695N	136°59.992E	2862m	IKMT-NET STARTED
ST-62	22:36	07°58.981N	136°59.047E	2873m	IKMT-NET DEEPEST (W.O.1200m)
ST-62	23:18	07°58.137N	136°57.804E	2623m	IKMT-NET FINISHED
		----- 25 JULY02 (GMT) -----			
ST-63	03:16	07°00.107N	136°59.991E	4214m	CTD-CMS STARTED
ST-63	03:35	07°00.103N	136°59.927E	4212m	CTD-CMS DEEPEST
ST-63	03:54	07°00.105N	136°59.906E	4212m	CTD-CMS FINISHED
ST-63	04:04	07°00.068N	136°59.770E	4212m	IKMT-NET STARTED
ST-63	04:31	06°59.811N	136°58.552E	4198m	IKMT-NET DEEPEST (W.O.1200m)
ST-63	05:13	06°59.537N	136°57.121E	4166m	IKMT-NET FINISHED
	09:15	06°56.862N	136°05.647E	3373m	SUNSET & TURNED ON REGULATION LIGHTS
	20:55	07°25.802N	134°13.883E	1237m	SUNRISE & TURNED OFF REGULATION LIGHTS

Leg2

		----- 01 AUG02 (GMT) -----			
	09:17	07°27.470N	135°27.522E	3066m	SUNSET & TURNED ON REGULATION LIGHTS
ST-64	11:10	07°35.339N	135°55.278E	2538m	IKMT-NET STARTED
ST-64	11:36	07°35.460N	135°56.398E	2850m	IKMT-NET DEEPEST (W.O.1200m)
ST-64	12:19	07°35.474N	135°57.902E	2570m	IKMT-NET FINISHED
ST-64	12:23	07°35.490N	135°58.095E	2512m	IKMT-NET STARTED
ST-64	12:39	07°35.635N	135°58.720E	2322m	IKMT-NET DEEPEST (W.O. 700m)
ST-64	13:31	07°35.990N	136°00.322E	1904m	IKMT-NET FINISHED
	20:41	08°09.787N	137°46.015E	7171m	SUNRISE & TURNED OFF REGULATION LIGHTS
		----- 02 AUG02 (GMT) -----			
	09:00	09°34.942N	140°38.870E	1514m	SUNSET & TURNED ON REGULATION LIGHTS
ST-65	11:04	09°54.578N	141°04.854E	3033m	IKMT-NET STARTED
ST-65	11:27	09°54.983N	141°05.893E	3154m	IKMT-NET DEEPEST (W.O.1200m)
ST-65	12:09	09°55.027N	141°07.409E	3179m	IKMT-NET FINISHED
ST-65	12:14	09°55.026N	141°07.595E	3149m	IKMT-NET STARTED
ST-65	12:29	09°54.890N	141°08.285E	3166m	IKMT-NET DEEPEST (W.O. 700m)
ST-65	13:19	09°54.388N	141°09.938E	3282m	IKMT-NET FINISHED
	20:18	11°02.154N	142°34.259E	6742m	SUNRISE & TURNED OFF REGULATION LIGHTS
MM-1	21:36	11°01.894N	142°34.774E	6659m	RELEASED MM-1
MM-1	22:14	11°02.298N	142°33.686E	6716m	POPPED UP MM-1
MM-1	23:05	11°02.278N	142°33.694E	6716m	STARTED TO RETRIEVE MM-1
		----- 03 AUG02 (GMT) -----			
MM-1	00:12	11°02.804N	142°32.499E	6828m	FINISHED TO RETRIEVE MM-1
MM-2	01:50	11°22.352N	142°35.881E	0m	RELEASED MM-2
MM-2	02:42	11°22.797N	142°35.065E	10459m	POPPED UP MM-2
MM-2	03:30	11°22.164N	142°35.645E	10501m	STARTED TO RETRIEVE MM-2
MM-2	05:29	11°23.182N	142°33.847E	10236m	FINISHED TO RETRIEVE MM-2
MM-2	05:50	11°23.382N	142°33.538E	10094m	STARTED TO SET
	20:18	11°25.925N	142°26.808E	9343m	SUNRISE & TURNED OFF REGULATION LIGHTS
		----- 04 AUG02 (GMT) -----			
MM-2	02:06	11°25.908N	142°24.964E	9359m	RELEASED OMLET BUOY
MC01S	02:23	11°25.082N	142°25.006E	9552m	CTD-CMS STARTED
MC01S	02:40	11°25.164N	142°24.946E	9538m	CTD-CMS DEEPEST
MC01S	02:56	11°25.209N	142°24.970E	9530m	CTD-CMS FINISHED
MM-3	04:31	11°41.975N	142°34.731E	5744m	RELEASED MM-3
MM-3	05:00	11°42.213N	142°34.406E	5670m	POPPED UP MM-3
MM-3	05:23	11°41.915N	142°34.526E	5813m	STARTED TO RETRIEVE MM-3
MM-3	06:22	11°42.380N	142°34.158E	5578m	FINISHED TO RETRIEVE MM-3
	08:56	11°21.678N	142°03.457E	8912m	SUNSET & TURNED ON REGULATION LIGHTS

MC02	09:26	11°20.437N	142°00.018E	8963m	CTD-CMS STARTED
MC02	12:13	11°20.593N	141°59.116E	8725m	CTD-CMS DEEPEST
MC02	14:53	11°20.045N	141°57.469E	8840m	CTD-CMS FINISHED
MC01D	17:09	11°20.186N	142°26.828E	9971m	CTD-CMS STARTED
	20:18	11°20.060N	142°25.992E	9981m	SUNRISE & TURNED OFF REGULATION LIGHTS
MC01D	20:24	11°20.059N	142°25.981E	9966m	CTD-CMS DEEPEST
MC01D	23:44	11°19.944N	142°25.513E	9991m	CTD-CMS FINISHED
		----- 05 AUG02 (GMT) -----			
	02:33	11°27.273N	142°12.200E	8640m	PICKED UP OMLET BUOY
ST-66	05:34	12°00.018N	142°39.028E	4311m	CTD STARTED
ST-66	05:50	11°59.986N	142°38.895E	4292m	CTD DEEPEST
ST-66	06:03	11°59.962N	142°38.852E	4286m	CTD FINISHED
	07:05	12°10.946N	142°47.969E	4010m	STARTED PASSING FRONT
	07:30	12°10.565N	142°49.766E	3796m	ABIS STARTED
	08:38	12°05.176N	142°47.793E	3879m	STARTED ANGLING
	08:54	12°05.139N	142°47.769E	3877m	SUNSET & TURNED ON REGULATION LIGHTS
	09:06	12°05.125N	142°47.740E	3876m	FINISHED ANGLING
ST-67	13:30	13°00.059N	143°27.657E	3270m	CTD STARTED
ST-67	13:45	13°00.006N	143°27.446E	3294m	CTD DEEPEST
ST-67	13:57	12°59.789N	143°27.377E	3263m	CTD FINISHED
ST-68	17:26	13°39.975N	143°59.886E	3830m	CTD STARTED
ST-68	17:43	13°39.722N	143°59.687E	3804m	CTD DEEPEST
ST-68	17:56	13°39.548N	143°59.542E	3793m	CTD FINISHED
ST-68	18:13	13°39.629N	143°59.292E	3741m	IKMT-NET STARTED
ST-68	18:39	13°39.395N	143°57.720E	3365m	IKMT-NET DEEPEST (W.O.1200m)
ST-68	19:21	13°38.691N	143°55.894E	3122m	IKMT-NET FINISHED
		----- 06 AUG02 (GMT) -----			
S2-1	01:40	14°12.777N	142°53.153E	322m	STARTED ANGLING
S2-1	02:00	14°12.786N	142°52.945E	396m	FINISHED ANGLING
S2-2	05:35	14°12.600N	142°52.761E	626m	IKMT-NET STARTED
S2-2	06:08	14°13.893N	142°51.767E	705m	IKMT-NET DEEPEST (W.O.1200m)
S2-2	06:50	14°15.277N	142°50.873E	0m	IKMT-NET FINISHED
	08:58	14°13.208N	142°53.785E	498m	SUNSET & TURNED ON REGULATION LIGHTS
	10:05	14°14.143N	142°51.757E	744m	ABIS FINISHED
S2-3	10:24	14°12.595N	142°51.535E	0m	IKMT-NET STARTED
S2-3	10:54	14°12.476N	142°52.794E	698m	IKMT-NET DEEPEST (W.O.1200m)
S2-3	11:37	14°12.282N	142°54.021E	0m	IKMT-NET FINISHED
S2-4	12:38	14°13.279N	142°52.670E	193m	STARTED ANGLING
S2-4	12:48	14°13.326N	142°52.577E	255m	FINISHED ANGLING
S2-5	13:05	14°13.193N	142°52.776E	162m	STARTED ANGLING
S2-5	13:17	14°13.369N	142°52.638E	165m	FINISHED ANGLING
S2-6	14:06	14°14.698N	142°51.967E	653m	IKMT-NET STARTED
S2-6	14:34	14°14.701N	142°53.044E	718m	IKMT-NET DEEPEST (W.O.1200m)
S2-6	15:16	14°14.970N	142°54.173E	1271m	IKMT-NET FINISHED
	20:09	14°51.176N	143°47.528E	4164m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-69	21:11	15°00.029N	144°00.028E	4062m	CTD STARTED
ST-69	21:30	15°00.079N	144°00.052E	4047m	CTD DEEPEST
ST-69	21:41	15°00.096N	144°00.040E	4046m	CTD FINISHED
ST-69	21:51	15°00.112N	143°59.968E	4020m	IKMT-NET STARTED
ST-69	22:19	15°00.178N	144°01.364E	4088m	IKMT-NET DEEPEST (W.O.1200m)
ST-69	23:01	15°00.301N	144°03.027E	3916m	IKMT-NET FINISHED
		----- 07 AUG02 (GMT) -----			
A3-1	05:36	15°38.543N	142°45.251E	588m	STARTED ANGLING
A3-1	05:47	15°38.514N	142°45.261E	549m	FINISHED ANGLING
A3-2	05:55	15°38.483N	142°45.409E	448m	STARTED ANGLING
A3-2	06:18	15°38.619N	142°45.421E	576m	FINISHED ANGLING
A3-3	06:29	15°38.459N	142°45.340E	473m	STARTED ANGLING
A3-3	06:43	15°38.423N	142°45.249E	508m	FINISHED ANGLING
A3-4	06:57	15°38.522N	142°45.410E	487m	STARTED ANGLING
A3-4	07:57	15°38.530N	142°45.464E	515m	FINISHED ANGLING
A3-5	08:05	15°38.536N	142°45.436E	0m	STARTED ANGLING
A3-5	08:20	15°38.522N	142°45.452E	0m	FINISHED ANGLING
A3-6	08:53	15°38.218N	142°46.451E	640m	IKMT-NET STARTED
	08:57	15°38.052N	142°46.388E	660m	SUNSET & TURNED ON REGULATION LIGHTS
A3-6	09:29	15°36.905N	142°45.833E	764m	IKMT-NET DEEPEST (W.O.1200m)
A3-6	10:10	15°35.655N	142°45.368E	0m	IKMT-NET FINISHED
A3-7	10:33	15°37.738N	142°45.298E	270m	ABIS STARTED
A3-8	12:31	15°38.816N	142°45.167E	0m	IKMT-NET STARTED

A3-8	12:59	15°37.684N	142°44.596E	757m	IKMT-NET DEEPEST (W.O.1200m)
A3-8	13:41	15°36.411N	142°43.949E	0m	IKMT-NET FINISHED
A3-9	14:08	15°38.462N	142°45.337E	480m	ORI-NET STARTED
A3-9	14:25	15°38.666N	142°45.743E	478m	ORI-NET DEEPEST (W.O. 400m)
A3-9	14:49	15°38.812N	142°46.398E	583m	ORI-NET FINISHED
ST-70	20:02	16°00.017N	143°59.972E	3573m	IKMT-NET STARTED
	20:06	15°59.922N	143°59.770E	3573m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-70	20:31	15°59.338N	143°58.540E	3765m	IKMT-NET DEEPEST (W.O.1200m)
ST-70	21:13	15°58.531N	143°56.921E	3938m	IKMT-NET FINISHED
ST-70	21:18	15°58.456N	143°56.778E	3955m	CTD STARTED
ST-70	21:35	15°58.313N	143°56.657E	3956m	CTD DEEPEST
ST-70	21:47	15°58.233N	143°56.580E	3959m	CTD FINISHED
ST-70	21:57	15°58.076N	143°56.247E	3969m	IKMT-NET STARTED
ST-70	23:41	15°55.938N	143°51.322E	3489m	IKMT-NET DEEPEST (W.O.6000m)
		----- 08 AUG02 (GMT) -----			
ST-70	01:23	15°55.809N	143°48.072E	3775m	IKMT-NET FINISHED
P3-1	06:05	16°29.996N	143°08.348E	438m	STARTED ANGLING
P3-1	06:34	16°30.352N	143°08.291E	400m	FINISHED ANGLING
P3-2	07:14	16°30.795N	143°08.436E	528m	STARTED ANGLING
P3-2	08:10	16°30.707N	143°08.542E	385m	FINISHED ANGLING
	08:57	16°30.978N	143°08.246E	0m	SUNSET & TURNED ON REGULATION LIGHTS
P3-3	09:17	16°30.421N	143°08.256E	456m	ABIS STARTED
P3-3	09:51	16°29.892N	143°08.372E	0m	ABIS FINISHED
P3-3	10:30	16°29.599N	143°08.418E	555m	ORI-NET STARTED
P3-3	10:44	16°30.038N	143°08.366E	428m	ORI-NET DEEPEST (W.O. 450m)
P3-3	11:12	16°30.962N	143°08.320E	0m	ORI-NET FINISHED
P3-4	11:27	16°31.564N	143°07.990E	0m	IKMT-NET STARTED
P3-4	11:54	16°30.655N	143°08.030E	5m	IKMT-NET DEEPEST (W.O.1200m)
P3-4	12:36	16°29.652N	143°07.981E	957m	IKMT-NET FINISHED
P3-5	12:49	16°29.430N	143°07.922E	1115m	IKMT-NET STARTED
P3-5	13:14	16°29.504N	143°09.205E	749m	IKMT-NET DEEPEST (W.O.1205m)
P3-5	13:56	16°30.040N	143°10.904E	0m	IKMT-NET FINISHED
P3-6	14:21	16°30.877N	143°09.645E	457m	IKMT-NET STARTED
P3-6	14:40	16°30.693N	143°08.924E	225m	IKMT-NET DEEPEST (W.O. 587m)
P3-6	15:09	16°30.569N	143°07.996E	712m	IKMT-NET FINISHED
ST-71	17:00	16°14.442N	143°02.094E	2614m	IKMT-NET STARTED
ST-71	17:27	16°13.735N	143°01.570E	2678m	IKMT-NET DEEPEST (W.O.1200m)
ST-71	18:08	16°12.964N	143°00.940E	2597m	IKMT-NET FINISHED
ST-72	18:58	16°02.927N	142°57.045E	2773m	IKMT-NET STARTED
ST-72	19:28	16°02.037N	142°56.461E	2672m	IKMT-NET DEEPEST (W.O.1199m)
ST-72	20:09	16°01.095N	142°55.791E	2579m	IKMT-NET FINISHED
	20:11	16°01.016N	142°55.751E	2584m	SUNRISE & TURNED OFF REGULATION LIGHTS
ST-73	21:04	15°49.785N	142°51.018E	3259m	IKMT-NET STARTED
ST-73	21:32	15°48.683N	142°50.434E	3282m	IKMT-NET DEEPEST (W.O.1200m)
ST-73	22:12	15°47.399N	142°49.790E	3234m	IKMT-NET FINISHED
A4-1	23:07	15°39.258N	142°47.085E	1368m	IKMT-NET STARTED
A4-1	23:31	15°38.379N	142°46.660E	806m	IKMT-NET DEEPEST (W.O.1200m)
		----- 09 AUG02 (GMT) -----			
A4-1	00:13	15°37.160N	142°46.173E	855m	IKMT-NET FINISHED
A4-2	00:28	15°36.255N	142°46.035E	1474m	IKMT-NET STARTED
A4-2	00:51	15°36.948N	142°45.433E	806m	IKMT-NET DEEPEST (W.O.1200m)
A4-2	01:33	15°37.908N	142°44.483E	868m	IKMT-NET FINISHED
A4-3	01:41	15°37.997N	142°44.134E	1230m	IKMT-NET STARTED
A4-3	02:05	15°38.694N	142°45.251E	737m	IKMT-NET DEEPEST (W.O.1200m)
A4-3	02:48	15°39.619N	142°46.823E	1444m	IKMT-NET FINISHED
ST-74	06:00	15°25.425N	142°47.659E	2878m	IKMT-NET STARTED
ST-74	06:28	15°24.211N	142°47.488E	3324m	IKMT-NET DEEPEST (W.O.1200m)
ST-74	07:08	15°22.853N	142°47.273E	3364m	IKMT-NET FINISHED
ST-75	08:02	15°10.446N	142°48.650E	3020m	IKMT-NET STARTED
ST-75	08:30	15°09.219N	142°48.512E	2580m	IKMT-NET DEEPEST (W.O.1200m)
	08:55	15°08.366N	142°48.371E	2621m	SUNSET & TURNED ON REGULATION LIGHTS
ST-75	09:12	15°07.752N	142°48.194E	2715m	IKMT-NET FINISHED
ST-76	10:01	14°57.459N	142°49.524E	2725m	IKMT-NET STARTED
ST-76	10:30	14°56.136N	142°49.806E	2677m	IKMT-NET DEEPEST (W.O.1200m)
ST-76	11:12	14°54.514N	142°50.058E	2779m	IKMT-NET FINISHED
ST-77	12:00	14°43.489N	142°50.333E	3282m	IKMT-NET STARTED
ST-77	12:29	14°42.442N	142°50.874E	3049m	IKMT-NET DEEPEST (W.O.1200m)
ST-77	13:10	14°41.041N	142°51.669E	3132m	IKMT-NET FINISHED

ST-78	14:00	14°29.762N	142°51.891E	2347m	IKMT-NET STARTED
ST-78	14:24	14°28.779N	142°52.538E	2138m	IKMT-NET DEEPEST (W.O.1200m)
ST-78	15:05	14°27.386N	142°53.315E	1978m	IKMT-NET FINISHED
S3-1	16:18	14°14.690N	142°51.685E	663m	IKMT-NET STARTED
S3-1	16:46	14°13.523N	142°51.980E	668m	IKMT-NET DEEPEST (W.O.1200m)
S3-1	17:28	14°12.201N	142°52.588E	889m	IKMT-NET FINISHED
S3-2	17:47	14°12.647N	142°51.694E	1041m	IKMT-NET STARTED
S3-2	18:15	14°12.429N	142°53.002E	695m	IKMT-NET DEEPEST (W.O.1200m)
S3-2	18:57	14°13.148N	142°54.182E	842m	IKMT-NET FINISHED
	19:32	14°13.015N	142°52.834E	307m	ABIS STARTED
	20:13	14°12.849N	142°52.707E	541m	SUNRISE & TURNED OFF REGULATION LIGHTS
	20:30	14°14.133N	142°53.778E	564m	ABIS FINISHED
ST-79	22:04	13°57.627N	142°53.372E	4000m	IKMT-NET STARTED
ST-79	22:33	13°58.906N	142°53.152E	3737m	IKMT-NET DEEPEST (W.O.1200m)
ST-79	23:13	14°00.381N	142°52.779E	3434m	IKMT-NET FINISHED
		----- 10 AUG02 (GMT) -----			
A5-1	05:27	15°36.582N	142°46.019E	1058m	IKMT-NET STARTED
A5-1	05:52	15°37.528N	142°44.955E	669m	IKMT-NET DEEPEST (W.O.1200m)
A5-1	06:34	15°39.120N	142°44.058E	0m	IKMT-NET FINISHED
	06:54	15°37.958N	142°45.214E	243m	ABIS STARTED
	07:55	15°37.873N	142°44.947E	517m	ABIS FINISHED
A5-2	08:12	15°38.430N	142°45.395E	424m	STARTED ANGLING
A5-2	09:25	15°38.376N	142°45.396E	342m	FINISHED ANGLING
	09:28	15°38.224N	142°45.318E	275m	ABIS STARTED
	09:59	15°37.929N	142°45.044E	425m	ABIS FINISHED
A5-3	10:12	15°38.140N	142°45.166E	376m	STARTED ANGLING
A5-3	10:48	15°37.710N	142°44.832E	614m	FINISHED ANGLING
A5-4	10:54	15°37.757N	142°44.964E	522m	IKMT-NET STARTED
A5-4	11:13	15°38.490N	142°45.380E	498m	IKMT-NET DEEPEST (W.O. 700m)
A5-4	11:37	15°39.370N	142°45.896E	1016m	IKMT-NET FINISHED
A5-5	11:45	15°39.495N	142°45.953E	1050m	RELEASED ARGOS BUOY 75m
P4-1	16:07	16°30.850N	143°09.834E	552m	IKMT-NET STARTED
P4-1	16:25	16°30.820N	143°08.990E	376m	IKMT-NET DEEPEST (W.O. 500m)
P4-1	16:43	16°30.735N	143°08.323E	561m	IKMT-NET FINISHED
P4-2	18:02	16°30.286N	143°09.725E	568m	IKMT-NET STARTED
P4-2	18:10	16°30.698N	143°09.672E	442m	IKMT-NET DEEPEST (W.O. 200m)
P4-2	18:22	16°31.213N	143°09.580E	706m	IKMT-NET FINISHED
P4-3	19:47	16°29.300N	143°08.291E	745m	IKMT-NET STARTED
P4-3	20:22	16°31.087N	143°07.948E	923m	IKMT-NET DEEPEST (W.O.1200m)
P4-3	21:05	16°32.820N	143°07.495E	0m	IKMT-NET FINISHED
	21:29	16°30.299N	143°08.370E	330m	ABIS STARTED
	22:02	16°29.995N	143°08.454E	358m	ABIS FINISHED
P4-4	22:10	16°29.976N	143°08.461E	381m	STARTED ANGLING
P4-4	22:23	16°29.838N	143°08.526E	380m	FINISHED ANGLING
P4-5	22:37	16°30.113N	143°09.486E	442m	STARTED ANGLING
P4-5	22:53	16°30.103N	143°09.458E	410m	FINISHED ANGLING
P4-6	22:58	16°30.041N	143°09.305E	336m	STARTED ANGLING
P4-6	23:09	16°30.053N	143°09.305E	327m	FINISHED ANGLING
P4-7	23:28	16°30.402N	143°09.402E	175m	STARTED ANGLING
		----- 11 AUG02 (GMT) -----			
P4-7	00:02	16°29.805N	143°08.785E	326m	FINISHED ANGLING
P4-8	00:08	16°29.855N	143°09.030E	349m	IKMT-NET STARTED
P4-8	00:33	16°30.649N	143°10.173E	832m	IKMT-NET DEEPEST (W.O.1200m)
P4-8	01:15	16°31.707N	143°12.006E	0m	IKMT-NET FINISHED
ST-80	05:06	17°00.026N	144°00.000E	3602m	CTD-CMS STARTED
ST-80	05:23	17°00.092N	144°00.057E	3587m	CTD-CMS DEEPEST
ST-80	05:56	17°00.285N	144°00.155E	3588m	CTD-CMS FINISHED
ST-80	06:00	17°00.260N	144°00.133E	3590m	IRRADIANCE MEASUREMENT STARTED
ST-80	06:25	17°00.125N	144°00.148E	3584m	IRRADIANCE MEASUREMENT FINISHED
ST-80	06:31	17°00.101N	144°00.281E	3586m	IKMT-NET STARTED
ST-80	07:03	17°00.268N	144°01.915E	3614m	IKMT-NET DEEPEST (W.O.1200m)
ST-80	07:44	17°00.549N	144°03.600E	4018m	IKMT-NET FINISHED
	08:52	17°15.006N	143°56.865E	3841m	SUNSET & TURNED ON REGULATION LIGHTS
	20:05	20°14.906N	143°15.943E	3269m	SUNRISE & TURNED OFF REGULATION LIGHTS
		----- 12 AUG02 (GMT) -----			
	09:05	23°43.651N	142°27.846E	3167m	SUNSET & TURNED ON REGULATION LIGHTS
	20:03	26°39.594N	141°46.063E	3579m	SUNRISE & TURNED OFF REGULATION LIGHTS