BULLETIN ZOOLOGISCH MUSEUM

UNIVERSITEIT VAN AMSTERDAM

Vol. 8 No. 1 1981

LIST OF DISCRETE DEPTH SAMPLES AND OPEN NET HAULS OF THE AMSTERDAM MID NORTH ATLANTIC PLANKTON EXPEDITION 1980 (PROJECT 101A) [1]

S. van der SPOEL

ABSTRACT

The technical details and hydrographical data of the hauls with open nets and opening-and-closing nets, made during the Amsterdam Mid North Atlantic Plankton Expedition are given together with the general conditions during the sampling period April 11 - May 2, 1980. A temperature and salinity profile between 55° and 25°N to a depth of 2000 m are presented with ten XBT records.

INTRODUCTION

The research programme 101A of the Institute of Taxonomic Zoology, University of Amsterdam, primarily aims at elucidating the patterns of latitudinal diversity, taxonomic variation below the species level, vertical variation and the interaction of climate, hydrographic features, ecology and morphological variation of marine plankton.

[1]) AMNAPE, Proj. 101A, rep. no. 1, supported by a grant of the Netherlands Ministry of Education and Sciences

The present list comprises the data on all discrete depth samples and open net hauls made in the period April 11 - May 2, 1980 in the Mid North Atlantic between 55° and 24°N. The discrete depth samples were made between 30 m and 1200 m depth with the Rectangular Midwater Trawl (RMT1+8) developed by the Institute of Oceanographic Sciences, Wormley, Great Britain. The open net hauls were made with an open one square metre Rectangular Midwater Trawl (RMT1) and with an open ringnet in the upper 150 metres.

In addition to these samples, microplankton pump samples were taken, temperature, daylight

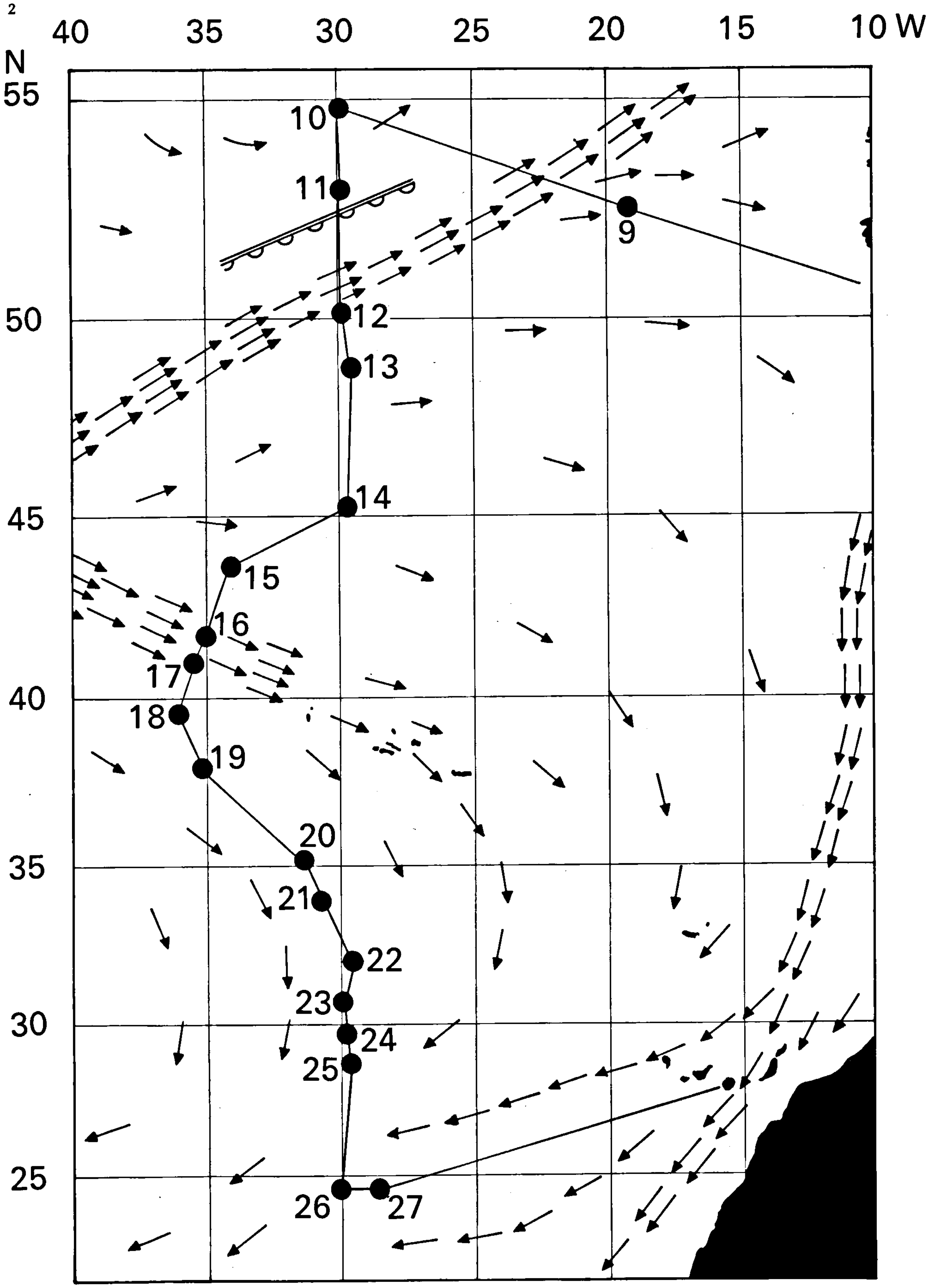

Fig. 1a - Position of the stations with a diagrammatic representation of surface currents (arrows) and the polar front (double line).

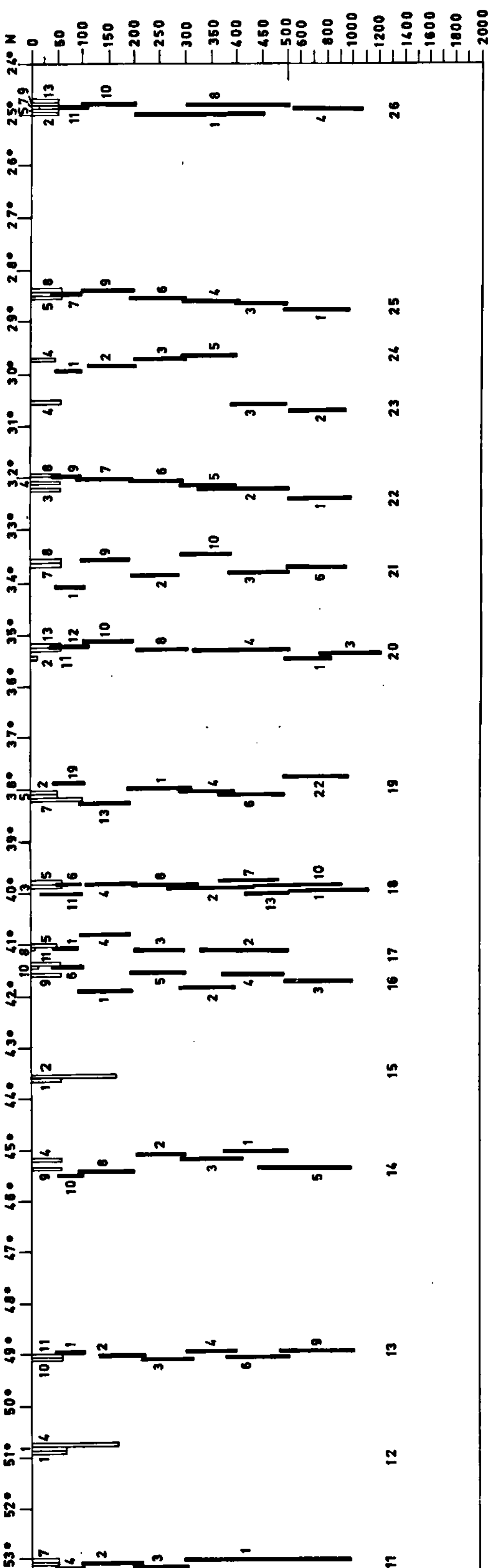

Fig. 1b - Position of the stations and hauls in a vertical profile, giving the opening-closing net samples (solid) and open net hauls (open).

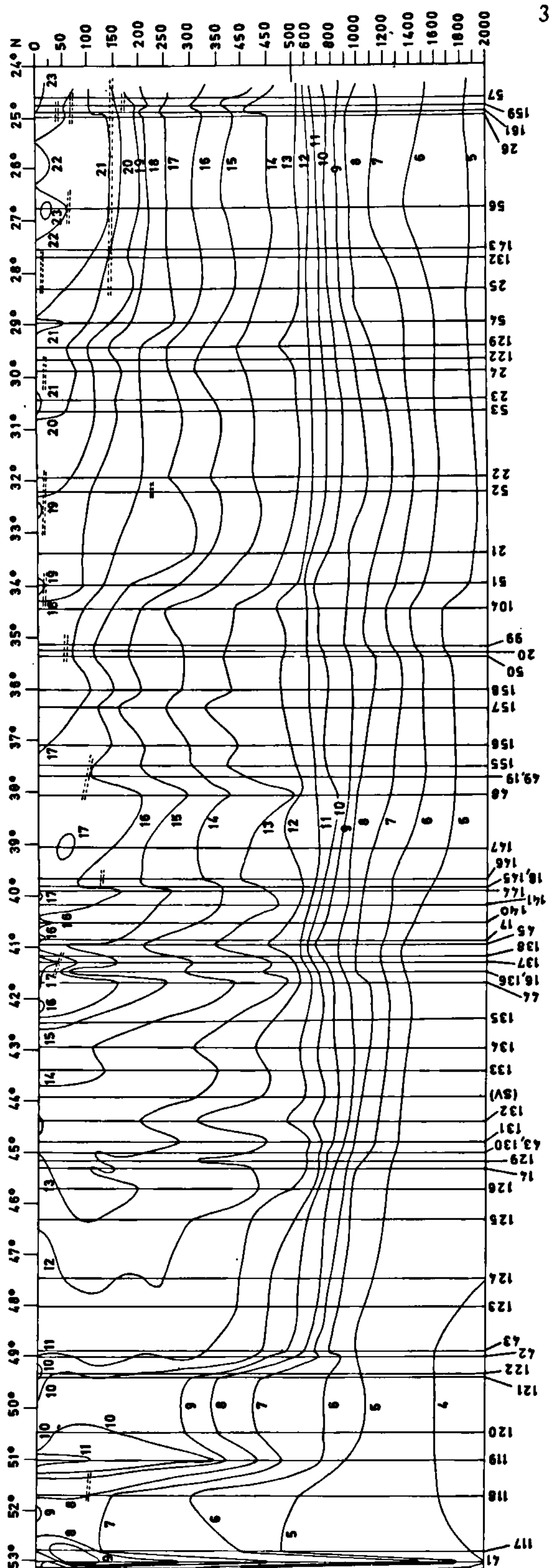

Fig. 2 - Temperature (°C) profile of the cruise between 55° and 24°N. Vertical lines indicate XBT and net monitor temperatures, with their numbers along the y-axis, depth in metres along x-axis.

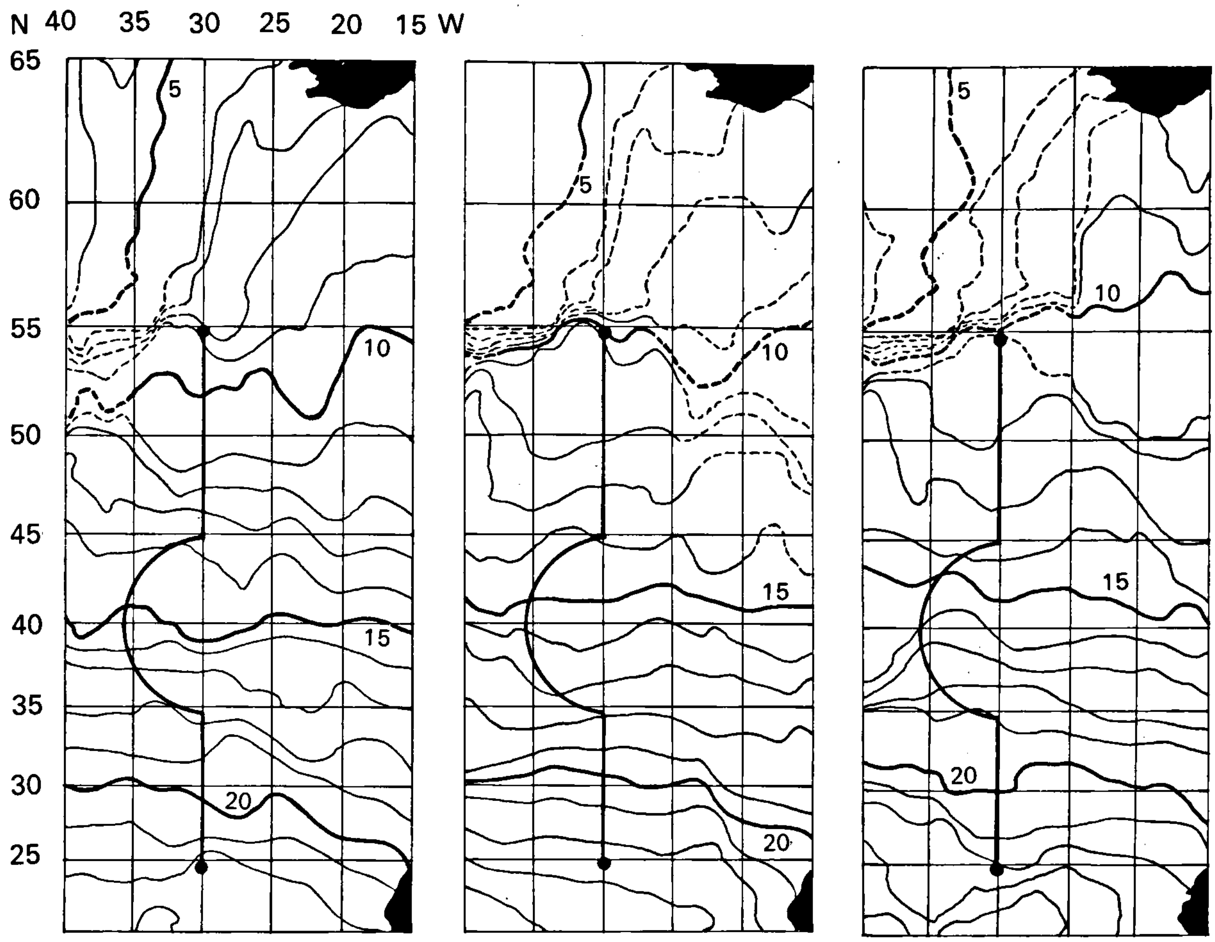

Fig. 3 - Sea surface temperatures (°C) in the area investigated, from the left to the right on 15, 22 and 29 April, 1980 based on NOAA satellite measurements (courtesy of the U.S. Dept. Commerce, National Oceanographic and Atmospheric Administration).

fluctuations and DSL migration were measured, and bird countings were carried out; these results will be published elsewhere.

The discrete depth samples and open net hauls are given in fig. 1a and, except for the test stations 9 and 27, also in fig. 1b. The stations 1-5 concern the test cruise to the Bay of Biscay the data of which will be published by Heyman (in press). All samples were roughly sorted aboard ship, fixed and preserved in the most appropriate way according to the animal groups concerned. Alcohol 70°/₀₀, propylene phenoxetol, formalin 4 % and formalin 2 % in seawater were the most frequently used fixatives (Heyman, in press). All material is preserved in the Institute of Taxonomic Zoology, Amsterdam.

The temperature measurements made with XBTs and with the RMT net monitor system form the basis of the temperature profile in fig. 2. In fig. 3 sea surface temperatures are shown, based on NOAA satellite data, for three days during the expedition, viz. 15, 22 and 29 April, 1980. The diagrammatic salinity profile in fig. 4 is composed from temperature and sound velocity records which do not provide sufficiently accurate data to produce here more than the 36 °/₀₀ and 34.9 °/₀₀ isohalines.

COLLECTING METHODS

The Rectangular Midwater Trawl RMT1+8 is a combined opening and closing net composed of a large net with an effective mouth area of 8 m^2 (the RMT8) and a smaller one on top with an effective mouth area of 0.8 m^2 (the RMT1). The RMT1 is made of nylon sifting cloth with a mesh size of 0.32 mm throughout. The RMT8 is made of nylon sifting cloth with a mesh size of 4.5 mm and in the cod end of 1.0 mm. Ship-speed during fishing was kept as close to two knots as

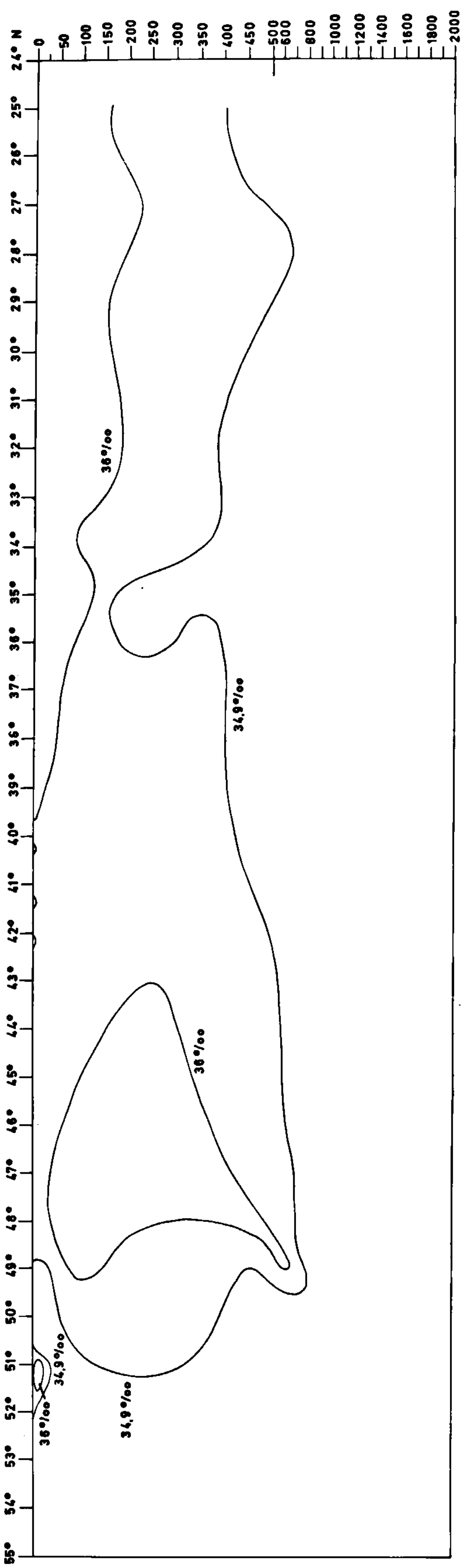

Fig. 4 - Salinity profile of the cruise between 55° and 24°N based on sound velocity measurements, made available by courtesy of the Hydrographic Office of the Royal Dutch Navy, in relation to temperature, depth in metres.

possible. Fundamentally, a sampling scheme was maintained in which hauls between 50-100, 100-200, 200-300, 300-400, 400-500 and 500-1000 m depth were made. Fishing was carried out obliquely downwards through the layers sampled. The net monitor provides accurate data on depth, temperature and flow during fishing. For a full description of the nets and their behaviour one is referred to Baker & al. (1973) and Roe & al. (1980).

The open Rectangular Midwater Trawl (RMT1) was the same net as the one used in the RMT1+8 combination.

The ringnet, designed for this cruise, has a circular mouth opening of 0.78 m^2 and is made of a conical sifting cloth with a mesh size of 0.18 mm, the sifting surface is 2.8 m^2, cod end included. It is towed through the water at a speed of ca 2 knots with 80 or 360 metres wire out. This method results in an estimated fishing depth of 50 and 180 metres respectively, and an effective mouth area of ca 0.55 m^2. In some of the hauls the normal cod end of 0.18 mm mesh size was replaced by a RMT1 liner with mesh size 0.32 mm.

At stations 9-19 the open hauls were made from the stern of the ship and the RMT1+8 was lowered from the main working deck at starboard, at stations 20-27 the RMT1+8 and the open RMT1 were handled from the stern and the open ringnets were lowered from the main working deck at starboard. Slight differences in behaviour of the nets are to be expected resulting from these various ways of operation, but any influence on the catching rate is presumed to be absent.

Nine hauls were made at dawn, 69 in the daytime, 14 at dusk and 40 during the night, making a total of 132 hauls; details are given in table I.

CONDITIONS

From the temperature and salinity data presented in figs. 1-3 the different water masses can be roughly deduced.

Between 55° and 53°N the Polar thermal fronts are found; the most southern frontal phenomenon is found at 53°N. The water north of

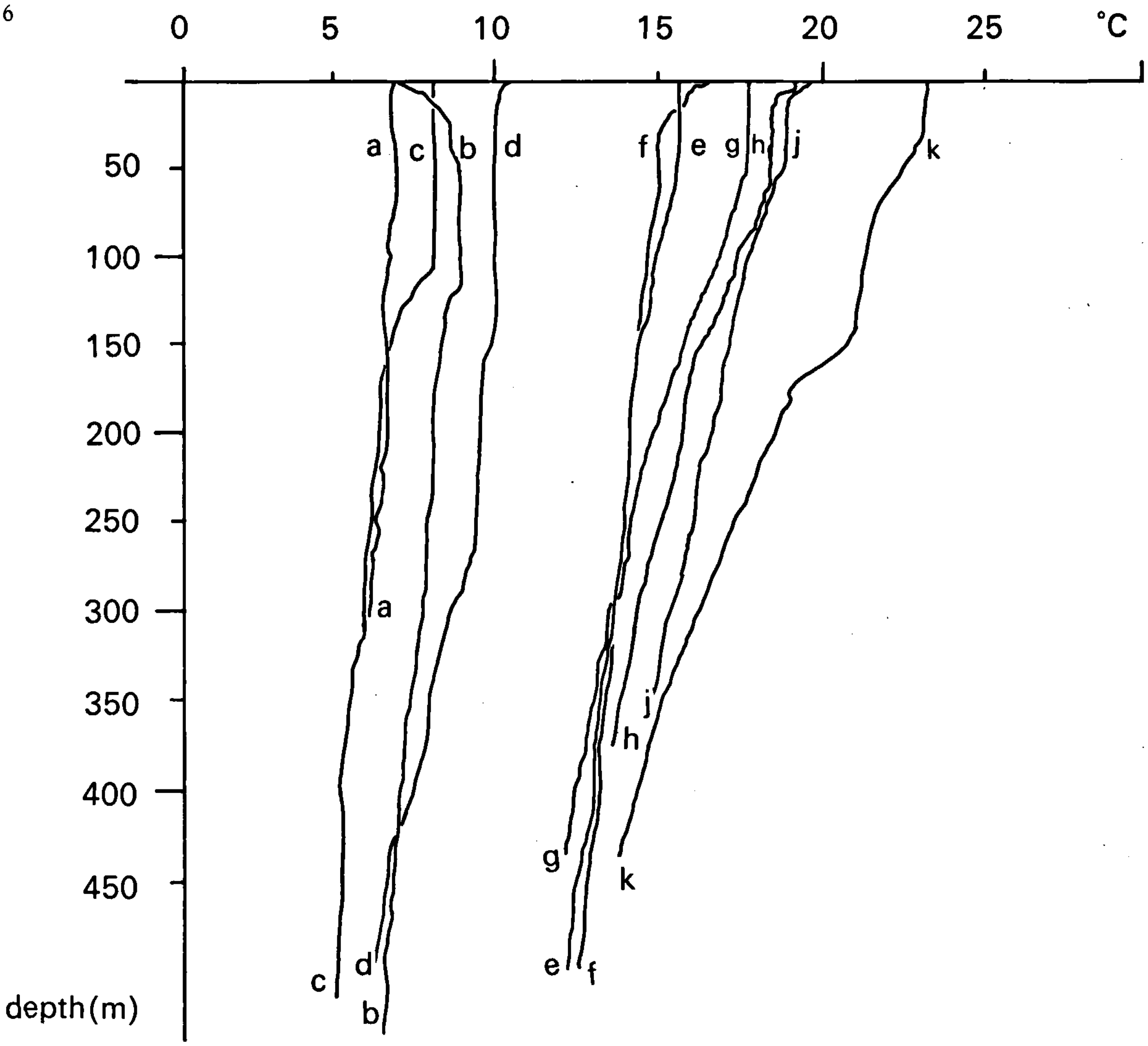

Fig. 5 - Ten temperature curves from XBTs taken at the most characteristic localities.
a) 53°14'N 30°02'W, 15-IV-1980, 08.35 h., near stat. 11; isothermal Subarctic Waters;
b) 53°00'N 29°56'W, 15-IV-1980, 11.30 h., stat. 11; in thermal front;
c) 51°40'N 30°02'W, 16-IV-1980, 05.30 h., stat. 12; with cold surface layer;
d) 50° 27'N 30°06'W, 16-IV-1980, 14.35 h., between stats 12 and 13; surface layers still isothermal;
e) 42°21'N 34°36'W, 20-IV-1980, 05.35 h., near stat. 16; surface layers still isothermal;
f) 41°32'N 34°55'W, 20-IV-1980, 20.30 h., stat. 16; influence of North Atlantic Current, southern branches;
g) 36°01'N 32°41'W, 25-IV-1980, 08.30 h., near stat. 20; surface layers still isothermal;
h) 34°01'N 30°44'W, 26-IV-1980, 16.00 h., stat. 21; developing shallow thermocline;
j) 32°14'N 29°59'W, 27-IV-1980, 16.05 h., stat. 22; with surface water thermocline;
k) 25°00'N 30°00'W, 01-V-1980, 05.45 h., stat. 26; with deeper thermoclines.

53°N can be considered Subarctic Water. Near 51°N the North Atlantic Current influences the temperature profile. A southward running branch of the North Atlantic Current, found near 42°N, is bordered at its northern side by a weak thermal front. Warm Temperate Water is found between 50° and 42°N. A subtropical convergence cannot be indicated. The North Atlantic Central Water reaches 38°N. The Sargasso Sea Water is considered to occur between 27° and 40°N. South of 27°N the influence of the Canary Current Water is traceable.

Below a depth of 500 m the Antarctic and Arctic Intermediate Waters are found. The rising of the 34.9 ‰ isohaline near 36°N probably indicates the presence of a tongue of Antarctic Intermediate Water. A core of Mediterranean Water, expected at depths of 300-1000 m, is not found, though between 38° and 42°N the isotherm bent downwards, probably due to this water mass. The high salinity core at moderate depth between 43° and 51°N is too large to be considered to represent Mediterranean Water.

In fig. 1b the thermoclines visible in XBT curves are indicated by dotted lines. Below, both the North Atlantic Current-north and -south branch thermoclines are visible. In the North Atlantic Central Water surface layers show the spring development of a thermocline south of 35°N, while south of 29°N a probably constant thermocline at 150 m depth is found below a newly developing one at ca 50 m depth.

Test station 9 was made in water mass of 10°C, isothermal to a depth of 400 m, probably the North Atlantic Current is found near this locality. The conditions of test station 27 in the Canary Current do not differ essentially from those at station 26.

A few simple Secchi-disc readings were made with a white disc with a diameter of 91 cm. The results are given in table II.

ACKNOWLEDGEMENTS

The author, who was responsible for the expedition, expresses his sincere thanks to the Royal Dutch Navy for help during the organisation and more especially to commander and crew of the ocean research vessel H.M.S. "Tydeman", for their never-failing efforts during the cruise. The technical advice and the final supplying of the fishing gear by the Institute of Oceanographic Sciences, Godalming, Great Britain, were of basic importance and deeply felt gratitude is expressed to the staff of the I.O.S. for this kind assistance.

LITERATURE

BAKER, A. de C., M.R. CLARKE & M.J. HARRIS, 1973. The N.I.O. combination net (RMT1+8) and further developments of rectangular midwater trawls.- J. mar. biol. Ass. U.K., 53: 167-184.

HEYMAN, R., in press. Narcotisation, fixation and preservation experiments with marine zooplankton.- Versl. techn. Geg. ITZ (AMNAPE, Proj. 101A, rep. no. 2).

ROE, H.S.J., A. de C. BAKER, R.M. CARSON, R. WILD & D.M. SHALE, 1980. Behaviour of the Institute of Oceanographic Science's rectangular midwater trawls: Theoretical aspects and experimental observations.- Mar. Biol., 56: 247-259.

Prof. Dr. S. van der Spoel,
Instituut voor Taxonomische Zoölogie,
Plantage Middenlaan 53,
1018 DC Amsterdam,
The Netherlands.

received : 13.XI.1980.
mailed : 20.II.1981.

Table I. Station list

date - day, month
position - the geographic position at the beginning of each haul
aver. crse - the average course of the ship during the haul
haul in min./km - the duration in minutes and the distance towed.in kilometres during the haul
at surface: temp./sal. - the temperature (in °C) and the salinity (in $^{\circ}/_{\circ\circ}$) at the start of the haul at the sea surface
temp. depth - the average temperature (in °C) over the depth sampled
gear - R18 = Rectangular Midwater Trawl RMT1+8; R01 = Open Rectangular Midwater Trawl RMT1; RNR = Open Ringnet with RMT1 liner; RDD = Open double Ringnet; RNO = Open Ringnet; 000 = collected by hand
period - D = day; D-N = dusk; N = night; N-D = dawn

st.	haul	date 1980	position N:	W:	aver. crse	depth in m	haul min.	in km	time start	at surface temp.	sal.	temp. depth	gear	period
9	1	11.4	52°22.9'	17°49.6'	-	-	1	0	11.00	10.40	35.40	10.40	R18	D
9	8	12.4	52°38.8'	19°11.9'	200	120-350	51	-	16.35	10.10	35.34	-	R18	D
10	1	14.4	54°57.4'	30°00.0'	150	390-510	60	4.45	10.16	06.00	34.87	05.12	R18	D
10	2	14.4	54°53.9'	29°55.8'	213	0-50	60	2.09	12.00	06.00	34.87	07.00	R01	D
10	3	14.4	54°54.0'	30°32.3'	161	480-1010	60	3.91	14.25	06.10	34.87	04.45	R18	D
10	4	14.4	54°51.4'	30°29.0'	210	0-50	62	2.87	16.48	06.50	34.83	07.00	RNO	D
10	5	14.4	54°44.9'	29°56.4'	180	265-400	56	5.17	18.53	06.60	34.82	05.95	R18	D
10	7	14.4	54°43.1'	29°58.9'	268	0-170	80	3.95	22.20	06.60	34.84	07.00	R01	N
11	1	15.4	53°00.8'	29°58.1'	112	290-995	110	6.93	10.36	06.50	34.71	05.00	R18	D
11	2	15.4	53°01.3'	29°51.1'	358	92-210	60	3.55	14.35	06.50	34.67	06.50	R18	D
11	3	15.4	53°04.6'	29°51.8'	340	190-302	60	3.91	16.38	06.50	34.76	06.50	R18	D
11	4	15.4	53°08.1'	29°53.9'	360	40-100	60	3.64	18.29	06.50	34.76	06.90	R18	D
11	6	15.4	53°10.3'	29°54.8'	180	0-50	52	2.89	19.53	06.50	34.73	08.00	RNO	D-N
11	7	15.4	53°08.2'	29°55.5'	180	0-50	69	4.47	20.50	06.50	34.73	08.00	R01	D-N
12	1	16.4	50°58.6'	30°00.4'	178	0-60	63	4.09	08.57	10.10	35.28	11.00	R01	D
12	3	16.4	50°57.2'	30°01.2'	180	0-50	60	3.52	10.00	10.20	35.26	11.00	RNO	D
12	4	16.4	50°54.5'	30°02.3'	180	0-170	60	3.52	11.00	10.20	35.24	11.00	R01	D
13	1	16.4	48°58.9'	30°01.3'	95	40-100	60	4.90	22.53	10.80	35.36	10.90	R18	N
13	2	17.4	49°01.1'	30°00.6'	95	130-220	60	4.81	00.31	10.90	35.40	10.90	R18	N
13	3	17.4	49°00.9'	29°42.7'	100	215-310	60	3.91	02.27	10.60	35.32	10.85	R18	N
13	4	17.4	48°59.8'	29°35.1'	100	310-400	60	3.28	04.26	10.50	35.35	10.25	R18	N
13	6	17.4	49°00.7'	29°31.0'	95	375-500	60	4.27	06.26	10.60	35.36	09.20	R18	N-D
13	9	17.4	49°00.8'	29°18.5'	73	480-1005	98	8.47	08.29	11.20	35.40	06.70	R18	D
13	10	17.4	49°04.5'	29°07.0'	240	0-50	60	3.34	11.00	11.30	35.45	11.00	R01	D
13	11	17.4	49°03.8'	29°08.9'	240	0-50	60	3.71	12.10	11.40	35.46	11.00	RNO	D
14	1	18.4	45°02.8'	29°59.3'	35	375-500	60	4.09	13.14	12.50	35.72	11.87	R18	D
14	2	18.4	45°07.6'	29°54.3'	60	205-300	60	4.54	16.33	12.50	35.74	12.70	R18	D
14	3	18.4	45°10.2'	29°50.5'	29	280-410	59	3.91	18.34	12.50	35.74	12.35	R18	D
14	4	18.4	45°10.5'	29°50.5'	30	0-50	70	2.38	18.40	12.50	35.74	13.00	RNO	D
14	5	18.4	45°15.0'	29°50.0'	30	430-1000	123	9.17	20.54	12.60	35.74	09.00	R18	D-N
14	8	19.4	45°21.8'	29°46.4'	65	85-200	102	6.40	00.07	12.70	35.60	13.00	R18	N
14	9	19.4	45°21.8'	29°46.4'	60	0-50	58	2.69	00.07	12.70	35.60	13.00	R01	N
14	10	19.4	45°24.1'	29°40.6'	60	50-100	60	4.00	02.30	12.70	35.61	13.50	R18	N
15	1	19.4	43°37.7'	32°21.1'	225	0-50	62	3.64	16.59	14.30	35.78	14.00	RNO	D
15	2	19.4	43°33.4'	32°27.2'	223	0-170	64	4.15	18.06	14.30	35.79	14.00	R01	D
16	1	20.4	41°56.4'	35°00.7'	208	90-200	60	4.36	08.29	15.40	35.99	15.35	R18	D
16	2	20.4	41°51.8'	35°02.4'	177	285-400	60	3.82	10.51	15.30	35.94	14.20	R18	D
16	3	20.4	41°47.8'	35°02.8'	160	490-1000	120	7.73	13.05	15.60	35.98	09.85	R18	D
16	4	20.4	41°39.1'	34°59.1'	164	365-495	60	3.64	16.48	16.00	35.95	13.35	R18	D
16	5	20.4	41°35.4'	34°57.2'	164	190-300	60	3.72	18.49	15.60	35.89	14.15	R18	D
16	6	20.4	41°31.6'	34°55.9'	190	45-100	73	4.45	20.47	15.90	35.94	15.15	R18	D-N
16	9	20.4	41°35.9'	34°57.5'	165	0-50	65	3.41	18.35	15.60	35.89	16.00	RNO	D
16	10	20.4	41°31.4'	34°55.9'	215	0-2	30	1.48	20.55	15.90	35.94	16.00	RNO	D-N
16	11	20.4	41°31.7'	34°55.8'	215	0-50	60	2.96	20.42	15.90	35.94	15.90	R01	D-N
17	1	21.4	41°01.4'	35°31.3'	360	45-95	117	7.64	01.55	15.70	35.93	15.45	R18	N
17	2	21.4	41°10.6'	35°30.9'	5	330-505	60	3.82	04.48	15.80	35.93	12.75	R18	N
17	3	21.4	41°15.8'	35°31.5'	50	200-300	60	3.19	06.41	15.60	35.89	14.70	R18	N-D
17	4	21.4	40°54.6'	35°54.8'	70	95-190	61	4.27	11.06	14.90	35.83	14.70	R18	D
17	5	21.4	40°54.4'	35°55.1'	70	0-50	60	2.59	11.00	14.90	35.83	14.90	R01	D
17	8	21.4	41°02.0'	35°49.1'	217	0-1	1	0.01	10.00	14.90	35.83	14.60	000	D
18	1	22.4	39°58.5'	36°24.9'	135	520-1130	94	6.40	00.15	16.40	36.19	09.50	R18	N
18	2	22.4	39°52.2'	36°18.1'	170	265-430	58	4.72	03.43	16.40	36.14	14.00	R18	N
18	3	22.4	39°53.6'	36°18.7'	170	0-50	60	3.15	03.08	16.40	36.14	16.50	RNO	N
18	4	22.4	39°47.2'	36°16.1'	150	110-205	60	3.55	05.28	16.40	36.14	16.50	R18	N
18	5	22.4	39°47.3'	36°16.2'	130	0-50	65	2.61	05.25	16.40	36.14	16.50	RNR	N

continued overleaf

Table I (continued)

st.	haul	date 1980	position N:	W:	aver. crse	depth in m	haul min.	in km	time start	at surface temp.	sal.	temp. depth	gear	period
18	6	22.4	39°45.2'	36°13.1'	65	50-100	52	3.20	07.08	16.50	36.19	16.65	R18	N-D
18	7	22.4	39°47.8'	36°07.9'	36	360-470	60	3.55	08.48	16.50	36.17	13.50	R18	D
18	8	22.4	39°50.7'	36°03.7'	65	200-325	48	3.02	10.43	16.00	36.09	15.00	R18	D
18	10	22.4	39°53.9'	35°58.9'	55	440-910	118	7.19	12.54	16.00	36.09	10.40	R18	D
18	11	22.4	39°57.7'	35°50.8'	55	20-100	46	2.66	16.01	16.00	36.08	16.05	R18	D
18	13	22.4	39°59.8'	35°47.2'	53	420-510	60	3.28	17.38	16.00	36.08	13.30	R18	D
19	1	23.4	38°00.6'	35°29.7'	288	190-320	60	3.64	05.30	16.50	36.07	15.35	R18	N
19	2	23.4	38°00.6'	35°29.7'	288	0-50	60	3.15	05.30	16.50	36.07	16.50	RNO	N
19	4	23.4	38°00.9'	35.39.3'	325	290-400	60	4.00	11.13	16.40	36.07	14.10	R18	D
19	5	23.4	38°00.8'	35°38.9'	325	0-50	68	3.99	11.00	16.40	36.04	16.50	RNR	D
19	6	23.4	38°05.1'	35°44.9'	330	370-495	58	4.09	13.27	16.50	36.05	13.20	R18	D
19	7	23.4	38°09.5'	35°53.3'	320	0-100	11	0.14	18.10	16.70	35.98	16.50	RDD	D
19	13	24.4	38°00.1'	35°26.9'	40	100-200	60	4.09	09.12	16.50	36.12	16.20	R18	D
19	19	24.4	37°53.7'	35°17.7'	150	50-110	60	3.73	13.49	16.40	36.03	16.40	R18	D
19	22	24.4	37°48.5'	35°17.4'	135	500-1000	100	5.68	16.06	16.50	35.99	10.25	R18	D
20	1	25.4	35°27.2'	31°51.6'	126	505-870	79	4.88	13.54	17.40	36.02	10.50	R18	D
20	2	25.4	35°26.3'	31°49.3'	126	0-2	30	1.58	14.45	17.40	36.08	17.40	RNO	D
20	3	25.4	35°22.7'	31°44.9'	123	770-1250	94	5.68	17.41	17.70	36.07	08.25	R18	D
20	4	25.4	35°18.1'	31°36.7'	133	320-530	81	5.60	21.18	17.70	36.06	12.50	R18	D-N
20	8	26.4	35°14.0'	31°32.5'	135	205-305	61	3.73	00.03	17.70	36.10	14.05	R18	N
20	10	26.4	35°11.0'	31°29.2'	338	100-200	60	3.37	02.14	17.70	36.14	15.55	R18	N
20	11	26.4	35°11.3'	31°29.3'	338	0-50	60	3.34	02.25	17.70	36.13	17.50	RNO	N
20	12	26.4	35°14.4'	31°31.6'	338	40-110	61	3.91	04.21	17.60	36.07	17.20	R18	N
20	13	26.4	35°13.2'	31°30.5'	338	0-50	60	2.22	03.35	17.70	36.09	17.50	RNR	N
21	1	26.4	34°07.6'	30°43.1'	79	50-110	106	6.93	13.42	18.60	36.15	17.65	R18	D
21	2	26.4	33°56.5'	30°43.0'	179	200-295	120	7.64	18.32	18.80	36.13	15.35	R18	D-N
21	3	26.4	33°47.3'	30°41.8'	180	390-530	60	3.91	21.46	19.00	36.36	13.30	R18	N
21	6	27.4	33°40.5'	30.40.6'	180	510-1000	112	8.37	00.15	18.80	36.38	10.60	R18	N
21	7	26.4	33°41.9'	30°40.9'	180	0-50	64	4.94	23.44	18.80	36.38	18.00	RNO	N
21	8	27.4	33°38.3'	30°40.2'	180	0-50	60	2.96	01.05	18.80	36.38	18.00	RNR	N
21	9	27.4	33°30.7'	30°39.3'	180	105-200	60	3.37	04.03	18.70	36.40	16.45	R18	N
21	10	27.4	33°26.1'	30°38.1'	158	300-400	59	3.64	06.02	18.60	36.36	15.20	R18	N-D
22	1	27.4	32°19.0'	30°03.1'	150	500-1000	122	7.46	13.45	18.60	36.15	10.50	R18	D
22	2	27.4	32°11.4'	29°56.4'	149	360-520	60	3.73	17.18	19.30	36.25	13.70	R18	D
22	3	27.4	32°11.9'	29°56.9'	150	0-60	49	3.18	16.55	19.30	36.27	19.00	RNR	D
22	4	27.4	32°10.3'	29°55.4'	150	0-50	70	3.46	17.50	19.30	36.27	19.20	RNR	D
22	5	27.4	32°07.3'	29°54.5'	179	295-405	60	3.28	19.43	19.60	36.39	15.20	R18	D-N
22	6	27.4	32°04.1'	29°54.0'	179	195-300	120	8.18	21.35	19.50	36.39	15.95	R18	N
22	7	28.4	31°58.2'	29°54.0'	80	90-200	120	7.46	00.19	19.50	36.47	17.85	R18	N
22	8	28.4	31°58.1'	29°53.9'	57	0-50	69	3.84	00.22	19.40	36.47	19.20	RNO	N
22	9	28.4	31°55.9'	29°52.2'	210	45-100	116	6.47	03.04	19.30	36.46	19.05	R18	N
23	2	28.4	30°39.9'	29°59.5'	179	505-960	123	5.93	13.15	19.80	36.63	11.00	R18	D
23	3	28.4	30°32.4'	30°00.6'	170	385-500	119	5.48	16.51	20.20	36.70	13.90	R18	D
23	4	28.4	30°33.5'	30°00.8'	165	0-50	60	5.00	16.23	20.20	36.70	20.50	RNR	D
24	1	29.4	29°53.7'	29°57.1'	174	45-100	120	6.74	00.32	20.10	36.64	19.50	R18	N
24	2	29.4	29°48.1'	29°57.5'	189	110-205	59	2.92	03.05	20.00	36.65	18.15	R18	N
24	3	29.4	29°44.0'	29°57.7'	160	200-300	120	8.00	05.00	20.00	36.63	16.25	R18	N-D
24	4	29.4	29°44.8'	29°58.1'	154	0-50	66	5.71	04.41	20.00	36.94	20.70	RNO	N
24	5	29.4	29°37.2'	29°56.3'	180	290-400	85	4.88	08.20	19.80	36.65	14.80	R18	D
25	1	29.4	28°42.0'	29°59.1'	180	490-1000	116	7.28	16.00	21.30	37.02	10.50	R18	D
25	3	29.4	28°34.7'	29°58.1'	179	390-500	60	3.37	19.39	21.30	37.10	14.10	R18	D-N
25	4	29.4	28°30.6'	29°57.2'	179	290-405	60	3.10	21.46	21.30	37.02	15.65	R18	N
25	5	29.4	28°31.0'	29°57.3'	180	0-50	63	4.09	21.30	21.30	37.02	21.20	RNR	N
25	6	29.4	28°27.2'	29°56.5'	182	195-300	60	3.46	23.32	21.30	37.02	17.05	R18	N
25	7	30.4	28°23.5'	29°55.9'	186	40-100	60	3.73	01.25	21.30	37.06	21.20	R18	N
25	8	30.4	28°24.2'	29°56.0'	183	0-50	60	3.71	01.50	21.40	37.05	21.20	RNO	N
25	9	30.4	28°20.0'	29°55.8'	194	100-200	88	4.07	03.16	21.30	37.08	19.90	R18	N
26	1	01.5	24°57.9'	29°59.1'	180	200-450	85	5.60	07.17	22.90	37.25	16.10	R18	N-D
26	2	01.5	24°59.0'	29°59.7'	180	0-50	64	2.96	06.27	22.90	37.24	22.50	RNO	N-D
26	4	01.5	24°52.0'	29°59.5'	179	510-1090	120	7.19	10.04	22.90	37.25	09.80	R18	D
26	5	01.5	24°53.0'	29°59.4'	185	0-50	63	4.28	09.34	22.90	37.25	22.50	RNR	D
26	7	01.5	24°50.5'	29°59.8'	180	0-2	28	1.47	11.38	23.10	37.19	22.50	RNO	D
26	8	01.5	24°44.9'	30°00.6'	220	300-500	236	14.38	13.59	23.20	37.12	15.10	R18	D
26	9	01.5	24°42.3'	30°01.4'	270	0-50	90	4.45	15.20	23.30	37.11	22.50	RNR	D
26	10	01.5	24°44.9'	30°08.3'	30	95-200	62	3.82	18.42	23.60	37.15	20.05	R18	D
26	11	01.5	24°47.9'	30°07.6'	336	55-100	74	4.35	20.18	23.30	37.14	21.45	R18	D-N
26	13	01.5	24°48.0'	30°07.6'	337	0-50	70	3.68	20.20	23.30	37.14	22.50	RNO	D-N

continued overleaf

Table I (continued)

st.	haul	date 1980	position N:	W:	aver. crse	depth in m	haul min.	in km	time start.	at surface temp.	sal.	temp. depth	gear	period
27	2	02.5	24°48.7'	28°35.3'	289	180-300	60	4.27	06.22	22.50	37.13	16.95	R18	N-D
27	3	02.5	24°48.7'	28°34.8'	289	0-50	67	1.86	06.10	22.50	37.12	22.20	RNO	N-D
27	6	02.5	24°48.3'	28°41.8'	289	290-400	120	7.82	08.35	22.60	37.17	15.00	R18	D
27	7	02.5	24°48.4'	28°40.8'	290	0-50	62	2.87	08.18	22.60	37.17	22.20	RNR	D
27	10	02.5	24°48.6'	28°47.2'	70	475-1000	145	8.97	12.18	22.30	37.22	10.35	R18	D
27	17	02.5	24°51.7'	28°40.4'	70	400-500	60	3.37	16.12	22.80	37.09	13.80	R18	D
27	20	02.5	24°53.6'	28°37.3'	360	100-195	60	4.09	18.02	22.90	37.03	19.35	R18	D
27	21	02.5	24°53.4'	28°37.3'	360	0-50	64	2.77	17.55	22.90	37.02	22.50	RNR	D
27	23	02.5	24°56.3'	28°37.6'	357	45-100	102	6.76	19.40	22.80	37.06	21.35	R18	D-N
27	24	02.5	24°56.3'	28°37.6'	359	0-50	57	2.29	19.39	22.80	37.06	22.50	RNO	D-N

Table II: Secchi disc readings (white, ϕ 91 cm)

date	time	depth in m	position N	W
15-IV-1980	09.45	22	53°00.1'	30°00.2'
17-IV-1980	15.00	33	49°01.9'	29°11.8'
18-IV-1980	15.00	20	45°05.7'	29°58.1'
20-IV-1980	10.00	22	41°35.2'	35°02.2'
26-IV-1980	16.15	41	34°00.9'	30°43.5'
27-IV-1980	19.00	28	32°08.3'	29°54.7'
28-IV-1980	12.00	47	30°41.5'	29°58.8'
29-IV-1980	15.05	43	28°43.5'	29°59.5'
01- V-1980	13.15	40	24°46.0'	30°00.4'
02- V-1980	15.30	39	24°51.1'	28°41.2'