

OCEANOGRAPHIC AND MARINE BIOLOGICAL DATA BASED ON THE
ROUTINE OBSERVATIONS NEAR SYOWA STATION BETWEEN
FEBRUARY 1984 AND JANUARY 1985 (JARE-25)

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Introduction

A three-year programme of marine biological investigations in the fast ice area near Syowa Station was planned by the Japanese Antarctic Research Expedition (JARE) as part of the international BIOMASS (Biological Investigations of Marine Antarctic Systems and Stocks) programme. One of the main objectives of the programme was to acquire marine biological data and samples with environmental parameters throughout the year to draw out a scheme of Antarctic under-ice marine ecosystems near Syowa Station. This programme commenced in 1982 (JARE-23) and we took part in the third year survey in 1984. The third year survey was stressed on the ecology of higher producers such as fish and krill and also on the decomposition processes

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of organic matter under the fast ice. Series of routine oceanographic observations were made at three fixed stations.

In this report, we present oceanographic and marine biological data (Tables 3-5). Description of the sea ice condition in the study area is also given.

Study Area

Observations were carried out at three fixed stations (Stns. 1, 2 and 3) out of the five stations established by JARE-23. Localities of Stns. 1, 2 and 3 are shown in Fig. 1. As the fast ice around Stn. 3 was carried away in the middle of March, the routine observation was interrupted at Stn. 3 until May when the sea ice grew thick enough to support a snow vehicle and a sledge. Both breakage and formation processes of sea ice around study area are indicated in Figs. 2 and 3.

Methods

Eleven series of observations were carried out from 18 February 1984 to 6 January 1985. The date and items of each observation are listed in Table 1. Water samples for physical and chemical analyses were collected from depths listed in Table 2 using Van Dorn bottles of 6 l capacity. The depth indicated in the Table 2 was measured from sea level. Method for physical, chemical and plant pigment analyses were almost the same as those employed by JARE-23 (Fukuchi et al., 1985) and JARE-24 (Watanabe et al., 1986).

For measuring salinity and temperature of sea water, we newly employed a in situ CSTD monitor (FIC Model AFC-III) as well as an ordinary salinometer (Auto Lab. Model 601 MK III)

and reversing thermometers, both of which had been used in JARE-23 and -24. The CSTD monitor was very convenient to record continuous vertical profiles of temperature and salinity. Digital data of temperature and salinity are recorded at one meter depth intervals. These data were compared with ordinary determinations by salinometer and thermometer. Temperature determined by two methods is almost identical, however, salinity is quite different by both methods in some cases. Because of these results, temperature determined by the CSTD and salinity determined by salinometer are adopted and listed in the tables unless otherwise stated in the present report.

For nutrients analyses, a Hitachi Model 320 spectrophotometer (same as JARE-24) and for pigment analyses, a Shimadzu Model RF-510 spectrofluorometer (same as JARE-23) were employed. An under-water fluorometric observation was made by an in situ fluorometer of Variosens II. A total of 56 plankton samples were collected by two kinds of NORPAC nets. Size of both is 45 cm in diameter and 180 cm in side length. The mesh openings of the nets were 25 μm (p25 net) and 330 μm (GG54), respectively. Sediment sample was collected by a gravity corer or Ekman-Birge sampler.

Acknowledgments

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search facilities ready to use for us from the beginning of our field observation.

References

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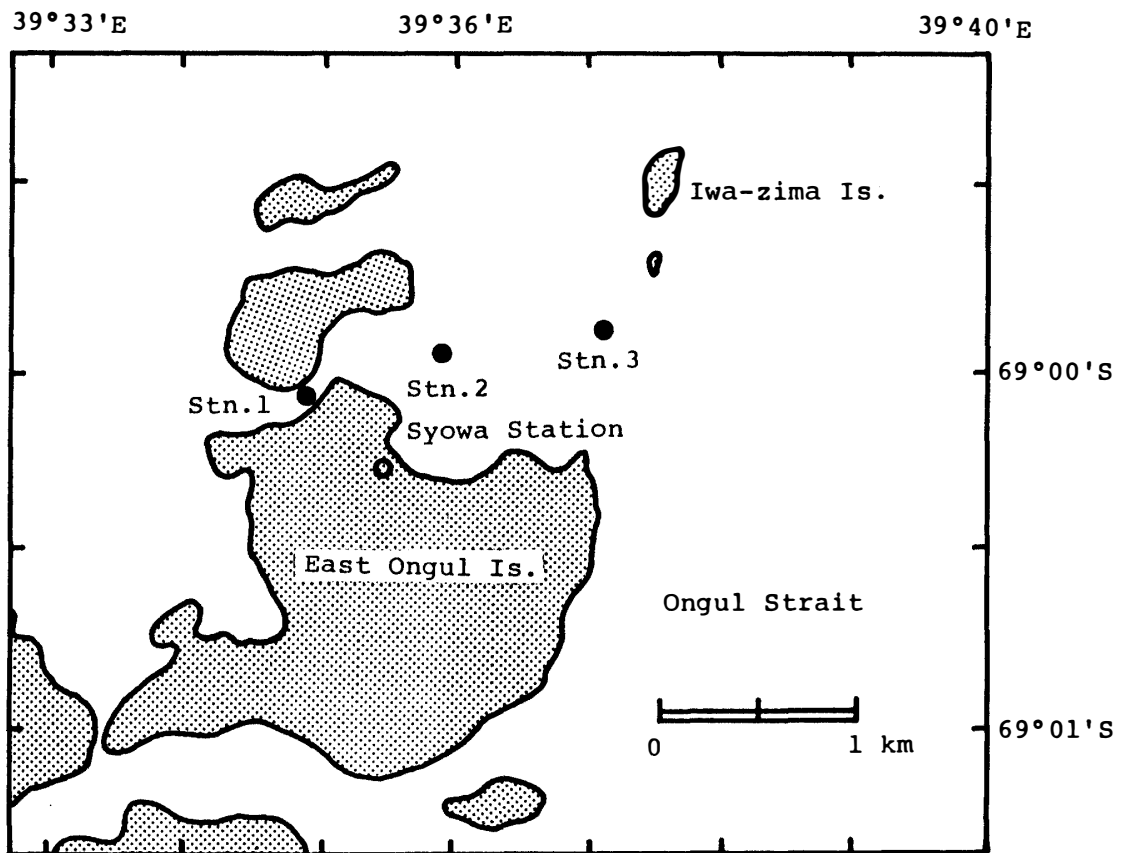


Fig.1. Sampling locations for routine observations by JARE-25.

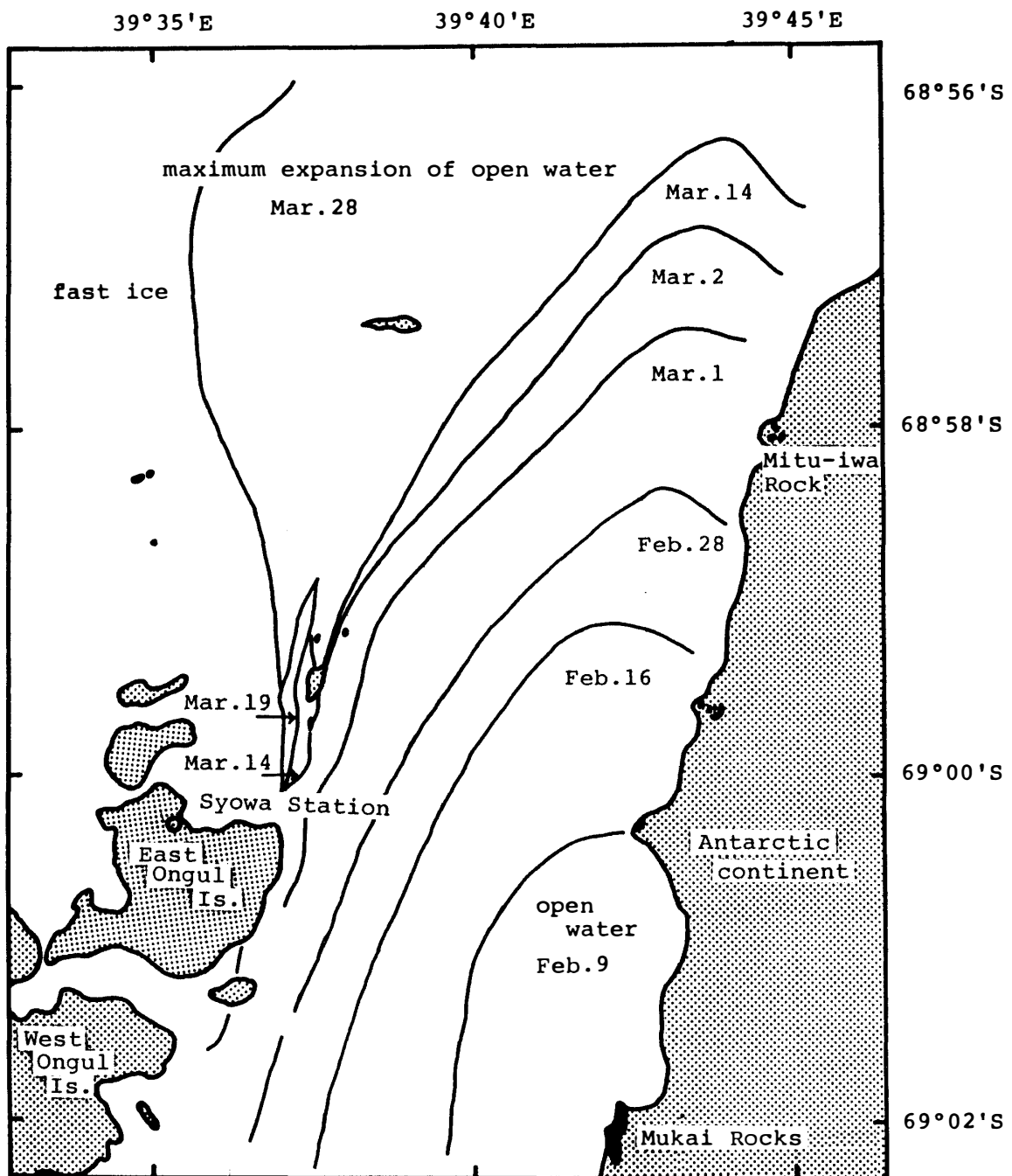


Fig.2. Breakage of fast ice near Syowa Station expressed by the expansion of open water originated from Ongul Strait (Feb.-Mar.1984).

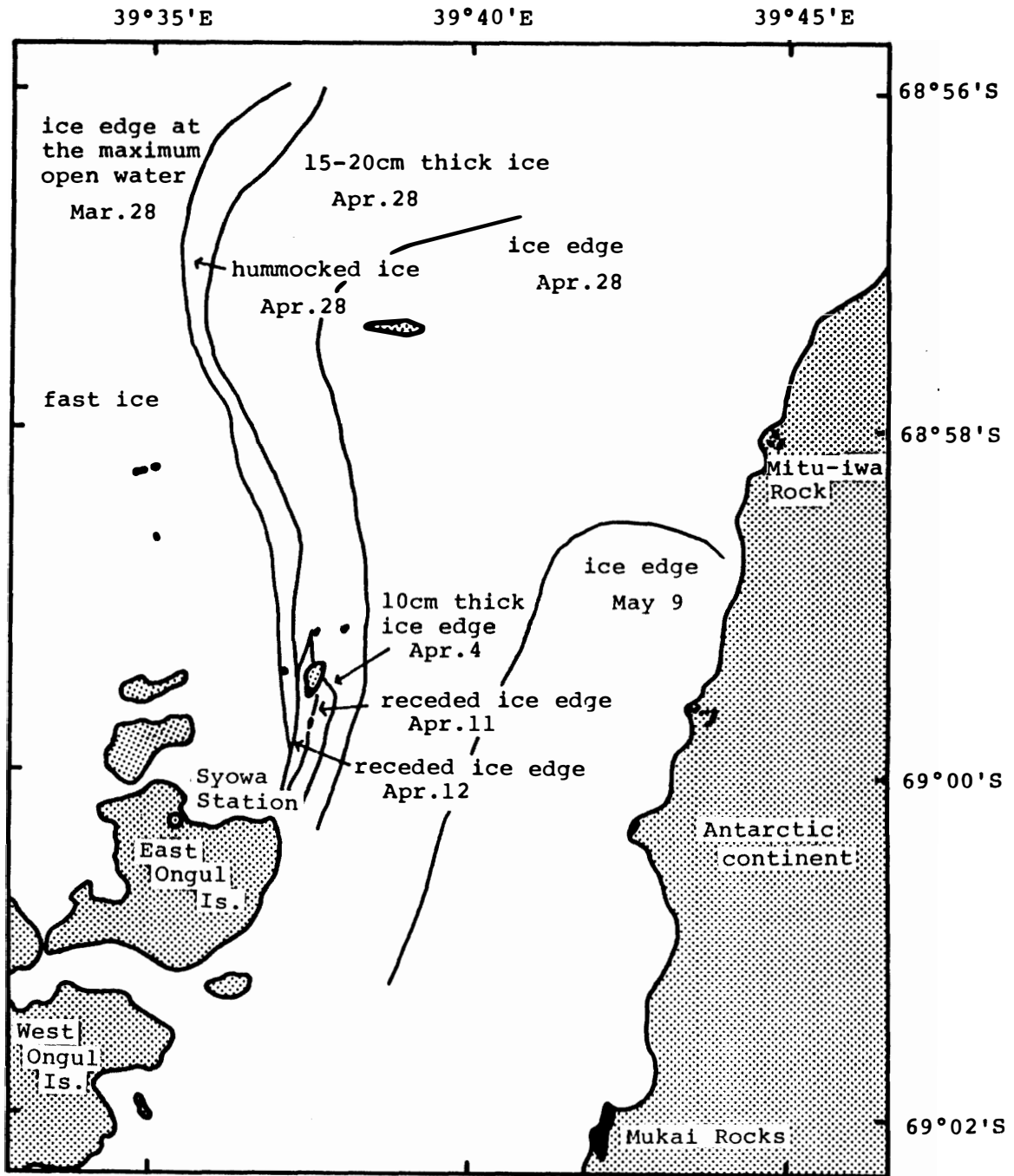


Fig.3. Formation of sea ice near Syowa Station expressed by the transition of ice edge (Apr.-May 1984). In winter, Ongul Strait was all covered with thick fast ice.

Table 1. Details of routine observations with special reference to the items of field work. Abbreviations are footnoted.

Year	Stn. 1		Stn. 2		Stn. 3	
Month	Date	Items	Date	Items	Date	Items
1984					18	STD,VD,NET, VAR,SED
Feb.						
Mar.	12	STD,VD,NET, SED	16 19	STD,VD,NET VAR,SED		
Apr.	12 18	VD,SED STD,NET,VAR	12 13	VD,SED STD,NET,VAR		
May	19	STD,VD,NET, VAR,SED	16	STD,VD NET, VAR,SED	18	STD,VD,NET, VAR,SED
June			16 17	VD,NET STD,VAR,SED	14	STD,VD,NET, VAR,SED
July			12	STD		
	11	VD	13	VD,NET,SED	14	VD,NET,SED
	12	STD,NET,SED	17	VAR	17	STD,VAR
Sept.	4	VD	4	VD		
	6	STD,VAR,SED	6	STD,VAR,SED	5	VD,SED
	10	NET	10	NET	6	STD,NET,VAR
Oct.			9 12	VD,NET,SED STD,VAR	8 12	VD,NET,SED STD,VAR
Nov.	17	STD,VD,NET, VAR,SED	16 17	VD,SED STD,NET,VAR	15	STD,VD,NET, VAR,SED
Dec.	5	STD,VD,NET, VAR,SED	5	STD,VD,NET, VAR,SED	4	STD,VD,NET, VAR,SED
1985						
Jan.			6	STD,VD,NET, VAR,SED	4 6	VD,NET STD,VAR,SED

Abbreviations:

STD; observation of sea water temperature and salinity by a CSTD monitor.

VD ; sampling of sea water by Van Dorn bottle.

NET; plankton sampling by NORPAC net.

VAR; under water fluorometric observation by Variosens II.

SED; sediment collection by gravity corer or Ekman-Birge sediment sampler.

Table 2. Sampling depths of water for physical and chemical analyses.

Station No.	Depth (m)
1	0, 2, 5, 8, 11
2	0, 2.5, 5, 10, 15, 25, 35
3	0, 2.5, 5, 10, 15, 25, 35

Table 3. Oceanographic data obtained at Station 1.

Depth m	Temp. °C	Salinity ‰	pH	DO ml/l	PO ₄ -P	SiO ₃ -Si	NO ₃ -N	NO ₂ -N	NH ₄ -N	Chl.a	Phaeo.	Pigment ratio %
					µg-at/l					µg/l		
March 12, 1984												
0	-1.56	10.635	9.27	11.21	0.50	28.9	0.6	0.08	0.4	12.96	3.61	78.2
2	-1.72	27.649	8.31	8.29	1.51	56.3	20.6	0.18	0.4	0.94	0.06	94.2
5	-1.72	32.268	8.25	8.35	1.74	59.8	25.8	0.20	0.4	0.24	0.03	88.7
8	-1.69	31.813	8.26	8.62	1.59	57.7	25.4	0.16	0.4	0.31	0.00	100.0
11	-1.65	31.013	8.25	8.34	1.72	58.9	28.1	0.16	0.4	0.23	0.04	86.2
April 12, 1984												
0	-1.87	33.252	-	7.89	1.91	54.5	26.2	0.19	0.3	0.07	0.07	50.6
2	-1.88	33.330	-	7.77	1.56	43.7	17.3	0.14	0.2	0.07	0.09	43.1
5	-1.88	33.319	-	7.72	1.91	65.6	28.2	0.23	0.5	0.05	0.03	65.2
8	-1.88	33.300	-	7.76	1.97	66.5	30.1	0.22	0.2	0.05	0.04	53.7
11	-1.88	33.249	-	7.73	2.07	65.3	30.3	0.23	0.4	0.05	0.04	57.5
May 19, 1984												
0	-1.88	33.86 *	8.09	7.89	1.87	61.3	29.9	0.24	1.0	0.04	0.04	49.8
2	-1.87	33.85 *	8.12	7.90	1.92	65.5	31.3	0.24	0.9	0.03	0.17	14.8
5	-1.88	33.86 *	8.13	7.89	1.87	65.0	30.5	0.24	1.7	0.04	0.22	14.1
8	-1.88	33.86 *	8.14	7.92	2.02	63.0	30.3	0.25	1.0	0.04	0.23	13.6
11	-1.88	33.86 *	8.15	7.86	1.92	61.3	30.5	0.25	1.0	0.03	0.16	17.2

* data obtained by a CSTD monitor.

Table 3. Continued.

Depth	Temp.	Salinity	pH	DO	PO ₄ -P	SiO ₃ -Si	NO ₃ -N	NO ₂ -N	NH ₄ -N	Chl.a	Phaeo.	Pigment ratio
July 11, 1984												
0	-1.92	33.924	8.01	8.00	1.83	61.5	46.5	0.53	0.9	0.03	0.09	23.0
2	-1.91	33.794	8.01	8.03	1.87	61.5	45.4	0.50	2.4	0.01	0.04	23.0
5	-1.91	33.776	8.01	7.97	1.88	61.0	44.7	0.49	0.6	0.01	0.04	20.7
8	-1.91	33.776	8.01	8.06	1.92	63.0	44.2	0.50	0.8	0.01	0.04	23.0
11	-1.91	33.784	8.01	8.00	1.92	63.5	44.3	0.50	0.8	0.01	0.06	17.2
September 4, 1984												
0	-1.91	33.973	7.85	7.49	1.55	39.4	15.9	0.29	0.9	0.02	0.30	6.3
2	-1.91	33.934	7.84	7.65	1.21	41.2	33.2	0.15	0.5	0.02	0.01	57.5
5	-1.91	34.101	7.84	7.73	1.89	66.1	29.2	0.42	0.8	0.02	0.01	57.5
8	-1.91	33.906	7.84	7.69	1.96	64.7	29.2	0.41	0.6	0.01	0.03	27.6
11	-1.91	33.932	7.85	8.24	1.89	66.6	29.3	0.42	0.6	0.02	0.04	34.3
November 17, 1984												
0	-1.85	33.950	8.15	7.69	2.02	57.3	14.8	0.11	0.8	0.41	0.09	82.3
2	-1.87	33.990	8.16	7.75	1.93	74.8	39.4	0.11	2.0	0.34	0.12	74.1
5	-1.87	33.989	8.15	7.57	1.97	65.2	53.0	0.13	0.7	0.31	0.08	79.1
8	-1.87	33.990	8.15	7.59	1.97	65.7	63.5	0.10	0.7	0.28	0.10	73.4
11	-1.85	33.991	8.16	7.60	1.98	65.5	72.1	0.11	1.1	0.44	0.11	80.5

Table 3. Continued.

Depth	Temp.	Salinity	pH	DO	PO ₄ -P	SiO ₃ -Si	NO ₃ -N	NO ₂ -N	NH ₄ -N	Chl.a	Phaeo.	Pigment ratio
m	°C	‰		ml/l			µg-at/l			µg/l		%
December 5, 1984												
0	-1.83	33.676	8.24	9.60	1.83	60.7	58.2	0.12	1.0	3.19	0.00	100.0
2	-1.84	33.928	8.06	8.12	1.92	63.5	63.6	0.11	1.0	1.02	0.00	100.0
5	-1.83	34.014	7.98	7.45	1.64	54.0	63.9	0.08	0.9	0.24	0.06	80.1
8	-1.83	34.015	7.97	7.40	1.97	65.4	65.5	0.11	0.7	0.23	0.06	80.5
11	-1.83	34.019	7.97	7.41	1.96	67.1	64.5	0.10	0.8	0.19	0.07	72.8

Table 4. Oceanographic data obtained at Station 2.

Depth m	Temp. °C	Salinity ‰	pH	DO ml/l	PO ₄ -P	SiO ₃ -Si	NO ₃ -N	NO ₂ -N	NH ₄ -N	Chl.a	Phaeo.	Pigment ratio %
					µg-at/l					µg/l		
March 16, 1984												
0	-1.42	7.095	9.58	11.84	0.26	28.6	0.5	0.05	0.4	4.86	1.50	76.4
2.5	-1.78	32.620	8.16	8.06	1.86	63.0	10.6	0.30	0.3	0.25	0.08	75.1
5	-1.77	33.043	8.15	8.14	1.68	58.9	21.0	0.18	0.4	0.16	0.11	59.1
10	-1.76	32.959	8.16	8.14	1.74	61.8	23.8	0.19	0.2	0.57	0.53	52.0
15	-1.75	33.389	8.15	8.09	1.82	52.8	18.9	0.15	0.3	0.11	0.12	48.9
25	-1.73	33.616	8.12	8.04	1.85	62.7	24.4	0.15	0.1	0.09	0.04	69.0
34	-1.73	33.610	8.06	8.04	2.31	65.0	27.3	0.14	0.2	0.07	0.04	63.2
April 12, 1984												
0	-1.87	32.444	-	7.02	2.10	62.4	22.5	0.21	0.4	0.20	0.22	47.8
2.5	-1.86	33.328	-	7.79	1.76	46.6	16.2	0.14	0.3	0.07	0.05	60.4
5	-1.85	33.344	-	7.81	2.05	67.0	28.0	0.23	0.3	0.08	0.04	69.0
10	-1.85	33.285	-	7.77	2.06	65.6	28.5	0.23	0.3	0.06	0.03	69.0
15	-1.85	33.323	-	7.78	2.07	66.2	28.1	0.23	0.3	0.06	0.03	65.2
25	-1.84	33.273	-	7.80	2.08	64.7	27.9	0.23	0.3	0.05	0.02	69.0
35	-1.84	33.342	-	7.78	1.47	34.7	8.6	0.10	0.4	0.05	0.02	73.9

Table 4. Continued.

Depth m	Temp. °C	Salinity ‰	pH	DO ml/l	PO ₄ -P	SiO ₃ -Si	NO ₃ -N	NO ₂ -N	NH ₄ -N	Chl.a	Phaeo.	Pigment
										µg-at/l		
May 16, 1984												
0	-1.88	31.678	8.04	7.94	1.97	61.3	30.9	0.24	0.9	0.21	0.11	65.9
2.5	-1.87	33.502	8.08	7.91	2.07	62.7	31.3	0.25	0.9	0.04	0.06	40.8
5	-1.87	33.522	8.13	7.88	2.02	58.1	31.1	0.24	0.9	0.04	0.04	49.8
10	-1.87	33.514	8.12	7.88	2.02	62.4	30.7	0.25	0.8	0.03	0.05	38.3
15	-1.87	33.518	8.11	7.82	1.97	63.8	30.3	0.24	0.7	0.03	0.03	49.3
25	-1.85	33.533	8.13	7.86	1.87	59.3	30.0	0.24	0.9	0.03	0.08	28.7
34	-1.83	33.541	8.13	7.82	1.97	61.5	22.9	0.24	0.9	0.02	0.07	23.0
June 15, 1984												
0	-	33.161	8.03	8.07	1.87	55.6	29.8	0.37	1.1	0.02	0.20	9.0
2.5	-1.89	33.667	8.08	7.76	2.07	59.5	29.9	0.37	0.6	0.02	0.04	28.7
5	-1.88	33.668	8.11	7.81	1.97	57.3	29.9	0.37	0.6	0.02	0.02	43.1
10	-1.88	33.675	8.13	7.93	1.97	60.1	30.1	0.37	0.6	0.02	0.04	28.7
15	-1.88	33.645	8.13	8.10	1.97	60.4	29.5	0.37	0.6	0.01	0.04	23.0
25	-1.88	33.698	8.15	8.07	1.87	61.5	29.9	0.37	0.5	0.02	0.06	21.6
34	-1.88	33.746	8.15	8.06	1.97	61.5	29.4	0.36	0.8	0.01	0.03	27.6

Table 4. Continued.

Depth	Temp.	Salinity	pH	DO	PO ₄ -P	SiO ₃ -Si	NO ₃ -N	NO ₂ -N	NH ₄ -N	Chl.a	Phaeo.	Pigment
										µg-at/l		
m	°C	‰		ml/l								%
July 13, 1984												
0	-1.89	33.800	7.91	7.92	1.88	64.7	44.5	0.56	0.6	0.01	0.03	27.6
2.5	-1.89	33.610	7.97	8.04	1.93	63.5	44.6	0.49	0.6	0.01	0.03	25.9
5	-1.89	33.728	7.98	8.00	2.04	65.5	35.9	0.53	0.7	0.01	0.05	11.5
10	-1.89	33.638	7.98	8.03	1.90	61.3	43.2	0.49	0.7	0.01	0.03	27.6
15	-1.89	33.703	7.99	8.00	1.89	63.2	43.2	0.49	0.7	0.01	0.04	20.7
25	-1.91	33.890	8.00	8.07	1.32	53.0	43.3	0.54	0.6	0.01	0.09	6.9
34	-1.89	33.696	7.99	8.00	1.92	55.0	38.0	0.43	0.7	0.01	0.05	11.5
September 4, 1984												
0	-1.92	33.860	7.84	7.72	1.95	65.2	29.4	0.45	0.6	0.02	0.00	62.4
2.5	-1.92	33.889	7.85	7.75	1.95	65.0	29.1	0.42	0.5	0.03	0.41	6.7
5	-1.92	33.883	7.85	7.69	2.05	66.0	28.8	0.41	0.7	0.03	0.42	7.3
10	-1.92	33.899	7.84	7.73	1.93	64.7	29.2	0.40	0.6	0.02	0.13	11.5
15	-1.92	33.910	7.85	7.68	1.94	66.3	28.9	0.46	0.6	0.02	0.07	23.0
25	-1.92	33.922	7.85	7.89	1.91	68.0	28.8	0.46	0.6	0.01	0.04	23.0
34	-1.92	33.939	7.85	7.76	1.91	66.0	28.7	0.46	0.5	0.02	0.12	12.3

Table 4. Continued.

Depth	Temp.	Salinity	pH	DO	PO ₄ -P	SiO ₃ -Si	NO ₃ -N	NO ₂ -N	NH ₄ -N	Chl.a	Phaeo.	Pigment
					μg-at/l					μg/l		%
m	°C	‰		ml/l								
October 9, 1984												
0	-1.85	33.954	8.11	7.52	1.93	67.9	72.5	0.22	0.4	0.09	0.00	100.0
2.5	-1.85	33.939	8.12	7.52	1.89	68.5	74.4	0.21	0.2	0.06	0.12	34.5
5	-1.85	33.956	8.10	7.50	2.02	68.1	71.4	0.22	0.2	0.07	0.02	80.5
10	-1.85	33.952	8.09	7.46	1.98	68.4	71.7	0.24	0.2	0.05	0.00	92.0
15	-1.85	33.976	8.11	7.52	1.41	39.8	31.5	0.11	0.2	0.05	0.02	69.0
25	-1.85	34.018	8.11	7.41	1.95	70.1	65.7	0.20	0.2	0.04	0.03	59.1
34	-1.77	34.036	8.10	7.24	1.91	68.3	68.5	0.12	0.3	0.02	0.03	40.2
November 16, 1984												
0	-1.88	34.015	8.07	7.52	1.98	64.4	71.9	0.11	0.7	0.21	0.14	59.7
2.5	-1.88	33.985	8.08	7.64	1.88	57.0	61.4	0.10	0.6	0.20	0.11	65.8
5	-1.85	33.996	8.08	7.49	2.01	65.2	70.1	0.09	0.6	0.14	0.07	67.4
10	-1.85	33.988	8.09	7.38	0.81	13.9	28.7	0.02	0.5	0.15	0.08	64.7
15	-1.84	33.996	8.10	7.45	1.63	39.4	31.7	0.05	0.7	0.15	0.07	69.0
25	-1.84	33.999	8.09	7.40	1.95	17.4	66.8	0.10	0.6	0.13	0.10	57.5
34	-1.80	34.025	8.09	7.25	1.87	58.6	61.3	0.08	0.6	0.11	0.09	55.8

Table 4. Continued.

Depth m	Temp. °C	Salinity ‰	pH	DO ml/l	PO ₄ -P	SiO ₃ -Si	NO ₃ -N	NO ₂ -N	NH ₄ -N	Chl.a	Phaeo.	Pigment ratio %
					µg-at/l					µg/l		
December 5, 1984												
0	-1.85	33.874	7.97	7.76	2.11	63.5	61.5	0.14	0.7	0.35	0.00	100.0
2.5	-1.85	33.998	7.96	7.36	1.98	63.9	61.5	0.11	0.6	0.15	0.04	77.6
5	-1.85	34.008	7.95	7.23	1.90	65.1	63.3	0.11	0.6	0.14	0.02	90.5
10	-1.85	34.017	7.95	7.35	2.12	65.4	69.5	0.11	0.5	0.11	0.04	73.3
15	-1.84	34.016	7.94	7.32	2.04	65.9	69.1	0.11	0.5	0.13	0.02	87.4
25	-1.83	34.027	7.95	7.28	2.07	65.4	67.9	0.12	0.5	0.09	0.05	66.5
34	-1.79	34.030	7.96	7.28	1.99	65.9	66.1	0.10	0.6	0.10	0.04	71.3
January 6, 1985												
0	-0.68	-	7.20	7.77	0.23	10.6	0.2	0.12	0.2	1.87	0.13	93.5
2.5	-1.46	32.566	8.08	7.94	1.67	62.4	27.3	0.15	0.4	0.44	0.02	95.7
5	-1.64	33.702	8.08	8.13	1.94	64.0	28.7	0.14	0.4	0.49	0.08	86.0
10	-1.69	33.987	8.08	8.00	1.99	65.3	29.1	0.14	0.4	0.41	0.10	80.4
15	-1.69	34.010	8.09	7.73	1.93	62.9	29.5	0.13	0.4	0.20	0.07	74.1
25	-1.72	34.033	8.09	7.65	2.02	64.9	30.3	0.13	0.4	0.18	0.05	78.3
34	-1.71	34.069	8.08	7.32	1.99	69.9	30.6	0.13	0.3	0.10	0.04	71.4

Table 5. Oceanographic data obtained at Station 3.

Depth m	Temp. °C	Salinity ‰	pH	DO ml/l	PO ₄ -P	SiO ₃ -Si	NO ₃ -N NO ₂ -N NH ₄ -N			Chl.a	Phaeo.	Pigment ratio %
							µg-at/l					
February 18, 1984												
0	-1.15	4.268	8.27	9.59	0.58	18.4	0.3	0.05	0.8	0.36	0.01	98.0
2.5	-1.21	33.331	8.29	10.71	1.33	58.6	11.0	0.11	0.0	1.58	0.10	94.0
5	-1.33	33.897	8.28	10.08	1.58	63.5	18.7	0.17	0.0	2.02	0.11	94.7
10	-1.52	34.018	8.24	9.05	1.72	66.5	24.8	0.11	0.0	1.53	0.05	96.8
15	-1.56	34.093	8.11	8.07	2.25	67.0	28.7	0.11	0.0	0.46	0.14	77.3
25	-1.61	34.114	8.07	7.77	1.94	68.8	31.7	0.11	0.0	0.13	1.66	7.1
35	-1.64	34.133	8.03	7.52	2.18	67.6	32.5	0.10	0.0	0.06	0.70	7.4
May 18, 1984												
0	-1.87	33.437	8.05	7.61	1.92	61.5	29.9	0.24	1.1	0.03	0.06	34.5
2.5	-1.87	33.323	8.11	7.74	1.87	63.2	30.0	0.25	0.8	0.03	0.06	30.7
5	-1.87	33.476	8.12	7.89	2.02	61.5	30.0	0.24	0.8	0.03	0.08	28.2
10	-1.87	33.546	8.13	7.86	1.87	57.5	29.9	0.25	1.1	0.16	0.25	38.5
15	-1.87	33.235	8.14	7.81	1.82	56.4	29.9	0.21	1.0	0.03	0.04	43.1
25	-1.85	33.492	8.13	7.84	1.87	61.0	29.7	0.26	0.8	0.18	0.15	54.2
35	-1.85	33.586	8.14	7.84	2.07	59.0	29.9	0.24	0.8	0.04	0.04	47.4

Table 5. Continued.

Depth	Temp.	Salinity	pH	DO	PO ₄ -P	SiO ₃ -Si	NO ₃ -N	NO ₂ -N	NH ₄ -N	Chl.a	Phaeo.	Pigment ratio %
					µg-at/l					µg/l		
m	°C	‰		ml/l								
June 14, 1984												
0	-1.91	33.736	8.04	7.70	1.97	57.8	30.0	0.38	0.9	0.03	0.04	44.4
2.5	-1.91	33.650	8.04	8.04	1.92	58.1	29.7	0.36	0.9	0.02	0.02	51.7
5	-1.91	33.709	8.00	8.06	2.07	59.0	29.6	0.34	0.6	0.02	0.02	43.1
10	-1.89	33.742	8.04	7.69	2.02	49.0	25.8	0.32	0.9	0.07	0.05	58.4
15	-1.91	33.755	8.06	7.52	2.12	50.1	29.1	0.35	0.9	0.02	0.05	29.6
25	-1.91	33.769	8.08	7.92	2.12	61.5	29.3	0.36	0.6	0.04	0.09	32.0
35	-1.88	33.704	8.08	7.95	2.07	61.5	28.5	0.34	0.6	0.02	0.07	19.2
July 14, 1984												
0	-1.89	33.703	8.00	7.74	1.90	61.3	43.1	0.52	0.6	0.01	0.05	19.7
2.5	-1.89	33.808	8.01	7.42	1.82	62.7	43.9	0.51	0.7	0.01	0.04	23.0
5	-1.89	33.782	8.03	7.91	1.82	62.7	43.3	0.50	0.5	0.01	0.03	25.9
10	-1.89	33.823	8.04	7.95	1.86	62.7	43.8	0.50	0.5	0.02	0.04	28.7
15	-1.89	33.775	8.03	7.95	1.84	62.4	43.3	0.49	0.5	0.01	0.04	20.7
25	-1.85	33.750	8.04	7.90	1.96	63.0	42.8	0.48	0.4	0.01	0.07	15.3
35	-1.83	33.793	8.04	7.87	1.87	62.1	42.2	0.47	0.4	0.02	0.04	28.7

Table 5. Continued.

Depth	Temp.	Salinity	pH	DO	PO ₄ -P	SiO ₃ -Si	NO ₃ -N	NO ₂ -N	NH ₄ -N	Chl.a	Phaeo.	Pigment ratio
m	°C	‰		ml/l	µg-at/l				µg/l		%	
September 5, 1984												
0	-1.89	33.944	7.86	7.57	1.92	64.7	28.9	0.39	0.6	0.02	0.06	21.6
2.5	-1.91	33.916	7.85	7.69	1.77	66.3	28.5	-	0.6	0.01	0.00	100.0
5	-1.91	33.923	7.86	7.71	1.94	66.8	28.4	0.40	0.5	0.01	0.03	17.2
10	-1.91	33.923	7.86	7.68	1.91	64.8	28.6	0.39	0.7	0.01	0.03	17.2
15	-1.91	33.926	7.86	7.63	1.91	65.8	29.1	0.39	0.8	0.01	0.00	100.0
25	-1.91	33.974	7.87	7.69	2.04	66.0	28.4	0.39	0.4	0.01	0.01	51.7
35	-1.91	33.925	7.88	7.71	1.98	66.9	28.1	0.38	0.4	0.01	0.02	46.0
October 8, 1984												
0	-1.87	33.944	8.05	7.53	1.88	67.2	68.2	0.25	0.3	0.07	0.04	62.7
2.5	-1.87	33.914	8.05	7.54	2.02	66.6	68.2	0.25	0.5	0.06	0.00	93.6
5	-1.87	33.936	8.05	7.53	1.87	66.0	68.4	0.24	0.3	0.07	0.04	63.2
10	-1.87	33.947	8.04	7.36	1.92	67.8	66.9	0.17	0.3	0.04	0.01	75.9
15	-1.87	33.980	8.05	7.29	1.99	69.4	66.7	0.13	0.3	0.05	0.03	60.4
25	-1.87	34.059	8.03	7.06	1.99	71.9	68.3	0.08	0.3	0.03	0.02	55.2
35	-1.85	34.076	8.04	7.06	1.92	73.3	65.6	0.07	0.1	0.02	0.02	51.7

Table 5. Continued.

Depth m	Temp. °C	Salinity ‰	pH	DO ml/l	PO ₄ -P	SiO ₃ -Si	NO ₃ -N	NO ₂ -N	NH ₄ -N	Chl.a	Phaeo.	Pigment ratio %
					µg-at/l					µg/l		
November 15, 1984												
0	-1.87	33.952	8.08	7.58	1.98	64.1	70.1	0.10	0.6	0.15	0.19	44.4
2.5	-1.87	33.975	8.09	7.61	1.89	62.7	71.1	0.09	0.5	0.10	0.24	28.6
5	-1.87	33.983	8.09	7.68	1.91	65.0	68.1	0.11	0.5	0.13	0.10	57.0
10	-1.84	33.985	8.08	7.46	2.07	66.6	68.1	0.09	0.6	0.14	0.07	67.4
15	-1.83	33.989	8.10	7.54	1.99	64.8	69.0	0.09	0.6	0.13	0.07	65.7
25	-1.83	33.989	8.09	7.46	2.02	64.4	69.2	0.09	0.6	0.17	0.08	69.0
35	-1.80	34.010	8.09	7.65	1.88	56.4	60.1	0.08	0.6	0.10	0.05	66.8
December 4, 1984												
0	-1.85	34.026	8.00	7.40	1.97	63.1	64.2	0.10	0.7	0.12	0.03	80.5
2.5	-1.87	34.012	8.00	7.20	2.00	64.7	66.2	0.16	0.5	0.10	0.05	66.8
5	-1.87	34.006	8.01	7.53	2.01	65.0	64.1	0.10	0.4	0.10	0.06	62.9
10	-1.85	34.023	8.00	7.32	2.02	66.8	63.2	0.10	0.5	0.09	0.04	69.0
15	-1.85	34.018	8.00	7.28	2.15	65.9	62.5	0.10	0.4	0.07	0.03	69.0
25	-1.83	34.036	7.98	7.08	2.10	67.2	63.2	0.09	0.5	0.09	0.02	84.7
35	-1.83	34.033	7.98	7.11	2.10	66.9	63.2	0.07	0.5	0.11	0.04	73.6

Table 5. Continued.

Depth	Temp.	Salinity	pH	DO	PO ₄ -P	SiO ₃ -Si	NO ₃ -N	NO ₂ -N	NH ₄ -N	Chl.a	Phaeo.	Pigment ratio
m	°C	‰		ml/l	µg-at/l				µg/l		%	
January 4, 1985												
0	-0.35	-	7.43	9.92	0.22	7.1	0.7	0.09	0.8	0.23	0.15	60.5
2.5	-1.31	33.681	8.09	8.10	1.81	62.5	27.2	0.17	0.3	0.55	0.01	98.2
5	-1.68	33.731	8.10	8.13	1.83	63.5	27.9	0.16	0.4	0.56	0.04	93.3
10	-1.73	33.931	8.09	7.71	1.92	65.6	29.1	0.13	0.3	0.44	0.13	77.2
15	-1.73	34.005	8.09	8.16	1.92	65.4	29.7	0.13	0.3	0.41	0.11	78.8
25	-1.75	34.027	8.09	8.40	1.96	64.1	30.6	0.11	0.5	0.25	0.06	80.6
35	-1.72	34.038	8.08	7.60	1.97	69.8	31.0	0.11	0.3	0.32	0.08	80.0