Preliminary Report
of
The Hakuho Maru Cruise KH-81-1

February 18 — March 24, 1981

The sea around Kuroshio

and

Kuroshio Extension area

Ocean Research Institute

University of Tokyo

1987

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by

The Scientific Members of the Expedition

Edited by

Toshiyuki Hirano

PREFACE

This cruise was conducted in the sea around the Kuroshio and the Kuroshio Extension area during a period of 35 days from February 18 to March 24 1981, following the previous cruise of KH-77-2 during summer in 1977. The main purpose of this cruise was to clear the structure of oceanographic environment and its relation to the distribution of marine organisms. Emphasis was placed on fisheries oceanographical aspects with special reference to the processes of transport of fish eggs and larvae which were seemed to be closely related with fluctuations in the abundance of marine fish resources.

With the progress of studies on the western subtropical gyre of the North Pacific, it was cleared that the Kuroshio and the Kuroshio Countercurrent were formed subgyre with meridional scales of 300 km, so that the Kuroshio Countercurrent play an important role in the transport of marine organisms.

This report contains mainly hydrographical data obtained during this cruise and brief summaries of the research carried out by each scientist aboard.

On behalf of the scientists aboard, I wish to express our sincere thanks to Captain I. Tadama, officers and all the crew of the R. V. Hakuho Maru for their cooperation and support throughout this cruise.

March 1986

Toshiyuki Hirano

Chief Scientist of the Cruise

CONTENTS

1. Outline of the cruise

T. Hirano

The cruise consisted of two legs as shown in Fig. 1a. Leg I was from Tokyo to Yokohama, and leg I·I was from Yokohama to Tokyo. The names and specialities of the 23 scientists who participated in this cruise are listed in Table 1., and the observations at each station are summarized in Table 2.

The following research items were investigated in the sea around the Kuroshio and the Kuroshio Countercurrent during winter seasons: (1) the structure of the Kuroshio Countercurrent and the Kuroshio, (2) measurement of heat budget across the sea surface, (3) distribution, specific composition of fish eggs and larvae, (4) distribution of neuston, (5) distribution of phytoplankton, (6) distribution of marine bacteria, (7) observation of SL layers by means of echo sounder, and (8) distribution of mackerel in fishing ground and its relation to oceanographical environment (including moored current meter systems as shown in Fig. 1b.).

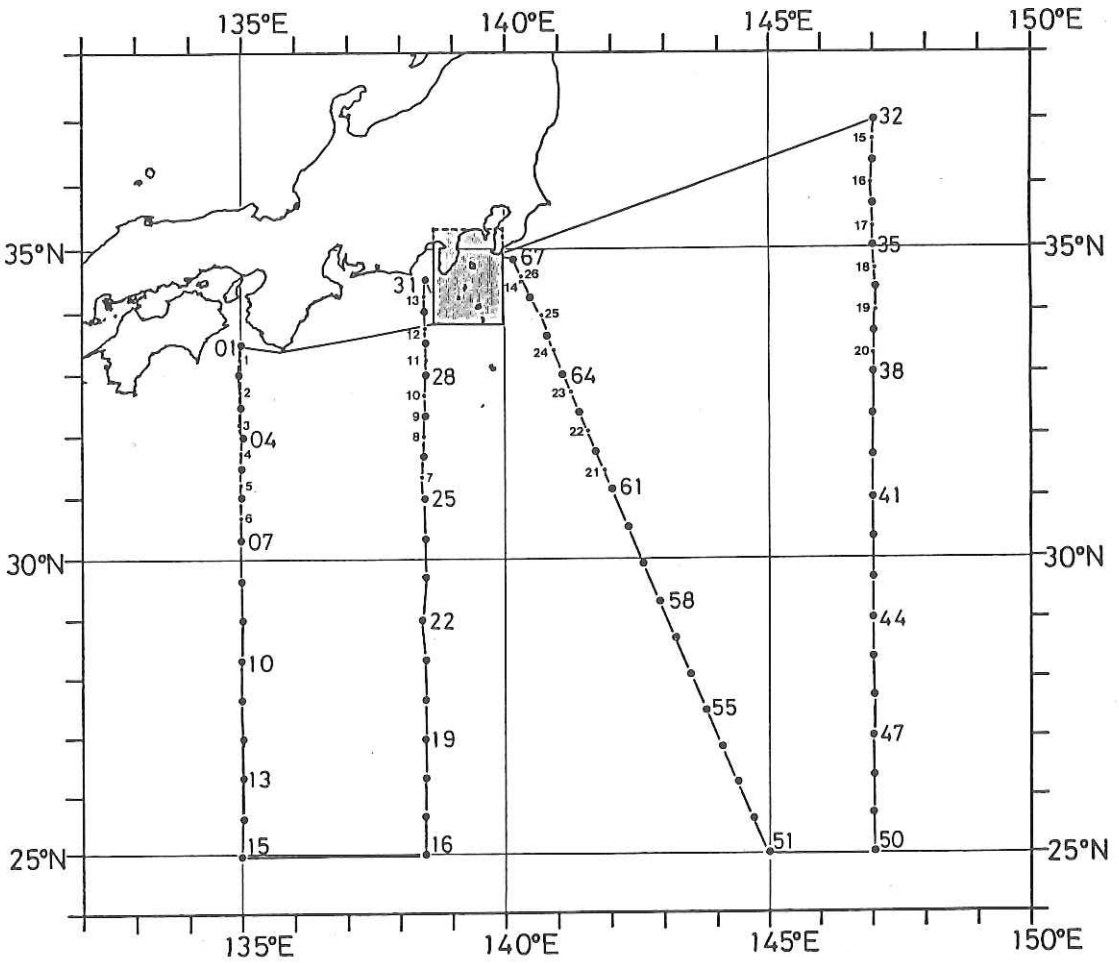

Fig. 1(a). Track chart and station numbers of the KH-81-1 cruise of the Hakuho Maru(February 18 to March 24, 1981). The large closed circles are 1000-m hydrographic station locations, the small closed circles are XBT station locations, shaded area indicate investigation area by echo sounder as shown in Fig. 1(b). The specific sections(01-15, 31-16, 67-51, 32-50) are shown in Figures 2(a-c).

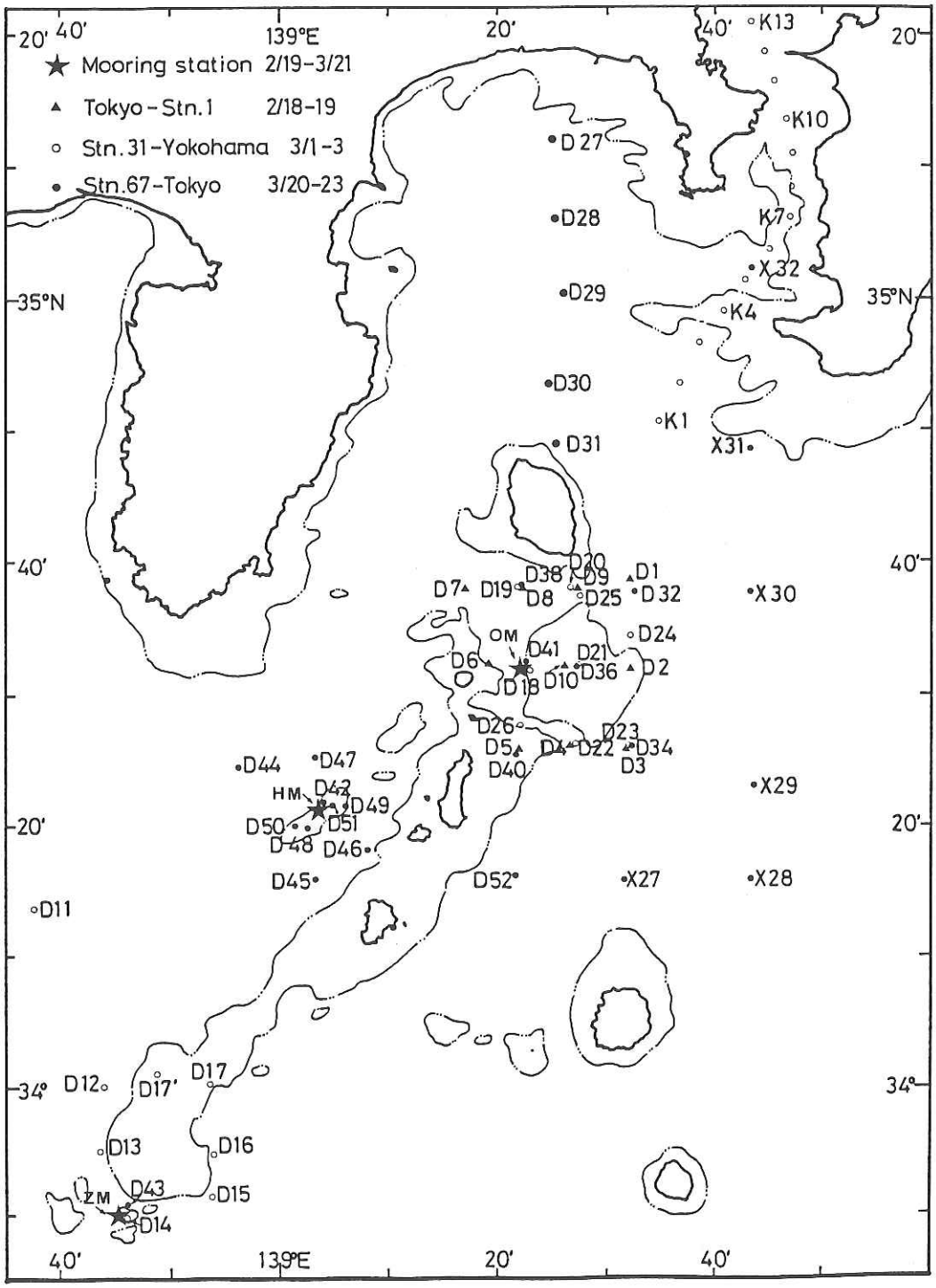

Fig. 1(b). Station location of moorings, DBT, and XBT observations.

Table 1. Scientists aboard

* Toshiyuki HIRANO	Ocean Research Institute, Univ. of Tokyo	Fish. Oceanog.
Toshisuke NAKAI	"	Phys. Oceanog.
Keiichi HASUNUMA	"	Fish. Oceanog.
** Kouichi KAWAGUCHI	"	Fish. Ecology
Hideaki NAKATA	"	Fish. Oceanog.
Hirotaka OTOBE	"	Phys. Oceanog.
Tadashi INAGAKI	"	Fish. Ecology
Hideo NAGAE	"	Fish. Oceanog.
** Kazuhiro KOGURE	"	Bacteria
Yutaka MATSUO	"	Plankton
Denzou INAGAKE	"	Fish. Oceanog.
** Kahoru OGAWA	"	Plankton
Yasuhiro KAWASAKI	"	Fish. Oceanog.
*** Kiyoshi ITOH	"	Fish. Oceanog.
** Apichart TERMVIDCHAKORN	"	Fish. Ecology
** Ryoji DEGUCHI	Fac. Fish., Hokkaido Univ.	Phys. Oceanog.
Tamiji YAMAMOTO	Fac. Agr., Tohoku Univ.	Plankton
Hiroji TAKEUCHI	Fac. Agr., Univ. of Tokyo	Ichthyoplankton
*** Masato KOBAYASHI	Fac. Fish., Tokyo Univ. of Fish.	Fish. Oceanog.
*** Luis Icochea SALAS	"	Fish. Oceanog.
** Yoshio NISHIMURA	Fac. Eng., Ehime Univ.	Phys. Oceanog.
** Kazuteru YOSHIKAWA	"	Phys. Oceanog.
*** Kouhei IWASAKI	"	Phys. Oceanog.

* chief Scientist
** from Tokyo to Yokohama only
*** from Yokohama to Tokyo only

Table 2. List of research sites (leg I, Stn.1-31: leg II, Stn.32-67).

CTD Stn.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
RMS	o					o					o					o							
Van Dorn	o		o			o			o			o			o	o			o				
Niskin																o							
Quanta meter						o			o							o			o				
Norpac twin	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o		
ORI-69 surface	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o		o
ORI-69 obl.200m	o	o	o	o	o	o		o		o		o			o	o			o		o		o
ORI-69 obl.1500m	o	o	o	o	o	o		o		o		o			o	o			o		o		o
Neuston	o			o		o		o		o		o	o		o	o			o				

CTD Stn.	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
RMS			o	o			o		o				o						o			
Van Dorn		o			o	o		o	o						o							
Niskin					o																	
Norpac twin	o	o	o	o	o	o	o	o														
ORI-69 surface	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
ORI-69 obl.200m		o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
ORI-69 obl.1500m		o	o	o	o	o	o	o														
Neuston				o	o		o			o		o			o		o				o	

CTD Stn.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
RMS		o					o					o					o					o
Van Dorn					o												o					o
ORI-69 surface	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
ORI-69 obl.200m	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
Neuston		o			o	o		o				o	o	o	o	o	o	o	o	o	o	o
MTD												o										

Abbreviations: RMS, rosette multisampler; Van Dorn, Van Dorn water sampler; Niskin, Niskin water sampler; ORI, Ocean Research Institute plankton net; MTD, Motoda horizontal plankton net

2. Hydrographic characteristic

K. Hasunuma, Y. Kawasaki, T. Nakai and H. Nagae

The primary objective of this cruise was to make a synoptic observation of the Kuroshio and the Kuroshio Extension area in order to examine the features of the Kuroshio Countercurrent.

The vertical distribution of temperature and salinity were measured with a continuous conductivity-temperature depth recorder (CTD, Plessy model 9040). The CTD was lowered at a speed of 0.5 m/sec down to 1000 m. The output was recorded in both digital and analog forms, and the digitized data were taken every one second. Four sections were made at the longitude 135°E (Section I), 139°30'E (Section II), 147°E (Section IV), and southeast of Boso Peninsula, from 35°N-140°E to 25°N-145°E, roughly parallel to the Izu Ridge (Section III) as shown in Fig. 1a. The CTD stations were taken at intervals of 40 nautical miles for each section except near the Kuroshio Front (from Stn. 1 to 6, Stn. 28 to 31). On the northern part of each section expendable bathythermographs (XBT probes) were launched above 550 m depth between the CTD stations.

The CTD data obtained during this cruise are tabulated in Table 6, and subsurface temperature by means of XBT probes are listed in Table 8. Cross sections of oceanographic variables (temperature, salinity, and thermosteric anomaly) from this cruise are illustrated in Figs. 2a, b, c. Geostrophic volume transports (in $10^6 m^3$/sec) across each section are calculated from the hydrographic section relative to 1000 db and the results are illustlated in Fig. 3.

The Kuroshio and the Kuroshio Extension:

A warm core structure of the Kuroshio and the Kuroshio Extension were clearly shown at the northern part of each section (Fig. 2a). The Kuroshio Front located 33°15'N at Section I, 33°30'N at Section II, 33°50'N at Section III, and 34°10'N at

Section IV. Low density water higher than 290 cl/ton in thermosteric anomaly, as the water characteristic of the Subtropical Mode Water (Masuzawa, 1969), were observed along northern part of Section I, II, and III, but it was not observed at the Kuroshio Extension area (Fig. 2c).

Extremely high saline water greater than 35 permil in upper layer, and high water temperature more than 5°C of 1000 m depth were observed at Stn. 63 (32°23'N, 141°25'E) along Section III (Fig. 2a, b). These values were scarcely observed in this area. Eastward geostrophic velocity and volume transport relative to 1000 db of the Kuroshio were estimated about 100 cm/sec, and 45 x $10^6 m^3$/sec during the cruise, which were underestimated values because of a eastward deep flow under the 1000 db surface.

The Kuroshio Countercurrent:

The Kuroshio Countercurrent were not strictly defined owing to scarcity of the hydrographic data around the interested area. Using long-term mean field of geopotential anomaly, Hasunuma and Yoshida (1978) indicated that the Kuroshio and the Kuroshio Countercurrent might form a subgyre in which the upper water characteristics were fairly uniform during winter, and that the Kuroshio Countercurrent might originate at the eastern end of the subgyre, near 30°N, 155°E, from that area a well-defined trough deeply penetrated westward, the current directed southwestward along the northern slope of the trough.

During this cruise a strong westward flow, which was seemed to be the Kuroshio Countercurrent, were observed around 32°N at Section IV with relative current speed of 40 cm/sec and transport of 17 x $10^6 m^3$/sec over 1000 db. This current extended west around 31°N at Section III, and 30°N at Section II and I. Volume transport of this current were estimated about 10 x $10^6 m^3$/sec, which corresponded to 20% upper transport of the Kuroshio.

Well-defined trough along each section appearing in the map of the dynamic topography were located 25°40'N, 26°15'N, 31°N at

Section II, III, IV, respectively. However, the deep trough observed at Section II and III were seemed to be disconnected from the Kuroshio Countercurrent.

The sea surface secondary density front distinguished the Kuroshio and the Kuroshio Countercurrent subgyre from another surface water. It was observed at Stns. 12 (27^{o}N), 19 (27^{o}N), 55 ($27^{o}30'$N), 45 ($28^{o}20'$N) with a density change from 290 to 330 cl/ton (Fig.2c). Changes in ocean variables around this front, 18^{o}C to 21^{o}C in water temperature and 34.9 to 35.1 permil in salinity, were associated with the density change (Fig. 2a, b).

The Subtropical Countercurrent:

The Subtropical Countercurrent associated with the characteristic density of the front, centered at 390 cl/ton in thermosteric anomaly was observed at the southern end of Section IV, $25^{o}40'$N, 147^{o}E. The results of hydrographical observation by Ryofu Maru, Japan Meteorological Agency (1982), indicated that the Subtropical Countercurrent was observed at 23^{o}N, 137^{o}E, with eastward direction at the end of former month January.

References

Hasunuma, K. and K. Yoshida (1978): Splitting of the Subtropical Gyre in the western North Pacific. J. Oceanogr. Soc. Japan, 34, 160-172.

Japan Meteorological Agency (1982): The results of marine meteorological and oceanographical observations. 69, 236pp.

Masuzawa, J. (1969): Subtropical Mode Water. Deep-Sea Res., 16, 463-472.

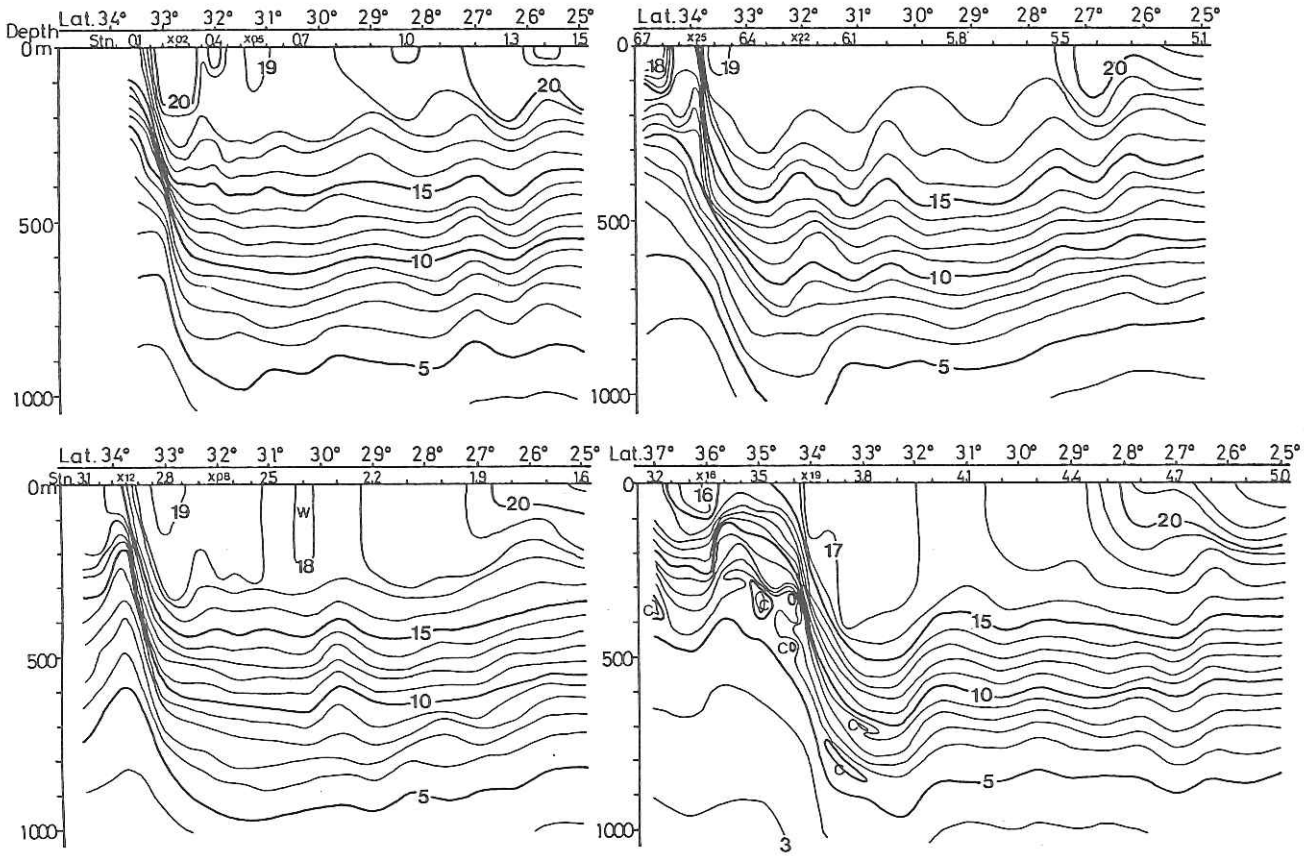

Fig. 2(a). Temperature(^{O}C) sections from the deep hydrographic section(Figure 1a) along 135^{O}E(upper left), 138^{O}30'E(lower left), southeast of Boso(35^{O}N,140^{O}E-25^{O}N,145^{O}E; upper right), and 147^{O}E(lower right). The sections have been detailed above 550 m by XBT data.

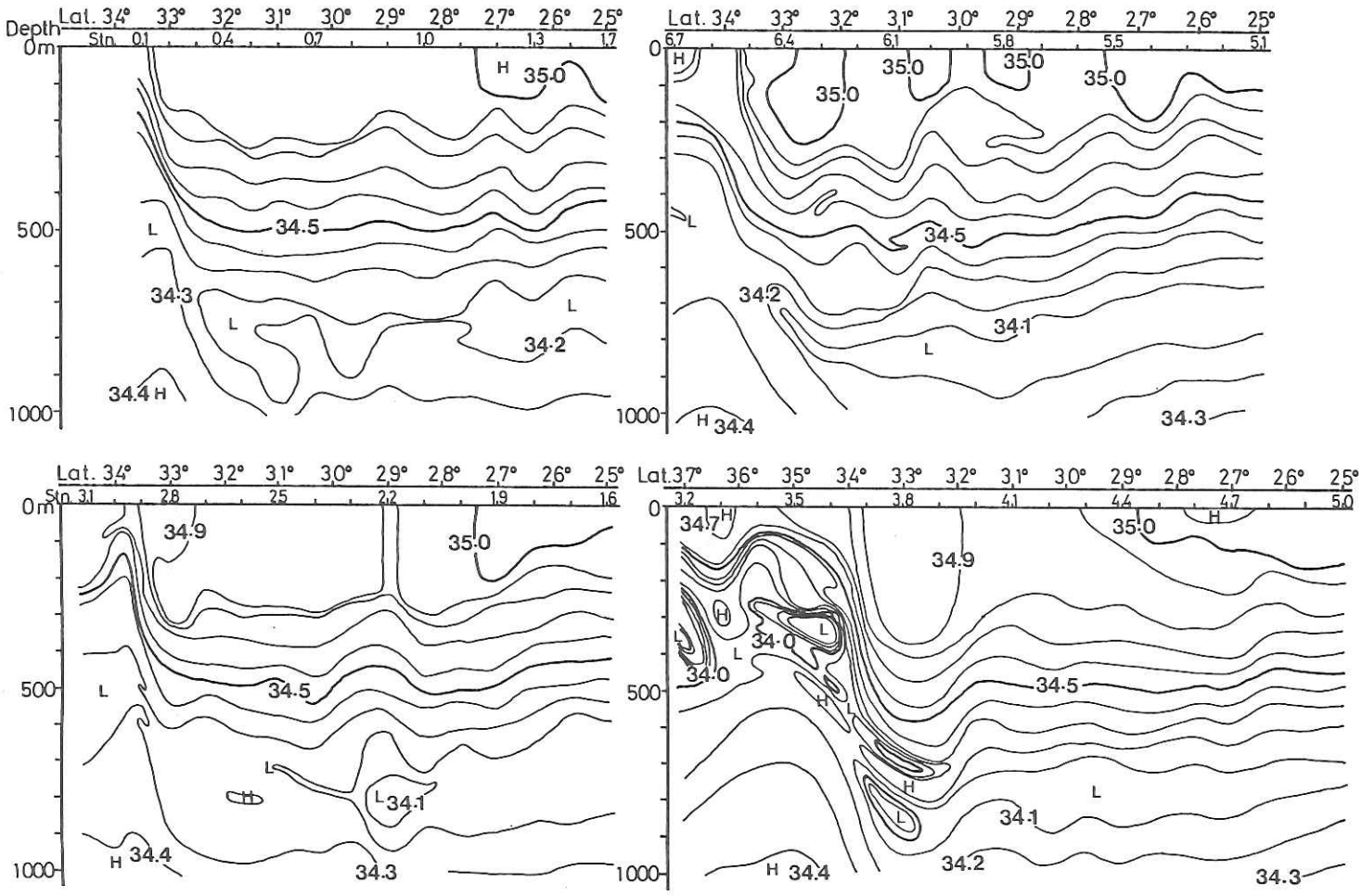

Fig. 2(b). As shown in Figure 2(a), but except salinity(permil).

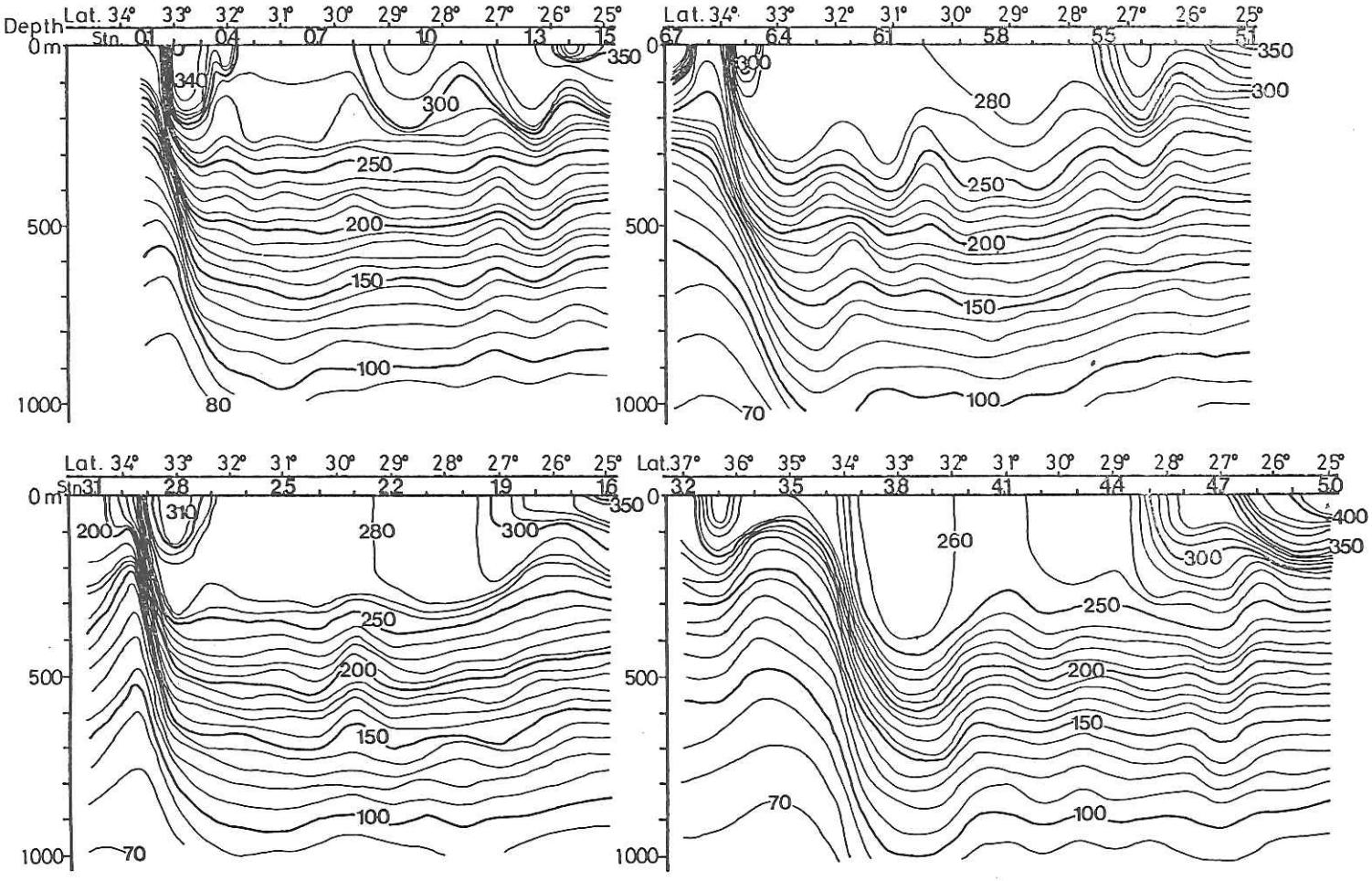

Fig. 2(c). As shown in Figure 2(a), but except thermosteric anomaly(Δst, cl/ton).

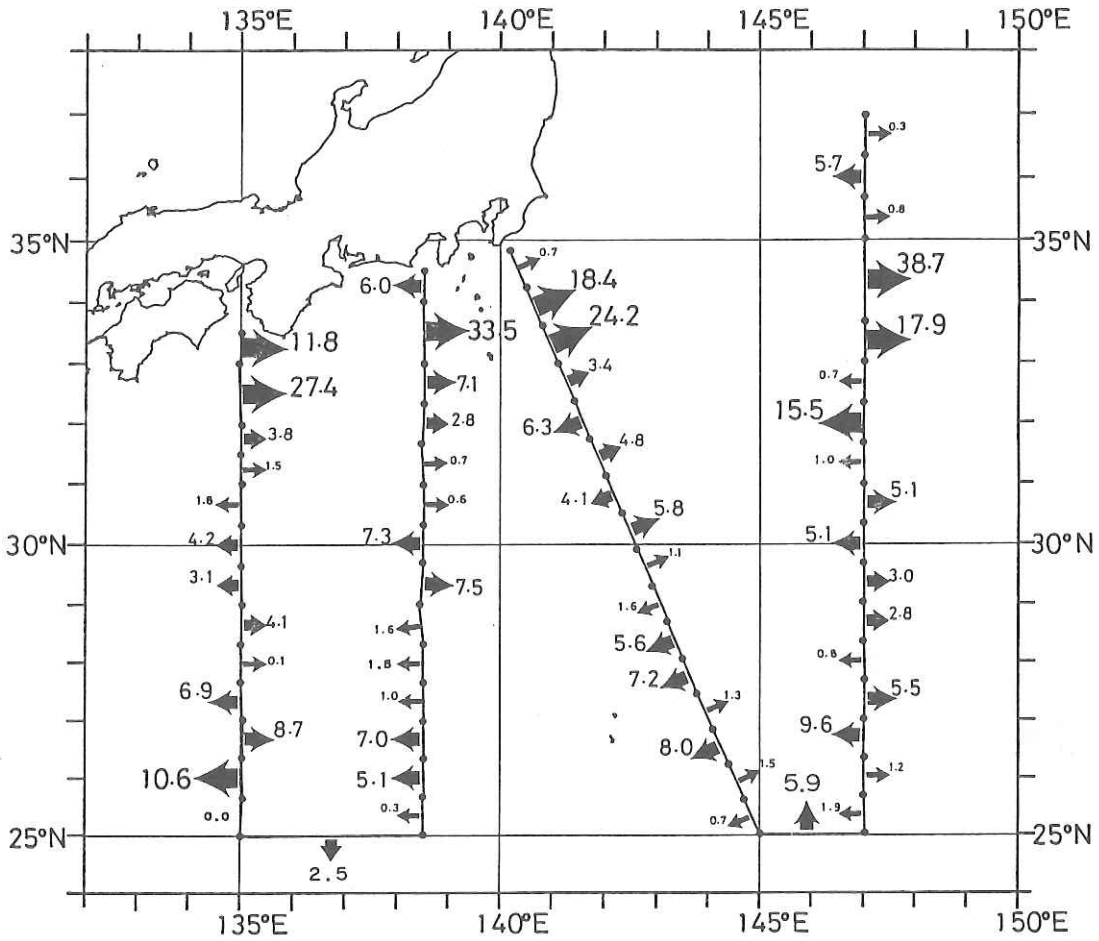

Fig. 3. Geostrophic volume transports(in 10^6 m^3/sec, relative to 1000 db) for the deep hydrographic section(Figure 1a).

3. Estimation of surface current by NNSS

T. Nakai and H. Otobe

Ship's drift data of NNSS (Navy Navigation Satellite System Hokushin Magnabox HX-1107) were collected during the cruise in order to estimate the surface currents in the Kuroshio and it's adjacent sea.

The accurate ship's positions were calculated by the orbital data and the integrated data of doppler frequency shift from the navigation satellite (TRANSIT) passed adjacent area of the vessel. The differences between ship's position fixed by satellite and dead reckoning correspond to the ship's drift. The update data in this area were obtained at interval about 1 or 2 hours.

These data plotted on the map is shown in Fig. 4. The values of the ship's drift include the wind effect. However, the drift data show the surface current approximately expect on the condition of strong wind speed. Especially, meander of the strong Kuroshio current in this area may be clearly evident from the drift data.

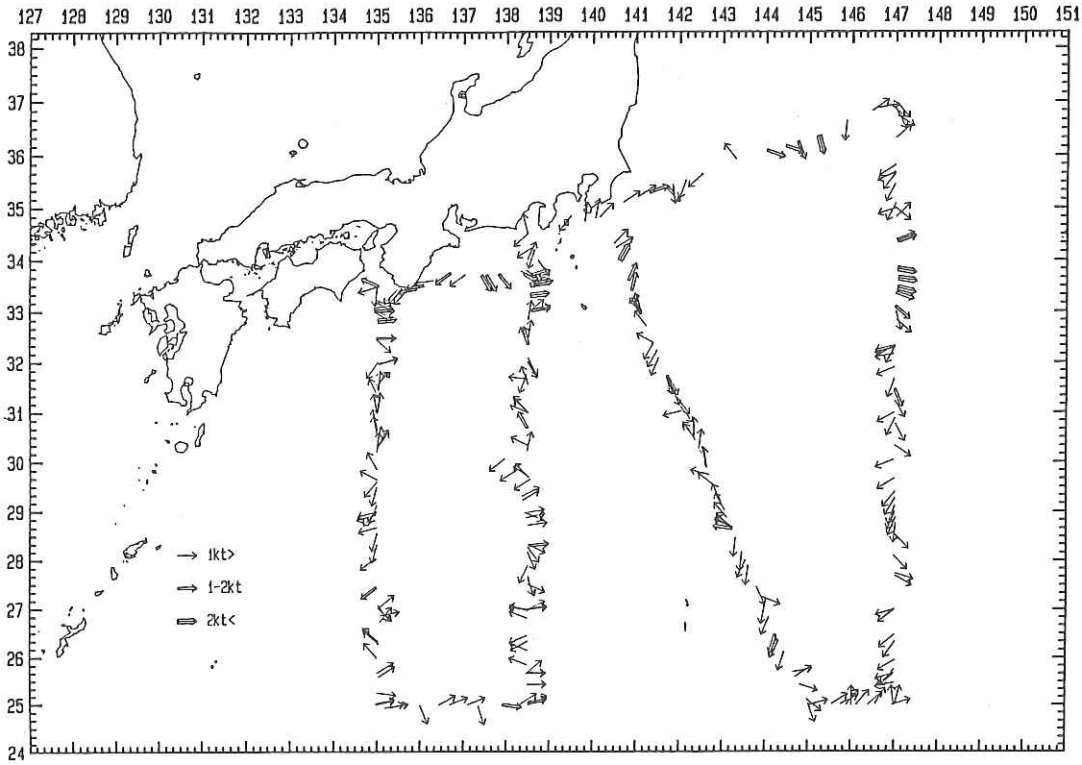

Fig. 4. Surface currents estimated from the ship's drift.

4. Radiation measurement and heat budget across the sea surface

H, Otobe and T. Nakai

Downward fluxes of short- and long-wave radiation were measured directly on board in order to estimate the heat budget across the sea surface of the Kuroshio and it's adjacent area off Honshu. A short-wave sensor (Pyranometer Model S-185, Ishikawa Sangyo Co., Tokyo) and a long-wave sensor (Ishikawa Radiometer Model RL-5) mounted on the gimbals respectively were installed on the handrail of the anti-rolling tank at the top of the vessel.

Heat budget across the sea surface (Q) is given by

$$Q = Rn - (lE + H) \qquad (1)$$

and

$$Rn = (1 - r)S\downarrow - \varepsilon(\sigma T^4 - L\downarrow), \qquad (2)$$

where Rn is the net radiation flux, lE latent heat flux, H sensible heat flux, r albedo, T sea surface temperature, ε emissibity of sea water, and σ Stefan-Boltzman constant, lE and H were estimated by an aerodynamic bulk method (Kondo, 1975) using the routine meteorological data obtained at 3 hour interval. Payne's table (Payne, 1972) was used for the values of r.

References

Kondo, J. (1975): Air-sea bulk transfer coefficients in diabatic condition. Boundary-Layer Meteorology, 9, 91-112.

Payne, R.E. (1972): Albedo of the sea surface. J. Atmospher. Sci., 29, 959-970.

Table 3. Mean values of heat fluxes during the leg I and leg II.

	$S\downarrow$	$rS\downarrow$	$L\downarrow$	$\varepsilon\sigma T^4$	Rn	E	H	Q
leg I	137	9	327	384	71	328	128	385
leg II	186	11	365	382	158	200	64	106

5. Kind, abundance and distribution of the fish larvae from KH-81-1 Cruise

A. Termvidchakorn and K. Kawaguchi

From the Hakuho Maru stations (Fig. 1a), fish larvae samples were caught by surface haul from 23 stations and oblique haul from 21 stations. There were 27 identified families of fish larvae in the former and 30 identified larvae in the latter numbering 10411 and 21535, respectively. Abundance of the larvae are shown in Figs. 5a and 5b. The fish larvae in decreasing order at the surface layer were Clupeidae, 86.17%; Gonostomatidae, 5.15%; Myctophidae, 4.45%; Bathylagidae, 2.07%; Sparidae, 0.47%; Bramidae, 0.22% while other identified families corresponded of 0.83%, leptocephalus 0.64% and unidentified families was 0.04%. The larvae collected by oblique haul consisted of, in decreasing order, Clupeidae, 90.46%; Gonostomatidae, 5.07%; Myctophidae, 2.32%; Bathylagidae, 0.96%; Sparidae, 0.51%; Scorpaenidae, 0.11%; other identified families 0.47%; leptocephalus, 0.06% and 0.04% of unidentified families.

Family Clupeidae

There were 8971 larvae from 11 positive stations at the surface haul while that of the oblique haul had 19483 from 12 positive stations. At Stn. 29, which yielded the most abundant of the clupeid larvae in both hauls, had 4223 larvae at the surface haul and 19483 larvae at the oblique haul. The distribution of clupeid larvae was found to be most at the southern part of Honshu near the shore.

Family Gonostomatidae

There were 536 larvae from 14 positive stations of surface haul while 1092 larvae from 20 positive stations were obtained from the oblique haul. Gonostomatid larvae was most abundant at Stn. 10 consisting of 153 larvae at the surface layer while for oblique haul was concentrated at Stn. 25 which had 130 larvae.

Family Bathylagidae

Surface haul from 8 positive stations yielded 216 larvae, and 6 positive stations of oblique haul had 206 larvae. The larvae were most abundant at Stn. 2 for both hauls with 78 larvae at the surface and 92 larvae at the oblique haul.

Family Myctophidae

The myctophid larvae consisted of 463 larvae from 14 positive stations at the surface layer and 500 larvae from 19 positive stations of the oblique haul. Stn. 10 gave the most abundant from the surface haul consisting of 171 larvae and at the oblique haul, most of the larvae were caught at Stn. 29 with 100 larvae.

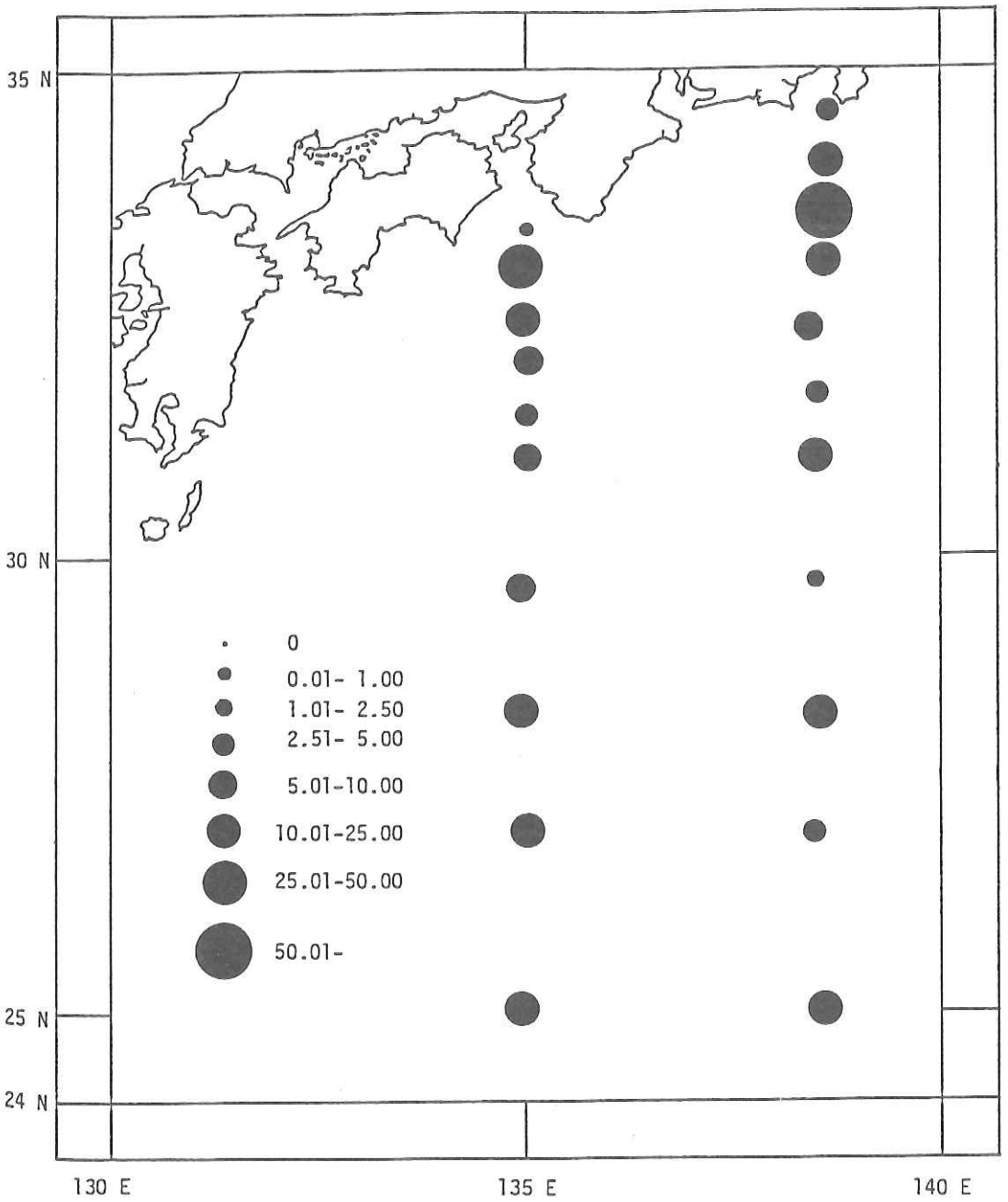

Fig. 5a. Occurrence of the fish larvae per 100 cubic meters from the Kuroshio and adjacent regions collected by ORI-69 net at the surface layer between February and March, 1981.

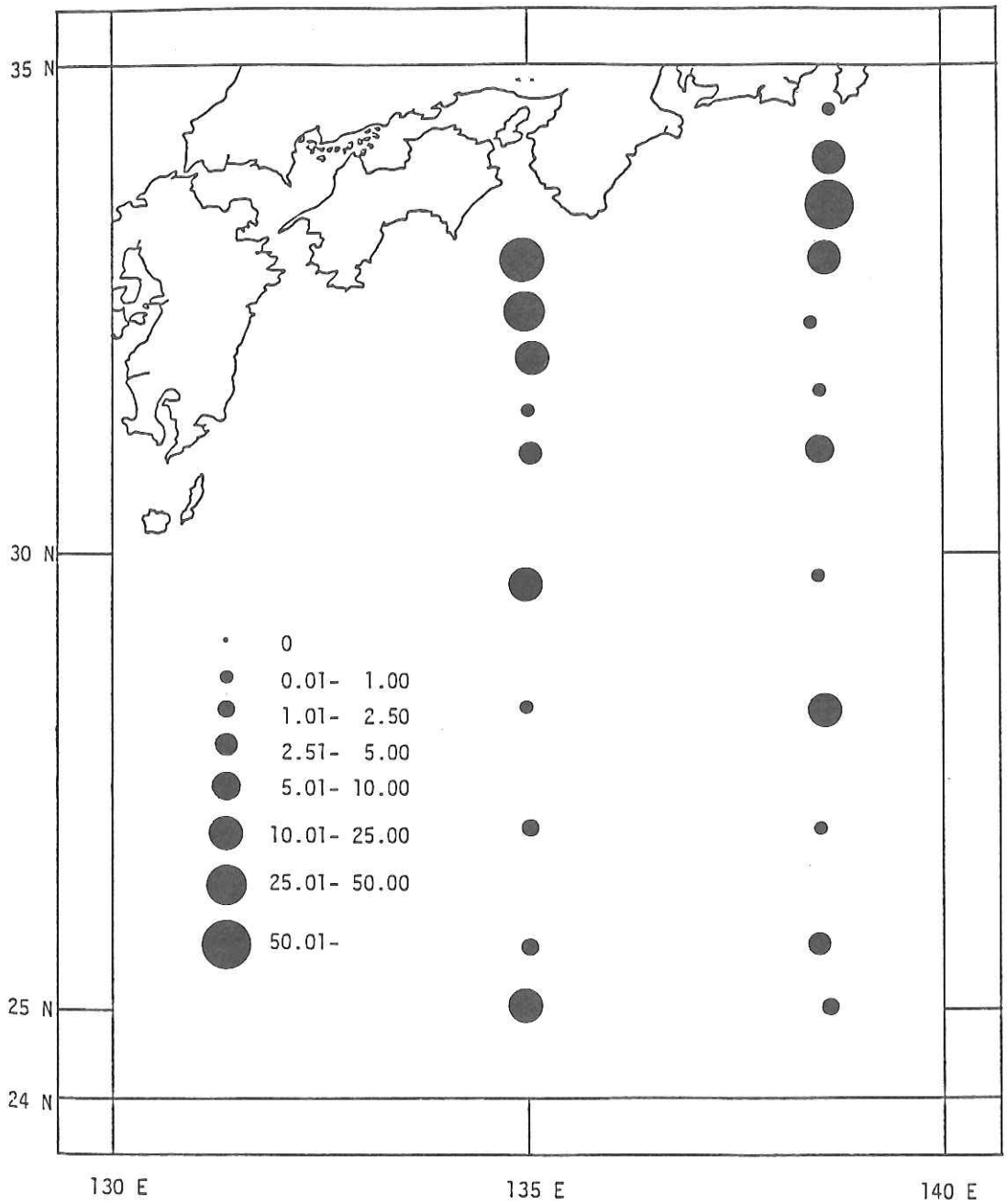

Fig. 5b. Occurrence of the fish larvae per 100 cubic meters from the Kuroshio and adjacent regions collected by oblique haul of ORI-69 net between February and March, 1981.

6. Distribution of ichthyoplankton collected with ORI net

H. Nakata, K. Matsuo, and H. Takeuchi

In order to clarify the characteristics of the distribution of ichthyoplankton in the sea around Kuroshio Extention areas, efforts were made for collecting ichthyoplankton at all stations of CTD observation except Stn. 22. A 160-cm ORI net, made of 0.69 mm mesh filtering cloth, was towed at the surface layer for 20 minutes at a speed of 2 knots. During the second leg of the cruise(Stn. 32-Stn. 67), in addition, tows were made obliquely through the layer of 0-200 meters.

The number of samples thus obtained by ORI-net tow amounted to 102 in total. The samples were all preserved in a 10 % formalin-sea water solution for later identification.

Table 4 shows total number of fish larvae and eggs per 100 cubic meters collected by surface tows at each station. "Temp.(^{O}C)" means the value of surface temperature at the location of net in. In the Kuroshio Front off the Omaezaki(Stns. 29, 30), high values of the total number of fish larvae were observed, which resulted from the abundance of elongated eel-like larvae. On the other hand, the occurrence of fish eggs were more concentrated and very high values were obtained at Stns. 66 and 60.

Table 4. Total number of fish larvae and eggs (No./100m^3) collected by ORI-net tows at the surface layer during the cruise

Stn.	Larvae	Eggs	Temp. (°C)	+	Stn.	Larvae	Eggs	Temp. (°C)
1	0.3	0.1	15.9	+	32	0.5	3.4	13.0
2	9.6	1.5	19.4	+	33	58.4	4.4	16.2
3	5.3	10.5	20.2	+	34	0.9	4.9	14.1
4	10.1	8.6	20.0	+	35	0.3	17.1	15.1
5	3.2	5.5	18.7	+	36	0.1	0.6	15.3
6	4.6	13.8	19.2	+	37	1.3	0.6	17.4
7	10.9	10.2	18.8	+	38	1.5	1.2	17.6
8	5.1	55.0	19.2	+	39	0.2	1.1	17.8
9	1.1	38.5	20.1	+	40	0.04	7.2	17.0
10	27.6	5.8	20.3	+	41	1.9	18.2	17.0
11	5.6	5.9	19.7	+	42	4.9	8.0	17.6
12	4.6	4.7	20.8	+	43	0.5	6.2	17.7
13	0.4	5.8	20.9	+	44	0.0	14.1	17.8
14	0.2	2.4	22.9	+	45	0.0	4.2	20.0
15	6.6	9.6	21.9	+	46	0.6	1.0	21.2
16	0.7	4.7	21.6	+	47	3.6	3.6	21.1
17	1.8	5.4	20.6	+	48	0.2	3.2	22.8
18	1.3	7.4	20.6	+	49	0.1	2.2	23.5
19	0.3	7.6	19.4	+	50	0.1	18.2	24.1
20	15.3	9.6	18.4	+	51	0.4	9.2	21.7
21	8.8	7.4	19.1	+	52	0.1	7.3	21.3
22	-	-	-	+	53	0.7	3.2	20.8
23	0.5	3.5	17.8	+	54	0.4	2.5	21.0
24	5.6	3.8	17.9	+	55	4.1	17.2	19.9
25	7.8	3.5	17.7	+	56	0.4	6.1	18.7
26	0.5	6.5	18.1	+	57	0.2	3.5	19.0
27	0.1	4.5	18.6	+	58	14.6	10.0	18.1
28	15.9	6.1	19.6	+	59	0.3	4.5	18.6
29	55.8	2.0	18.6	+	60	0.1	74.7	18.6
30	66.8	8.7	14.9	+	61	2.8	8.7	18.2
31	3.2	0.6	13.1	+	62	32.3	10.9	18.3
				+	63	0.3	3.9	18.4
				+	64	0.0	4.4	18.5
				+	65	1.0	10.5	19.4
				+	66	1.2	198.2	14.6
				+	67	18.8	6.9	18.6

7. Geographical distribution of diatoms

K. Ogawa and R. Marumo

In order to study the abundance and community structure of diatoms, water samples and NORPAC-net (0.10 mm in mesh aperture) samples were collected. Water samples of line G were taken from the seawater-tap of the laboratory during cruising. Water samples were collected with Van Dorn water samplers in the layers from the surface to 300 m depth at Stns. 1, 3, 6, 9, 12, 15, 16, 19, 25, 28, 29, 31. At the other stations of Section E and F, surface water samples were collected by a plastic bucket(Fig. 6).

Specimens collected from surface layers were examined with an inverted microscope to assess the abundance and species composition, and by a scanning electron microscope to examine species and fine structures. Cluster analysis (average linkage method) was carried out based on the values of the percentage similarity index of Whittaker for the surface diatom communities.

Six clusters were recognized. The dominant species in each cluster are shown in Table 5. and distribution of clusters is shown in Fig. 7.(Ogawa, 1982). The distribution of each cluster corresponds to the hydrography.

Reference

Ogawa, K. (1982): Studies on distribution ecology of planktonic diatoms in Tokyo Bay, Sagami Bay and the Kuroshio. Ph. D. Thesis, Univ. of Tokyo, 163 pp.

Table 5. Dominant species in clusters of similarity in Cruise KH-81-1

Cluster	Species
A	*Chaetoceros debile*
	Skeletonema costatum
	Chaetoceros didymum
	Chaetoceros radicans
B	*Thalassiosira diporocyclus*
C	*Thalassiosira* spp.
	Skeletonema costatum
	Nitzschia longissima
D	*Nitzschia pseudodelicatissima* complex
	Rhizosolenia sp. cf. 1
E	*Nitzschia pseudodelicatissima* complex
	Nitzschia longissima
	Thalassionema nitzschioides
F	*Nitzschia pseudodelicatissima* complex
	Mastogloia woodiana

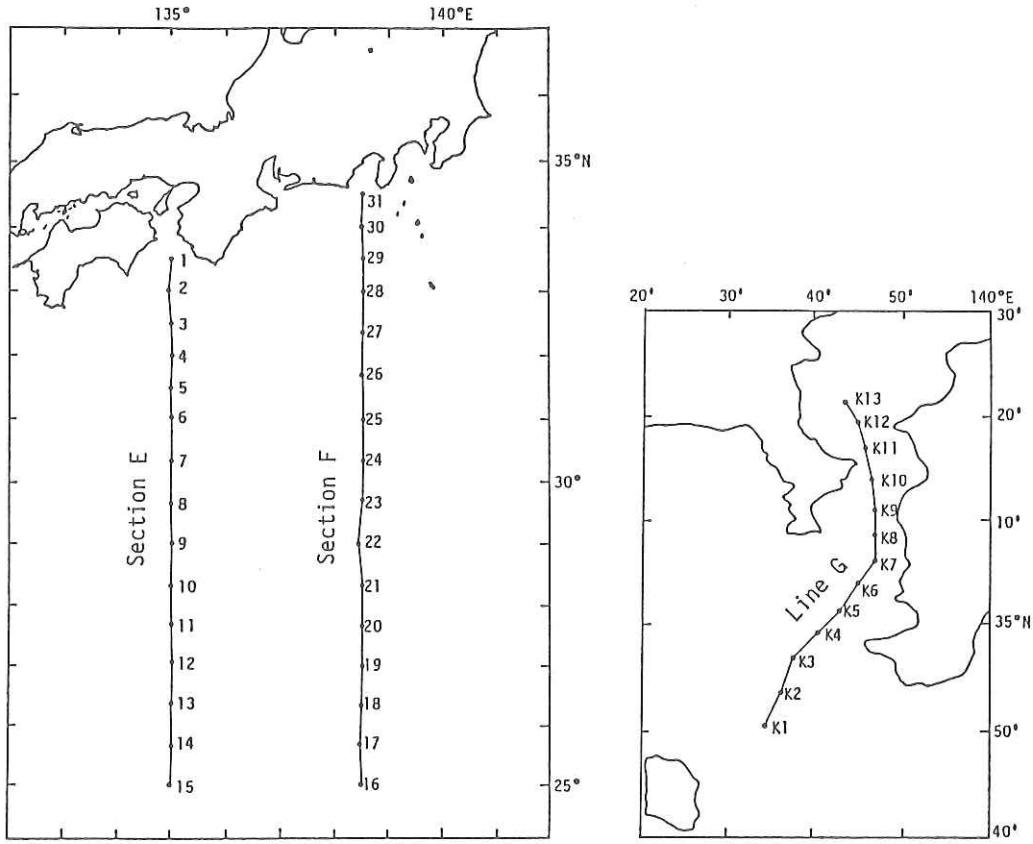

Fig. 6. Sampling stations in Cruise KH-81-1.

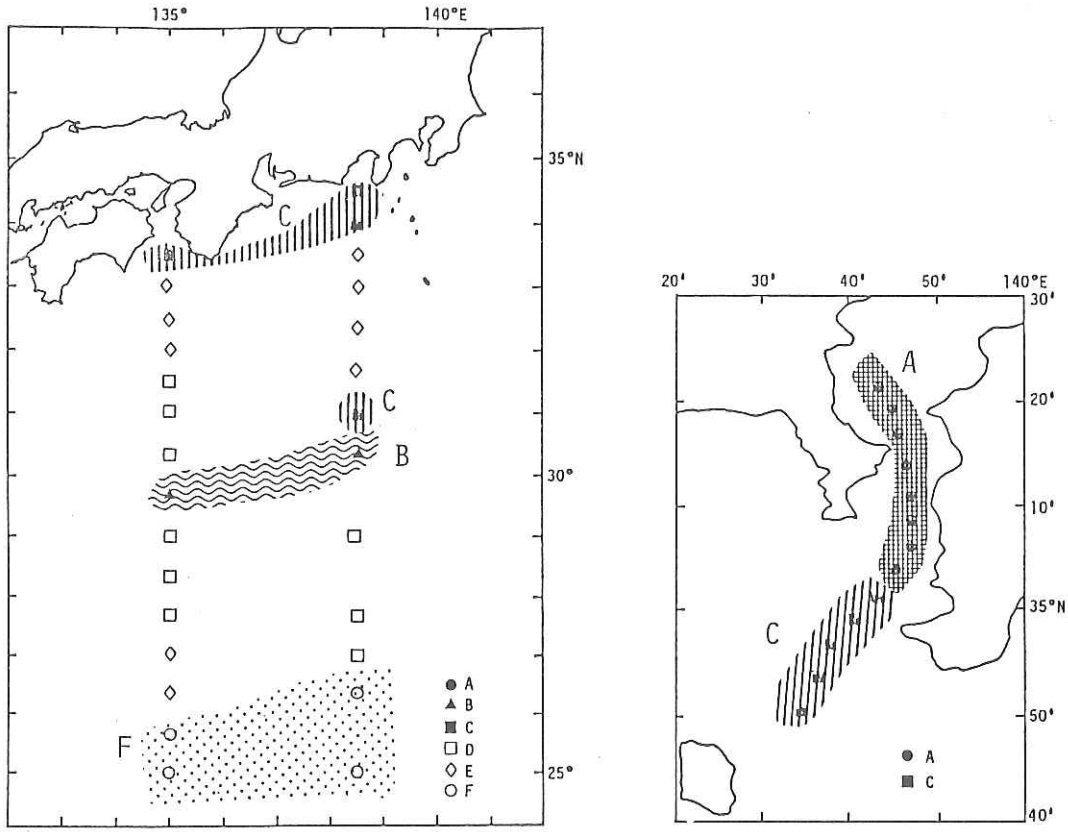

Fig. 7. Surface distribution of clusters of similarity of diatom communities in Cruise KH-81-1.

8. Sampling of neuston

Y. Matsuo

Neuston in the surface layer of the sea (0-10 cm and 10-30 cm layers) was collected using ORI neuston net at Stns. 1, 4, 6, 8, 10, 12, 13, 15, 16, 27, 28, 30, 33, 35, 38, 40, 47, 50, 51, 53, 57-67. ORI neuston net was towed during 30 minutes at the side of the vessel at a speed of two knots. Volume of water filtered in the 10-30 cm layer net was estimated from the value of the RGS flow meter fitted in the mouth part of the net. Volume of water filtered in the 0-10 cm layer net was calculated as half volume of the 10-30 cm layer net. At Stn. 57, neuston net was towed 4 times around sunset at intervals of 2 or 3 hours. At Stns. 66 and 67, neuston net was towed on March 9 and March 19-20. All the samples collected were fixed immediately and preserved in the borax-buffered formalin sea water.

9. In vivo fluorescence method for estimating standing crop and photosynthetic activity of marine phytoplankton

T. Yamamoto

Samuelsson and Öquist (1977) have recently reported that DCMU (dichlorophenyl dimethylurea)-induced step-up of in vivo fluorescence in a unialgal culture ($F_{+DCMU} - F_{-DCMU}$) shows a good correlation with photosynthetic activity of the culture as observed by the conventional ^{14}C-method. Slovacek and Hannan (1977) have demonstrated that DCMU added in vivo fluorescence (F_{+DCMU}) of a unialgal culture has a higher correlation than in vivo fluorescence with no DCMU addition (F_{-DCMU}) with acetone extract chlorophyll a fluorescence (Yentsch and Menzel, 1963); the latter has been widely used for estimating chlorophyll a concentration in natural aquatic systems.

In the present study, applying these new methods to natural phytoplankton community, photosynthetic activity was estimated and a correlativity comparison was made between in vivo fluorescence (F_{+DCMU} and F_{-DCMU}) and acetone extract fluorescence of phytoplankton chlorophyll a.

Vertical profiles of observed photosynthetic activity, $F_{+DCMU} - F_{-DCMU}$, in arbitrary unit and chlorophyll a concentration measured by the extraction method for sample waters taken at selected stations are illustrated in Fig. 8. Chlorophyll a concentrations tended to be high in the coastal area(Stns. 1, 31 and 67) and the perturbed area north of the Kuroshio Current (Stn. 32) compared with those in the oceanic area (Stns. 6, 15, 16, 25, 38, 50 and 62). Vertical profiles of photosynthetic activity as observed by the DCMU method showed a fairly good parallelism with those of chlorophyll a concentrations in each station.

All the data obtained during this cruise are plotted in Fig. 9. for correlation tests. Chlorophyll a fluorescence from acetone extract showed a higher correlation coefficient with F_{+DCMU} ($r = 0.94$) than with F_{-DCMU} ($r = 0.90$). F_{+DCMU} might be preferred as an index for estimating standing crop of natural phytoplankton. In vivo fluorescence method is considered to be a useful rapid survey technique because of its operational simplicity and can be utilized with necessary modifications in various fields of biological oceanography although there are several criticisms regarding absolute quantitative rigorousness of the method (Cullen and Renger, 1979; Roy and Legendre, 1979).

References

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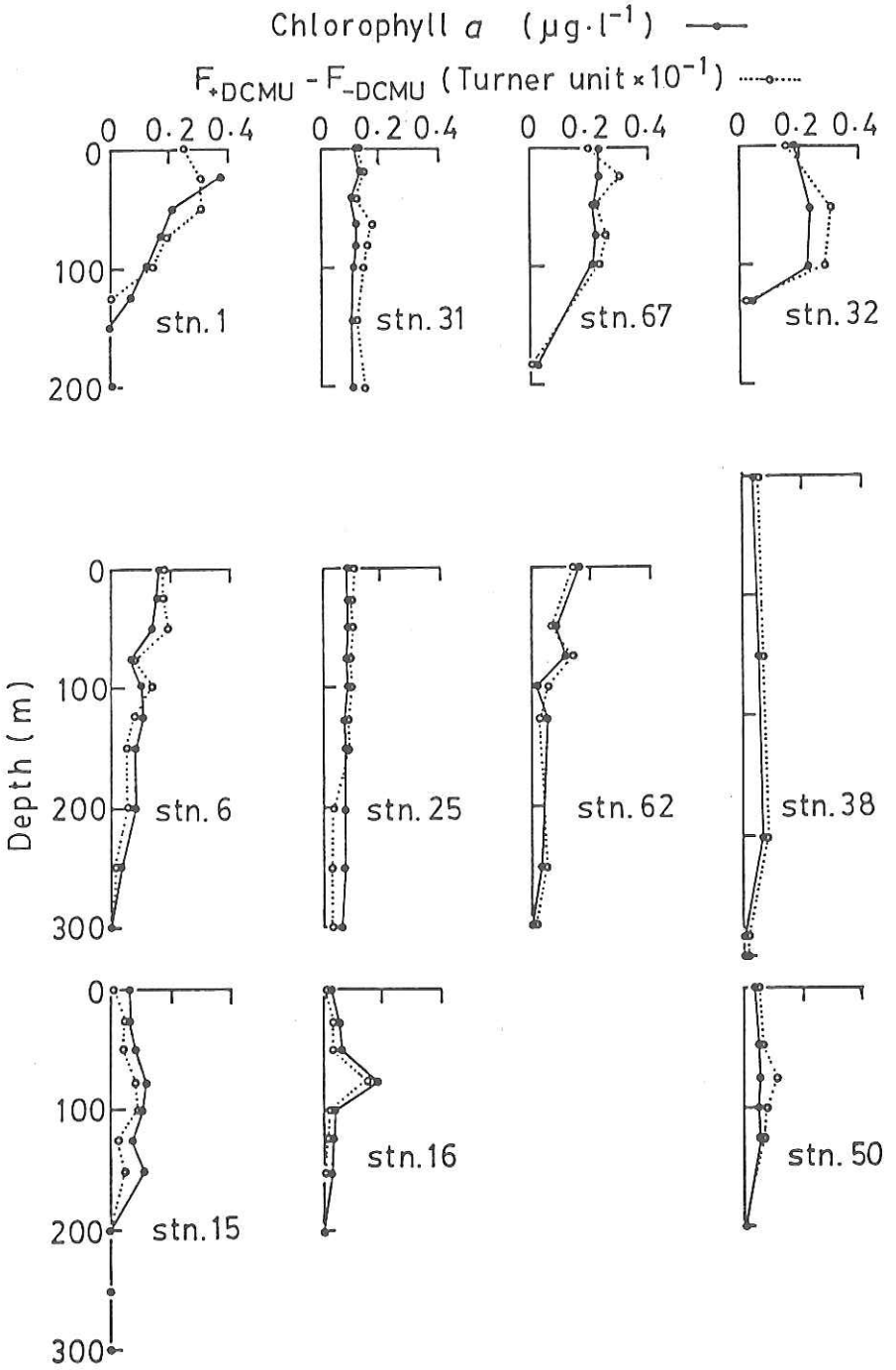

Fig. 8. Vertical profiles of photosynthetic activity, $F_{+DCMU} - F_{-DCMU}$, in arbitrary unit and chlorophyll a concentration measured by the extraction method at selected stations.

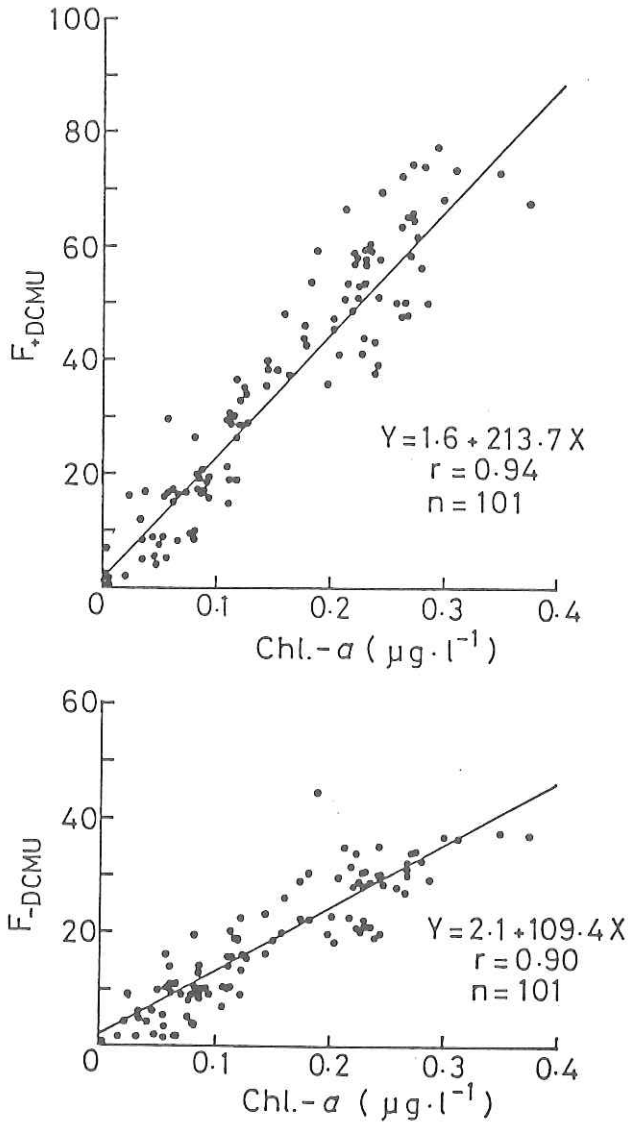

Fig. 9. Correlations between in vivo fluorescence(F_{+DCMU} and F_{-DCMU}) and acetone extract fluorescence of natural phytoplankton chlorophyll a.

10. Bacterial biomass and growth characteristics in Pacific Ocean

K. Kogure

Vertical profiles of bacteria and their growth characteristics with special emphasis on their size were investigated.

Seawater samples were collected with Niskin microbiological samplers (G.O.) at several off-shore stations in North-Western Pacific Ocean during KH-81-1 Cruise of Hakuho Maru. All the microbiological treatments were carried out on board immediately after sample collection. Bacterial total counts were obtained using epifluorescent microscopic method (Hobbie et al., 1977) on board. Their size spectrum was also clarified by combining differential filtration technique. For the growth experiments, seawater samples at the surface or from 400 m depth were used. The seawater was filtrated through Nuclepore filter of different size (0.4, 0.6, 0.8, 1.0, and 5.0 μm), followed by the incubation at 20 ^{o}C in a glass bottle with and without substrate. The growth was observed by the total count method.

The total counts of bacteria at the surface layer were 4.1 - 5.8 x 10^{5} per ml. The number decreased gradually with depth. Most bacteria passed through 5.0 μm filter, on which the bacteria attached to some particles were retained. About 90 % of bacteria also passed through 0.8 μm Nuclepore filter, whereas about half was retained on 0.4 μm filter. This spectrum was more or less similar regardless of the depth. During the incubation experiment, bacteria which had passed through 1.0 μm or less entered exponential growth phase after as long as 20 - 24 hours lag time. Especially, the fraction less than 0.4 μm took longer lag time.

This indicates that most of these small sized cells have slowed their metabolic activity probably due to the lack of sufficient nutrients in off-shore seawaters. Bacterial cells first increased the cell size to a certain level before starting active growth. The small sized cells didn't show any increase in number during the present incubation experiment. The growth rate of these cells in situ is estimated to be more than a couple of days. These results indicate that bacterial cells in natural seawaters have adapted to the low-nutrient condition by decreasing their size and slowing down metabolic activities. This seems to be their strategy to survive longer under unfavorable conditions.

Reference

Hobbie, J. E., R. J. Daley, and S. Jasper (1977): Use of Nuclepore filters for counting bacteria by fluorescence microscopy. Appl. Environ. Microbiol., 33, 1225-1228.

11. Temperature and current observations at the spawning grounds of mackerel south of Izu Peninsula using mooring systems

D. Inagake, K. Hasunuma and H. Nagae

In order to make clear mechanisms of movements and distributions of mackerel in relation to temperature and current conditions, temperature and current measurements were conducted at three stations in the spawning grounds of mackerel (Scomber japonicus), southeast of Izu Peninsula between Feb. 19 and Mar. 21, 1981.

The station location of moorings, DBT and XBT observations are shown in Fig. 1(b). Mooring observations were done at Omuro Dashi, Hyotan Se and Zeni Su, where mackerel was usually caught and spawned in this season. The depths of a current meter(MTCM-5A), a temperature recorder (DTR) and water were 75 m, 187 m and 230 m in the Omuro Dashi(OM) station, 43 m, 127 m and 145 m in the Hyotan Se(HM) station, and 125 m, 235 m and 280 m in the Zeni Su(ZM) station, respectively. DBT and XBT observations were done around the mooring stations in three legs, and echo sounder was operated throughout in this observation period.

Distributions of mackerel observed by echo sounder is shown in Fig. 10(a-c). In February 18-19, mackerel was observed scarcely, except in western part of Omuro Dashi (Fig. 10a). In March 1-3, a few schools of mackerel were observed intermittently in the northern part of Omuro Dashi and a part of Zeni Su, but there was no shape of mackerel in Hyotan Se (Fig. 10b). In March 19-23, there is little trace of mackerel in Omuro Dashi and Zeni Su, but many mackerels appeared in Hyotan Se (Fig. 10c). Similarly to this survey, mackerel was not caught by fishing boat around this survey area from the middle of February till early in March, and fishing of mackerel was resumed from March 11 around Hyotan Se(from the Japan Fisheries Information Center).

Time series of temperature and current at three mooring stations are shown in Figs 11(a-c). At the OM station (Fig. 11a), temperature was more or less than 14^{o}C between February 19 and March 8, and it increased more than 15^{o}C from March 8, after the current direction changed to south-southeastward. When the current speed was decreased between March 12 and 19, temperature also decreased to 13^{o}C. After south-southeastward current appeared from March 19, temperature increased rapidly.

Temperature at HM station(Fig. 11b), changed similar to one at the OM station, but current at the HM station moved to the opposite direction to one at the OM station. At the HM station, temperature increased with northeastward current from March 6 to 10, and also with east-northeastward current from March 19.

At the ZM station(Fig. 11c), temperature was not so stable as one at other two stations, and it changed different from others. Temperature at ZM station decreased from March 6 to 11 with northwestward current, contrary to the temperature increasing at other stations, and it increased rapidly with southeastward current from March 16, ahead of three days from others.

Mackerel fisheries were resumed from March 11, three days behind temperature increasing, and current direction changed from northwestward to southeastward at March 10. It suggests that the movements of mackerel schools are affected by the movement of a water mass rather than the temperature fluctuations.

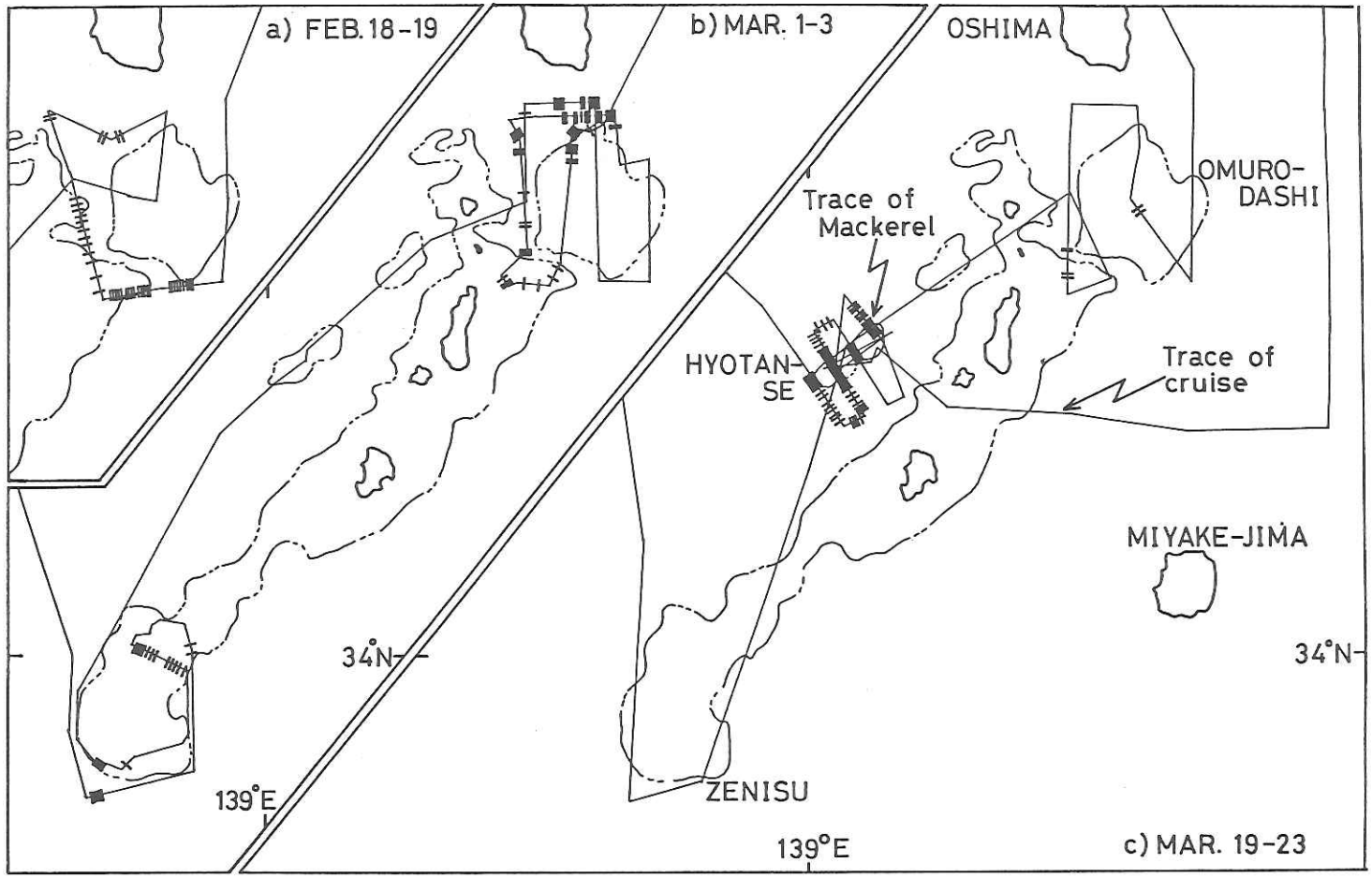

Fig. 10. Distribution of echo trace of mackerel at February 18-19(a), March 1-3(b), and March 19-23(c). Stick on the cruise line denotes trace of echo.

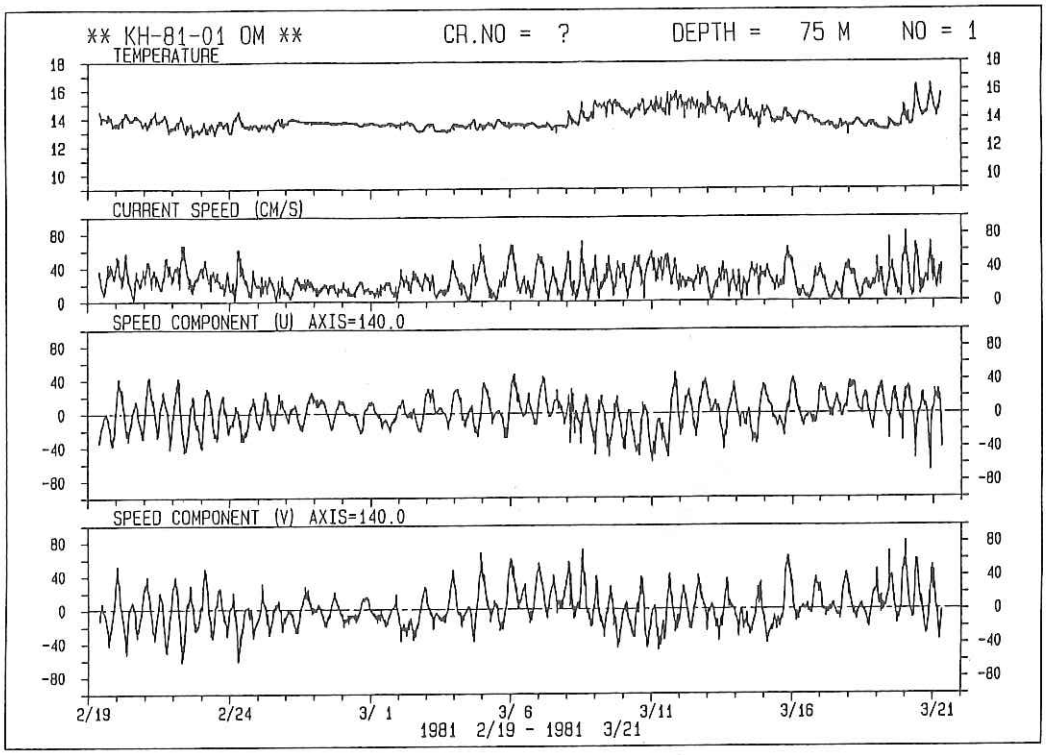

Fig. 11(a). Time series of temperature, current speed, zonal current component and meridional current component at the Omuro Dashi station.

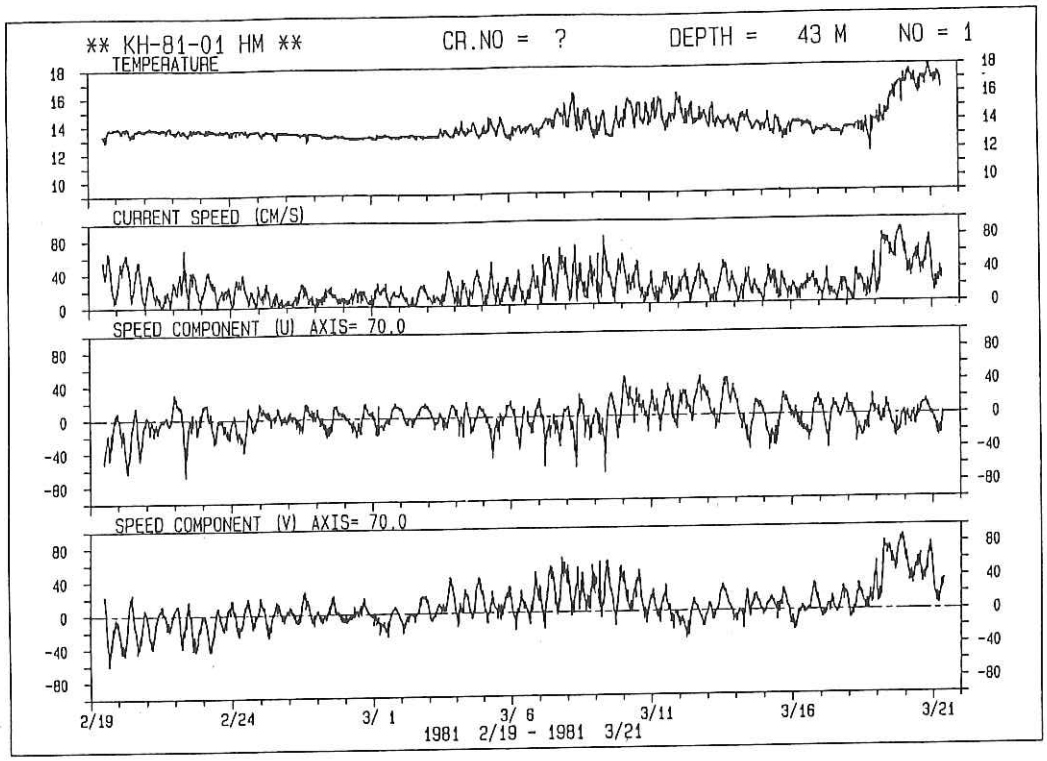

Fig. 11(b). As in Figure 11a, but except at the Hyotan Se station.

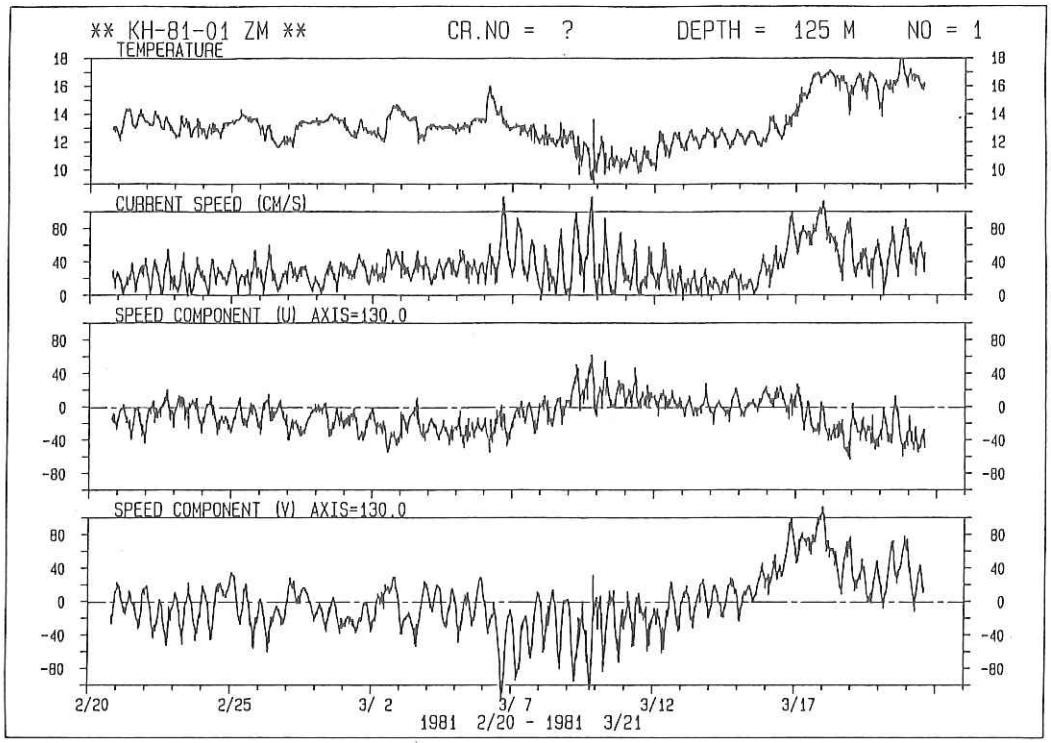

Fig. 11(c). As in Figure 11a, but except at the Zeni Su station.

Table 6. Summary of CTD data.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
01	2/20	1241	33-30.0	134-59.9	1050m
		1357	33-29.3	134-59.5	1150m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	15.873	34.750	239.6	0.000
10	15.876	.753	239.5	.024
20	15.863	.752	239.3	.048
30	15.859	.755	238.9	.072
50	15.856	.748	239.4	.120
*75	15.819	.744	238.9	.180
100	15.360	.669	234.6	.240
*125	14.116	.580	215.5	.297
150	13.329	.557	201.6	.349
200	11.724	.470	178.2	.446
250	9.794	.380	152.2	.530
300	8.695	.320	139.7	.605
350	8.183	.333	131.2	.675
400	7.617	.314	124.8	.743
450	6.826	.289	116.0	.807
500	6.360	.294	109.8	.867
550	5.855	.299	103.3	.923
600	5.273	.316	95.2	.977
650	5.075	.316	93.0	1.027
700	4.776	.330	88.7	1.076
750	4.528	.339	85.5	1.123
800	4.298	.362	81.4	1.167
850	4.100	.376	78.4	1.211
900	3.917	.387	75.8	1.253
950	3.756	.402	73.0	1.294
1000	3.625	.416	70.8	1.334

**

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
02	2/20	1904	33-00.7	134-57.1	1070m
		1959	33-00.7	134-58.8	1400m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	20.746	34.902	343.9	0.000
10	20.748	.900	344.0	.034
20	20.766	.902	344.4	.069
30	20.772	.901	344.6	.103
50	20.758	.907	343.8	.172
*75	20.684	.902	342.3	.259
100	20.622	.901	340.8	.345
*125	20.441	.918	334.9	.430
150	20.182	.900	329.6	.514
200	18.385	.838	290.2	.673
250	16.994	.764	263.3	.816
300	15.851	.759	238.5	.944
350	13.878	.684	203.1	1.060
400	10.239	.357	161.1	1.152
450	8.619	.316	138.9	1.230
500	6.911	.293	116.9	1.297
550	6.211	.299	107.6	1.357
600	5.624	.306	100.0	1.412
650	5.370	.307	97.1	1.465
700	4.892	.330	90.0	1.515
750	4.591	.352	85.2	1.563
800	4.316	.365	81.4	1.608
850	4.065	.381	77.7	1.651
900	3.847	.400	74.1	1.693
950	3.735	.412	72.1	1.733
1000	3.636	.414	71.0	1.773

**

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
03	2/21	0011	32-28.9	134-59.2	4480m
		0058	32-28.6	134-59.8	4480m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	20.352	34.932	331.7	0.000
10	20.346	.932	331.5	.033
20	20.350	.931	331.6	.066
30	20.368	.929	332.3	.100
50	20.378	.928	332.6	.166
*75	20.385	.931	332.5	.250
100	20.384	.933	332.4	.334
*125	20.366	.944	331.1	.419
150	20.358	.940	331.2	.501
200	18.681	.875	294.6	.663
250	18.107	.819	285.0	.811
300	17.200	.771	267.5	.953
350	15.878	.691	244.0	1.086
400	14.900	.645	226.7	1.208
450	13.836	.589	221.1	1.324
500	12.379	.493	188.4	1.430
550	10.948	.391	170.5	1.526
600	9.881	.333	157.1	1.614
650	8.519	.283	139.8	1.695
700	7.434	.228	128.6	1.767
750	6.875	.238	120.5	1.834
800	6.227	.262	110.5	1.897
850	5.695	.281	102.7	1.955
*900	5.150	.304	94.8	2.009
*950	4.498	.365	83.3	2.059
*1000	4.235	.406	77.5	2.103

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
04	2/21	0538	31-59.9	135-01.2	4460m
		0631	31-59.7	135-02.4	4425m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	20.080	34.923	325.4	0.000
10	20.080	.919	325.7	.032
20	20.084	.920	325.7	.065
30	20.090	.911	326.5	.098
50	20.092	.912	326.5	.163
*75	19.418	.853	314.0	.245
100	18.690	.907	292.5	.321
*125	18.469	.963	283.1	.393
150	18.319	.974	278.7	.465
200	18.288	.990	276.8	.606
250	17.549	.813	272.4	.748
300	16.565	.751	254.7	.882
350	15.694	.680	240.9	1.011
400	14.838	.620	227.2	1.134
450	13.996	.560	214.5	1.249
500	12.788	.473	197.5	1.358
550	11.647	.385	183.1	1.460
600	10.655	.337	169.5	1.554
650	9.282	.239	154.6	1.641
700	7.881	.171	139.0	1.720
750	7.142	.170	129.0	1.793
800	6.314	.165	118.8	1.860
850	5.891	.215	110.0	1.923
900	5.549	.274	101.6	1.981
950	5.052	.299	94.1	2.035
1000	4.567	.344	85.5	2.085

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
05	2/21	1102	31-30.0	135-00.0	2600m
		1146	31-30.0	135-00.1	2650m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.522	34.960	284.6	0.000
10	18.525	.962	284.5	.028
20	18.527	.971	283.9	.057
30	18.536	.963	284.7	.085
50	18.533	.969	284.2	.142
*75	18.510	.967	283.8	.214
100	18.466	.965	282.9	.285
*125	18.421	.961	282.1	.357
150	18.410	.959	282.0	.428
200	18.373	.944	282.2	.572
250	18.286	.938	280.6	.717
300	17.321	.804	267.9	.860
350	16.405	.731	252.6	.994
400	15.502	.671	237.4	1.122
450	14.556	.599	222.9	1.244
500	13.446	.515	207.0	1.358
550	12.423	.429	193.9	1.465
600	10.993	.329	175.8	1.563
650	9.492	.233	158.3	1.652
700	8.357	.198	143.8	1.734
750	7.481	.138	136.0	1.810
800	6.424	.142	121.9	1.880
850	5.542	.126	112.5	1.943
900	5.679	.249	104.9	2.002
950	5.312	.280	98.4	2.058
1000	4.737	.325	88.7	2.111

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
06	2/21	1609	31-01.6	135-00.8	4290m
		1707	31-01.6	135-00.7	4290m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	19.061	34.986	295.6	0.000
10	19.074	.989	295.7	.030
20	19.082	.992	295.7	.059
30	19.082	.988	296.1	.089
50	19.021	.973	295.7	.148
*75	18.779	.963	290.5	.222
100	18.709	.980	287.6	.295
*125	18.695	.972	287.8	.368
150	18.693	.975	287.6	.441
200	18.688	.984	286.8	.587
250	18.190	.848	284.8	.734
300	17.103	.772	265.3	.874
350	16.171	.718	248.4	1.008
400	15.223	.633	234.3	1.134
450	14.321	.561	221.0	1.253
500	13.151	.497	202.6	1.366
550	12.234	.417	191.3	1.471
600	11.125	.328	178.2	1.570
650	9.835	.245	162.8	1.661
700	8.741	.173	151.3	1.746
750	7.865	.180	138.1	1.824
800	7.251	.236	125.6	1.895
850	6.042	.137	117.6	1.961
900	5.379	.146	109.2	2.023
950	4.960	.169	102.8	2.081
1000	4.616	.227	94.8	2.134

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
07	2/21	2335	30-19.7	135-00.4	4600m
	2/22	0019	30-19.7	135-00.8	4620m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.753	34.972	289.2	0.000
10	18.753	.972	289.2	.029
20	18.755	.973	289.2	.058
30	18.757	.974	289.2	.087
50	18.764	.973	289.5	.145
*75	18.765	.978	289.1	.218
100	18.764	.970	289.6	.291
*125	18.690	.976	287.4	.364
150	18.665	.963	287.8	.437
200	18.553	.961	285.3	.582
250	18.429	.952	282.9	.728
300	17.190	.780	266.6	.871
350	16.312	.746	249.5	1.003
400	15.518	.667	238.1	1.131
450	14.560	.591	223.6	1.253
500	13.416	.500	207.5	1.367
550	12.301	.434	191.3	1.473
600	11.087	.337	176.8	1.573
650	10.002	.297	161.7	1.664
700	8.881	.214	150.4	1.749
750	7.825	.234	133.5	1.826
800	6.788	.243	119.0	1.895
850	6.082	.262	108.7	1.957
900	5.396	.252	101.4	2.015
950	4.964	.309	92.4	2.068
1000	4.495	.308	87.5	2.118

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
08	2/22	0442	29-39.3	135-00.0	4730m
		0530	29-38.7	134-59.9	4750m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	19.212	34.984	299.5	0.000
10	19.236	.987	299.9	.030
20	19.238	.987	299.9	.060
30	19.206	.984	299.4	.090
50	18.969	.986	293.4	.149
*75	18.878	.984	291.4	.223
100	18.700	.974	287.8	.296
*125	18.356	.942	281.9	.368
150	18.240	.946	278.9	.439
200	18.213	.944	278.4	.581
250	18.143	.936	277.3	.724
300	16.634	.749	256.4	.861
350	15.984	.720	244.2	.990
400	14.867	.608	228.7	1.114
450	13.663	.539	209.5	1.228
500	12.992	.485	200.4	1.337
550	11.952	.418	186.2	1.440
600	10.517	.321	168.4	1.535
650	9.251	.270	151.8	1.622
700	8.084	.220	138.2	1.700
750	7.122	.199	126.6	1.772
800	6.030	.130	118.0	1.839
850	5.447	.161	108.8	1.900
900	4.899	.175	101.7	1.957
950	4.716	.249	94.2	2.010
1000	4.468	.314	86.7	2.060

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
09	2/22	1019	29-00.1	135-00.9	4800m
		1104	29-00.2	134-59.6	4800m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	19.795	34.979	314.2	0.000
10	19.787	.987	313.5	.031
20	19.777	.989	313.0	.063
30	19.763	.986	312.9	.094
50	19.698	.975	312.1	.157
*75	19.445	.973	306.0	.234
100	19.431	.970	305.9	.312
*125	19.338	.967	303.8	.388
150	19.072	.929	300.1	.465
200	17.790	.828	276.9	.612
250	16.862	.778	259.4	.749
300	16.098	.732	245.8	.879
350	15.407	.663	236.0	1.005
400	14.905	.627	228.1	1.126
450	13.899	.547	213.6	1.243
500	12.690	.444	197.8	1.351
550	11.453	.354	181.9	1.451
600	10.007	.304	161.2	1.543
650	8.738	.239	146.4	1.626
700	7.655	.216	132.6	1.701
750	6.834	.209	122.1	1.769
800	6.185	.217	113.3	1.833
850	5.471	.220	104.7	1.893
900	5.097	.295	94.9	1.947
950	4.674	.314	88.9	1.998
1000	4.348	.354	82.5	2.046

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
10	2/22	1600	28-19.7	134-59.8	4930m
		1647	28-19.4	134-59.8	4930m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	20.259	.955	327.6	0.000
10	20.261	.958	327.4	.033
20	20.221	.955	326.6	.066
30	20.185	.955	325.7	.098
50	20.016	.975	320.0	.163
*75	19.911	.991	316.3	.243
100	19.879	.986	315.8	.323
*125	19.777	.979	313.8	.403
150	19.429	.972	305.7	.481
200	19.188	.961	300.6	.635
250	18.012	.823	282.5	.785
300	16.952	.785	260.9	.924
350	16.257	.729	249.5	1.057
400	15.109	.643	231.2	1.183
450	14.361	.583	220.2	1.302
500	13.147	.501	202.3	1.414
550	11.536	.353	183.5	1.516
600	10.569	.343	167.6	1.610
650	9.202	.262	151.7	1.696
700	7.816	.219	134.6	1.773
750	6.966	.198	124.7	1.844
800	6.448	.208	117.3	1.910
850	5.868	.216	109.6	1.971
900	5.176	.249	99.2	2.029
950	4.507	.303	88.0	2.080
1000	4.232	.310	84.7	2.128

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
11	2/22	2146	27-40.8	135-00.0	3250m
		2247	27-40.4	134-59.6	3380m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	19.660	34.986	310.4	0.000
10	19.664	.992	310.0	.031
20	19.669	.995	309.9	.062
30	19.672	.990	310.4	.093
50	19.622	.992	309.0	.155
*75	19.394	.980	304.2	.232
100	19.035	.979	295.5	.308
*125	19.007	.978	295.0	.383
150	18.968	.981	293.8	.457
200	18.710	.971	288.3	.606
250	18.322	.887	285.1	.752
300	16.952	.779	261.3	.893
350	16.209	.724	248.8	1.026
400	15.311	.654	234.6	1.152
450	14.526	.602	222.1	1.272
500	12.902	.486	198.6	1.384
550	11.601	.406	180.7	1.486
600	10.282	.315	164.9	1.579
650	9.411	.276	153.9	1.665
700	8.412	.233	142.0	1.745
750	7.105	.212	125.4	1.818
800	6.434	.196	118.0	1.884
850	5.648	.241	105.2	1.945
900	5.227	.268	98.4	2.001
950	4.695	.275	92.0	2.054
1000	4.205	.317	83.8	2.102

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
12	2/23	0232	27-01.2	135-01.1	3850m
		0323	27-01.1	135-01.8	3850m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	20.794	35.020	336.6	0.000
10	20.794	.025	336.2	.034
20	20.802	.020	336.7	.067
30	20.802	.021	336.7	.101
50	20.653	34.999	334.5	.168
*75	20.228	.997	323.8	.251
100	20.070	35.008	319.0	.332
*125	20.054	.005	318.8	.413
150	19.848	34.979	315.5	.493
200	18.024	.834	282.0	.646
250	17.197	.799	265.4	.787
300	16.570	.740	255.6	.922
350	15.452	.671	236.4	1.049
400	14.206	.571	217.9	1.168
450	13.323	.500	205.7	1.280
500	11.760	.393	184.5	1.383
550	10.798	.338	171.8	1.477
600	9.150	.238	152.7	1.566
650	8.121	.196	140.5	1.646
700	7.231	.174	129.9	1.718
750	6.195	.167	117.2	1.785
800	5.594	.152	111.2	1.847
850	4.986	.209	100.1	1.903
900	4.682	.254	93.5	1.956
950	4.343	.291	87.2	2.005
1000	4.107	.320	82.7	2.052

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
13	2/23	0944	26-21.0	135-00.9	4860m
		1029	26-21.6	135-00.6	4860m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	20.794	35.011	337.2	0.000
10	20.800	.005	337.7	.034
20	20.792	.010	337.2	.067
30	20.794	.011	337.2	.101
50	20.790	.011	337.1	.169
*75	20.778	.008	337.0	.254
100	20.752	34.996	337.2	.339
*125	20.680	35.003	334.9	.424
150	20.663	34.991	335.3	.508
200	20.384	.996	327.8	.677
250	18.656	.833	297.0	.840
300	17.124	.771	265.8	.986
350	16.049	.721	245.5	1.118
400	15.556	.679	238.0	1.245
450	14.684	.612	224.6	1.366
500	13.394	.501	207.0	1.481
550	11.838	.401	185.3	1.585
600	10.372	.303	167.3	1.680
650	9.223	.235	154.0	1.766
700	7.867	.182	138.1	1.843
750	6.814	.168	124.9	1.913
800	6.019	.159	115.7	1.979
850	5.510	.196	106.9	2.039
900	4.993	.222	99.2	2.096
950	4.410	.264	89.9	2.148
1000	4.053	.303	83.3	2.195

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
14	2/23	1514	25-39.0	135-01.3	4750m
		1605	25-39.7	135-01.9	4760m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	22.907	35.036	391.5	0.000
10	22.909	.033	391.8	.039
20	22.861	.022	391.3	.078
30	22.531	.002	383.7	.117
50	21.137	34.963	349.5	.190
*75	20.676	.979	336.5	.276
100	20.225	.966	325.9	.359
*125	19.794	.918	318.6	.440
150	19.224	.898	306.0	.520
200	18.417	.866	288.9	.670
250	17.144	.788	265.0	.813
300	16.209	.714	249.5	.947
350	15.204	.637	233.6	1.072
400	14.432	.572	222.4	1.191
450	12.932	.490	198.9	1.300
500	11.876	.398	186.2	1.403
550	10.335	.301	166.9	1.497
600	8.896	.221	150.0	1.582
650	7.871	.199	136.8	1.659
700	6.682	.134	125.8	1.731
750	5.889	.155	114.4	1.795
800	5.507	.212	105.7	1.854
850	5.151	.217	101.3	1.911
900	4.672	.262	92.8	1.964
950	4.285	.295	86.3	2.013
1000	3.998	.324	81.2	2.059

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
15	2/23	2018	25-00.0	134-59.1	5250m
		2107	25-00.4	134-59.0	5250m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	21.548	35.030	355.4	0.000
10	21.405	.018	352.6	.035
20	21.355	.024	350.8	.071
30	21.240	.012	348.7	.106
50	21.047	.023	342.8	.175
*75	20.956	.020	340.7	.261
100	20.807	.001	338.3	.346
*125	20.738	.004	336.3	.432
150	20.614	34.991	334.0	.517
200	18.730	.842	298.1	.680
250	17.058	.779	263.7	.823
300	16.195	.727	248.3	.955
350	15.144	.649	231.5	1.080
400	13.901	.532	214.7	1.197
450	12.575	.445	195.6	1.304
500	11.710	.404	182.8	1.404
550	10.153	.288	164.8	1.497
600	8.462	.221	143.6	1.580
650	7.817	.197	136.2	1.655
700	6.961	.188	125.3	1.725
750	6.522	.187	119.8	1.791
800	5.569	.191	108.0	1.854
850	5.123	.247	98.8	1.910
900	4.781	.258	94.2	1.963
950	4.459	.301	87.7	2.013
1000	4.093	.331	81.6	2.059

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
16	2/24	1602	25-00.8	138-30.5	5260m
		1659	25-00.9	138-31.6	5180m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	21.459	35.049	351.7	0.000
10	21.314	.035	349.0	.035
20	21.010	.020	342.1	.070
30	20.836	.020	337.7	.104
50	20.685	.010	334.5	.171
*75	20.368	34.987	328.1	.255
100	19.567	.961	309.9	.335
*125	19.320	.991	301.6	.412
150	19.240	35.001	299.0	.488
200	18.736	34.886	295.0	.640
250	16.864	.773	259.8	.782
300	15.911	.709	243.4	.912
350	14.801	.614	226.9	1.035
400	13.828	.547	212.2	1.149
450	12.544	.438	195.5	1.256
500	11.278	.363	178.2	1.355
550	10.195	.296	164.9	1.447
600	8.649	.195	148.3	1.531
650	7.337	.151	133.0	1.606
700	6.447	.130	123.1	1.675
750	5.638	.129	113.4	1.739
800	5.136	.150	106.1	1.797
850	4.856	.204	99.1	1.853
900	4.454	.236	92.4	1.905
950	4.164	.273	86.7	1.954
1000	3.971	.304	82.5	2.001

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
17	2/24	2356	25-40.4	138-29.3	4780m
	2/25	0049	25-40.5	138-29.6	4780m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	20.468	35.074	324.3	0.000
10	20.476	.070	324.8	.032
20	20.488	.079	324.5	.065
30	20.478	.082	324.0	.097
50	20.296	.073	320.0	.162
*75	19.449	.013	303.2	.241
100	19.087	.015	294.2	.316
*125	18.770	34.979	289.1	.390
150	18.484	.936	285.4	.463
200	17.222	.832	263.6	.603
250	16.536	.770	252.7	.736
300	15.814	.697	242.2	.864
350	15.021	.623	230.8	.987
400	13.997	.561	214.5	1.104
450	12.839	.445	200.5	1.214
500	11.531	.345	184.0	1.316
550	10.073	.265	165.2	1.409
600	8.571	.176	148.5	1.492
650	7.637	.160	136.5	1.569
700	6.402	.126	122.8	1.639
750	5.790	.135	114.8	1.703
800	5.245	.148	107.5	1.763
850	4.909	.182	101.3	1.819
900	4.526	.226	93.9	1.872
950	4.213	.267	87.7	1.922
1000	3.955	.308	82.1	1.968

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
18	2/25	0510	26-20.2	138-30.3	4650m
		0559	26-20.1	138-29.7	4645m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	20.508	35.086	324.4	0.000
10	20.506	.089	324.2	.032
20	20.485	.087	323.8	.065
30	20.427	.083	322.6	.097
50	20.294	.081	319.4	.161
*75	19.617	.056	304.2	.240
100	19.313	.027	298.9	.316
*125	19.002	34.989	294.0	.391
150	18.664	.951	288.6	.465
200	17.278	.825	265.4	.607
250	16.794	.803	256.0	.740
300	16.118	.734	246.1	.870
350	15.519	.686	236.7	.996
400	14.385	.574	221.3	1.117
450	13.147	.474	204.2	1.230
500	11.883	.392	186.8	1.333
550	10.628	.310	171.0	1.428
600	9.534	.259	157.1	1.517
650	8.480	.199	145.5	1.598
700	7.631	.160	136.4	1.674
750	6.384	.135	121.9	1.744
800	5.789	.156	113.2	1.808
850	5.299	.171	106.4	1.868
900	4.711	.213	96.9	1.923
950	4.396	.251	90.7	1.974
1000	4.187	.281	86.3	2.023

**

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
19	2/25	0955	26-59.6	138-29.9	4870m
		1040	26-59.6	138-29.8	4870m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	19.373	35.025	300.5	0.000
10	19.368	.028	300.1	.030
20	19.359	.028	299.9	.060
30	19.348	.033	299.3	.090
50	19.357	.023	300.2	.150
*75	19.348	.025	299.9	.226
100	19.332	.029	299.1	.301
*125	19.199	.017	296.8	.377
150	19.074	34.998	295.1	.452
200	18.850	.990	290.3	.600
250	18.179	.856	284.0	.748
300	16.660	.747	257.1	.887
350	15.942	.712	243.9	1.017
400	15.068	.645	230.2	1.141
450	14.444	.599	220.6	1.259
500	12.992	.472	201.4	1.371
550	11.913	.411	185.9	1.473
600	10.620	.337	168.9	1.569
650	9.455	.254	156.2	1.655
700	8.465	.173	147.2	1.737
750	7.278	.165	131.2	1.812
800	5.920	.137	116.1	1.879
850	5.483	.181	107.8	1.940
900	4.872	.207	99.0	1.997
950	4.828	.212	98.2	2.050
1000	4.651	.209	96.5	2.104

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
20	2/25	1848	27-39.1	138-30.1	4700m
		1940	27-38.8	138-30.4	4680m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.416	34.940	283.5	0.000
10	18.415	.942	283.3	.028
20	18.420	.941	283.6	.057
30	18.418	.946	283.1	.085
50	18.428	.939	283.9	.142
*75	18.428	.941	283.7	.213
100	18.401	.948	282.6	.285
*125	18.363	.941	282.2	.356
150	18.360	.939	282.2	.428
200	18.310	.938	281.1	.572
250	18.243	.939	279.3	.715
300	17.473	.865	266.9	.857
350	16.719	.790	255.3	.992
400	15.716	.693	240.4	1.122
450	14.703	.624	224.2	1.245
500	13.349	.518	204.9	1.357
550	11.811	.431	182.6	1.459
600	10.592	.349	167.6	1.554
650	9.578	.282	156.0	1.642
700	7.743	.169	137.2	1.720
750	6.785	.165	124.8	1.791
800	6.574	.163	122.3	1.859
850	5.697	.168	111.2	1.922
900	5.208	.192	103.8	1.981
950	4.815	.208	98.3	2.035
1000	4.508	.265	90.8	2.088

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
21	2/26	0002	28-19.9	138-30.5	3850m
		0052	28-19.9	138-31.7	3850m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.981	34.992	293.3	0.000
10	18.975	.987	293.5	.029
20	19.004	.978	294.9	.059
30	18.789	.942	292.3	.088
50	18.445	.939	284.3	.146
*75	18.410	.936	283.7	.217
100	18.416	.937	283.7	.289
*125	18.417	.934	284.0	.360
150	18.421	.931	284.3	.433
200	18.414	.932	284.0	.578
250	18.335	.935	282.0	.723
300	18.070	.887	279.2	.868
350	16.745	.765	257.7	1.007
400	15.713	.672	241.8	1.138
450	14.897	.620	228.4	1.262
500	13.833	.535	213.1	1.380
550	12.354	.425	192.9	1.488
600	10.892	.342	173.1	1.585
650	9.638	.285	156.7	1.674
700	8.804	.246	146.8	1.756
750	7.461	.160	134.1	1.832
800	6.148	.166	116.7	1.900
850	5.531	.167	109.3	1.962
900	4.956	.220	99.0	2.018
950	4.692	.249	94.0	2.071
1000	4.321	.278	87.9	2.121

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
22	2/26	0710	29-00.0	138-26.3	3980m
		0757	29-00.0	138-26.7	3990m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.689	34.989	286.5	0.000
10	18.707	.986	287.1	.029
20	18.708	.991	286.8	.057
30	18.719	.989	287.2	.086
50	18.717	.978	287.9	.144
*75	18.637	.971	286.5	.216
100	18.591	.971	285.4	.288
*125	18.424	.937	283.9	.360
150	18.386	.930	283.5	.432
200	18.321	.930	281.9	.576
250	18.124	.904	279.2	.721
300	17.132	.781	265.3	.862
350	16.600	.767	254.3	.996
400	15.881	.685	244.5	1.126
450	14.823	.591	229.0	1.251
500	13.932	.531	215.3	1.367
550	12.501	.441	194.5	1.476
600	11.107	.361	175.4	1.575
650	9.819	.297	158.8	1.665
700	9.115	.256	150.8	1.748
750	8.157	.230	138.6	1.827
800	7.208	.210	127.0	1.899
850	6.280	.245	112.4	1.965
900	5.543	.248	103.4	2.024
950	4.983	.298	93.4	2.078
1000	4.499	.337	85.3	2.128

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
23	2/27	1422	29-42.8	138-30.3	3770m
		1509	29-43.1	138-30.0	3750m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	17.883	34.958	269.6	0.000
10	17.903	.947	270.9	.027
20	17.901	.946	270.9	.054
30	17.902	.942	271.2	.081
50	17.914	.941	271.6	.136
*75	17.914	.948	271.1	.204
100	17.928	.945	271.6	.272
*125	17.935	.947	271.7	.341
150	17.933	.949	271.4	.410
200	17.938	.947	271.7	.549
250	17.929	.932	272.6	.688
300	16.599	.749	255.6	.825
350	15.748	.665	243.1	.955
400	14.728	.600	226.4	1.077
450	13.242	.496	204.4	1.191
500	12.325	.431	191.9	1.296
550	10.752	.341	170.9	1.393
600	9.578	.268	157.1	1.481
650	8.838	.237	148.0	1.563
700	8.507	.247	142.4	1.641
750	7.600	.223	131.3	1.716
800	6.956	.224	122.6	1.785
850	5.896	.245	107.8	1.848
900	5.247	.290	96.9	1.904
950	4.867	.327	89.9	1.956
1000	4.472	.335	85.2	2.005

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
24	2/27	1907	30-20.1	138-30.6	3440m
		1957	30-20.1	138-30.0	3440m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.050	34.943	274.7	0.000
10	18.053	.946	274.5	.027
20	18.051	.951	274.1	.055
30	18.050	.952	274.0	.082
50	18.056	.947	274.5	.137
*75	18.062	.951	274.3	.207
100	18.057	.949	274.4	.276
*125	18.052	.943	274.7	.345
150	18.052	.943	274.7	.415
200	18.036	.947	274.0	.555
250	17.986	.936	273.6	.695
300	17.832	.894	273.1	.836
350	16.479	.747	253.1	.972
400	15.797	.683	242.9	1.101
450	14.900	.619	228.6	1.226
500	13.858	.544	212.9	1.343
550	12.685	.461	196.4	1.453
600	11.546	.365	182.7	1.554
650	10.402	.327	166.0	1.646
700	9.180	.272	150.6	1.733
750	8.088	.232	137.4	1.811
800	6.990	.213	123.8	1.882
850	6.264	.239	112.7	1.946
900	5.499	.282	100.4	2.005
950	4.943	.294	93.3	2.059
1000	4.485	.337	85.2	2.108

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
25	2/28	0017	30-59.9	138-29.9	3410m
		0106	30-59.8	138-29.9	3410m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	17.843	34.944	269.7	0.000
10	17.868	.931	271.3	.027
20	17.897	.925	272.3	.054
30	17.889	.928	272.0	.081
50	17.891	.937	271.4	.136
*75	17.905	.932	272.0	.205
100	17.911	.934	272.1	.273
*125	17.918	.932	272.4	.342
150	17.921	.929	272.6	.411
200	17.925	.929	272.7	.550
250	17.935	.923	273.4	.690
300	17.124	.797	263.9	.830
350	16.229	.723	249.3	.963
400	15.451	.672	236.2	1.090
450	14.515	.584	223.2	1.211
500	13.205	.498	203.5	1.324
550	12.505	.449	193.9	1.431
600	11.145	.361	176.0	1.530
650	10.020	.283	163.0	1.621
700	8.843	.208	150.2	1.706
750	7.914	.210	136.6	1.783
800	7.165	.252	123.2	1.854
850	6.541	.258	114.7	1.920
900	5.899	.270	106.0	1.980
950	5.350	.285	98.4	2.037
1000	4.706	.325	88.4	2.088

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
26	2/28	0817	31-41.4	138-27.3	3570m
		0914	31-40.8	138-27.3	3560m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.110	34.945	275.9	0.000
10	18.121	.940	276.5	.028
20	18.124	.947	276.1	.055
30	18.125	.946	276.2	.083
50	18.128	.945	276.3	.138
*75	18.135	.944	276.6	.208
100	18.109	.941	276.2	.278
*125	18.019	.943	273.9	.347
150	18.016	.945	273.7	.417
200	18.016	.944	273.8	.556
250	18.018	.942	274.0	.697
300	17.412	.833	267.9	.837
350	16.263	.732	249.4	.971
400	15.494	.658	238.2	1.099
450	14.732	.601	226.4	1.221
500	13.463	.492	209.0	1.337
550	12.382	.432	193.0	1.443
600	11.097	.352	175.9	1.542
650	9.746	.292	158.0	1.633
700	8.540	.258	142.0	1.714
750	7.902	.275	131.6	1.788
800	7.387	.302	122.5	1.858
850	6.392	.266	112.3	1.923
900	5.555	.261	102.6	1.983
950	5.141	.276	96.8	2.038
1000	4.756	.312	89.9	2.090

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
27	2/28	1457	32-20.7	138-29.8	3400m
		1552	32-21.0	138-30.2	3400m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.659	34.926	290.3	0.000
10	18.665	.930	290.2	.029
20	18.673	.933	290.1	.058
30	18.514	.911	288.0	.087
50	18.228	.942	278.9	.144
*75	18.154	.947	276.8	.214
100	18.142	.949	276.3	.284
*125	18.131	.950	276.0	.354
150	18.120	.953	275.5	.424
200	17.929	.926	273.0	.564
250	17.671	.887	269.9	.703
300	16.960	.782	261.3	.841
350	16.077	.708	247.1	.972
400	15.595	.665	239.9	1.099
450	14.561	.552	226.5	1.222
500	13.121	.461	204.7	1.337
550	11.738	.368	186.0	1.441
600	10.468	.320	167.6	1.536
650	9.282	.237	154.7	1.623
700	8.048	.179	140.8	1.703
750	7.256	.228	126.3	1.774
800	6.394	.210	116.5	1.840
850	5.825	.251	106.5	1.901
900	5.378	.260	100.7	1.959
950	4.803	.247	95.3	2.012
1000	4.540	.318	87.2	2.063

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
28	2/28	1912	33-00.1	138-30.6	3340m
		2005	33-00.2	138-32.6	3350m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	19.578	34.892	315.2	0.000
10	19.613	.897	315.7	.032
20	19.616	.897	316.1	.063
30	19.618	.896	315.8	.095
50	19.620	.894	316.0	.158
*75	19.628	.899	315.9	.238
100	19.628	.892	316.4	.317
*125	19.640	.892	316.7	.397
150	18.689	.867	295.3	.475
200	18.197	.954	277.3	.620
250	18.148	.959	275.8	.762
300	18.138	.964	275.2	.904
350	16.349	.692	254.2	1.044
400	15.072	.609	232.9	1.170
450	13.589	.511	210.0	1.287
500	12.159	.412	190.3	1.394
550	11.320	.393	176.7	1.491
600	9.845	.342	155.9	1.580
650	8.118	.222	138.6	1.660
700	7.287	.238	125.9	1.731
750	6.086	.243	110.2	1.796
800	5.431	.265	100.9	1.853
850	4.554	.257	91.9	1.905
900	4.210	.298	85.3	1.954
950	3.983	.335	80.3	1.999
1000	3.839	.380	75.5	2.042

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
29	3/ 1	0152	33-30.1	138-30.6	3500m
		0254	33-31.0	138-33.6	3350m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.645	34.855	295.2	0.000
10	18.658	.854	295.6	.030
20	18.663	.859	295.3	.059
30	18.683	.851	296.3	.089
50	18.282	.816	289.3	.148
*75	17.423	.798	270.6	.219
100	16.633	.784	253.8	.284
*125	16.609	.786	253.1	.349
150	16.442	.768	250.7	.413
200	14.904	.648	226.5	.537
250	13.766	.685	200.8	.645
300	13.142	.639	192.0	.747
350	11.471	.438	176.1	.844
400	8.921	.362	140.0	.925
450	8.104	.322	131.0	.997
500	7.220	.299	120.5	1.063
550	6.193	.272	109.4	1.125
600	5.629	.308	99.9	1.180
650	4.957	.301	92.9	1.232
700	4.644	.333	87.1	1.280

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
30	3/ 1	0750	34-00.1	138-29.2	3650m
		0848	34-00.4	138-29.8	3560m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	14.799	34.710	219.9	0.000
10	14.820	.707	220.5	.022
20	14.821	.704	220.7	.044
30	14.692	.691	219.1	.066
50	14.418	.696	213.1	.109
*75	14.345	.698	211.4	.163
100	13.460	.548	204.8	.215
*125	12.904	.593	190.9	.265
150	12.517	.540	187.5	.313
200	10.416	.400	160.8	.404
250	9.297	.352	146.4	.483
300	8.441	.324	135.7	.556
350	8.093	.320	131.0	.625
400	7.732	.307	126.8	.693
450	6.823	.294	115.6	.756
500	6.323	.278	110.5	.817
550	5.505	.286	100.2	.873
600	5.260	.273	98.3	.926
650	4.902	.327	90.3	.975
700	4.626	.342	86.3	1.023
750	4.326	.362	81.6	1.068
800	4.129	.371	79.0	1.112
850	4.017	.377	77.5	1.155
900	3.869	.385	75.4	1.196
950	3.670	.408	71.8	1.237
1000	3.552	.420	69.8	1.276

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
31	3/ 1	1311	34-30.4	138-30.1	2000m
		1353	34-30.9	138-30.4	2100m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	13.030	34.656	188.6	0.000
10	13.039	.656	188.8	.019
20	13.047	.654	189.1	.038
30	13.050	.654	189.1	.057
50	13.059	.655	189.3	.095
*75	13.056	.654	189.3	.143
100	13.043	.649	189.4	.190
*125	13.050	.650	189.5	.239
150	13.043	.651	189.3	.286
200	13.008	.638	189.5	.383
250	11.690	.466	177.9	.479
300	10.484	.390	162.7	.567
350	9.506	.334	151.0	.649
400	8.798	.309	142.0	.726
450	8.081	.291	132.9	.798
500	7.470	.296	124.1	.866
550	7.173	.299	119.8	.930
600	6.484	.299	110.9	.992
650	5.663	.282	102.3	1.049
700	5.236	.297	96.3	1.102
750	4.753	.330	88.5	1.152
800	4.464	.340	84.7	1.199
850	4.175	.364	80.0	1.244
900	3.927	.380	76.4	1.287
950	3.696	.404	72.3	1.328
1000	3.494	.423	69.0	1.367

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
32	3/11	2035	36-58.1	147-00.2	5630m
		2126	36-57.5	147-01.0	5600m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	13.045	34.610	192.3	0.000
10	13.057	.597	193.5	.019
20	13.054	.603	193.0	.039
30	13.073	.613	192.6	.058
50	13.079	.615	192.6	.097
*75	13.066	.604	193.2	.146
100	13.054	.604	192.9	.194
*125	12.075	.377	191.4	.243
150	11.438	.378	179.9	.290
200	9.925	.166	170.1	.380
250	7.005	33.772	156.9	.464
300	5.938	.706	148.6	.543
350	3.796	.503	141.1	.618
400	5.262	.945	122.9	.682
450	4.707	.904	120.0	.744
500	4.381	.981	110.8	.803
550	4.353	34.075	103.5	.859
600	4.687	.207	97.0	.912
650	4.109	.163	94.4	.962
700	3.482	.147	89.7	1.011
750	3.418	.210	84.4	1.057
800	3.339	.272	79.0	1.101
850	3.239	.299	76.1	1.142
900	3.042	.316	73.0	1.183
950	2.927	.338	70.4	1.221
1000	2.825	.383	66.1	1.258

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
33	3/12	0103	36-20.3	147-00.0	5570m
		0152	36-20.1	147-00.3	5570m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	16.303	34.781	246.8	0.000
10	16.313	.789	246.3	.025
20	16.318	.800	245.7	.049
30	16.319	.796	246.0	.074
50	16.301	.787	246.2	.123
*75	15.691	.692	239.9	.185
100	14.776	.686	221.1	.243
*125	14.365	.637	216.3	.298
150	14.076	.626	211.3	.352
200	11.834	.404	185.0	.453
250	9.452	.120	166.0	.544
300	8.902	.225	149.8	.626
350	7.434	.127	136.2	.701
400	6.359	.051	127.9	.769
450	5.639	.054	119.0	.833
500	4.860	.062	109.8	.893
550	4.688	.145	101.7	.948
600	4.406	.177	96.4	1.000
650	4.129	.223	90.2	1.050
700	3.863	.254	85.2	1.097
750	3.700	.295	80.6	1.141
800	3.522	.324	76.7	1.183
850	3.374	.339	74.3	1.224
900	3.172	.357	71.1	1.263
950	3.051	.370	69.0	1.301
1000	2.919	.395	66.0	1.337

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
34	3/12	0606	35-40.6	146-59.7	5750m
		0658	35-40.0	146-59.5	5730m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	14.182	34.630	213.1	0.000
10	14.183	.628	213.3	.021
20	14.182	.631	213.1	.043
30	14.153	.618	213.4	.064
50	14.008	.594	212.2	.107
*75	13.804	.547	211.7	.160
100	11.285	.251	186.6	.212
*125	9.465	.129	165.6	.256
150	9.159	.122	161.4	.297
200	8.704	.153	152.2	.376
250	6.945	.020	137.7	.450
300	5.986	.054	123.1	.517
350	5.494	.039	118.5	.580
400	4.916	.079	109.1	.639
450	4.456	.093	103.2	.694
500	4.464	.173	97.3	.747
550	4.140	.202	91.9	.797
600	3.895	.224	87.8	.844
650	3.816	.271	83.5	.889
700	3.635	.265	82.2	.933
750	3.552	.321	77.2	.975
800	3.360	.337	74.3	1.016
850	3.226	.361	71.2	1.055
900	3.070	.376	68.8	1.093
950	2.955	.401	65.9	1.129
1000	2.865	.408	64.6	1.165

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
35	3/12	1042	35-00.2	147-00.0	6000m
		1120	35-00.2	147-00.1	6000m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	14.838	34.725	219.5	0.000
10	14.669	.720	216.4	.022
20	14.625	.730	214.8	.043
30	14.616	.722	215.2	.065
50	14.297	.659	213.3	.108
*75	13.351	.595	199.3	.160
100	12.008	.419	187.0	.209
*125	10.857	.293	176.2	.254
150	10.134	.267	166.1	.297
200	9.240	.253	152.9	.378
250	8.369	.255	139.8	.453
300	5.377	33.745	139.2	.524
350	3.448	.666	125.6	.590
400	5.098	34.010	116.3	.650
450	5.045	.120	107.4	.709
500	4.491	.136	100.4	.763
550	4.311	.192	94.3	.813
600	4.092	.235	88.9	.862
650	3.864	.257	85.0	.907
700	3.716	.299	80.5	.951
750	3.562	.344	75.6	.993
800	3.359	.341	74.0	1.033
850	3.241	.346	72.5	1.073
900	3.076	.371	69.2	1.111
950	2.948	.400	65.9	1.147
1000	2.849	.410	64.3	1.183

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
36	3/12	1630	34-21.1	147-02.5	5700m
		1728	34-21.1	147-04.3	5900m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	15.400	34.769	228.1	0.000
10	15.146	.746	224.4	.023
20	15.103	.749	223.3	.045
30	15.110	.746	223.7	.067
50	15.092	.756	222.6	.112
*75	15.034	.736	222.8	.169
100	14.809	.646	224.7	.224
*125	13.906	.566	212.3	.280
150	13.201	.505	203.0	.333
200	11.646	.432	179.6	.432
250	10.629	.405	164.1	.519
300	6.728	33.783	152.6	.601
350	5.206	.672	142.9	.678
*400	5.766	.853	135.6	.749
*450	6.353	34.084	125.4	.816
*500	6.126	.218	112.6	.878
550	5.908	.232	109.0	.937
600	4.586	.143	100.9	.992
650	4.472	.205	95.0	1.043
700	4.164	.240	89.3	1.093
750	3.895	.260	85.1	1.139
800	3.680	.271	82.2	1.184
850	3.523	.301	78.5	1.227
900	3.351	.342	73.9	1.269
950	3.161	.338	72.5	1.309
1000	3.078	.390	67.8	1.347

Table 6. Continue.

**

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
37	3/12	2106	33-40.0	147-00.6	5700m
		2157	33-39.9	147-02.9	5780m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	17.465	34.922	262.6	0.000
10	17.465	.922	262.6	.026
20	17.453	.916	262.8	.052
30	17.459	.918	262.7	.079
50	17.463	.921	262.6	.132
*75	17.474	.921	262.9	.197
100	17.393	.917	261.3	.264
*125	17.106	.885	257.1	.330
150	16.968	.871	255.0	.395
200	16.926	.870	254.1	.524
250	16.902	.862	254.2	.655
300	16.733	.837	252.2	.785
350	15.561	.693	237.0	.913
400	14.257	.602	216.7	1.032
450	13.194	.520	201.8	1.142
500	11.974	.447	184.4	1.244
550	10.706	.374	167.6	1.338
600	9.776	.313	156.9	1.425
650	8.165	.225	139.0	1.504
700	7.635	.247	130.0	1.577
750	6.073	.088	121.6	1.646
800	5.651	.141	112.7	1.709
850	5.009	.178	102.6	1.767
900	4.712	.198	98.0	1.822
950	4.411	.204	94.4	1.875
1000	4.320	.260	89.2	1.925

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
38	3/13	0229	33-00.4	147-00.8	5950m
		0319	33-00.2	147-01.0	5950m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	17.574	34.936	264.1	0.000
10	17.574	.936	264.1	.026
20	17.571	.940	263.7	.053
30	17.576	.937	264.0	.079
50	17.581	.940	264.0	.132
*75	17.588	.935	264.5	.198
100	17.592	.934	264.6	.266
*125	17.590	.939	264.2	.332
150	17.592	.940	264.2	.400
200	17.600	.939	264.5	.535
250	17.600	.941	264.3	.670
300	17.606	.939	264.6	.807
350	17.600	.940	264.4	.945
400	16.880	.784	259.3	1.082
450	16.124	.723	247.0	1.215
500	15.198	.638	233.4	1.343
550	14.203	.570	218.0	1.464
600	12.418	.424	194.2	1.575
650	11.304	.385	177.1	1.674
700	8.159	33.939	160.2	1.765
750	8.967	34.289	146.1	1.847
800	7.566	.137	137.2	1.925
850	5.142	33.858	128.1	1.996
900	5.561	34.073	116.7	2.061
950	4.637	.085	105.7	2.123
1000	4.519	.102	103.2	2.182

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
39	3/13	0935	32-19.7	146-59.0	5920m
		1018	32-19.8	146-58.5	5900m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	17.670	34.943	265.8	0.000
10	17.664	.944	265.6	.027
20	17.656	.936	265.9	.053
30	17.650	.944	265.3	.080
50	17.654	.937	265.8	.133
*75	17.654	.938	265.8	.200
100	17.652	.942	265.4	.267
*125	17.653	.942	265.5	.334
150	17.664	.939	266.0	.401
200	17.663	.938	266.0	.537
250	17.568	.929	264.5	.673
300	17.491	.926	262.9	.810
350	17.247	.883	260.5	.946
400	16.565	.766	253.6	1.079
450	15.891	.698	243.8	1.210
500	15.049	.636	230.4	1.335
550	13.835	.539	212.8	1.455
600	12.630	.422	198.3	1.564
650	11.471	.381	180.3	1.664
700	10.125	.310	162.7	1.757
750	8.802	.252	146.4	1.842
800	7.590	.193	133.4	1.918
850	6.056	.034	125.5	1.988
900	5.440	.066	115.9	2.053
950	5.154	.130	107.9	2.114
1000	4.718	.160	100.9	2.172

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
40	3/13	1343	31-40.1	146-59.9	5900m
		1430	31-40.2	147-00.0	5930m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	16.946	34.869	254.6	0.000
10	16.948	.869	254.7	.025
20	16.915	.875	253.5	.051
30	16.836	.871	252.0	.076
50	16.822	.875	251.4	.127
*75	16.815	.871	251.5	.190
100	16.794	.864	251.6	.254
*125	16.785	.862	251.5	.317
150	16.781	.864	251.3	.381
200	16.761	.862	251.0	.509
250	16.759	.864	250.8	.638
300	16.730	.849	251.2	.768
350	16.107	.755	244.4	.897
400	14.760	.622	225.5	1.020
450	13.675	.536	209.9	1.135
500	12.455	.463	192.0	1.242
550	11.131	.368	175.3	1.341
600	9.870	.289	160.2	1.431
650	8.831	.237	147.9	1.514
700	7.483	.137	136.1	1.590
750	6.459	.082	126.8	1.661
800	5.620	.080	116.9	1.727
850	5.162	.133	107.8	1.787
900	4.658	.151	100.9	1.844
950	4.366	.208	93.7	1.897
1000	4.091	.227	89.4	1.947

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
41	3/13	1850	30-59.9	146-59.6	6000m
		1943	30-59.8	146-59.3	6000m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	16.936	.867	254.5	0.000
10	16.938	.864	254.8	.025
20	16.936	.864	254.8	.051
30	16.930	.858	255.1	.076
50	16.930	.863	254.7	.128
*75	16.926	.868	254.3	.192
100	16.920	.867	254.2	.256
*125	16.911	.863	254.3	.320
150	16.904	.863	254.1	.385
200	16.888	.854	254.4	.515
250	16.599	.799	252.0	.645
300	15.987	.716	244.6	.773
350	15.345	.655	235.2	.898
400	14.576	.611	222.5	1.018
450	13.726	.548	210.0	1.132
500	12.456	.453	192.8	1.239
550	11.335	.388	177.4	1.337
600	10.101	.316	161.9	1.428
650	9.030	.233	151.2	1.512
700	7.457	.158	134.2	1.589
750	6.373	.128	122.4	1.659
800	5.407	.121	111.4	1.723
850	5.132	.165	105.0	1.782
900	4.573	.163	99.1	1.837
950	4.389	.246	91.1	1.889
1000	3.924	.236	87.1	1.938

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
42	3/13	2335	30-20.2	146-59.8	6150m
	3/14	0028	30-20.2	146-59.6	6140m

Dept (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	17.541	34.882	267.3	0.000
10	17.535	.884	267.0	.027
20	17.533	.880	267.2	.053
30	17.517	.881	266.8	.080
50	17.490	.874	266.7	.134
*75	17.465	.874	266.1	.200
100	17.469	.879	265.8	.268
*125	17.433	.872	265.5	.335
150	17.269	.834	264.5	.402
200	17.120	.814	262.5	.536
250	16.751	.792	255.8	.669
300	16.552	.769	253.1	.801
350	16.171	.733	247.3	.931
400	15.459	.662	237.2	1.058
450	14.487	.577	223.2	1.179
500	13.275	.503	204.5	1.292
550	11.926	.384	188.1	1.398
600	10.688	.308	172.1	1.493
650	9.100	.219	153.3	1.581
700	7.644	.115	139.9	1.660
750	6.285	.049	127.1	1.732
800	5.585	.033	120.0	1.798
850	5.116	.051	113.3	1.861
900	4.667	.119	103.4	1.920
950	4.386	.173	96.5	1.974
1000	4.146	.214	91.0	2.025

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
43	3/14	0439	29-40.4	146-59.7	6110m
		0530	29-40.1	146-59.1	6100m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	17.692	34.909	268.8	0.000
10	17.691	.908	268.8	.027
20	17.692	.907	268.9	.054
30	17.687	.906	268.9	.081
50	17.539	.881	267.2	.135
*75	17.501	.883	266.3	.201
100	17.398	.860	265.5	.269
*125	17.349	.857	264.7	.335
150	17.340	.857	264.4	.403
200	17.342	.856	264.6	.538
250	17.012	.824	259.4	.673
300	16.419	.766	250.4	.805
350	16.014	.719	245.0	.934
400	14.896	.627	227.9	1.058
450	13.809	.539	212.3	1.174
500	12.683	.479	195.1	1.281
550	11.026	.366	173.7	1.380
600	9.714	.260	159.8	1.469
650	8.311	.182	144.3	1.550
700	6.863	.073	132.7	1.625
750	5.808	.048	121.5	1.692
800	5.133	.072	112.0	1.755
850	4.738	.112	104.7	1.814
900	4.459	.164	97.9	1.869
950	4.204	.205	92.3	1.921
1000	3.940	.233	87.6	1.970

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
44	3/14	0915	29-00.0	146-59.9	6050m
		1000	28-59.2	146-59.5	6060m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	17.596	34.899	267.3	0.000
10	17.575	.895	267.1	.027
20	17.553	.899	266.3	.053
30	17.547	.898	266.2	.080
50	17.531	.900	265.7	.133
*75	17.508	.897	265.4	.200
100	17.501	.895	265.4	.267
*125	17.496	.900	264.9	.334
150	17.332	.861	263.9	.402
200	17.171	.848	261.2	.536
250	16.831	.824	255.3	.668
300	16.392	.759	250.3	.799
350	15.933	.718	243.2	.927
400	15.111	.637	231.6	1.052
450	14.064	.570	215.2	1.170
500	12.651	.470	195.1	1.280
550	11.504	.399	179.5	1.380
600	10.310	.324	164.7	1.472
650	8.973	.214	151.7	1.558
700	7.532	.118	138.1	1.636
750	6.278	.040	127.7	1.707
800	5.536	.051	118.1	1.773
850	5.020	.074	110.6	1.835
900	4.646	.129	102.5	1.893
950	4.269	.184	94.5	1.946
1000	4.082	.222	89.7	1.997

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
45	3/14	1419	28-20.2	146-59.5	5850m
		1503	28-20.4	146-58.5	5850m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	19.745	35.044	308.3	0.000
10	19.632	.040	305.8	.031
20	19.432	.036	301.1	.061
30	19.366	.037	299.4	.091
50	19.262	.040	296.7	.151
*75	19.225	.026	296.8	.226
100	18.815	34.959	291.7	.300
*125	18.372	.939	282.5	.372
150	18.323	.946	280.9	.444
200	17.957	.868	277.9	.587
250	17.823	.862	275.2	.729
300	17.037	.799	261.7	.868
350	16.390	.770	249.5	1.000
400	15.324	.656	234.8	1.127
450	14.385	.585	220.5	1.246
500	13.341	.492	206.6	1.360
550	12.265	.449	189.5	1.464
600	10.904	.314	175.4	1.562
650	9.042	.171	155.9	1.650
700	8.079	.134	144.5	1.730
750	6.631	.063	130.4	1.805
800	5.583	.073	117.0	1.872
850	4.951	.111	107.1	1.932
900	4.563	.156	99.6	1.989
950	4.206	.206	92.2	2.041
1000	3.971	.249	86.6	2.090

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
46	3/14	1857	27-40.9	147-01.0	5700m
		1953	27-41.1	147-01.1	5700m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	21.063	35.113	336.7	0.000
10	21.063	.109	337.5	.034
20	21.036	.098	337.2	.067
30	20.959	.099	335.1	.101
50	20.774	.081	331.6	.168
*75	20.715	.076	330.5	.252
100	20.580	.059	328.6	.334
*125	19.987	.032	315.2	.416
150	19.536	34.999	306.3	.494
200	18.856	.933	294.5	.647
250	17.996	.856	279.7	.795
300	17.013	.805	260.8	.934
350	16.519	.772	252.2	1.067
400	15.572	.689	237.6	1.195
450	14.256	.570	219.0	1.316
500	12.754	.455	198.2	1.427
550	11.407	.350	181.4	1.528
600	9.666	.225	161.6	1.620
650	8.661	.150	151.8	1.703
700	7.485	.094	139.3	1.781
750	6.251	.066	125.5	1.852
800	5.463	.075	115.5	1.917
850	5.037	.105	108.4	1.977
900	4.698	.159	100.8	2.034
950	4.366	.199	94.3	2.087
1000	4.091	.246	88.0	2.136

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
47	3/14	2355	27-00.2	147-00.1	5520m
	3/15	0052	26-59.6	146-59.1	5550m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	21.093	35.107	338.0	0.000
10	21.092	.099	338.5	.034
20	20.957	.068	337.3	.068
30	20.828	.097	331.8	.101
50	20.821	.098	331.6	.168
*75	20.585	.027	330.7	.251
100	20.050	.049	315.5	.332
*125	19.489	34.950	308.8	.412
150	19.041	.932	299.1	.488
200	18.710	.937	290.7	.638
250	18.317	.855	287.3	.787
300	17.243	.807	265.8	.929
350	16.619	.771	254.4	1.064
400	16.135	.730	246.8	1.194
450	14.957	.580	232.6	1.320
500	13.364	.493	207.0	1.436
550	12.057	.385	190.4	1.543
600	10.431	.253	172.0	1.640
650	9.193	.156	159.4	1.728
700	8.355	.118	149.7	1.810
750	7.355	.053	140.6	1.888
800	6.203	.069	124.7	1.960
850	5.429	.117	111.9	2.024
900	4.959	.164	103.2	2.082
950	4.643	.197	97.3	2.137
1000	4.377	.218	93.0	2.189

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
48	3/15	0525	26-20.1	147-00.6	5380m
		0614	26-19.8	147-00.1	5390m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	22.689	35.055	384.2	0.000
10	22.689	.057	384.0	.038
20	22.691	.061	383.8	.077
30	22.689	.062	383.6	.115
50	22.273	.041	373.9	.192
*75	21.839	.070	360.2	.284
100	21.323	.063	347.2	.373
*125	20.368	.014	326.1	.459
150	19.371	34.942	306.4	.539
200	17.622	.846	271.3	.685
250	16.890	.804	258.1	.820
300	16.366	.764	249.4	.951
350	15.618	.692	238.4	1.078
400	14.513	.591	222.7	1.199
450	13.182	.479	204.5	1.311
500	11.720	.372	185.3	1.415
550	10.315	.275	168.4	1.509
600	9.186	.204	155.8	1.596
650	8.257	.143	146.5	1.677
700	7.290	.088	137.1	1.753
750	6.356	.095	124.6	1.824
800	5.538	.100	114.4	1.889
850	5.042	.126	106.9	1.948
900	4.703	.167	100.2	2.004
950	4.409	.213	93.7	2.057
1000	4.189	.258	88.1	2.106

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
49	3/15	1004	25-40.0	147-00.0	3450m
		1049	25-40.0	146-59.4	3600m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	23.288	35.039	401.8	0.000
10	23.301	.030	402.8	.040
20	23.143	.036	398.0	.080
30	23.032	.053	393.7	.120
50	22.983	.056	392.1	.199
*75	22.848	.046	389.2	.297
100	22.400	.060	376.0	.393
*125	22.008	.069	364.8	.488
150	21.552	.055	353.7	.578
200	19.048	34.899	301.6	.747
250	17.745	.855	273.9	.891
300	16.873	.793	258.5	1.028
350	15.700	.686	240.6	1.157
400	14.783	.607	227.0	1.279
450	13.388	.498	207.1	1.393
500	11.860	.382	187.1	1.497
550	10.534	.280	171.7	1.593
600	9.244	.215	155.8	1.681
650	8.140	.131	145.7	1.762
700	6.873	.085	131.9	1.836
750	6.433	.101	125.1	1.905
800	5.554	.113	113.6	1.971
850	5.038	.174	103.3	2.030
900	4.515	.217	94.5	2.084
950	4.316	.245	90.4	2.135
1000	4.121	.272	86.4	2.183

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
50	3/15	1600	25-00.3	147-01.4	4200m
		1644	25-00.4	147-01.6	4100m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	23.859	35.026	418.6	0.000
10	23.779	.018	417.0	.042
20	23.706	.022	414.7	.083
30	23.691	.029	413.7	.125
50	23.633	.010	413.5	.208
*75	22.375	.036	377.0	.307
100	21.949	.062	363.7	.400
*125	21.672	.055	356.9	.491
150	20.867	34.977	341.5	.580
200	18.851	.903	296.6	.743
250	17.807	.862	274.8	.888
300	16.616	.751	255.8	1.025
350	15.559	.683	237.7	1.153
400	14.409	.572	221.9	1.274
450	13.419	.497	207.8	1.387
500	11.943	.369	189.6	1.492
550	10.288	.254	169.5	1.587
600	9.068	.191	154.9	1.674
650	7.972	.134	143.0	1.754
700	7.072	.092	133.9	1.828
750	6.175	.092	122.6	1.897
800	5.344	.152	108.4	1.959
850	4.861	.194	99.9	2.016
900	4.593	.240	93.6	2.068
950	4.381	.273	88.9	2.118
1000	4.208	.318	83.8	2.165

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
51	3/16	0307	24-59.9	144-59.9	5050m
		0353	24-59.8	145-00.0	5050m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	21.594	35.106	351.2	0.000
10	21.426	.092	347.8	.035
20	21.206	.091	342.1	.070
30	21.133	.092	340.1	.104
50	20.899	.096	333.8	.171
*75	20.675	.079	329.2	.255
100	20.100	.028	318.3	.336
*125	19.188	34.961	300.6	.414
150	18.450	.908	286.6	.489
200	17.505	.842	269.4	.632
250	16.758	.773	257.4	.767
300	15.541	.663	238.8	.894
350	14.430	.563	223.0	1.014
400	13.710	.526	211.3	1.126
450	12.265	.411	192.3	1.233
500	11.241	.318	180.9	1.332
550	10.467	.278	170.7	1.425
600	8.734	.161	152.1	1.511
650	7.488	.089	139.7	1.589
700	6.439	.060	128.2	1.661
750	5.625	.075	117.3	1.726
800	4.869	.116	105.8	1.785
850	4.587	.158	99.7	1.841
900	4.296	.202	93.4	1.894
950	4.120	.232	89.4	1.943
1000	3.823	.281	82.8	1.991

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
52	3/16	0826	25-36.4	144-42.3	5050m
		0949	25-36.2	144-43.2	5080m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	21.308	35.103	343.9	0.000
10	21.111	.092	339.5	.034
20	20.952	.092	335.4	.068
30	20.658	.087	328.2	.101
50	20.294	.089	318.8	.166
*75	19.881	.010	314.1	.246
100	19.543	.051	302.8	.323
*125	19.144	34.976	298.4	.400
150	18.488	.879	289.6	.475
200	16.977	.804	260.0	.612
250	16.243	.715	250.2	.743
300	15.718	.678	241.5	.870
350	14.880	.595	229.9	.993
400	13.522	.442	213.8	1.108
450	11.978	.362	190.7	1.214
500	10.995	.282	179.3	1.311
550	10.049	.230	167.4	1.403
600	8.424	.136	149.4	1.488
650	7.785	.085	144.1	1.566
700	7.057	.024	138.8	1.641
750	5.985	.045	123.8	1.710
800	5.031	.092	109.4	1.772
850	4.699	.133	102.8	1.829
900	4.203	.195	93.0	1.883
950	3.966	.235	87.7	1.932
1000	3.619	.304	79.1	1.978

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
53	3/16	1406	26-13.5	144-24.2	3100m
		1449	26-13.5	144-23.8	3100m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	20.705	35.101	328.4	0.000
10	20.597	.086	326.7	.033
20	20.233	.070	318.7	.065
30	20.006	.078	312.3	.097
50	19.859	.065	309.6	.159
*75	19.159	34.970	299.2	.236
100	18.711	.928	291.4	.310
*125	18.247	.915	281.3	.382
150	18.090	.898	278.9	.454
200	16.973	.791	260.9	.591
250	16.229	.734	248.5	.721
300	15.338	.652	235.3	.846
350	14.419	.569	222.3	.965
400	13.274	.464	207.4	1.077
450	12.358	.413	193.9	1.182
500	11.182	.292	181.8	1.282
550	9.970	.237	165.6	1.374
600	9.164	.197	155.9	1.460
650	7.482	.094	139.2	1.540
700	6.150	.067	124.1	1.610
750	5.767	.065	119.7	1.675
800	5.067	.093	109.7	1.736
850	4.587	.144	100.7	1.793
900	4.268	.186	94.3	1.845
950	3.926	.246	86.4	1.894
1000	3.808	.272	83.3	1.941

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
54	3/16	1951	26-50.2	144-06.5	5120m
		2038	26-49.8	144-06.8	5120m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	20.947	35.129	332.6	0.000
10	20.961	.113	334.1	.033
20	20.963	.121	333.6	.067
30	20.957	.118	333.7	.100
50	20.866	.108	332.0	.167
*75	20.741	.109	328.7	.250
100	20.729	.112	328.2	.333
*125	20.693	.097	328.4	.416
150	20.075	.032	317.4	.498
200	19.362	34.980	303.5	.655
250	17.579	.842	271.0	.803
300	16.777	.790	256.6	.939
350	16.093	.711	247.2	1.070
400	14.959	.610	230.4	1.194
450	13.665	.516	211.2	1.311
500	12.475	.415	195.9	1.419
550	10.672	.284	173.7	1.517
600	9.807	.247	162.2	1.608
650	8.254	.134	147.1	1.690
700	6.710	.072	130.8	1.764
750	5.627	.063	118.2	1.832
800	5.206	.077	112.4	1.894
850	4.804	.116	105.1	1.952
900	4.503	.156	99.0	2.007
950	4.153	.211	91.3	2.059
1000	3.907	.254	85.6	2.107

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
55	3/17	0052	27-27.2	143-48.6	6400m
		0140	27-27.1	143-48.9	6400m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	19.835	35.073	308.4	0.000
10	19.837	.071	308.6	.031
20	19.848	.070	308.9	.062
30	19.843	.068	309.0	.093
50	19.854	.068	309.2	.155
*75	19.482	.054	301.0	.231
100	19.216	.025	296.6	.307
*125	18.447	34.889	287.9	.382
150	17.873	.843	277.7	.453
200	17.387	.833	267.3	.592
250	16.720	.788	255.5	.726
300	16.068	.729	245.4	.856
350	15.019	.631	230.2	.979
400	14.321	.581	219.5	1.097
450	13.624	.522	209.9	1.210
500	12.221	.406	191.9	1.316
550	10.807	.290	175.5	1.413
600	9.431	.211	159.0	1.503
650	8.348	.137	148.2	1.585
700	7.193	.100	135.0	1.661
750	6.336	.057	127.2	1.732
800	5.548	.059	117.6	1.798
850	4.951	.104	107.6	1.859
900	4.515	.160	98.8	1.915
950	4.249	.191	93.7	1.967
1000	3.991	.232	88.1	2.016

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
56	3/17	0556	28-03.5	143-31.3	7400m
		0642	28-03.3	143-31.5	7400m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.613	34.978	285.4	0.000
10	18.631	.979	285.8	.028
20	18.631	.976	286.0	.057
30	18.631	.980	285.7	.086
50	18.622	.975	285.8	.143
*75	18.488	.955	284.1	.215
100	18.320	.944	280.9	.286
*125	17.983	.900	276.2	.357
150	17.821	.893	272.9	.427
200	17.697	.921	268.0	.564
250	17.325	.867	263.4	.701
300	16.699	.783	255.3	.835
350	16.014	.709	245.6	.965
400	15.208	.645	233.1	1.089
450	14.324	.574	220.1	1.208
500	13.176	.492	203.4	1.320
550	11.970	.398	187.9	1.425
600	10.619	.283	172.9	1.521
650	9.540	.211	160.7	1.611
700	8.135	.104	147.6	1.694
750	6.963	.090	132.6	1.770
800	6.182	.063	124.8	1.840
850	5.323	.078	113.7	1.905
900	4.968	.104	107.8	1.965
950	4.604	.135	101.6	2.022
1000	4.217	.190	93.5	2.075

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
57	3/17	1103	28-40.7	143-13.3	8100m
		1158	28-41.1	143-13.9	8150m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.657	34.984	286.1	0.000
10	18.665	.974	287.0	.029
20	18.651	.979	286.3	.057
30	18.629	.983	285.5	.086
50	18.622	.984	285.2	.143
*75	18.585	.982	284.5	.215
100	18.589	.975	285.1	.287
*125	18.583	.975	284.9	.359
150	18.577	.977	284.7	.431
200	18.328	.933	281.9	.576
250	17.853	.901	273.1	.719
300	17.611	.885	268.7	.858
350	16.915	.789	259.8	.996
400	16.355	.752	250.0	1.128
450	15.096	.629	231.9	1.256
500	13.729	.506	213.2	1.374
550	12.566	.435	196.1	1.483
600	11.363	.364	179.7	1.583
650	10.469	.266	171.6	1.678
700	8.881	.154	154.8	1.766
750	7.374	.084	138.6	1.845
800	6.542	.079	128.1	1.918
850	5.848	.090	118.8	1.984
900	5.130	.092	110.5	2.047
950	4.794	.128	104.1	2.106
1000	4.454	.176	97.0	2.160

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
58	3/18	0101	29-17.6	142-56.1	8550m
		0147	29-17.7	142-56.3	8550m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.764	35.015	286.4	0.000
10	18.768	.012	286.7	.029
20	18.770	.010	286.9	.057
30	18.778	.018	286.5	.086
50	18.774	.018	286.4	.144
*75	18.770	.015	286.5	.215
100	18.745	.003	286.8	.288
*125	18.629	34.974	286.1	.361
150	18.330	.921	282.9	.433
200	17.989	.878	277.9	.576
250	17.782	.917	270.2	.717
300	17.055	.797	262.3	.855
350	16.569	.763	253.9	.989
400	16.064	.711	246.6	1.120
450	14.911	.607	229.7	1.245
500	13.739	.512	212.9	1.362
550	12.558	.435	196.0	1.470
600	11.398	.337	182.2	1.572
650	10.379	.267	170.0	1.667
700	9.470	.204	160.1	1.756
750	8.231	.131	146.9	1.840
800	7.281	.106	135.6	1.916
850	6.056	.030	125.7	1.987
900	5.287	.063	114.4	2.051
950	4.839	.089	107.5	2.111
1000	4.514	.126	101.3	2.168

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
59	3/18	0643	29-54.5	142-38.2	9030m
		0732	29-54.6	142-38.4	8600m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.538	34.979	283.6	0.000
10	18.542	.986	283.2	.028
20	18.542	.988	283.0	.057
30	18.531	.989	282.7	.085
50	18.510	.983	282.6	.142
*75	18.483	.973	282.7	.213
100	18.402	.945	282.8	.284
*125	17.982	.855	279.4	.355
150	17.923	.891	275.4	.426
200	17.680	.881	270.5	.565
250	17.604	.897	267.6	.702
300	17.457	.878	265.6	.840
350	16.623	.776	254.1	.975
400	16.012	.703	246.1	1.106
450	15.345	.641	236.3	1.232
500	14.099	.551	217.2	1.352
550	13.038	.480	201.7	1.464
600	11.551	.361	183.1	1.567
650	10.474	.289	170.0	1.662
700	9.288	.217	156.3	1.750
750	7.865	.120	142.6	1.831
800	6.740	.070	131.2	1.906
850	5.936	.057	122.3	1.975
900	5.147	.077	111.7	2.038
950	4.664	.129	102.6	2.096
1000	4.443	.167	97.5	2.151

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
60	3/18	1206	30-30.8	142-21.1	9100m
		1252	30-30.9	142-21.2	9100m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.480	35.021	279.1	0.000
10	18.485	.021	279.3	.028
20	18.462	.021	278.7	.056
30	18.388	.019	277.1	.084
50	18.368	.023	276.3	.139
*75	18.349	.019	276.2	.209
100	18.341	.019	276.0	.278
*125	18.314	.012	275.9	.348
150	17.926	34.921	273.4	.418
200	17.152	.811	263.5	.555
250	16.755	.783	256.6	.688
300	16.183	.731	247.8	.819
350	15.410	.660	236.3	.945
400	14.801	.607	227.4	1.065
450	13.851	.533	213.6	1.182
500	12.862	.462	199.7	1.291
550	11.941	.387	188.2	1.395
600	10.631	.293	172.3	1.492
650	9.476	.226	158.6	1.581
700	8.331	.163	146.0	1.663
750	7.466	.119	137.2	1.741
800	6.360	.061	127.2	1.813
850	5.712	.082	117.8	1.879
900	5.179	.107	109.9	1.941
950	4.788	.121	104.6	2.000
1000	4.401	.169	96.9	2.055

Table 6. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
61	3/18	1738	31-07.9	142-02.3	7640m
		1857	31-06.9	142-03.4	7600m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.217	34.974	276.3	0.000
10	18.264	.962	278.3	.028
20	18.189	.971	275.9	.055
30	18.167	.975	275.0	.083
50	18.165	.970	275.4	.138
*75	18.158	.978	274.6	.208
100	18.163	.974	275.1	.277
*125	18.141	.964	275.3	.347
150	18.138	.961	275.4	.416
200	18.042	.944	274.4	.557
250	18.019	.952	273.2	.697
300	17.924	.941	271.9	.838
350	17.515	.885	266.4	.978
400	16.356	.738	251.0	1.113
450	15.226	.640	233.9	1.241
500	13.865	.537	213.6	1.360
550	12.882	.513	196.3	1.468
600	11.437	.411	177.4	1.569
650	10.499	.346	166.2	1.662
700	9.408	.336	149.4	1.748
750	7.731	.139	139.4	1.826
800	6.239	.052	126.4	1.898
850	5.489	.070	116.2	1.963
900	5.154	.104	109.8	2.024
950	4.596	.133	101.7	2.082
1000	4.394	.191	95.2	2.136

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
62	3/18	2339	31-44.4	141-43.8	6200m
	3/19	0035	31-43.6	141-44.3	6220m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.273	34.951	279.3	0.000
10	18.246	.956	278.3	.028
20	18.187	.965	276.2	.056
30	18.185	.964	276.3	.083
50	18.185	.963	276.3	.139
*75	18.153	.958	276.0	.208
100	18.130	.967	274.8	.278
*125	18.150	.981	274.2	.347
150	18.181	.997	273.8	.417
200	17.967	.954	271.9	.556
250	17.757	.934	268.4	.695
300	17.116	.810	262.8	.833
350	16.107	.719	246.9	.965
400	15.178	.640	232.8	1.090
450	13.947	.548	214.4	1.209
500	12.226	.453	188.5	1.315
550	10.656	.364	167.5	1.410
600	10.325	.358	162.4	1.498
650	9.610	.331	152.9	1.584
700	8.779	.309	141.8	1.663
750	7.815	.283	129.8	1.738
800	7.243	.269	123.0	1.807
850	6.699	.220	119.6	1.874
900	6.115	.247	110.3	1.938
950	5.737	.245	105.9	1.998
1000	5.255	.242	100.6	2.056

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
63	3/19	0624	32-22.4	141-25.3	3750m
		0716	32-22.9	141-25.4	3790m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.263	35.013	274.6	0.000
10	18.270	.015	274.6	.027
20	18.273	.020	274.3	.055
30	18.278	.020	274.4	.082
50	18.285	.018	274.7	.138
*75	18.290	.015	275.1	.207
100	18.291	.018	274.9	.276
*125	18.297	.015	275.2	.346
150	18.297	.020	274.9	.416
200	18.303	.016	275.3	.556
250	18.258	34.991	276.1	.697
300	17.445	.851	267.3	.837
350	16.016	.690	247.1	.970
400	14.882	.603	229.4	1.095
450	13.914	.567	212.3	1.211
500	13.224	.533	201.4	1.321
550	12.162	.460	186.8	1.425
600	11.238	.402	174.7	1.522
650	10.590	.367	166.2	1.614
700	9.671	.308	155.5	1.701
750	8.938	.305	144.5	1.783
800	7.608	.123	138.8	1.861
850	6.618	.072	129.5	1.934
900	6.514	.146	122.7	2.002
950	5.899	.176	113.0	2.067
1000	5.506	.212	105.7	2.127

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
64	3/19	1116	32-59.5	141-06.2	2600m
		1208	33-00.8	141-06.7	2620m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.311	34.964	279.3	0.000
10	18.311	.963	279.4	.028
20	18.295	.964	278.9	.056
30	18.279	.980	277.3	.084
50	18.265	.999	275.6	.139
*75	18.243	35.003	274.8	.209
100	18.237	.006	274.5	.278
*125	18.238	.003	274.7	.347
150	18.223	.004	274.3	.417
200	18.240	.004	274.7	.557
250	18.150	34.977	274.5	.698
300	17.924	.927	272.8	.840
350	16.895	.785	259.6	.979
400	16.137	.724	247.2	1.111
450	14.827	.609	227.8	1.236
500	13.448	.489	208.9	1.351
550	11.920	.391	187.5	1.456
600	10.919	.309	176.0	1.552
650	9.692	.239	161.0	1.643
700	8.371	.142	148.2	1.726
750	7.343	.115	135.9	1.803
800	7.376	.263	125.3	1.874
850	6.791	.255	118.1	1.941
900	5.989	.266	107.4	2.003
950	5.224	.281	97.4	2.061
1000	4.547	.308	88.0	2.112

Table 6. -Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
65	3/19	1605	33-36.6	140-48.6	2130m
		1704	33-38.6	140-50.0	2340m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	19.294	34.931	305.3	0.000
10	19.300	.935	305.2	.030
20	19.304	.930	305.7	.061
30	19.302	.928	305.8	.092
50	19.260	.921	305.3	.153
*75	19.081	.899	302.5	.229
100	18.714	.878	295.1	.305
*125	18.288	.909	282.7	.377
150	18.191	.922	279.5	.449
200	17.324	.799	268.3	.588
250	15.849	.697	243.0	.718
300	15.388	.672	235.0	.842
350	14.535	.612	221.6	.962
400	13.795	.560	210.6	1.075
450	12.546	.461	193.9	1.182
500	9.517	.329	151.6	1.273
550	8.277	.309	134.4	1.349
600	7.023	.265	120.4	1.416
650	6.201	.269	109.7	1.478
700	5.636	.260	103.6	1.535
750	5.040	.294	94.3	1.589
800	4.472	.279	89.4	1.638
850	4.100	.309	83.4	1.685
900	3.917	.320	80.8	1.729
950	3.748	.336	77.9	1.773
1000	3.532	.358	74.2	1.815

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
66	3/19	2101	34-13.3	140-29.5	2500m
		2201	34-13.9	140-30.7	2550m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	14.452	34.697	213.7	0.000
10	14.434	.695	213.4	.021
20	14.292	.684	211.4	.043
30	14.254	.687	210.4	.064
50	14.225	.694	209.3	.106
*75	14.026	.670	207.1	.158
100	13.787	.661	203.0	.210
*125	13.628	.653	200.4	.261
150	13.349	.649	195.3	.312
200	13.100	.640	191.1	.411
250	10.951	.395	170.2	.506
300	9.705	.376	151.1	.589
350	8.421	.296	137.5	.665
400	7.613	.264	128.4	.735
450	6.820	.258	118.3	.800
500	6.368	.247	113.4	.861
550	5.890	.280	105.1	.919
600	5.171	.229	100.6	.974
650	4.637	.253	93.1	1.026
700	4.544	.314	87.5	1.074
750	4.193	.314	83.9	1.120
800	3.936	.331	80.2	1.164
850	3.736	.336	77.8	1.207
900	3.478	.340	75.1	1.249
950	3.375	.375	71.5	1.289
1000	3.275	.417	67.5	1.327

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
67	3/20	0220	34-49.5	140-10.0	2230m
		0315	34-50.1	140-09.5	2230m

Depth (m)	Temp. (°C)	Sal. (permil)	delta-st (cl/ton)	delta-D (dyn*m)
0	18.641	34.862	294.6	0.000
10	18.654	.868	294.4	.029
20	18.662	.873	294.2	.059
30	18.661	.867	294.6	.088
50	18.568	.863	292.7	.147
*75	17.901	.784	282.7	.220
100	15.683	.663	241.9	.286
*125	14.588	.630	221.4	.344
150	14.177	.606	214.8	.400
200	12.517	.505	190.1	.504
250	10.609	.400	164.1	.595
300	8.384	.284	137.8	.673
350	7.407	.230	128.1	.742
400	6.535	.220	117.5	.805
450	5.941	.198	111.8	.865
500	5.550	.259	102.7	.922
550	5.224	.266	98.5	.975
600	4.993	.279	94.9	1.026
650	4.822	.282	92.9	1.077
700	4.576	.296	89.2	1.126
750	4.293	.310	85.3	1.173
800	4.082	.323	82.2	1.218
850	3.844	.353	77.6	1.262
900	3.753	.356	76.5	1.304
950	3.457	.358	73.6	1.344
1000	3.281	.374	70.8	1.384

Salinity and density are calculated by the previous salinity scale and the previous Knudsen-Ekman's equation of state for seawater.

Appearing noisy data during the cast downward, upward data from a 1000 m depth to the sea surface are used, and those stations are shown in double asterisk at the upper side of station number.

CTD (Plessey, Model 9040) data list are based on every ten meter values, and interpolated values are shown in asterisk at the left side of depth value.

Table 7. Summary of hydrographic data by RMS and CTD.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
01	2/20	1241	33-30.0	134-59.9	1050m
		1257	33-29.3	134-59.5	1150m

	Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
	1.0	15.837	34.767	34.745
	25.7	15.837	.757	.739
	52.3	15.820	.729	.737
	75.2	15.802	.718	.730
	99.9	15.282	.672	.702
	126.6	14.118	.605	.608
	150.4	13.187	.512	.536
	175.1	12.578	.497	-
	200.8	11.396	.453	.452
	249.4	9.999	.358	.376
	1000.3	3.587	.428	.423
#	1024.4	3.650		

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
06	2/21	1609	31-01.6	135-00.8	4290m
		1707	31-01.6	135-00.7	4290m

	Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
	2.9	19.025	34.999	34.988
	-	-	-	-
	28.6	19.061	34.975	34.966
	50.4	19.061	.983	.970
	79.0	18.721	.974	.955
	98.0	18.685	.966	.959
	119.9	18.685	.973	.959
	148.5	18.685	-	.963
	199.9	18.613	.941	-
	298.9	17.109	.796	.778
	1003.2	4.608	.236	-
#	(1230.0)	(3.620)		

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
11	2/22	2146	27-40.8	135-00.0	3250m
		2247	27-40.4	134-59.6	3380m

	Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
	2.9	19.670	34.961	34.973
	29.5	19.688	.983	.967
	60.0	19.616	.969	.963
	99.9	19.043	.948	.940
	200.8	18.721	.961	.957
	291.2	17.342	.796	.792
	371.2	15.945	.696	.689
	468.3	13.975	.524	.552
	524.4	12.166	.435	.420
	728.1	7.528	-	.207
	1004.1	4.179	.347	.328
#	1001.0	4.230		

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
16	2/24	1602	25-00.8	138-30.5	5260m
		1659	25-00.9	138-31.6	5180m

	Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
	2.9	21.461	35.031	35.038
	19.0	21.049	.029	.017
	49.5	20.709	34.994	34.996
	101.8	19.527	.919	.938
	149.4	19.222	.984	.974
	198.9	18.828	.887	.924
	298.9	16.106	.685	.716
	399.7	13.670	.525	.523
	500.6	11.199	-	.349
	700.5	6.310	.105	.126
	1043.2	3.749	.350	.358
#	1038.8	3.778		

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
26	2/28	0817	31-41.4	138-27.3	3570m
		0914	31-40.8	138-27.3	3560m

	Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
	1.9	18.058	34.958	34.932
	24.7	18.112	.847	-
	50.4	18.130	.838	-
	99.9	18.130	.835	-
	149.4	18.022	.844	-
	198.0	18.022	.842	-
	298.9	17.145	.708	-
	450.2	14.996	.503	-
	599.6	11.127	.259	-
	701.5	8.638	.110	-
	1059.3	4.358	.212	-
#	-	-		

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
27	2/28	1457	32-20.7	138-29.8	3400m
		1552	32-21.0	138-30.2	3400m

	Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
	1.0	18.685	34.922	34.918
	23.8	18.685	.898	.917
	51.4	18.309	.935	-
	101.8	18.166	.925	.929
	152.3	18.112	.952	-
	199.9	17.772	.902	.893
	298.9	16.751	.775	.770
	451.1	14.584	.599	.590
	599.6	10.518	.326	-
	697.7	8.136	.225	.228
	1019.4	4.411	.364	.340
#	1017.8	4.444		

Table 7. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
30	3/ 1	0750	34-00.1	138-29.2	3650m
		0848	34-00.4	138-29.8	3560m

	Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
	1.9	14.760	34.708	34.693
	20.9	14.548	.683	-
	50.4	14.441	.680	-
	100.9	13.097	.579	.575
	150.4	12.309	.554	.564
	198.9	10.339	.366	-
	298.9	8.441	.316	.326
	450.2	6.811	.272	.282
	599.6	5.235	.276	.280
	699.6	4.662	.333	.343
	1000.3	3.516	.458	-
#	(698.8)	(4.705)		

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
32	3/11	2035	36-58.1	147-00.2	5630m
		2126	36-57.5	147-01.0	5600m

	Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
	3.8	13.026	34.613	34.604
	15.2	13.115	.617	-
	99.9	13.062	.594	-
	231.3	8.817	.064	-
	-	-	-	-
	289.3	6.578	33.766	-
	359.8	2.961	.506	-
	396.9	5.253	.927	-
	598.7	4.698	34.193	-
	697.7	3.480	.132	-
	998.4	2.835	.379	-
#	-	-		

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
36	3/12	1630	34-21.1	147-02.5	5700m
		1728	34-21.1	147-04.3	5900m

	Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
	0.0	15.229	34.760	34.759
	44.7	15.085	.714	.730
	96.1	14.942	.717	.724
	146.6	13.402	-	.527
	248.4	10.626	.379	-
	348.4	5.343	33.623	33.681
	428.3	7.546	34.259	34.231
	476.8	4.752	33.872	33.898
	600.6	4.644	34.138	34.152
	697.7	4.107	.243	.247
	1009.8	3.086	-	-
#	1014.9	3.108		

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
42	3/13	2335	30-20.2	146-59.8	6150m
	3/14	0028	30-20.2	146-59.6	6140m

	Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
	1.0	17.539	34.884	34.882
	47.6	17.485	.863	(.906)
	98.0	17.449	.875	(.750)
	198.9	16.948	.809	(.993)
	346.4	16.142	.719	(.951)
	398.8	15.390	.647	.679
	448.3	14.494	.593	.607
	495.9	13.294	.469	.507
	696.7	7.671	.132	.146
	846.1	5.146	.050	.056
	1013.6	4.053	.227	.241
#(	284.8)	(16.585)		

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
47	3/14	2355	27-00.2	147-00.1	5520m
	3/15	0052	26-59.6	146-59.1	5550m

	Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
	1.9	21.103	35.098	35.101
	48.5	20.798	.088	.081
	98.0	19.956	.030	.028
	251.3	17.986	34.828	34.838
	349.3	16.518	.775	.770
	448.3	14.799	.600	.615
	548.2	12.023	.391	.376
	650.1	9.444	.220	.200
	748.1	7.563	.091	.103
	842.3	5.522	.103	.112
	1006.0	4.358	.228	.252
#	1001.4	4.392		

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
52	3/16	0826	25-36.4	144-42.3	5050m
		0949	25-36.2	144-43.2	5080m

	Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
	0.0	21.282	35.118	35.103
	46.6	20.530	.097	.095
	99.0	19.652	34.972	.014
	198.9	16.966	.793	34.795
	297.0	15.712	.574	(.802)
	395.9	13.509	.494	.511
	497.8	10.895	.265	.299
	599.6	8.459	.119	.150
	698.6	6.955	.094	.092
	796.6	5.002	.111	.111
	1007.0	3.570	.330	.327
#	1006.5	3.592		

Table 7. Continue.

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
57	3/17	1103	28-40.7	143-13.3	8100m
		1158	28-41.1	143-13.9	8150m

Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
1.9	18.649	35.000	34.979
49.5	18.613	34.981	.969
97.1	18.577	.977	.965
197.0	18.327	.929	.925
297.9	17.646	.891	.892
396.9	16.375	.748	.753
498.7	14.136	.561	.552
596.8	11.378	-	.365
696.7	8.835	.171	.177
795.7	6.471	.068	.086
1007.0	4.376	.187	.187
# 1006.3	4.429		

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
62	3/18	2339	31-44.4	141-43.8	6200m
	3/19	0035	31-43.6	141-44.3	6220m

Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
1.9	18.273	34.952	34.962
48.5	18.183	.962	.953
99.0	18.130	.941	.955
198.0	17.986	.945	.952
296.0	17.539	.870	.891
395.0	15.282	.641	.650
497.8	12.202	.450	.456
597.7	10.357	.344	.350
699.6	8.799	.283	.305
798.5	7.241	.260	.267
1009.8	5.146	.251	.259
#(2056.7)	5.202		

Stn.	Date	Time	Lat.(N)	Long.(E)	Depth
67	3/20	0220	34-49.5	140-10.0	2230m
		0315	34-50.1	140-09.5	2230m

Dcal. (m)	Tcal. (°C)	Scal. (permil)	Sm. (permil)
1.0	18.649	34.841	34.813
48.5	18.488	.832	.858
100.9	15.067	.673	.679
199.9	12.130	.477	.500
297.9	8.190	.279	.280
397.8	6.578	.195	.227
496.8	5.558	.237	.259
597.7	5.002	.276	.268
697.7	4.644	.264	.298
798.5	4.089	.322	.334
1011.7	3.265	.376	.384
# 1008.0	3.291		

Abbreviation: Dcal, depth observed by CTD; Tcal, temperature observed by CTD; Scal, salinity values calculated from the digitized CTD data; Sm, salinity values determined from discrete water samples using an AUTO LAB 601 MKIII salinometer; #, Calibrated temperature values using pairs of protected reversing thermometers at selected depth; ( ), doubtful value; -, no data

Table 8. Subsurface Temperature

St.	Date	Time	Lat.(N)	Long.(N)	0m	10	20	30	50	75	100	125
					150	200	250	300	350	400	450	500
D 1	2/18	2027	34-38.6	139-32.2	14.52	14.54	14.53	14.54	14.43	14.29	14.22	14.22
					13.98	12.17	10.82	9.57	8.35	7.66	7.12	6.90
2	18	2138	34-31.9	139-32.3	14.64	14.65	14.66	14.67	14.67	14.62	-	-
3	18	2228	34-25.9	139-32.0	14.50	14.55	14.55	14.56	14.55	14.55	14.55	14.28
					13.93	12.89	12.18	9.86	9.07	8.58	7.22	-
4	18	2328	34-26.0	139-26.8	14.53	14.54	14.54	14.55	14.55	14.52	14.28	13.60
					13.45	12.80	11.40	-	-	-	-	-
5	19	0015	34-25.8	139-22.0	13.54	13.46	13.38	13.39	13.36	13.32	12.88	-
6	19	0114	34-32.2	139-19.3	14.02	13.99	13.99	13.93	13.88	13.61	12.89	12.60
					12.38	12.24	-	-	-	-	-	-
7	19	0215	34-38.0	139-17.1	14.17	14.18	14.19	14.18	14.19	14.17	14.12	14.10
					13.81	12.51	11.08	10.21	-	-	-	-
8	19	0304	34-38.1	139-22.2	14.53	14.54	14.55	14.55	14.44	13.97	13.94	13.36
					12.89	11.30	10.35	9.57	-	-	-	-
9	19	0351	34-38.0	139-27.3	14.48	14.48	14.47	14.36	14.33	14.21	13.92	12.60
					12.43	11.58	10.16	9.76	8.96	8.51	7.67	6.21
10	19	0457	34-32.1	139-26.2	14.50	14.50	14.51	14.51	14.51	14.45	14.40	-
X 1	20	1744	33-14.2	134-59.4	18.72	18.85	18.78	18.61	18.38	17.54	16.52	16.30
					15.89	13.46	11.16	10.30	9.70	8.55	7.54	7.04
2	20	2242	32-45.4	134-59.2	20.51	20.51	20.45	20.45	20.45	20.45	20.45	20.39
					20.19	18.78	18.38	17.42	16.09	14.38	12.29	10.81
3	21	0421	32-12.7	134-58.5	19.02	19.09	19.09	19.02	18.38	18.38	18.38	18.38
					18.32	17.81	17.14	16.46	15.89	14.95	13.86	12.67
4	21	0930	31-45.2	135-00.2	18.61	18.55	18.55	18.49	18.49	18.49	18.49	18.49
					18.49	18.49	18.21	17.20	16.40	15.39	14.42	13.29
5	21	1413	31-13.6	135-00.3	19.14	19.09	19.02	19.02	18.97	18.97	18.97	18.85
					18.67	18.61	18.49	17.31	16.36	15.39	14.19	13.15
6	21	2140	30-40.8	134-59.9	18.78	18.61	18.49	18.49	18.44	18.32	18.26	18.21
					18.21	18.21	17.64	16.67	16.19	15.19	14.14	12.97
7	28	0505	31-20.3	138-27.9	17.92	17.92	17.86	17.86	17.86	17.86	17.86	17.86
					17.86	17.86	17.86	16.98	16.09	15.29	14.38	13.33
8	28	1100	32-00.2	138-29.1	18.03	18.21	18.15	18.15	18.15	18.10	18.03	18.03
					18.03	17.98	17.92	16.94	15.99	15.29	14.19	13.15
9	28	1457	32-20.7	138-29.8	18.67	18.72	18.67	18.61	18.26	18.15	18.15	18.15
					18.15	17.86	17.59	16.67	15.94	15.39	14.24	13.25
10	28	1730	32-40.2	138-29.7	19.21	19.26	19.21	19.14	18.44	18.32	18.03	18.03
					18.03	18.03	17.98	17.98	16.94	15.79	14.70	12.97
11	3/ 1	0024	33-14.8	138-33.8	18.85	18.97	18.91	18.78	18.67	18.55	18.38	18.32
					18.26	17.76	16.46	15.79	14.70	13.37	12.09	10.22
12	1	0627	33-44.6	138-33.1	15.24	15.10	15.00	14.95	14.90	14.38	13.92	12.62
					11.76	9.67	9.31	8.59	7.62	6.92	6.40	5.91
13	1	1150	34-15.8	138-27.1	13.33	13.10	13.06	13.06	13.06	13.06	13.06	13.02
					13.02	12.93	10.95	10.27	8.98	8.19	7.39	6.76
D11	1	1845	34-13.7	138-37.6	13.0	13.1	13.1	13.1	13.1	13.1	13.1	13.1
					13.0	11.9	10.7	9.5	8.0	7.5	7.0	6.4
12	1	2017	34-00.0	138-44.0	15.0	15.1	14.6	14.2	13.7	13.6	13.2	13.2
					12.8	12.2	10.3	10.0	8.3	7.3	6.5	-
13	1	2110	33-55.0	138-43.5	14.64	14.29	13.61	13.40	13.35	13.27	12.84	12.62
					12.31	11.30	10.60	8.83	-	-	-	-
14	1	2200	33-50.1	138-45.2	14.98	15.01	15.03	14.99	14.43	13.40	12.89	12.88
					12.54	12.28	12.21	9.93	-	-	-	-
15	1	2339	33-51.4	138-53.7	15.83	15.83	15.43	14.63	14.00	13.79	13.65	13.63
					13.52	12.44	11.09	9.23	8.34	7.65	7.16	-
16	2	0032	33-54.9	138-53.9	16.13	16.05	15.78	15.71	15.32	14.89	13.77	12.84
					12.37	10.38	10.07	9.16	8.38	7.65	-	-
17	2	0125	34-00.2	138-53.5	15.58	15.53	15.43	15.06	14.53	13.74	-	-

Table 8. continue.

St.	Date	Time	Lat.(N)	Long.(N)	0m	10	20	30	50	75	100	125
					150	200	250	300	350	400	450	500
D17'3/	2	0313	34-00.9	138-48.7	15.10	15.14	15.10	14.97	14.54	14.25	-	-
18	2	1313	34-31.8	139-22.0	13.47	13.47	13.48	13.47	13.48	13.49	13.45	13.34
					13.06	12.96	-	-	-	-	-	-
19	2	1402	34-38.1	139-21.9	13.63	13.63	13.65	13.64	13.64	13.63	13.62	13.59
					13.60	12.32	10.96	-	-	-	-	-
20	2	1448	34-38.0	139-26.7	13.50	13.51	13.50	13.51	13.44	13.42	13.39	13.31
					12.78	12.12	11.09	9.45	7.58	7.18	6.63	-
21	2	1547	34-32.1	139-27.2	13.27	13.30	13.30	13.27	13.21	13.15	-	-
22	2	1632	34-26.1	139-27.1	16.26	16.27	13.93	13.13	13.05	13.04	13.02	12.99
					12.46	11.04	-	-	-	-	-	-
23	2	1706	34-26.0	139-32.1	16.52	16.55	16.10	14.35	13.39	13.11	13.06	13.04
					13.06	12.56	10.91	9.36	8.60	7.62	7.05	-
24	2	1805	34-34.4	139-32.1	13.62	13.62	13.64	13.64	13.65	13.65	13.65	13.65
					13.63	13.33	10.43	9.58	8.51	7.87	6.96	6.52
25	2	2051	34-37.3	139-28.4	13.57	13.58	13.58	13.56	13.56	13.53	13.39	13.31
					13.02	12.37	10.35	9.18	8.15	7.25	-	-
26	3	0030	34-28.1	139-21.9	13.18	13.18	13.19	13.13	13.10	13.07	13.05	13.01
					12.88	11.85	-	-	-	-	-	-
X14	9	1212	34-30.0	140-19.1	18.10	17.92	17.37	17.14	16.67	16.36	15.05	14.24
					13.64	13.06	11.67	10.22	8.78	7.66	7.11	6.52
D66	9	1530	34-11.8	140-31.2	19.13	19.11	19.09	19.06	19.07	19.07	18.99	18.76
					18.65	17.05	14.57	12.89	12.25	10.29	9.30	8.28
X15	11	2315	36-40.6	147-01.4	15.24	15.34	15.29	15.34	15.24	13.72	13.37	13.19
					13.10	11.51	9.78	8.34	6.92	6.40	5.74	5.04
16	12	0430	36-00.0	146-58.9	15.64	15.69	15.84	15.79	15.99	15.99	14.90	13.96
					12.97	11.19	10.12	8.39	6.89	5.85	5.62	5.18
17	12	0855	35-20.0	146-59.4	14.19	13.96	13.92	13.86	13.82	12.25	11.39	10.22
					9.64	6.51	7.62	5.85	5.91	5.37	4.78	4.75
18	12	1407	34-40.2	147-00.6	15.54	15.10	14.81	14.76	14.70	13.41	12.58	11.87
					11.36	9.67	8.87	8.11	5.15	6.16	5.91	5.15
19	12	1917	34-00.0	147-03.5	17.31	17.47	17.42	17.37	17.42	17.42	17.42	17.42
					17.20	16.15	15.59	14.14	12.89	11.36	10.22	8.53
20	13	0005	33-19.8	147-00.9	17.76	17.70	17.70	17.70	17.70	17.76	17.76	17.70
					17.76	17.47	17.42	17.31	17.20	17.09	15.64	13.92
21	18	2145	31-26.5	141-53.9	18.72	18.49	18.49	18.49	18.44	18.38	18.38	18.26
					18.10	17.98	17.76	17.54	16.56	15.54	13.92	12.71
22	19	0445	32-03.5	141-34.2	18.67	18.26	18.21	18.21	18.21	18.21	18.03	17.98
					17.98	17.86	17.76	16.36	15.54	13.51	12.50	11.59
23	19	0945	32-41.5	141-16.0	18.55	18.38	18.32	18.32	18.32	18.38	18.38	18.32
					18.26	18.26	18.21	17.98	16.94	16.04	14.81	13.77
24	19	1445	33-21.0	140-57.1	18.78	18.55	18.26	18.21	18.26	18.21	18.21	18.15
					17.98	17.86	17.70	16.98	16.30	15.19	13.77	12.58
25	19	1915	33-55.3	140-42.3	15.99	15.10	14.85	14.76	14.33	14.05	13.46	12.62
					12.20	11.27	10.77	10.46	10.08	9.67	8.98	8.39
26	20	0040	34-32.0	140-20.5	18.72	18.55	18.21	17.92	17.54	17.14	16.72	15.34
					13.59	11.79	10.08	8.87	8.02	6.92	6.25	5.64
D27	20	1717	35-12.1	139-25.0	13.31	13.25	13.22	13.22	13.19	12.96	12.84	12.39
					12.07	10.80	9.54	8.75	8.40	7.67	6.92	6.22
28	20	1830	35-06.0	139-25.2	14.00	13.99	13.94	13.88	13.05	13.03	12.89	12.67
					12.32	11.18	9.83	8.79	8.18	7.35	6.91	6.19
29	20	1959	35-00.3	139-26.0	13.73	13.72	13.71	13.71	13.71	13.41	13.05	12.80
					12.36	10.67	10.50	9.31	8.04	7.21	6.92	6.16
30	20	2123	34-53.5	139-24.6	14.85	14.52	13.96	13.57	13.44	13.45	12.92	12.45
					12.31	11.07	10.23	9.57	8.97	8.01	7.01	6.35
31	20	2231	34-49.0	139-25.2	14.30	14.31	14.31	14.26	13.80	13.06	12.66	12.40
					12.04	11.42	10.93	9.89	9.19	8.79	7.87	-
32	21	0015	34-37.8	139-32.5	18.28	18.22	17.38	16.03	14.87	13.21	12.85	12.68
					12.55	11.70	11.38	9.99	8.79	8.57	7.62	-

Table 8. Continue.

St.	Date	Time	Lat.(N)	Long.(N)	0m	10	20	30	50	75	100	125
					150	200	250	300	350	400	450	500
34	21	0128	34-26.0	139-32.2	17.7	17.5	17.1	16.6	16.3	15.8	15.7	15.2
					14.9	13.8	13.3	11.8	10.7	8.5	-	-
D36	3/21	0234	34-32.0	139-27.2	17.48	17.16	16.34	15.53	15.08	14.68	13.89	-
38	21	0346	34-38.3	139-22.2	17.28	16.60	16.51	16.49	15.52	14.69	13.93	13.43
					12.73	11.60	11.34	10.66	-	-	-	-
40	21	0505	34-25.3	139-21.8	17.41	17.01	16.59	16.49	16.29	16.08	15.22	15.06
41	21	0647	34-32.0	139-22.0	17.81	17.65	17.43	16.21	15.58	15.46	14.79	14.50
					13.72	13.02	-	-	-	-	-	-
42	21	0900	34-21.6	139-03.9	18.31	17.72	17.62	17.58	17.46	16.93	16.00	15.14
43	21	1253	33-51.0	138-46.0	20.43	20.43	20.43	20.43	19.30	18.40	17.67	17.17
					16.45	15.33	13.91	-	-	-	-	-
44	22	1834	34-24.5	138-56.1	19.64	19.64	19.31	18.75	18.60	17.93	16.28	16.15
					15.50	13.37	13.05	11.30	9.55	8.76	7.77	-
45	22	1951	34-16.0	139-03.2	20.19	20.17	20.05	19.93	19.30	18.77	18.21	17.68
					16.92	14.80	12.49	10.62	9.22	8.33	-	-
46	22	2140	34-18.1	139-08.0	20.19	19.97	19.65	18.97	18.69	18.25	18.07	17.53
					16.32	14.90	11.54	10.06	8.32	-	-	-
47	22	2233	34-25.1	139-03.1	19.83	19.83	19.82	19.68	18.96	17.99	17.13	15.62
					15.18	14.46	11.81	10.78	9.71	8.55	7.92	7.23
48	22	2328	34-19.9	139-02.4	19.85	19.85	19.63	19.29	18.58	17.21	16.81	-
49	23	0107	34-21.4	139-06.0	19.80	19.79	19.58	19.14	17.94	17.01	16.41	16.10
					14.95	12.60	-	-	-	-	-	-
50	23	0218	34-19.8	139-01.4	19.65	19.66	19.17	18.19	17.39	16.88	15.93	-
51	23	0352	34-21.3	139-04.8	19.47	19.48	19.41	19.05	17.81	17.32	17.09	-
52	23	0604	34-16.1	139-21.7	19.18	19.19	19.12	18.75	18.46	17.77	17.05	16.23
					16.00	14.46	12.99	-	-	-	-	-
X27	23	0652	34-15.8	139-31.8	20.13	20.01	19.94	19.94	18.91	18.21	16.83	15.99
					15.64	14.05	12.25	10.69	9.05	8.37	8.16	6.46
28	23	0734	34-15.9	139-43.5	20.32	20.19	20.19	20.13	18.38	17.47	17.09	15.79
					15.05	14.00	11.71	9.31	8.37	7.45	7.39	6.73
29	23	0820	34-23.0	139-43.6	18.10	17.86	17.09	17.04	16.87	16.30	15.79	14.90
					14.61	12.80	11.92	10.27	9.02	7.42	6.80	6.30
30	23	0940	34-37.8	139-43.3	17.26	17.04	16.09	15.94	15.89	15.24	14.38	13.86
					13.68	12.97	11.59	9.93	8.98	7.54	6.96	5.95
31	23	1045	34-48.7	139-43.3	18.44	18.32	17.81	17.20	16.56	15.43	13.92	13.41
					12.93	11.39	9.43	8.94	8.02	7.54	7.08	6.45
32	23	1200	35-02.2	139-43.5	15.29	14.52	14.00	13.72	13.41	12.97	12.97	12.62
					12.20	11.67	10.61	9.67	8.84	8.19	7.30	6.90

Abbreviation: X, XBT station; D, DBT station; -, no data; station location are showed in Figure 1(b)